Office of the Treasurer and Director of Asset Management

UNIVERSITY OF MINNESOTA

Vice President for Finance and Operations
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Minneapolis, Minnesota 55455
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December 13, 1990

TO: Warren Ibele

FROM: Roger Paschke

RE: Steam Plant Recommendation

Enclosed is the report and recommendation on steam service alternatives for the Twin Cities Campus. We would very much appreciate a review and comment on this report by the Senate Consultative Committee. Please call me at 5-4555 to discuss.

RP:pl

Enc.

cc: Gus Donhowe

UNIVERSITY OF MINNESOTA

REPORT AND RECOMMENDATION ON ALTERNATIVES FOR STEAM SERVICE TO THE TWIN CITIES CAMPUS

DECEMBER 10, 1990

UNIVERSITY OF MINNESOTA

REPORT AND RECOMMENDATION

ON

ALTERNATIVES FOR STEAM SERVICE

TO THE

TWIN CITIES CAMPUS

December 10, 1990

PREFACE

The Report and Recommendation on Alternatives for Steam Service to the Twin Cities Campus is presented to the Regents of the University of Minnesota on December 14, 1990. The report is based on the work and analysis of the Utilities Committee from September of 1989 to December of 1990, as directed by Senior Vice President for Finance and Operations G. M. Donhowe. The work of the Committee was facilitated by the University of Minnesota Office of Physical Plant, Office of Physical Planning, the Attorney's Office, the Treasurer's Office, and the University's Building Energy Efficiency Project, and by the GAMMA Institute, O'Neill, Burke, O'Neill, Leonard and O'Brien, Ltd., Orr-Schelen-Mayeron & Associates, Piper, Jaffray & Hopwood, and Dr. William Nordhaus. The University also recognizes the participation and assistance in this process of Diversified Energies, Inc., Foster Wheeler Power Systems, Northern States Power Company, and PSI Investments, Inc.

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I. EXECUTIVE SUMMARY

BACKGROUND

The 1989 Sirrine Report on University Utilities inventoried the University heating plants. The Report described an aging and overloaded system in need of major repairs and requiring major capital expenditures to continue as a reliable system. Sirrine examined 17 different options for various types of plants and recommended that the University either build a new plant at a cost of approximately $170 million, or explore opportunities for purchasing steam from a private party steam supplier.

Many of the major buildings in downtown Minneapolis and St. Paul, as well as many major cities and universities throughout the U.S., purchase their steam rather than producing it themselves. There are many advantages to using an independent steam supplier, including:

- o avoidance of large capital expenditures
- o avoidance of the risks associated with the ownership, management and operation of steam production facilities
- o specialized expertise of a steam supplier in providing reliable steam service

During late 1989 and 1990, the University, through the Utilities Committee, conducted a national search for companies with the experience and ability to own and operate large scale heating plants.[1] Over 300 firms received mailings about the University's Request for Qualifications ("RFQ"). One hundred firms received the RFQ. Twenty firms attended an informational meeting held in

[1]In 1989 the University created a Utilities Committee composed of University staff and outside advisors. The Committee's charge was to explore various steam service alternatives especially the option of a third party steam supplier.

Minneapolis in January 1990 and eighteen firms submitted their qualifications. All were corporations with substantial experience and credibility.

Eight firms were finally identified as "Qualified Proponents," meeting the minimum financial and engineering qualifications.[2] The University's Request for Proposal (RFP) was issued soliciting proposals to provide steam service. The four firms that ultimately submitted proposals are:

Diversified Energies, Inc. (DEI)
Foster Wheeler Power Systems, Inc. (Foster Wheeler)
Northern States Power Company (NSP)
PSI Power Resource Operations (PSI)

During the summer and fall of 1990, as the four parties prepared their proposals, key members of the University Physical Plant Department, Planning Office, and Office of Architecture and Engineering analyzed internal options for continuing steam service in the event an independent steam supplier was not selected. This "Internal Option," represents an elaboration of the Sirrine recommendation for a new plant. The Internal Option was thoroughly considered as an alternative to the four external proponents.

[2]These firms are identified in Section IV Financial and Technical Qualifications.

MAJOR FEATURES OF PROPOSALS

The major features of the proposals are summarized as follows:

	Anticipated Fuel Mix[3]	Total Capital Expenditures (in Millions of Dollars)	Location of Facilities
DEI	Gas(90%)/Oil(10%)	$71MM	Southeast or new location and St. Paul
FW	Coal(80%)/Gas(20%)	$103MM	Southeast, Main and St. Paul
NSP	Coal(90%)/Gas(10%)	$45MM	Southeast, Main and St. Paul ($6.5 MM) --connecting lines to High Bridge and MMC ($38.5 MM)
PSI	Coal(89%)/Gas(9%)/ Oil(2%)	$30MM (est.)	Southeast, Main and St. Paul
UofM	Coal(90%)/Gas(9%)/ Oil(1%)	$153MM	Southeast, Main and St. Paul until year 10; then new location

Each of the proposals is reviewed and discussed in detail in Section VII Engineering and Technical Evaluation of this report.

CRITERIA FOR EVALUATION

As stated in the RFQ and in the RFP, four basic criteria served as the starting point for the evaluation of the four proposals and the Internal Option. Many other related factors set out in the RFP were also considered during the evaluation process.

[3]This column reflects fuel mix assumptions in base case scenario, subject to change.

A comprehensive consideration of all of these factors and the information presented during the evaluation process has lead to the recommendation contained in this report.

Price--The 25 year life cycle cost in present value terms.

The analysis of present value of costs over the entire 25 year life cycle of the project (Graph I) indicates that of the external alternatives, the DEI proposal has the lowest total life cycle cost. As Graph I-A shows, the present value of the DEI proposal is $329.1 million. DEI's proposal is followed by NSP at $347.7 million, Foster Wheeler at $397.9 million for its taxable option and $356.4 for its tax-exempt option, and PSI at $410.1 million. The Internal Option has overall the lowest life cycle cost at $288.8 million. As addressed more thoroughly in this report, however, if the Internal Option is pursued, the University will retain the substantial risks associated with owning, managing and operating steam production facilities.

Variability of Price--A price which is stable and less subject to change due to price increases, inefficient operations, etc.

As set out on Graph II, 58% of DEI's total costs to the University are guaranteed. This includes a 15 year guarantee of the price and supply of fuel, a 25 year guarantee of the transportation costs for natural gas, and a guarantee of the costs of installed capital equipment for the 25 year life cycle. The Foster Wheeler proposal also guarantees or indexes 80% of the costs. This means that costs can only go up in relation to an inflation benchmark outside of the proponent's control. The NSP proposal guarantees about 31% of the costs. The remaining 69% are neither guaranteed nor indexed. The PSI proposal indexes over 90% of the costs. Since all risks are retained under the Internal

Option, there are neithers guarantees nor indexing of costs. Consequently, the Internal Option results in the highest degree of potential price variability.

Eight different fuel price scenarios were used to determine the variability of present value life cycle costs. The results are set forth in Section VI Financial and Economic Evaluation. DEI was the lowest cost of the external alternatives in six of the eight scenarios, including the Base Case Scenario. Overall, NSP had the second lowest costs, followed by Foster Wheeler and PSI. Although the Internal Option generally ranked lowest in the various scenarios, the lack of any guarantees or indexing of costs necessarily results in the highest degree of risk.

Reliability--A system with 100% reliability in meeting the University's steam needs.

All the proposals and the Internal Option can be considered to have a great deal of reliability. The proposals with the greatest amount of new boiler construction, however, were considered to be more reliable than those with little or no construction. The DEI proposal provides for a fully renovated Southeast Plant.[4] Foster Wheeler also provides for a very high degree of reliability through substantial capital investments. The capital investments are reflected in the relatively high cost of the Foster Wheeler proposal. DEI and Foster Wheeler were considered to provide greater reliability than the other proponents.

[4]DEI has also proposed to construct a new gas-fired plant located between the campuses.

NSP does not provide for new boiler construction but rather constructs steam transmission lines connected to NSP's High Bridge Plant and the Metropolitan Medical Center steam production facility. Almost all on-campus boilers would be at least 40 years old by the end of the 25 year contract. The age of the boilers raises concerns regarding reliability as the end of the 25 year term is approached. It also raises concerns regarding the capital investment necessary to replace the aged facilities.

The PSI proposal involves some new boiler construction after approximately 10 years. Most boiler capacity, however, would be approximately 40-50 years in age by the end of the 25 year contract. This again raises concerns regarding long-term reliability.

The Internal Option provides for a single new coal based plant serving both the Minneapolis and St. Paul campuses within 10 years. The Internal Option as with DEI and Foster Wheeler, also provides a high degree of reliability. There are issues, however, pertaining to siting, permitting, and the cost of a new coal plant which affect the feasibility of implementing the Internal Option.

Flexibility--The ability to grow and continue to receive reliable steam service at an economical price, and at the same time benefit from cost savings associated with conservation.

Growth resulting in the need for increased steam capacity translates into increased costs. All of the proponents indicated that it would be necessary to renegotiate the price of steam in the event additional capital investment was needed for increased capacity. The pricing structure proposed by all proponents,

however, would allow for cost savings to be passed onto the University when steam consumption is reduced.

It is clearly in the University's best interest to have considerable flexibility at the end of the 25 year term. As noted in regard to the issue of reliability, the proposals of NSP and PSI leave the University with far less flexibility at the end of the 25 year term. The relative age of the facilities will demand replacement which necessarily means major capital investments. DEI's and Foster Wheeler's proposals, however, provide greater flexibility because the University may continue to operate under a third party steam supplier arrangement, or it may choose to resume management and operation of its steam production facilities without facing major capital expenditures.

Many other factors were considered in the evaluation of the four external proposals and the Internal Option. Among those factors considered were:

- financial condition of proponent
- operating experience of proponent
- overall project viability
- public acceptability
- facility residual value
- impact on existing University employees

- o location and configuration of steam production facilities
- o fuel type, supply and diversity

On balance, consideration of all the factors considered in the evaluation process provides substantial support for the recommendation contained in this report.

ENVIRONMENTAL CONSIDERATIONS

The University is faced with the decision of how to provide for its future steam requirements. This decision presents a unique opportunity. The University is in a position to make a real contribution toward improving the environment and becoming a better neighbor to those who live near the campus. This report concludes that the University should seize this opportunity.

From the standpoint of the environment, there are very real differences in the manner used to meet the University's energy needs. In the past, the University has employed coal as the primary fuel for meeting its steam needs. Unfortunately, there are significant adverse environmental consequences associated with continuing to use coal in the existing heating plants. First, the burning of coal contributes to the deterioration of the quality of our air. There is also the matter of fugitive dust which has been a persistent problem on the St. Paul campus. Coal ash disposal

requires special treatment. The University is currently faced with finding a new and expensive disposal site. Finally, there is the unsightliness of having the campus's landscape dominated by the presence of coal piles, stacks and large production facilities.

The proposal submitted by DEI offers a real option. By turning to natural gas as the principal fuel, the University can achieve significant reductions in air emissions. As Graph I-3 demonstrates, the largest reduction in air emissions occurs under DEI's proposal. The problem with finding expensive new ash disposal sites is eliminated under the DEI proposal. The fugitive coal dust also disappears to the benefit of our neighbors. Finally, the campus's landscape is improved with the elimination of the coal piles.

Based upon an environmental assessment of each of the proposals, the DEI option does offer the University that opportunity to take an affirmative step to improve the environment and become a better leader. The presence of this opportunity clearly supports the recommendation contained in this report.

RECOMMENDATION

The competition among the external proponents and Internal Option has been intense and has yielded creative proposals which

all have merit. Each of the proposals and Internal Option have been critically evaluated with the goal of making a recommendation that will best serve the University of Minnesota. All of the information presented in the proposals, by the proponents and information provided by the experts has been considered. Based upon an evaluation which spanned nearly one and one-half years, the Senior Vice President for Finance and Operations and the Utilities Committee make the following recommendation:

The University of Minnesota should commence the negotiation of a definitive Steam Service Agreement with Diversified Energies, Inc. ("DEI") which will provide the University with 100% of its steam requirements for the Twin Cities Campus. If negotiations do not result in an agreement satisfactory to the University, then it is recommended that the University pursue the Internal Option.

DEI PROPOSAL

The Diversified Energies, Inc. plan would convert the University facilities to an all natural gas/oil operation. Use of coal would be discontinued after approximately one year. The University's Minneapolis Main steam plant would be closed. Heating

operations would be conducted from a rennovated Southeast plant.[5] The St. Paul Plant would also be converted to natural gas/oil. While natural gas is more expensive than coal, the cost of building and operating natural gas facilities is significantly less in the foreseeable future.

DEI has merged with Arkla, Inc., a major publicly owned natural gas exploration and distribution company effective November 29, 1990. DEI and Arkla have a combined pro forma shareholders' equity of approximately $1.3 billion. Arkla's senior debt obligations are rated A- by Standard & Poor's Corporation.

In addition to other businesses, DEI also operates the downtown Minneapolis district heating system through its wholly owned subsidiary, Minneapolis Energy Center, Inc. The Energy Center has a reputation for providing safe, reliable, and economical steam to much of downtown Minneapolis, including offices, apartments, sports and recreation facilities.

The DEI proposal provides low cost, price stability, high reliability, and an environmentally sound solution to meeting the University's steam requirements. The major considerations behind

[5]DEI also offered to construct a new facility on a site to the northeast of the main Minneapolis campus and remain committed to its proposed price for steam.

the DEI recommendation include:

* A simple, straightforward plan for reliable steam for the University. After the first year, DEI plans to have converted the University's coal facilities to gas/oil facilities. The Southeast Plant will be renovated, the Main Plant will be closed and the St. Paul heating plant converted to natural gas/oil.
* Improvement in Environmental Quality. The DEI proposal will result in far lower emissions than the current plants. In addition, issues of fugitive dust, ash disposal, and unsightly coal piles are eliminated. All of these environmental benefits would be achieved in the immediate future.
* Full Availability of Options. With a fully renovated facility (or the option provided by DEI to construct a new facility), the University will own all improvements at the end of the 25 year contract. Accordingly, the University at the end of this contract will have a full range of options available including the options of resuming ownership, management and operation of the facilities without the prospect of having to make major capital expenditures at the end of 25 years, or contracting for service for another term.
* Flexibility of DEI's proposal to meet the changing needs of the University. DEI's proposal provides incentives for energy conservation, which effectively coordinate

with the University's Building Energy Efficiency Project (UBEEP). DEI's natural gas fired steam option has a much lower embedded capital cost and a higher delivered fuel cost compared to a new coal fired steam plant. As a result, the greater the amount of energy conserved by the University, the greater the savings to be realized by the University relative to the coal option.

* Flexibility of Location. DEI's proposal to construct a new natural gas plant at another site as an alternative to using existing facilities provides additional benefits. It would allow the University the flexibility to place a new plant in a less conspicuous location and to eventually reclaim the riverfront now occupied by the Southeast and Main plants for other purposes. The impact on the campus environment and surrounding community would be extremely positive.

* Life cycle cost. The DEI proposal has the lowest life cycle cost of all proposals and will have a life cycle cost within 15% of the internal option.

* Price Sensitivity. Because 58% of DEI's costs are guaranteed or indexed, its overall price is relatively less sensitive to changes in labor rates, operating or maintenance costs.

* Competitive prices. DEI's estimated rate for steam in 1992 is $7.98 per thousand pounds of steam. In 1989, steam rates paid by customers of District Energy in St.

Paul were approximately $10.30 for equivalent units; customers of the Minneapolis Energy Center paid on average approximately $8.70 per thousand pounds of steam.

* Stable, predictable steam prices. DEI has structured its price so that the rate will increase slightly above the rate of inflation, or approximately 5.25% per year based upon inflation of 5% per year.

* Price Guarantees. DEI will guarantee the price and supply of fuel for 15 years and the transportation cost of fuel for 25 years. DEI will guarantee that all capital requirements to supply steam for the next 25 years will be borne by DEI.

* Capital requirements. Because DEI is guaranteeing all capital requirements for 25 years, there is no risk of project cost overruns due to inflation or delays in construction.

* Extensive Experience. DEI has decades of experience operating a large and diverse district heating system. There is no question about its ability to operate and maintain a gas/oil fueled steam plant.

* Financial Soundness. DEI and Arkla, Inc. are both financially sound with senior debt of DEI's subsidiary Minnegasco rated AA- by Standard & Poor's, and Arkla rated A-.

OTHER EXTERNAL PROPOSALS

Each of the external proposals reflected a great effort, thoughtfulness and a genuine desire to serve the University of Minnesota. Each proposal has its own merits. The DEI proposal on balance better serves the needs of the University. The proposals of Foster Wheeler, NSP and PSI present specific concerns which render their proposals unacceptable.

NSP PROPOSAL

Although NSP demonstrated the second lowest life cycle cost, the proposal provides for no new construction to the University's aging plants. Rather, connecting steam lines would be constructed between the St. Paul Campus and NSP High Bridge Plant, and the West Bank Campus and Metropolitan Medical Center facility to meet the University's demand. At the end of the 25 year contract, the average age of the boilers on campus would be 50-60 years, with questionable useful life remaining and requiring major capital expenditures. The capacity at the High Bridge and MMC facilities cannot meet all of the University's needs. These off-campus facilities as currently configured will also average at least 40 years in age after 25 years. Consequently, the University would be faced with unknown potentially major on-campus capital expenditures at the end of the term.

NSP proposes capital expenditures of $45.7 million. Only $6.5 million would be spent on-campus -- the lowest of the external proposals. Also, since NSP has guaranteed or indexed only about 35% of the total costs of providing service, the University assumes a greater risk associated with price variability and present value life cycle costs. Additionally, since NSP would be maintaining the plants essentially in their current state, a relatively slight improvement in air emissions would be realized. The University would still be faced with the problem of fugitive dust and the unsightliness of coal piles and stacks. The NSP proposal would have little positive impact on the campus and surrounding environment.

PSI PROPOSAL

The PSI proposal is similar to the NSP proposal because little new boiler capacity would be constructed. PSI would continue to operate all three plants and would add some capacity at the Southeast and St. Paul plants. By the end of the 25 years, however, the average age of the boilers would be approximately 50 years, with essentially no remaining useful life. As with NSP, significant capital would be required to maintain reliable steam service beyond year 25. Additionally, the PSI proposal has the highest life cycle costs of all the alternatives. Finally, the PSI proposal has a relatively slight improvement in air emissions and

like NSP has little positive impact on the campus and surrounding environment.

FOSTER WHEELER PROPOSAL

Unlike NSP and PSI, the Foster Wheeler proposal involves substantial new boiler construction, including three new boilers at the Southeast Plant and one new boiler at the St. Paul Plant within the first ten years of the contract. The University would have substantial installed capacity and would have a viable steam plant at the end of the 25 years. The primary concern with the Foster Wheeler proposal, however, is simply the cost. Foster Wheeler's proposal has a present value life cycle cost which totals $397.9 million, assuming taxable financing, and $356.4 million assuming tax-exempt financing. Even assuming tax exempt financing, this is over $27 million more than the cost of the DEI proposal, and over $67 million more than the Internal Option. Also, the Foster Wheeler proposal consistently ranks next to the highest in cost of the four external proposals over the range of financial and economic scenarios evaluated. Additionally, the potential difficulties with permitting substantial new coal capacity and the corresponding possibility of delays that could increase costs are a concern with the proposal.

INTERNAL OPTION

The Internal Option is a refinement of the Sirrine recommendation. It contemplates the construction of a new coal/gas/oil based plant which would burn primarily coal. The plant would be constructed on a site between, and with connecting lines to, the Minneapolis and St. Paul campuses. The existing plants would eventually be decommissioned.

The advantage of this option is that within ten years, the University would have a more efficient and highly reliable heating plant that would represent essentially a permanent solution to the University's steam needs. Additionally, the costs of such a system are somewhat lower than the DEI proposal--$288.8. million versus $329.1 million for DEI. The Internal Option is over $67.6 million lower than the next most comparable alternative, which is Foster Wheeler at $356.4 million (assuming tax-exempt financing). The lower costs primarily result from the ability of the University to borrow on a tax exempt basis.

The risks of the Internal Option, however, are many and significant. The risks include:

- The difficulties of siting a new coal plant in a new neighborhood within an increasingly environmentally conscious community.

- The difficulties of obtaining permitting for a new coal plant if regulations and clean air standards were to further tighten or to become more restrictive.
- The potential for significant cost overruns due to any delays resulting from siting and permitting issues.
- The lack of sufficient debt capacity on the part of the University to generate the approximately $153 million of total capital needed for construction.
- The potential for cost overruns resulting from construction or operating cost underestimates. Such reservations were expressed by the external proponents regarding the cost and feasibility of this option.

These are difficult issues which may not be able to be overcome. For these reasons, it is concluded that the DEI proposal overall represents the least risky, most cost effective, and most environmentally sound solution. The cost and reliability advantages, however, make the Internal Options an acceptable alternative in the event DEI negotiations are unsuccessful. Further research on the Internal Option should proceed simultaneously with negotiations with DEI in the event these negotiations are not successful.

OTHER ISSUES

The various other areas considered in arriving at the recommendation included the following:

Conservation. The conservation efforts under way through the University's Building Energy Efficiency Project (UBEEP) were carefully considered in the evaluation of all alternatives. The objective of UBEEP to reduce overall energy consumption by 30% over five years is not inconsistent with any of the proposals.

Gas vs. Coal. A major issue has been the question of gas versus coal as fuel sources. Natural gas is environmentally safe and clean compared to coal. Gas facilities are less expensive to build and operate than coal facilities. Coal is cheaper than gas and there is concern that gas prices may skyrocket or gas shortages may occur. DEI has limited much of this risk by agreeing to guarantee the price of gas to the University for the first fifteen years of the contract and to guarantee the transportation cost to the University for 25 years.

The Utilities Committee has also consulted on this issue with Dr. William Nordhaus, a specialist in energy economics. For purposes of identification, Dr. Nordhaus is John Musser Professor of Economics at Yale University and staff member of the Cowles

Foundation for Research in Economics. Dr. Nordhaus prepared a set of scenarios for fuel prices, inflation rates and interest rates to test the effect of these variables on the proposals. The scenarios developed by Dr. Nordhaus and the resulting steam costs are described in Section VI Financial and Economic Evaluation.

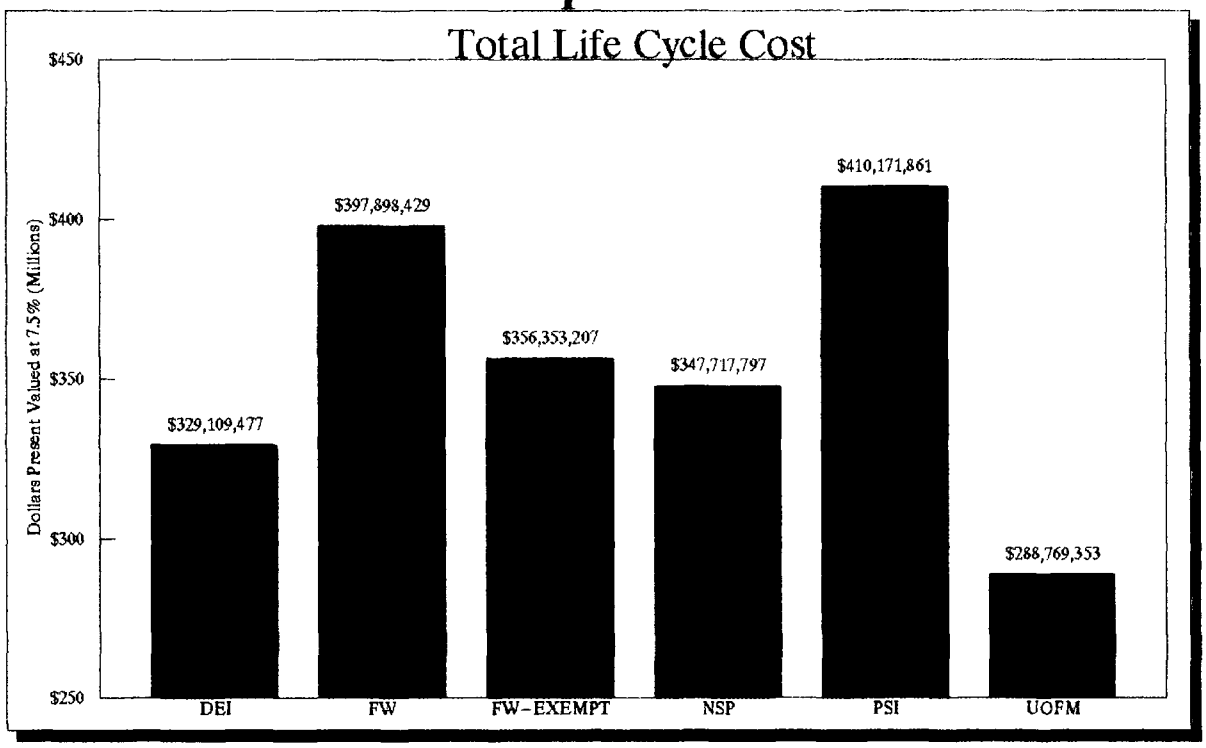
In his analysis, Dr. Nordhaus identified a full range of fuel price scenarios, including extreme oil disruption wherein gas prices are assumed to increase at the historically unprecedented rate of 16% per year for the next years. After consideration of the probabilities of such extreme scenarios, including scenarios in the opposite direction such as depression wherein gas prices are presumed to increase at 0% per year for the next 25 years, Dr. Nordhaus concludes that DEI's proposal will have the overall lowest expected life cycle present value of the four proposals.

Legal Analysis. A complete legal review of all the proposals was completed and is presented in Section IX Evaluation of Legal Structure. The proposed basic contract terms are compared, proposed legal structures are discussed and specific legal issues are addressed including those issues relating to property taxes and tax-exempt financing.

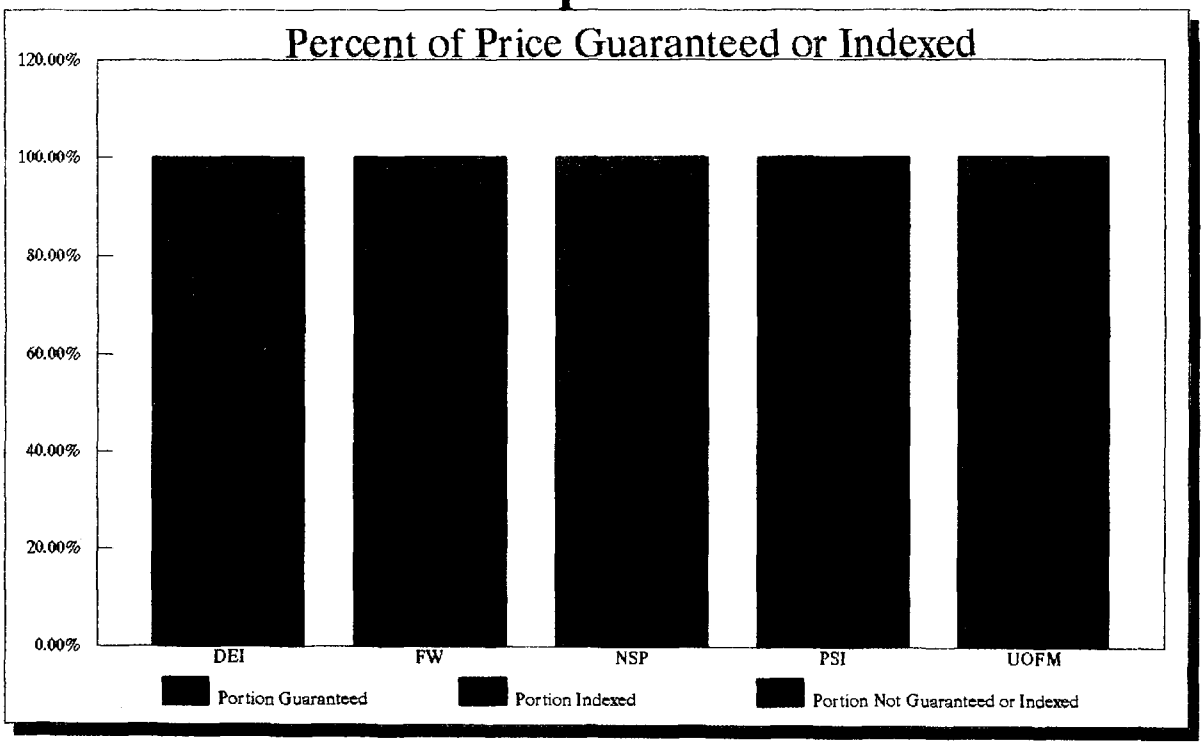
CONCLUSION

As supported by the remaining text of this report, the evaluation of the University's future steam needs and the options available to meet those needs has been thoroughly and exhaustively considered. The clear and strongly supported conclusion is that the DEI proposal overall offers the lowest cost, cleanest, most reliable and least risky solution. The Internal Option should be pursued as the only acceptable alternative in the event negotiations with DEI do not conclude satisfactorily.

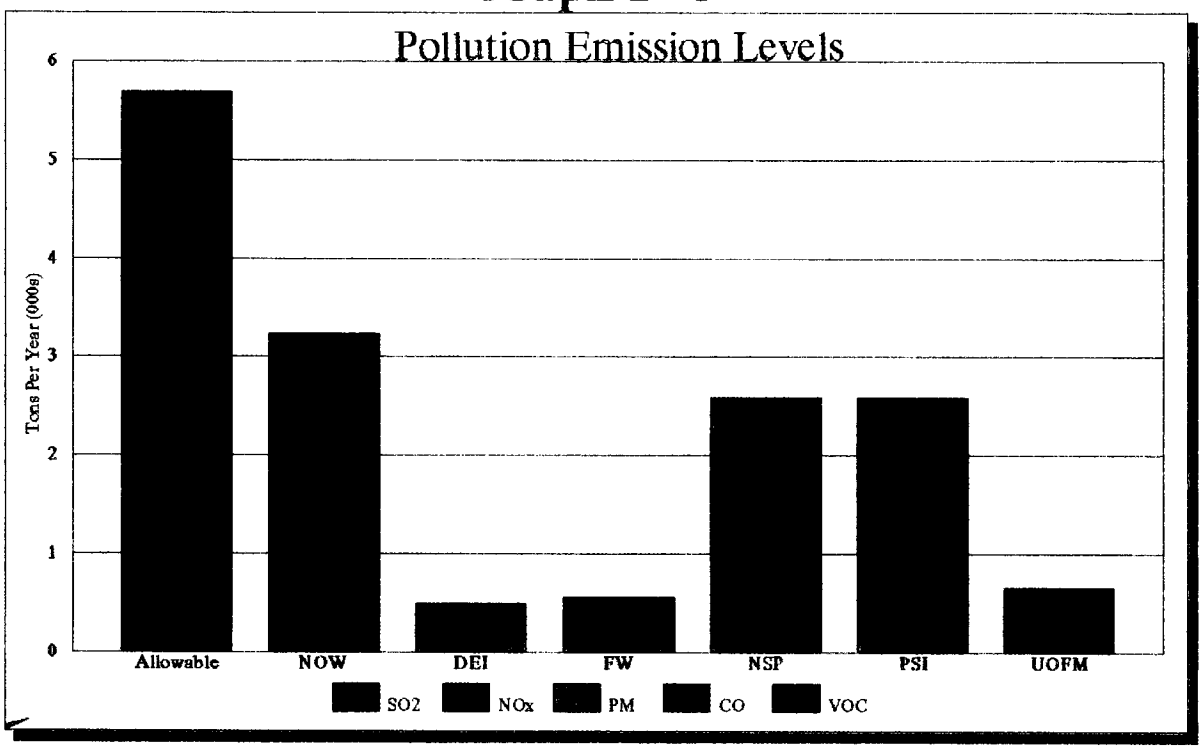
Graph I–1



Graph I–2



Graph I–3


Pollution Emission Levels
Tons Per Year (000s)
6
5
4
3
2
1
0
Allowable
NOW
DEI
FW
NSP
PSI
UOFM
SO2
NOx
PM
CO
VOC

II.
HISTORICAL BACKGROUND

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CRS SIRRINE REPORT

In August of 1989, the University of Minnesota received a comprehensive report from CRS Sirrine, an external consultant hired in 1988 to review the condition of the University's utilities.[1] A thorough evaluation of the steam, electrical, and air conditioning facilities at the University's Twin Cities Campus was completed. The Sirrine Report highlighted the condition of steam production facilities as the most significant area of concern and the area potentially the most costly to address.

The Sirrine Report discussed the existing steam supply system and the condition of the facilities. The Report noted that the University's current steam requirements are supplied by three steam production facilities, with a total of fourteen boilers. The average age of the boilers is approximately 34 years. The present installed capacity is 990,000 lbs/hr and will expand to 1,080,000 lbs/hr with the addition of the No. 7 boiler at the St. Paul Campus facility.

The Sirrine Report also made recommendations regarding future plans to serve the University's long-term steam requirements. The Report recommended the construction of a new coal and gas fired steam production facility without cogeneration of electric power. The Report indicated that the facility should consist of a minimum of four boilers with a total installed capacity of 1,200,000 lbs/hr. The Report also recommended that the Minneapolis and St.

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[1]The Executive Summary of the Sirrine Report is included as Appendix II-A. The location of the University's three steam facilities is reflected on the map contained in Appendix II-B.

Paul Campuses be interconnected with steam and condensate lines via the transportation corridor. Under the recommended construction schedule, the new plant should be fully operational by the year 2000. Finally, the Report estimated total capital costs for the project at $170,000,000 and concluded that this approach would provide the University with optimum life cycle costs.

The Sirrine Report went on to identify seventeen options for meeting the University's long-term steam requirements. Fourteen of these options involved steam production facilities developed, owned, and operated by the University. Three of the options involved third party suppliers of steam. Based upon its evaluation of these options, the Sirrine Report made the following specific recommendations:

- The construction of a new University-owned central steam plant (primarily coal-fired, but also involving to a lesser extent natural gas), with an estimated cost of $170 million.
- The construction of four University-owned chiller plants for long-term air conditioning needs at a total cost of $67.2 million.
- The establishment of a new service point for electrical distribution with a cost of $2.8 million. (The University already purchases electricity from NSP and is only in need of an expanded distribution system.)
- Consideration of third party sources of utilities as an alternative to construction of new facilities.

The Sirrine report made it clear that the present condition and remaining life of the University's steam production facilities

was a crucial concern. The substantial costs associated with the construction of a new University-owned steam production facility was of equal concern. Because the Sirrine Report included little detail and no cost estimates regarding the option of a third party steam supplier, the University decided to undertake a more intensive investigation of this option.

THIRD PARTY STEAM SUPPLIER INVESTIGATION

In October, 1989, the Utilities Committee was established to carry out this investigation. The Utilities Committee was composed of internal staff and external professional advisers who reported directly to Senior Vice President for Finance and Operations, G. M. Donhowe.[2] The financial group of Piper, Jaffray & Hopwood, Inc. ("PJH") was retained to serve as the Committee's financial advisor, PJH is among the most experienced in the region for evaluating and structuring specialized financing for utility facilities. Benjamin Oehler of PJH joined as a member of the Utilities Committee. Orr-Schelen-Mayeron & Associates ("OSM") was retained to provide expert engineering and technical advice relating to utilities services. OSM has provided the University engineering services in the past and is especially familiar with its steam production and distribution system. James Sebesta of OSM also became a member of the Committee. Finally, the Utilities Committee retained legal counsel experienced in utility related matters. Peter Grills of the law firm of O'Neill, Burke, O'Neill, Leonard & O'Brien, Ltd. joined as a member the Committee.

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[2]Members of the Utilities Committee are set out in Appendix II-C.

The Utilities Committee also includes University internal staff that are directly involved with the provision of utilities services. These members include:

Roger Paschke, Chair, Utilities Committee
Treasurer and Director of Asset Management
Larry Anderson, Director of Physical Planning
Otis Anderson, Director of Engineering & Architecture
Carolyn Hall, Attorney, General Counsel's Office
Sue Markham, Asst. Vice President of Physical Plant
Mike Nagel, Asst. Director, Physical Plant

The Utilities Committee developed the following process for the exploration and evaluation of third party alternatives for steam service.[3]

1. Research of potential proponents for providing steam service to the Twin Cities Campus

2. Issuance of a Request for Qualifications (RFQ) to determine the proponents qualified, technically and financially, to provide steam service

3. Issuance of a Request for Proposals (RFP) to those firms that met the minimum qualifications of the RFQ for providing steam service

4. Evaluation of proposals received compared to the internal option for steam service

5. Recommendation of the preferred alternative to the Board of Regents

[3]The schedule related to the process used by the Utilities Committee is contained in Appendix II-D. The initial alternatives considered by the Utilities Committee are contained in Appendix II-E.

The University issued the RFQ to more than 100 interested parties nationally and received formal responses from 17 different firms.[4] These responses were evaluated to identify the firms most qualified, technically and financially, to participate in the RFP phase of the project. Based on this evaluation, the following eight firms were invited to submit proposals to provide steam service to the University's Twin Cities Campus:[5]

- CRSS Capital Inc., Houston, Texas
- Diversified Energies, Inc., Minneapolis, Minnesota
- Enron Power Corp., The Woodlands, Texas
- Foster Wheeler Power Systems, Inc., Clinton, New Jersey
- Northern States Power Co., Minneapolis, Minnesota
- PG&E Operating Services Co., San Francisco, California
- PSI Power Resource Operations, Plainfield, Indiana
- Trigen Energy Corp., White Plains, New York

The Utilities Committee developed an RFP which outlined the University's requirements for steam service and the process the University intended to use in evaluating proposals. A draft of the RFP was issued on June 18, 1990, and proponents were invited to comment. The final RFP was issued on July 20, 1990.

Separate tours of the steam production facilities were arranged for each proponent on May 1, 1990. Each proponent was also allowed to inspect the facilities for a full day between

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[4]The list of parties to whom the RFQ was issued is contained in Appendix II-F. The intent and approach used to evaluate responses to the RFQ is contained in Appendix II-G. The list of parties responding to the RFQ is contained in Appendix II-H.

[5]A more complete list of the firms is contained in Appendix II-I.

July 19, 1990, and July 29, 1990. In August the proponents were allowed to spend the equivalent of 40 hours each inspecting the facilities.

CRSS Capital, Inc., Enron Power Corp., PG&E Operating Services Co., and Trigen Energy Corp. ultimately elected not to submit proposals. On September 11, 1990, proposals were received from Diversified Energies, Inc., Foster Wheeler Power Systems, Inc., Northern States Power Co., and PSI Power Resource Operations. These proposals, along with the University's internal options as recommended by the Sirrine Report, were evaluated thoroughly to arrive at the Utilities Committee's final recommendation.

BOARD OF REGENTS

Throughout this process, the Board of Regents was kept fully informed by Senior Vice President Donhowe and the Utilities Committee. The Regents were provided information regarding the progress of the Utilities Committee's investigation by correspondence dated November 21, 1989, April 13, 1990, and June 20, 1990. Presentations by the Utilities Committee to the Regents' Physical Planning and Operations Committee were made on December 7, 1989, and September 13, 1990. The Utility's Committee's recommendation is scheduled for presentation to the Regents' Committee of the Whole on December 14, 1990. The recommendation will be placed upon the Regents agenda as an information item on January 11, 1991. Action will be requested by the Regents on February 8, 1991.

Interviews of two hours were held with each proponent. The Utilities Committee and Senior Vice President Donhowe met with NSP and DEI on October 8, 1990, and with Foster Wheeler and PSI on October 10, 1990. Clarification questions were prepared and provided to the proponents in advance of each interview. During the interviews, each proponent was allowed a maximum of 30 minutes to present its proposal. The proponents also provided written responses to the University's questions and were allowed to make any additional comments deemed necessary. Members of the Utilities Committee were also provided the opportunity to ask additional questions. All interviews were tape recorded and a copy of the tape was provided to each proponent. A written transcript was also prepared.

The Utilities Committee also evaluated the internal option which was formulated as a result of the Sirrine Report. The internal option provided for the construction of a new primarily coal-based steam production facility, to be owned and operated by the University. The internal option represented a refinement of the Sirrine Report recommendation and estimated that a new central steam production facility could be built for approximately $153 million total capital for construction. The financial and economic analysis of the internal option indicated that the total life cycle costs of the internal option would be less than that of any of the proposals received from third party suppliers.

The Committee's evaluation of the internal option resulted in additional questions for the proponents. The proponents were provided with the complete description, outline, and computer model of the internal option. Each proponent was asked to comment on the feasibility of the internal option. The proponents responded by clarifying the differences between the University's internal option and their respective proposals. The proponents also raised a

number of concerns regarding the risks associated with the implementation of the University's internal option. The Utilities Committee incorporated all of the proponents' responses into their a final comparison of the four proposals and the internal option.

The Utilities Committee's evaluation also involved consultation with the University Building Energy Efficiency Project (UBEEP). The conservation assumptions contained in the proposals were reviewed by UBEEP. The feasibility of each proponent's assumptions regarding steam usage over the 25-year life cycle was assessed based upon consultation with the Director of UBEEP.[1]

The Utilities Committee had serious concerns regarding the long-term implications of committing to the use of one fuel type versus another. In particular, the Committee wanted to address the price risks associated with natural gas, coal and fuel oil. The Committee felt it was advisable to examine the historic price relationships among various fuels, and attempt to determine the likelihood of any significant change in these relationships under various economic and inflation scenarios.

In addressing these issues the Committee consulted with Dr. William Nordhaus, who is a nationally recognized expert in the area of energy pricing. For purposes of identification, Dr. Nordhaus is the John Musser Professor of economics at Yale University. Dr. Nordhaus is a staff member of the Cowles Foundation for Research in Economics and formerly a member of the President's Council of

[1]The conclusions of UBEEP are contained in Appendix III-A.

Economics Advisors.[2] Dr. Nordhaus examined the underlying assumptions of the financial models and determined the appropriateness of each assumption. Dr. Nordhaus's assistance was of considerable value to the Committee.[3]

Finally, the financial models used to evaluate the life cycle costs of each proposal were submitted to each proponent. The proponents were invited to make comments on the accuracy and completeness of the models. The comments of the proponents were incorporated into the Utilities Committee's final analysis.

The evaluation process was conducted in such a manner as to promote the highest level of integrity and to provide maximum fairness and opportunity for the proponents. Each proponent was given exactly the same consideration. Each proponent was given the same opportunity to inspect the steam production facilities, present its proposal to the Utilities Committee, respond to the Committee's questions, make any necessary clarifications to its proposal, and comment on the evaluation process itself. As the process now moves toward a decision, each proponent will have an opportunity to publicly address its proposal before the Board of Regents. The Utilities Committee firmly believes that the evaluation process has been fair and has resulted in a recommendation based upon the merits of the proposals submitted to the University.

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[2]Dr. Nordhaus' Biographical Sketch is included as Appendix III-B.

[3]The results of Dr. Nordhaus' study are presented in Appendix III-C.

IV.
FINANCIAL AND TECHNICAL QUALIFICATIONS

IV. FINANCIAL AND TECHNICAL QUALIFICATIONS

The University's RFQ required all parties to meet minimum financial and technical qualifications in order to participate in the RFP phase of the selection process. All four of the proponents now under consideration have satisfactorily met all minimum financial and technical qualifications. The following is a presentation of the Utilities Committee's analysis of the proponents' financial and technical qualifications.[1]

FINANCIAL QUALIFICATIONS

The objectives of applying minimum financial standards to proponents was to ensure that all participants in the process were financially sound and capable of providing steam service under a long-term arrangement. Proponents were required to have shareholders equity of at least $50 million, or in the alternative, be unconditionally guaranteed by an entity with the same amount of shareholders equity. The following table sets forth the shareholders equity for all four proponents and shows that each proponent is far in excess of the minimum required:

[1]Because the University already owns and operates its heating plants and would continue to do so if a third-party does not become involved, the analysis is not relevant for the Internal Option.

COMPARISON OF SHAREHOLDERS EQUITY

1989 Shareholders Equity	$ Millions
DEI	$1,349[2]
Foster Wheeler	$ 467[3]
NSP	$1,458
PSI	$561[4]

The only material change in financial qualifications since the RFQ process was the merger of DEI and Arkla, Inc. The merger was ratified by the shareholders of both companies on November 28, 1990, and became effective the following day. Prior to the merger, DEI had shareholders equity of $259 million, well in excess of the minimum. The merger with Arkla increased shareholders equity to $1.3 billion.

Although not included as a minimum qualification, other important financial criteria were also reviewed. The stock and debt ratings by Standard and Poor's Corporation provide an overall composite of each proponent's financial condition. The ratings for each of the proponents are summarized in the following table:

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[2]Reflects the pro forma shareholders equity of DEI and Arkla.

[3]Reflects the shareholders equity of Foster Wheeler Corporation as guarantor.

[4]Reflects the shareholders equity of PSI Resources, Inc. as guarantor.

STANDARD AND POOR'S RATINGS[5]

	S&P Stock Rating	S&P Senior Debt Rating
DEI	B	N/A
Arkla	A-	A-
Foster Wheeler	B	N/A
NSP	A	AA-
PSI	B	BBB+

Based upon an analysis of the financial condition of each proponent, the conclusion was reached that all four of the proponents are financially sound, have good or superior stock and debt ratings, and would be acceptable financially to enter into a steam service contract with the University.[6]

TECHNICAL QUALIFICATIONS

The minimum technical qualifications required of the proponents by the RFQ involved previous experience in operating a steam generating facility with an installed capacity of at least 500,000 lbs/hr. As with the financial qualifications, all four of the proponents under consideration as indicated below exceeded the minimum by a wide margin.

Minnegasco, Inc. is a subsidiary of DEI and distributes natural gas to communities in Minnesota and other midwestern

[5]A definition of these ratings is included in Appendix IV-A.

[6]Further financial information is provided in the financial reports of the proponents included with each proposal.

states, including much of downtown Minneapolis. The Dyco Petroleum subsidiary of DEI performs oil and gas exploration. Arkla, Inc., the surviving corporation after the merger, is a major natural gas exploration and distribution company. Minneapolis Energy Center, Inc., another subsidiary of DEI, manages and operates the district heating and cooling facilities in downtown Minneapolis. These plants, which rely on natural gas and fuel oil, serve a significant, diverse and growing group of customers in downtown Minneapolis.[7]

Foster Wheeler Corporation, headquartered in Clinton, New Jersey, is involved in the design, engineering and construction of Power Systems on essentially a worldwide basis. The operating group of Foster Wheeler Power Systems is responsible for the management of power systems on a build and operate, as well as a build, own and operate basis. Foster Wheeler has a long history of manufacturing boilers firing all kinds of fuel. The company's projects have involved all phases of steam plant development and operation-technology development; plant and equipment design; equipment manufacture; plant construction; plant operation and/or staff training; and internal financing and guarantees.[8]

Northern States Power Company, headquartered in Minneapolis, Minnesota, services the electrical and gas needs of customers in Minnesota and many other midwestern states. Although its main power source is coal, it also generates electric power from nuclear facilities and other sources. Although small in comparison to its

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[7]Appendix IV-B provides additional technical information on DEI.

[8]Appendix IV-C provides additional technical information on Foster Wheeler Power Systems.

40 million pounds of steam per hour used for electric power generation, NSP's direct steam sales are themselves significant, currently exceeding a million pounds per hour. Through its NORENCO subsidiary, NSP provides steam service to Waldorf Paper in St. Paul, St. Paul's Energy Park, and other customers.[9]

PSI Power Resource Opertations, Inc. is the holding company for PSI Energy, formerly Public Service of Indiana, and is located in Plainfield, Indiana. PSI is involved in diverse areas of utility operations, including district heating, chilled water and steam production. Through various operating companies, PSI has been involved in the construction, operation and maintenance of coal-fired power systems in a number of locations primarily in Indiana. PSI is currently engaged by Indiana University in the development and engineering of a new 25 MW cogeneration plant, installation of a new 150,000 lbs/hr boiler, and condition assessment of four existing boilers of the same size on the campus. It has also proposed an extensive project to serve Indiana State University's chilled water needs.[10]

It is clear that all four of the proponents have been involved in many diverse energy related endeavors. The four proponents have extensive technical and operational experience and have demonstrated the capability of managing and operating large sophisticated utility facilities and systems. Based upon the Utilities Committee's review of the proponents' technical qualifications, it was concluded that all four proponents have

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[9]Appendix IV-D provides additional technical information on NSP.

[10]Appendix IV-E provides additional technical information on PSI.

sufficient technical qualifications to manage and maintain and operate the steam production facilities necessary to serve the University's long term steam requirements.

V.
SUMMARY OF PROPOSALS

V. SUMMARY OF PROPOSALS

DIVERSIFIED ENERGIES, INC.

DEI is a Minnesota based holding company for Minnegasco, Inc., Minneapolis Energy Center, Inc. ("MEC") and Dyco Petroleum Corporation. Effective November 29, 1990, DEI merged into Arkla, Inc., a major publicly owned natural gas exploration and distribution company based in Little Rock, Arkansas.

Arkla will contract directly with the University of Minnesota to provide steam service. The Steam Service Agreement will then be assigned to MEC without novation. Arkla will remain directly obligated on the Steam Service Agreement. MEC will act as the principal operating entity. MEC currently operates the steam production and distribution system serving downtown Minneapolis.

DEI's proposal consists of modifying existing steam heating plants currently owned by the University of Minnesota. By the second year of the Steam Service Agreement, the facilities will be operated utilizing 90.8% natural gas and 9.2% No. 6 fuel oil. It is DEI's intent to close the Minneapolis Main Heating Plant by the third year and return the facility to the University of Minnesota. DEI intends to continue using the oil storage facility currently located at Minneapolis Main. Consequently, a complete decommissioning and return of the entire site to the University of Minnesota is not possible.

DEI proposes to install three (3) new 200,000 lbs/hr gas/oil fired steam boilers and convert existing Boilers No. 3 and 4 to fire on gas and oil at the Minneapolis Southeast Heating Plant.

As an alternative to the renovation of the Minneapolis Southeast heating plant described above, DEI has offered to build a new gas/oil plant to serve the Minneapolis campus. The location of the plant would be between the two campuses in a mutually agreeable location. DEI's price would not change if the University chooses this option. DEI would pay for all costs associated with this new plant except for land and distribution line easements. DEI's alternative proposal includes DEI's paying for a 2,000 to 2,500 foot steam line to connect the new plant to the Minneapolis campus steam distribution system.

The St. Paul Heating Plant will be converted to gas and fuel oil with additional boiler equipment being provided as required to maintain reliability of the system. It is DEI's intent to continue to utilize existing St. Paul boiler equipment through most of the contract term.

DEI's steam price formula has four elements:

- capacity charge
- fuel charge
- passthrough charge
- management fee

The Capacity Charge is a specific dollar amount payable irrespective of how much steam is consumed. DEI's Capacity Charge starts at $4,446,800 for the first year and increases according to a fixed schedule. This charge covers all capital expenditures required during the 25 year term. DEI will reduce its Capacity Charge by approximately 18% if tax exempt financing is available. DEI will not increase the Capacity Charge if the University requires more steam than the Contract Capacity, so long as steam is available from the facilities described in their proposal.

The Fuel Charge is a specific amount per million British Thermal Units ("MMBTU's") of fuel required to produce steam for the University during the 25 year term. The fuel charge is guaranteed to increase only 7% a year (no more, no less) for the first 15 years. Thereafter the fuel prices will be at market prices, although DEI has agreed to guarantee its transportation charge for gas for the 25 year term. DEI's guaranteed fuel charge is limited to a maximum of 3,850,000 MMBTU per year and a minimum of 120,000 MMBTU per month. DEI estimates that the University will need 3,551,000 MMBTU per year assuming purchases of 2.5 billion pounds of steam per year. DEI has offered to guarantee MMBTU's required to produce steam if the University will commit to return a certain percentage of condensate water at an agreed upon temperature.

The Passthrough Charge covers all operating and maintenance costs of the plants.

The Management Fee is 2% of the University charges other than the management fee.

FOSTER WHEELER POWER SYSTEMS

Foster Wheeler Power Systems, Inc. is a wholly owned subsidiary of Foster Wheeler Corporation. Foster Wheeler Corporation is a publicly traded corporation based in Perryville, New Jersey, and is involved in energy related engineering, construction and manufacturing. Foster Wheeler Corporation intends to create a new corporation, "Foster Wheeler Minnesota, Inc.," which will be responsible for the design, construction and operation of the University of Minnesota facility. The new corporation will contract directly with the University of Minnesota. Foster Wheeler Corporation will unconditionally guarantee all obligations of Foster Wheeler Minnesota, Inc.

Foster Wheeler intends to install two (2) 200,000 lb/hr coal based boilers and one (1) 250,000 lbs/hr gas/oil based boiler at the Minneapolis Southeast Heating Plant. The Southeast Heating Plant will also be retrofitted with a 15 megawatt steam turbine generator to utilize co-generation cycle and provide electric power to the University of Minnesota grid. All electricity requirements for the Main Heating Plant will be provided directly from this internal generator. Foster Wheeler intends to maintain oil and coal handling facilities at Minneapolis Main as well as utilize boilers for standby service.

Foster Wheeler will install one (1) new 250,000 lbs/hr gas/oil based boiler. The heating plant will be operated on gas and oil throughout the year. Other boiler equipment will be decommissioned and retired as required to maintain permitability of the site.

Under Foster Wheeler's proposal, the fuel will be coal, gas or oil. Foster Wheeler contemplates a somewhat greater reliance on gas than is currently utilized by the University.

Foster Wheeler's steam price formula has four elements:

- capacity charge
- O&M charge
- Fuel charge
- Tunnel charge
- electricity credit

The Capacity Charge is a fixed amount equalling $2,860,000 for each of the first four years. Beginning in the fifth year (or after the new facilities are complete) the Capacity Charge becomes $10,400,000 (assuming tax exempt financing), or $17,600,000 assuming taxable financing. The actual Capacity Charge will vary depending on the date of the new facility and interest rates at the

time of the debt placement. Foster Wheeler will not increase the Capacity Charge if the University requires more steam than the Contract Capacity.

The O&M Charge is a fixed dollar amount per thousand pounds of steam. This rate can only go up according to annual increases in the Consumer Price Index, or a combination of the Consumer Price Index and the University's union labor rates if the labor rates increase more rapidly than the CPI. Also, all fuel costs are passed through to the University. The tunnel charge is a one time fee estimated to be $1,000,000 for tunnel repairs. Finally, Foster Wheeler will co-generate electricity along with steam. Foster Wheeler will provide this electricity to the University and estimates that the University will save 4.5¢ per kilowatt.

NORTHERN STATES POWER COMPANY

Northern States Power Company ("NSP") is a large electric and natural gas utility based in Minneapolis. NSP, through its Minnesota and Wisconsin corporations, serves retail customers in Minnesota, Wisconsin, the Upper Peninsula of Michigan, North Dakota and South Dakota. NSP will contract directly with the University of Minnesota to provide steam service. It will then assign the Steam Service Agreement without novation to NRG Thermal. NRG thermal will act as the principal operating entity for the project. As of January 1, 1990, NRG Thermal, formerly NORENCO, will become a wholly owned subsidiary of NRG Group, who on the same date will become a wholly owned subsidiary of NSP. NSP will remain directly obligated on the Steam Service Agreement.

NSP intends to interconnect the University's Minneapolis steam distribution system with steam production facilities at Metropolitan Mount Sinai Medical Center ("MMC") in downtown

Minneapolis. The MMC facility will provide up to 140,000 lbs/hr steam supply. NSP intends to continue operating the two (2) existing heating plants on the Minneapolis campus to provide other required steam supply.

The St. Paul Heating Plant would be connected to a high pressure steamline to be constructed by NSP. The steamline would be an extension of NSP's steamline currently serving Waldorf Paper in St. Paul. The source of steam would be NSP's High Bridge electric generating plant. The steamline will provide a base load of approximately 150,000 lbs/hr with all peaking steam requirements being provided from the St. Paul Heating Plant.

NSP anticipates capital expenditures of $6.5 million at the Minneapolis and St. Paul Heating Plants. NSP intends to rely on existing heating plant equipment through the term of the contract. Other than base steam being provided from these off-campus heating plants, all University heating plants will be operated on a basis similar to that currently employed by the University of Minnesota. Fuel will be coal, gas or oil with full range-ability as dictated by lowest available fuel cost.

NSP's pricing formula has several elements:

- capacity charge
- capacity replacement charge
- per MMBTU charge
- increase demand charge
- tunnel repair charge

The Capacity Charge is a fixed $10,100,000 per year payable for 25 years. If the University incurs two (2) hourly peaks of its steam requirements in excess of 230,000 lbs/hr at the St. Paul Campus or 550,000 lbs/hr at the Minneapolis campus, in three (3)

consecutive years, then thirty (30) days after written notice by NSP of such condition the University, in addition to the Capacity Charge, the University shall pay NSP an Increased Demand charge of $1,200,000 per year to provide for increased use unless it can provide NSP with reasonable proof that it has taken appropriate action to reduce and keep usage below 230,000 lbs/hr at the St. Paul Campus and 550,000 lbs/hr at the Minneapolis Campus, through conservation, storage or other energy saving methods. In the event that the foregoing peaks have been exceeded at both campuses, then the Increased Demand charge will apply for each campus.

If the interconnect between campuses is built, at the option of the University as hereinafter provided, this Increased Demand charge will be based on an hourly peak of 800,000 lbs/hr for both campuses.

This Increased Demand charge is based on 1990 costs and a ten (10) year amortization schedule. The cost, at the time this charge actually commences, will be the listed Increased Demand charge increased by the same percentage that the Implicit Price Deflator - Investment in Nonresidential Structures - Public Utilities, as published by the United States Commerce Department, has increased since 1990, and adjusted for any changes in NSP's cost of capital.

The Capacity Replacement Charge is an additional charge payable anytime after the tenth year if NSP is required to invest more capital to maintain the University's steam generating capacity. The charge is $2,400,000 per year in 1991 dollars and will increase with inflation.

The tunnel charge is an additional annual charge beginning at approximately $100,000 per year in 1992 to pay for tunnel repairs.

The MMBTU Charge is a charge per quantity of steam purchased by the University. The rate starts at $5.79 per MMBTU of steam. It is adjusted after the first year to reflect NSP's actual operating costs in pounds of steam to the University. This charge increases as NSP's operating costs increase. NSP has offered to discuss further limitations on increases in the per MMBTU charge and/or tying increases in part to a mutually agreed upon index.

PSI POWER RESOURCES OPERATION, INC.

PSI Power Resources Operations, Inc. ("PSI-PRO") is a wholly owned subsidiary of PSI Resources, Inc. PSI-PRO is an Indiana based holding company for PSI Energy, Inc., formerly Public Service of Indiana. PSI-PRO will contract with the University of Minnesota and act as the principal operator for the project. PSI Resources, Inc. will unconditionally guarantee the obligations of PSI-PRO.

PSI intends to install two (2) new 150,000 lbs/hr pulverized coal steam boilers at the Minneapolis Southeast Heating Plant. The Minneapolis Southeast Plant and Minneapolis Main Plant will have appropriate equipment retired as required to maintain permitability of the new equipment and to maintain the plant capacity necessary to serve the contract requirements of the University.

The St. Paul Heating Plant will have one (1) additional 60,000 lbs/hr oil/gas boiler added by the year 2000. The two oldest boilers, Boilers No. 3 and 4 will be retired at that time.

All three heating plants will be operated on a basis similar to that currently employed by the University of Minnesota for the term of the contract. Fuel will be coal, gas or oil with full range-ability as dictated by lowest available fuel cost.

PSI's price formula has four basic elements:

- capital capacity charges
- labor capacity charges
- variable charges
- fuel charges

The Capital Capacity Charge is $4,809,792 for the first year and increases 5% per year plus changes in the price rate. PSI will not increase the Capacity Charge so long as University requirements do not exceed plant capacity.

The Labor Capacity Charge is $5,423,800 the first year and increases with actual price changes in the cost of labor at the University.

The Variable Charge starts at $1.68 per thousand pounds of steam and increases with a mutually agreed upon index.

The Fuel Charge starts at $2.50 per thousand pounds and increases with future charges in the cost of fuels over a base price given a specific mix of coal, gas and oil.

UNIVERSITY INTERNAL OPTION

The University's internal option consists of tying Minneapolis and St. Paul steam distribution systems together and utilizing a single new steam heating plant constructed between the campuses. The new steam heating plant would be operational by the year 2000. The University Internal Option will continue to utilize a full range of fuels including coal, gas and oil based on the most economical cost. Operating costs associated with continued maintenance and operation of the three existing heating plants will be significantly reduced with the implementation of a single steam plant.

VI. FINANCIAL AND ECONOMIC EVALUATION

VI. FINANCIAL AND ECONOMIC EVALUATION

The Utilities Committee performed a financial and economic evaluation of the four proposals and the University's Internal Option. The purpose of the evaluation was to determine which proposal provided the lowest steam price, or least cost to the University over the 25 year period. For each proposal and the Internal Option, the total cost to the University over the 25 year term was calculated using discounted present value. The result of this calculation is identified herein as the "Life Cycle Cost" of each proposal. The Utilities Committee also analyzed the variability of Life Cycle Costs through a number of sensitivity analyses.

EVALUATION PROCESS

The cost of steam to the University under each of the proposals was evaluated through the use of a series of financial models developed for each proposal. These models incorporated the same set of financial and economic assumptions for each proposal so that an accurate Life Cycle Cost could be determined and compared. For example, if proponents assumed different rates of inflation, the inflation rates were equalized so that the same rate was used in the evaluation of all proposals. These financial models were based upon the information contained in each proposal. The models were constructed by the GAMMA Institute and were provided to each proponent for their review and comment as to completeness and accuracy. All concerns raised by the proponents were incorporated into the final models.

As previously noted, the Utilities Committee also retained the services of Dr. William Nordhaus. For purposes of identification, Dr. Nordhaus is the John Musser Professor of Economics at Yale

University, a staff member of the Cowles Foundation for Research in Economics, and former member of the President's Council of Economic Advisors. Dr. Nordhaus developed a set of potential scenarios which would affect the price of steam under each proposal. In each scenario Dr. Nordhaus assumed different financial factors, including:

- general inflation
- natural gas prices
- prices for #2 and #6 fuel oil
- prices for western coal and eastern coal
- the discount rate
- the rate for taxable and tax-exempt debt
- the prime rate
- the rate on U.S. Government securities

Different financial scenarios were constructed by making different assumptions with respect to each of the financial factors. The purpose of constructing these different scenarios was to determine the impact upon the price of steam under each proposal given a change in circumstances. For example, to what extent would a change in the inflation rate, or the price of a particular fuel, affect the steam price over time.

The Utilities Committee also consulted with the University Building Energy Efficiency Project (UBEEP) regarding the conservation efforts currently being implemented by the University. UBEEP assisted in assessing the impact of current conservation efforts upon the cost of steam under each of the proposals. UBEEP also assisted in assessing the feasibility of the conservation assumptions contained in each of the proposals. The Utilities Committee concluded that the UBEEP goal of a thirty percent (30%) reduction in total energy consumption, including electrical,

heating and cooling, was not inconsistent with any of the assumptions contained in the proposals. Further, the Committee found that a cost savings from energy conservation could be realized under all of the proposals given the pricing structure of each proposal.

In addition to the financial factors suggested by Dr. Nordhaus, the Utilities Committee also considered various efficiency factors which included the cost of fuel, labor, operation and maintenance, and construction. Again, efficiency scenarios were developed by making different assumptions with respect to these factors. The Life Cycle Cost of each proposal was then calculated under these scenarios. The price of steam under each proposal was then compared for the various sets of assumptions.

PRICE COMPONENTS

The pricing structure for steam under each proposal contains different price components, including:

Capacity Charge: A specific dollar amount payable regardless of the amount of steam consumed. The Capacity Charge is based upon the fixed cost associated with providing steam capacity.

DEI--$4,446,800 for the first year and increases annually according to a fixed schedule. Covers all capital expenditures during the 25 year term. DEI has agreed to reduce this Capacity Charge if tax-exempt financing becomes available.

Foster Wheeler--$2,860,000 for first four years. $10,400,000 thereafter assuming tax-exempt financing, and

$17,600,000 if taxable financing. The actual Capacity Charge will depend upon the date of new construction and interest rates.

NSP--$10,100,000 per year for 25 years. An additional Capacity Replacement Charge becomes payable after ten years if capital expenditures are required to maintain University's steam generating capacity.

PSI--$5,302,788 per year inflated annually by 5% plus prime rate changes. A Labor Capacity Charge is also imposed which is $5,979,732 per year and increases with any increase in the cost of labor.

Fuel Charge: A specific amount per million British Thermal Units ("MMBTU's") payable for fuel required to produce steam during the 25 year contract.

DEI--Base fuel price which escalates at 7% per year for first 15 years; market prices thereafter. Natural gas transportation charges are guaranteed for the entire 25 years.

Foster Wheeler--All fuel costs passed through to University.

NSP--Fuel costs are included in MMBTU charge. A base MMBTU fuel charge would escalate with actual increases in the cost of fuel.

PSI--$3.08 per thousand pounds adjusted annually for actual increases in fuel cost per a given mix of coal, gas and oil, as well as reflecting costs for lime and ash disposal.

Operating and Maintenance Charge ("O&M"): Costs for O&M on the plants.

DEI--All O&M costs passed through to University.

Foster Wheeler--Fixed amount per thousand pounds of steam, adjusted annually by CPI and University labor rates.

NSP--O&M cost included in a MMBTU charge. A base MMBTU O&M charge would escalate with any actual increases in the cost of operation and maintenance.

PSI--A variable charge of $1.85 per thousand pounds of steam adjusted per an agreed upon index.

Management Fee:

DEI--2% of the University's charges, excluding the management fee.

Electricity Credit:

Foster Wheeler--A credit to the University for any electricity generated with steam, estimated to be 4.5 cents per kilowatt.

FINANCIAL AND EFFICIENCY SCENARIOS

An infinite number of possible scenarios can be developed depending upon the assumptions made with respect to the financial and efficiency factors. In order to develop a reasonable range of possible outcomes under each proposal and the Internal Option, the Utilities Committee relied on a number of sources of information, including:

- the historical costs incurred by the University in owning and managing its own steam production facilities;
- consultation with the financial and technical experts retained by the Utilities Committee;

- o information provided by the proponents and presented in their proposals;
- o the assumptions regarding possible future economic conditions under the scenarios developed by Dr. Nordhaus.

The Utilities Committee developed and reviewed many different financial and efficiency scenarios. For the purposes of this report, however, each proponent's Life Cycle Cost was determined under eight different financial scenarios and eight different efficiency scenarios. The sixteen scenarios represent a broad range of potential outcomes.

Dr. Nordhaus developed eight different possible financial scenarios.[1] Dr. Nordhaus's scenarios can be briefly described as follows:

Scenario A Base Case: The consensus outlook for price changes and current interest rates and, therefore, the outcome given the highest probability of occurring. The probability is estimated at 30%.

Scenario B High Oil and Gas Supply: Domestic gas and international oil supplies are at the optimistic end of forecasted supplies. The probability is estimated at 20%.

Scenario C Disruption: Oil supply disruption, upward pressure on oil and gas prices; likely increase in coal prices. The probability is estimated at 16%.

[1]These scenarios are more fully outlined by Dr. Nordhaus in Appendix VI-A.

Scenario D Extreme Oil Disruption: War or other factors result in extreme disruption of international oil supplies. The probability is estimated at 3%.

Scenario E Environmental Concerns: Steep taxes or other price effects on coal due to environmental concerns related to issues such as greenhouse climate changes. The probability is estimated at 10%.

Scenario F Stagflation and Tight Money: Non-energy factors causing sharp rise in inflation; recession and tight money causing oil and gas prices to decline. The probability is estimated at 8%.

Scenario G Oil Security Measures: Tariffs and other price effects due to efforts toward U.S. energy independence. The probability is estimated at 10%.

Scenario H Depression: Financial breakdown nationally and internationally. The probability is estimated at 3%.

In addition to the eight financial scenarios developed by Dr. Nordhaus, eight efficiency scenarios were also constructed. Each component of cost was assumed to be consistently twenty percent (20%) higher than forecast by the proponents and as estimated under the Internal Option. The Life Cycle Cost of each proposal was then determined under each of the following efficiency scenarios:

Scenario 1--Assumptions as proposed
Scenario 2--Fuel efficiency off 20%
Scenario 3--Labor costs off 20%
Scenario 4--O&M costs off 20%
Scenario 5--Construction costs off 20%

Scenario 6--Fuel and labor off 20%
Scenario 7--Fuel, labor and O&M off 20%
Scenario 8--Fuel, labor, O&M and construction off 20%

LIFE CYCLE COSTS

The Base Case Scenario was used to determine the Life Cycle Cost of each proposal and for the Internal Option. Again, the Base Case Scenario is the consensus outlook for price changes and current interest rates. Consequently, the outcome is given the highest probability of occurring. The more important assumptions contained in the Base Case Scenario include:

- Fuel, labor and operating costs provided by proponents.
- General inflation at a five percent (5%) annual rate.
- Natural gas and fuel prices increasing seven percent (7%) annually.
- Coal prices increasing five and one-half percent (5.5%) annually.
- Total steam consumption decreasing from the current level of 2.5 billion lbs. per year to a low of 2.0 billion lbs. per year in 1996 and then rising gradually to 2.3 billion lbs. per year at year 25.

Table VI-1 sets forth all of the underlying assumptions incorporated into the Base Case Scenario.

In developing the Base Case Scenario the Utilities Committee was concerned that the value of the steam production facilities at the end of the 25 year period be reflected in the financial model. Given the fact that the University will continue to require steam

service beyond 25 years, it would be in the University's best interest to have facilities capable of operating efficiently and economically at the end of the term. If aged plant equipment is not systematically replaced over the 25 year period, the University is at substantial risk of having to make major capital expenditures at the end of the term. Consequently, the Utilities Committee carefully examined the maintenance and capital expenditures proposed by each proponent. Each proponent was given a summary sheet of what the Utilities Committee understood to be its proposed system upgrade and replacements. All modifications and clarifications to these summary sheets were incorporated into the Committee's evaluation.

Based upon a review of the facilities remaining at the end of 25 years, the residual asset value was determined for each proposal. The residual asset value was then incorporated into each of the financial models used to evaluate the proposals. Based upon the residual asset values of each proposal, $7,403,884 was added to DEI's proposal, $5,288,489 to Foster Wheeler's proposal, $22,137,173 to NSP's proposal, and $7,774,078 to PSI's proposal. This was done because different amounts of money would be needed under the various proposals to bring the facilities existing at the end of the 25 year contract term into conformity with the University's ongoing needs.

Under the Base Case Scenario, the Life Cycle Cost of each proposal and the Internal Option are as follows:[2]

	Dollars (in millions)
DEI	329.1
Foster Wheeler	397.9
Foster Wheeler (Tax Exempt)	356.4
NSP	347.7
PSI	410.2
Internal Option	288.8

DEI's proposal results in a substantially lower Life Cycle Cost to the University than the other proposals. While the Internal Option provides the lowest Life Cycle Cost, there are substantial risks associated with implementation of the Internal Option. These are risks to which the University would not be exposed with a third party steam supplier. Graph VI-1 depicts the Life Cycle Cost of steam service associated with each proposal and the Internal Option.

The Utilities Committee carefully reviewed the assumptions provided by the proponents and which were used in the Base Case Scenario. Table VI-2 sets out the assumptions of the proponents, as well as those in the Internal Option, regarding the quantities of fuel consumed and total fuel costs during the 25 year period. Table VI-3 sets out the assumptions pertaining to the number of employees utilized, total labor costs and average compensation per employee. Each of these assumptions was verified as to reasonableness.

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[2]Life Cycle Costs are based upon taxable financing, as shown in Graph IV.

Table VI-4 identifies the total capital expenditures proposed to be made both on and off campus by each proponent during the 25 year term. If on campus capital expenditures are considered, Foster Wheeler makes the largest capital investment in facilities of the external options at $102,600,000. DEI is next with an investment of $70,700,000, following by PSI at at least $30,000,000 and NSP at $6,500,000.

Finally, the costs of steam under each proposal for each year during the 25 year period were analyzed. Tables VI-5 through VI-9 set out the annual cost of steam by price component and per 1,000 lbs. of steam for each proposal. As these tables indicate, of the external options DEI provides the lowest cost per thousand pounds of steam through the first ten years, and the second lowest cost per thousand pounds of steam the following ten years.

PRICE VARIABILITY

In addition to determining the Life Cycle Cost of each proposal under the Base Case Scenario, the Utilities Committee evaluated the price variability, or price sensitivity, of the proposals. The variability in price for each proposal was analyzed under each of the financial scenarios developed by Dr. Nordhaus. Table VI-10 sets out the assumptions under each scenario developed by Dr. Nordhaus. The Life Cycle Cost of each proposal under each of the eight scenarios is depicted in Graph VI-2. As can be seen from the Graph, DEI has the lowest cost for steam of the external proposals under six of the eight scenarios. DEI's proposal has only a slightly higher present value than NSP under Scenario C--Disruption, and a moderately higher present value under Scenario D--Extreme Oil Disruption. As indicated on the graph, these scenarios were assigned a sixteen percent (16%) and three percent (3%) probability of occurring, respectively.

A composite value for each proponent which incorporates all eight financial scenarios was developed by Dr. Nordhaus. This composite value is called the "expected value." The expected value is calculated by taking the sum of the Life Cycle Costs under each scenario as adjusted for the probability assigned to that scenario. The significance is that DEI's proposal provides the lowest cost steam under a broad range of possible outcomes, including extreme scenarios such as hyperinflation of oil and gas prices, when adjusted for Dr. Nordhaus's probabilities.

The variability of the proposal was also calculated under each of the eight efficiency scenarios, and the results are depicted in Graph VI-3. The highest, lowest, and average Life Cycle Cost under each of the eight efficiency scenarios was calculated for each proposal. The average calculated for DEI is the lowest of the external proposals. DEI's variability from highest to lowest is less than that of the other external proposals.

Finally, the Life Cycle Cost of each proposal was calculated using all of the Base Case Scenario assumptions, except that the quantities of steam purchased were changed. Specifically, three steam use scenarios were evaluated:

- UBEEP - steam use assumptions based upon projections from University Building Energy Efficiency Project.
- Constant 2.5 - assumed University steam use of 2.5 billion pounds per year through the 25 year term.
- Constant 3.0 - assumed University steam use of 3.0 billion pounds per year throughout the 25 year term.

As indicated in Graph VI-4, the DEI proposal had the lowest Life Cycle Cost of the external proponents under each of the steam use scenarios. This means that DEI's cost to the University is lowest

among the external proposals irrespective of whether the University's steam use decreases because of conservation or increases as a result of growth.

Table VI – 1

MASTER ASSUMPTIONS		SCENARIOS: FINANCIAL: Scenario A EFFICIENCY: E1		
	1992 Price	Escalation	District Steam Used By UofM	
General Inflation		5.00%	1992	2558031
Natural Gas Price/MMBTU	$2.75	7.00%	1993	2447295
#2 Fuel Oil Price/MMBTU	$6.00	7.00%	1994	2309379
#6 Fuel Oil Price/MMBTU	$3.06	7.00%	1995	2169422
Western Coal Price/MMBTU	$1.46	5.50%	1996	2027424
Eastern Coal Price/MMBTU	$2.00	5.50%	1997	2039328
Present Value Discount Rate		7.50%	1998	2051232
"A" Rated Tax Exempt Long Term Debt Rate		7.50%	1999	2063136
"A" Rated Taxable Long Term Debt Rate		9.00%	2000	2075040
Prime Rate		11.00%	2001	2086944
Fuel Efficiency Factor		1.00	2002	2098848
Labor Cost Factor		1.00	2003	2110752
O&M Cost Factor		1.00	2004	2122656
Construction Cost Factor		1.00	2005	2134560
			2006	2146464
			2007	2158368

Life Cycle Present Value Cost

	DEI	FW	NSP	PSI	UOFM
Base Case	$329,109,477	$397,898,429	$347,717,797	$410,171,861	$288,769,353
20% Overun	$329,109,477	$397,898,429	$347,717,797	$410,171,861	$306,672,337

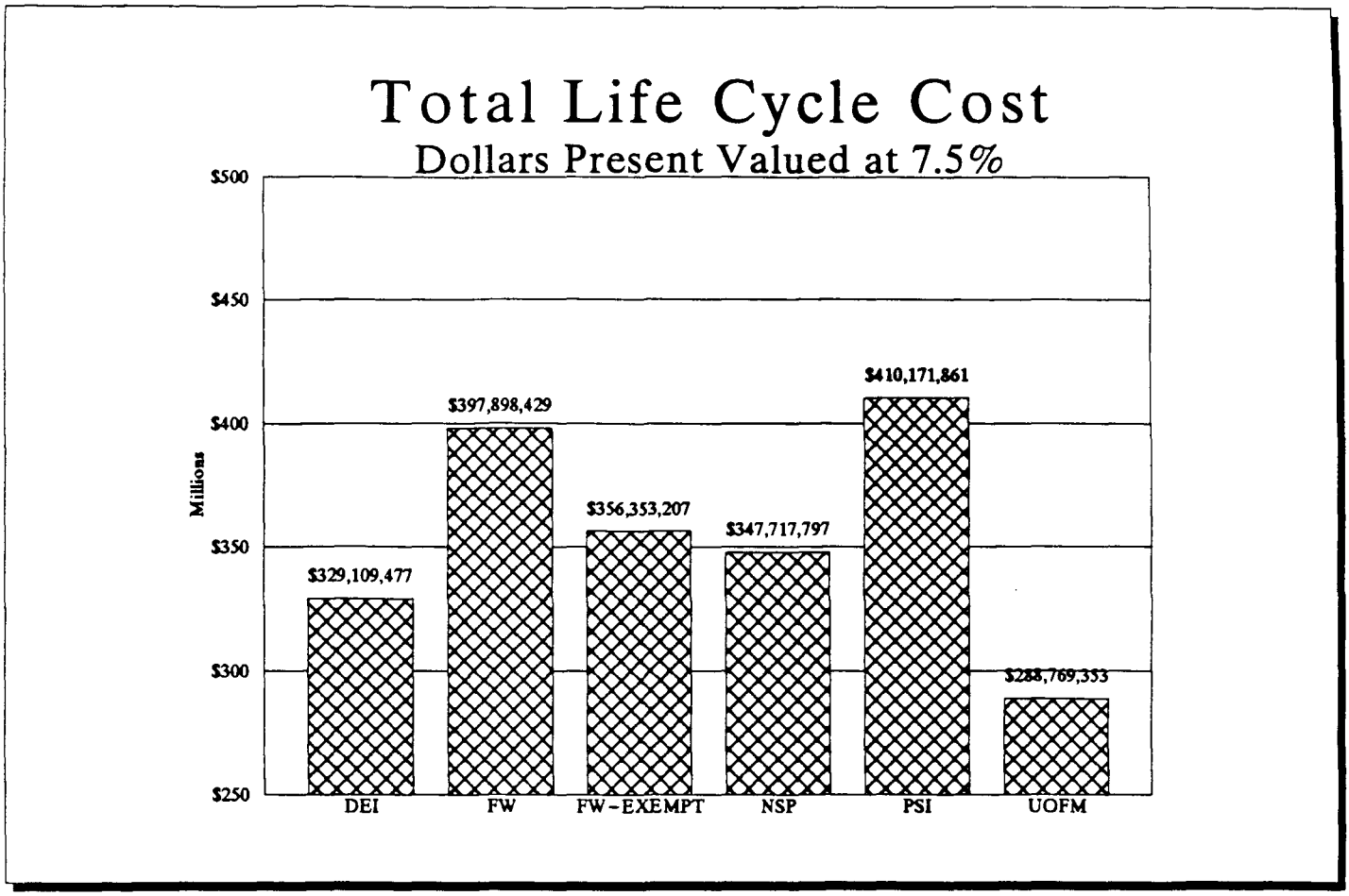
Discussion

This table sets forth the assumptions of the Base Case Scenario. In the Base Case, inflation is assumed to be 5% per year for the 25 year term. Oil and gas prices are assumed to increase annually at 7% and coal at 5.5%. The amounts of steam used by the University are assumed to be the amounts projected by the University Building Energy Efficiency Project (UBEEP).

At the bottom of the table, there are two sets of numbers. The first set titled "Base Case," shows the Life Cycle Cost for each proposal, given the Base Case Assumptions described above. The second set of numbers is titled "20% Overun" and shows the Life Cycle Cost if a 20% construction cost overrun occurs.

The Base Case shows that the University's Internal Option has the lowest life cycle cost at $288.8 million, followed by DEI at $329.1 million. Under the Cost Overun scenario, however, the costs for DEI and the other external options do not increase because their capital costs are guaranteed. Because the Internal Option costs are not currently guaranteed, the cost of that option goes up to $306.7 million, an increase of $17.9 million.

Graph VI – 1



Discussion

The Life Cycle Cost of each proposal and the Internal Option was calculated using a set of assumptions called the Base Case Scenario. The Base Case Scenario is the consensus outlook for price changes and current interest rates. Consequently, the outcome is given the highest probability of occurring. The more important assumptions contained in the Base Case include:

- o Fuel, labor and operating costs provided by proponents.
- o General inflation at a five percent (5%) annual rate.
- o Natural gas and fuel prices increasing seven percent (7%) annually.
- o Coal prices increasing five and one–half percent (5.5%) annually.
- o Total steam consumption projected by the University Building Energy Efficiency Project

DEI's proposal results in a substantially lower Life Cycle Cost to the University than the other proposals. While the Internal Option provides the lowest Life Cycle Cost, there are substantial risks associated with implementation of the Internal Option. These are risks to which the University would not be exposed with a third party steam supplier.

Table VI – 2

Comparison of Key Assumptions

		MMBTU of Fuel Used			
YEAR	DEI	FW	NSP	PSI	UOFM
1	4,155,000	4,246,331	4,234,565	3,960,000	4,251,448
2	3,476,272	3,413,977	3,742,893	3,960,000	4,013,564
3	3,280,368	3,221,584	3,562,448	3,960,000	3,611,869
4	3,081,566	3,026,344	3,241,248	3,960,000	3,392,976
5	2,879,864	2,970,176	3,029,095	3,960,000	3,170,891
6	2,896,773	2,987,616	3,046,880	3,960,000	3,148,722
10	2,964,410	3,057,373	3,118,021	3,960,000	3,180,503
15	3,048,955	3,144,570	3,206,948	3,960,000	3,271,211
20	3,133,500	3,231,767	3,295,874	3,960,000	3,361,920
25	3,218,046	3,318,963	3,384,801	3,960,000	3,452,628

		Fuel Cost			
YEAR	DEI	FW	NSP	PSI	UOFM
1	$6,834,768	$7,808,834	$7,231,037	$7,114,140	$7,472,259
2	$8,678,899	$6,651,631	$6,792,133	$7,527,247	$7,460,651
3	$8,763,091	$6,650,443	$6,827,013	$7,964,603	$7,101,050
4	$8,808,256	$6,619,594	$5,860,269	$8,427,649	$6,468,194
5	$8,807,938	$6,800,581	$5,793,582	$8,917,912	$6,394,567
6	$9,479,830	$7,246,224	$6,164,988	$9,437,011	$6,717,462
10	$12,716,259	$9,341,311	$7,904,299	$11,837,705	$8,828,148
15	$18,343,874	$12,834,306	$10,783,949	$15,727,164	$12,088,430
20	$27,062,655	$17,638,897	$14,713,793	$20,913,486	$13,099,780
25	$38,980,892	$24,251,270	$20,078,731	$27,836,202	$18,464,406

Discussion

The Utilities Committee reviewed the assumptions provided by the proponents. These assumptions were used in the Base Case Scenario. Table 2 sets out the assumptions of the proponents, as well as those in the Internal Option, regarding the quantities of fuel consumed and total fuel costs during the 25 year period.

Table VI – 3

		Employees			
YEAR	DEI	FW	NSP	PSI	UOFM
1	89	87	87	87	84
2	57	87	87	87	84
3	57	87	51	87	84
4	41	87	51	87	69
5	41	87	51	87	69
6	41	87	51	87	69
10	41	87	51	87	41
15	41	87	51	87	41
20	41	87	51	87	36
25	41	87	51	87	36

		Labor Costs			
YEAR	DEI	FW	NSP	PSI	UOFM
1	4,254,195	4,673,523	4,182,090	NA	4,037,880
2	2,417,901	4,694,768	3,883,176	NA	4,239,774
3	2,470,443	4,651,707	2,371,700	NA	4,451,763
4	1,859,391	4,588,286	2,490,285	NA	3,839,645
5	1,952,361	4,502,361	2,614,799	NA	4,031,628
6	2,049,979	4,755,237	2,745,539	NA	4,233,209
10	2,491,762	5,914,977	3,337,220	NA	3,057,466
15	3,180,190	7,764,479	4,259,233	NA	3,902,188
20	4,058,818	10,184,450	5,435,980	NA	4,372,938
25	5,180,194	13,348,933	6,937,841	NA	5,581,100

		Average Compensation			
YEAR	DEI	FW	NSP	PSI (See Note)	UOFM
1	$47,800	$53,719	$48,070	NA	$48,070
2	42,419	53,963	44,634	NA	50,474
3	43,341	53,468	46,504	NA	52,997
4	45,351	52,739	48,829	NA	55,647
5	47,619	51,751	51,271	NA	58,429
6	49,999	54,658	53,834	NA	61,351
10	60,775	67,988	65,436	NA	74,572
15	77,566	89,247	83,514	NA	95,175
20	98,996	117,063	106,588	NA	121,470
25	126,346	153,436	136,036	NA	155,031

Discussion

This table sets out the assumptions provided by each proponent and used in the Base Case Scenario for the number of heating plant employees, total labor costs and average compensaion per employee.

PSI's labor costs could not be determined from the information provided in the PSI proposal.

Table VI – 4

	Proposed Capital Expenditures ($ Millions)				
	DEI	FW	NSP	PSI	UOFM
Discount Rate	5.00%	5.00%	5.00%	5.00%	5.00%
Present Value	$51,360,000	$8,980,000	$42,420,000	$30,000,000	$108,100,000
Total	$70,680,000	$102,600,000	$45,670,000	NA	$153,450,000
On Campus	$70,680,000	$102,600,000	$6,500,000	$30,000,000	$153,450,000
Off Campus	0	0	39,170,000	0	0
Total	$70,680,000	$102,600,000	$45,670,000	$30,000,000	$153,450,000

Discussion

This Table identifies the total capital expenditures proposed to be made on and off campus by each proponent during the 25 year term. If on campus capital expenditures are considered, Foster Wheeler makes the largest capital investment in facilities of the external options at $102,600,000. DEI is next with an investment of $70,700,000, followed by PSI with at least $30,000,000 and NSP at $6,500,000.

In developing the Base Case the Utilities Committee was concerned that the value of the steam production facilities at the end of the 25 year period be reflected in the financial model. Given the fact that the University will continue to require steam service beyond 25 years, it would be in the University's best interest to have facilities capable of operating efficiently and economically at the end of the term. If aged plant equipment is not systematically replaced over the 25 year period, the University is at substantial risk of having to make major capital expenditures at the end of the term. Consequently, the Utilities Committee carefully examined the maintenance and capital expenditures proposed by each proponent. Each proponent was given a summary sheet of what the Utilities Committee understood to be its proposed system upgrade and replacements. All modifications and clarifications to these summary sheets were incorporated into the Committee's evaluation.

Based on a review of the facilities remaining at the end of 25 years, the residual asset value was determined for each proposal. The residual asset value was then incorporated into each of the financial models used to evaluate the proposals.

DIVERSIFIED ENERGIES, INC.

Summary Spreadsheet

Year	1	2	3	4	5	6	7	8	9
Component of Cost	1992	1993	1994	1995	1996	1997	1998	1999	2000
Fuel	$6,834,768	$8,678,899	$8,763,091	$8,808,256	$8,807,938	$9,479,830	$10,202,627	$10,980,165	$11,816,565
Labor, O&M and Management Fee	9,123,960	5,658,108	5,794,159	4,559,472	4,688,351	4,930,977	5,186,368	5,455,163	5,738,120
Capacity Charge	4,446,800	5,348,133	5,667,959	7,162,414	7,046,890	7,222,540	7,403,540	7,588,040	7,778,275
	0	0	0	0	0	0	0	0	0
Capacity Replacement in 2016	0	0	0	0	0	0	0	0	0
Total Cost to University	$20,405,527	$19,685,140	$20,225,209	$20,530,142	$20,543,179	$21,633,347	$22,792,535	$24,023,368	$25,332,960
Price Per Thousand Pounds of Steam	$7.98	$8.04	$8.76	$9.46	$10.13	$10.61	$11.11	$11.64	$12.21

Year	10	11	12	13	14	15	16	17	18
Component of Cost	2001	2002	2003	2004	2005	2006	2007	2008	2009
Fuel Charge	$12,716,259	$13,684,008	$14,724,933	$15,844,535	$17,048,730	$18,343,874	$20,200,328	$21,733,561	$23,382,464
Labor, O&M and Management Fee	6,035,951	6,349,484	6,679,537	7,027,002	7,392,818	7,777,942	8,192,698	8,620,339	9,070,635
Capacity Charge	7,972,275	8,171,809	8,376,023	8,585,408	8,800,574	9,020,302	9,245,702	9,476,813	9,713,688
	0	0	0	0	0	0	0	0	0
Capacity Replacement in 2016	0	0	0	0	0	0	0	0	0
Total Cost to University	$26,724,485	$28,205,301	$29,780,493	$31,456,945	$33,242,122	$35,142,118	$37,638,729	$39,830,713	$42,166,787
Price Per Thousand Pounds of Steam	$12.81	$13.44	$14.11	$14.82	$15.57	$16.37	$17.44	$18.35	$19.32

Year	19	20	21	22	23	24	25		Present
Component of Cost	2010	2011	2012	2013	2014	2015	2016	Total	Value
Fuel Charge	$25,155,719	$27,062,655	$29,113,300	$31,318,428	$33,689,619	$36,239,316	$38,980,892	$463,610,760	$159,100,052
Labor, O&M and Management Fee	9,544,815	10,044,135	10,569,981	11,123,761	11,707,008	12,321,291	12,968,276	80,738,797	32,231,130
Capacity Charge	9,956,973	10,205,473	10,460,873	10,722,123	10,990,790	11,265,790	11,546,790	115,821,554	44,969,153
	0	0	0	0	0	0	0	214,175,997	85,405,258
Capacity Replacement in 2016	0	0	0	0	0	0	45,151,399	45,151,399	7,403,884
Total Cost to University	$44,657,506	$47,312,263	$50,144,155	$53,164,312	$56,387,417	$59,826,397	$108,647,357	$919,498,507	$329,109,477
Price Per Thousand Pounds of Steam	$20.35	$21.45	$22.61	$23.84	$25.15	$26.55	$28.03		

Scenario Assumptions

Steam Use	UBEEP	1992 Gas	$2.75
Financial	Scenario A	1992 E. Coal	$2.00
Efficiency	E1	1992 W. Coal	$1.46
Inflation	5.00%	1992 # 6 Fuel	$3.06
Coal Escalation	5.50%	1992 #2 Fuel	$6.00
Gas/Oil Escal.	7.00%	Fuel Factor	1.00
Discount Rate	7.50%	Labor Factor	1.00
Const. Fact	NA	O&M Factor	1.00

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FOSTER WHEELER POWER SYSTEMS, INC. Taxable Option

Summary Spreadsheet

Component of Cost	Year	1 1992	2 1993	3 1994	4 1995	5 1996	6 1997	7 1998	8 1999	9 2000
Fuel Charge		$7,808,834	$6,651,631	$6,650,443	$6,619,594	$6,800,581	$7,246,224	$7,721,125	$8,227,211	$8,766,542
Operations & Maintenance Charge		11,026,713	11,059,182	10,933,607	10,757,283	11,179,752	11,812,759	12,481,118	13,186,780	13,931,806
Capacity Charge		2,860,000	2,860,000	2,860,000	2,860,000	17,602,000	17,602,000	17,602,000	17,602,000	17,602,000
		0	0	0	0	0	0	0	0	0
Electricity Savings		0	0	0	0	(3,015,215)	(3,165,976)	(3,324,275)	(3,490,488)	(3,665,013)
Total Cost to University		$21,695,547	$20,570,812	$20,444,050	$20,236,877	$32,567,118	$33,495,008	$34,479,968	$35,525,503	$36,635,335
Price Per Thousand Pounds of Steam		$8.48	$8.41	$8.85	$9.33	$16.06	$16.42	$16.81	$17.22	$17.66

Component of Cost	Year	10 2001	11 2002	12 2003	13 2004	14 2005	15 2006	16 2007	17 2008	18 2009
Fuel Charge		$9,341,311	$9,953,859	$10,606,681	$11,302,438	$12,043,971	$12,834,306	$13,676,673	$14,574,516	$15,531,512
Operations & Maintenance Charge		14,718,368	15,548,756	16,425,387	17,350,810	18,327,711	19,358,925	20,447,441	21,596,412	22,809,161
Capacity Charge		17,602,000	17,602,000	17,602,000	17,602,000	17,602,000	17,602,000	17,602,000	17,602,000	17,602,000
		0	0	0	0	0	0	0	0	0
Electricity Savings		(3,848,264)	(4,040,677)	(4,242,711)	(4,454,846)	(4,677,588)	(4,911,468)	(5,157,041)	(5,414,893)	(5,685,638)
Total Cost to University		$37,813,415	$39,063,938	$40,391,357	$41,800,402	$43,296,093	$44,883,763	$46,569,073	$48,358,035	$50,257,035
Price Per Thousand Pounds of Steam		$18.12	$18.61	$19.14	$19.69	$20.28	$20.91	$21.58	$22.28	$23.03

Component of Cost	Year	19 2010	20 2011	21 2012	22 2013	23 2014	24 2015	25 2016	Total	Present Value
Fuel Charge		$16,551,578	$17,638,897	$18,797,929	$20,033,433	$21,350,487	$22,754,506	$24,251,270	$317,735,551	$114,567,379
Operations & Maintenance Charge		24,089,194	25,440,208	26,866,099	28,370,980	29,959,183	31,635,279	33,404,087	472,717,003	174,770,800
Capacity Charge		17,602,000	17,602,000	17,602,000	17,602,000	0	0	0	328,276,000	137,508,028
Additional Distribution Cost		0	0	0	0	0	0	0	0	976,744
Capacity Replacement in 2016		0	0	0	0	0	0	32,250,999	32,250,999	5,288,489
Electricity Savings		(5,969,920)	(6,268,416)	(6,581,837)	(6,910,928)	(7,256,475)	(7,619,299)	(8,000,264)	(107,701,231)	(35,213,010)
Total Cost to University		$52,272,852	$54,412,689	$56,684,192	$59,095,485	$44,053,195	$46,770,487	$81,906,093	$1,043,278,322	$397,898,429
Price Per Thousand Pounds of Steam		$23.82	$24.67	$25.56	$26.50	$19.65	$20.75	$36.15		

Scenario Assumptions

Steam Use	UBEEP	1992 Gas	$2.75
Financial	Scenario A	1992 E. Coal	$1.46
Efficiency	E1	1992 W. Coal	$2.00
Inflation	5.00%	1992 # 6 Fuel	$6.00
Coal Escalation	5.50%	1992 #2 Fuel	$3.06
Gas/Oil Escal.	7.00%	Fuel Factor	1.00
Discount Rate	7.50%	Labor Factor	NA
Const. Fact	NA	O&M Factor	NA

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NORTHERN STATES POWER COMPANY

Summary Spreadsheet

Year	1	2	3	4	5	6	7	8	9
Component of Cost	1992	1993	1994	1995	1996	1997	1998	1999	2000
Per MMBTU Charge	$15,825,257	$15,679,827	$13,696,376	$11,471,853	$10,786,537	$11,475,825	$13,154,368	$13,964,382	$14,824,401
Capacity Charge	10,100,000	10,100,000	10,100,000	10,100,000	10,100,000	10,100,000	10,100,000	10,100,000	10,100,000
Additional Charge for Tunnel Roof Repairs	1,096,996	82,369	81,613	80,501	78,993	83,430	88,113	93,055	98,272
Capacity Repacement Charge	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
Total Cost to University	$27,022,253	$25,862,196	$23,877,989	$21,652,354	$20,965,530	$21,659,255	$23,342,480	$24,157,437	$25,022,673
Price Per Thousand Pounds of Steam	$10.56	$10.57	$10.34	$9.98	$10.34	$10.62	$11.38	$11.71	$12.06

Year	10	11	12	13	14	15	16	17	18
Component of Cost	2001	2002	2003	2004	2005	2006	2007	2008	2009
Per MMBTU Charge	$15,737,531	$16,707,072	$17,736,534	$18,829,646	$19,990,369	$21,222,918	$22,531,768	$23,921,681	$25,397,716
Capacity Charge	10,100,000	10,100,000	10,100,000	10,100,000	10,100,000	10,100,000	10,100,000	10,100,000	10,100,000
Additional Charge for Tunnel Roof Repairs	103,777	109,588	115,720	122,191	129,020	136,226	143,831	151,856	160,323
Capacity Repacement Charge	0	3,909,347	3,909,347	3,909,347	3,909,347	3,909,347	3,909,347	3,909,347	3,909,347
Total Cost to University	$25,941,308	$30,826,007	$31,861,601	$32,961,184	$34,128,736	$35,368,491	$36,684,947	$38,082,884	$39,567,386
Price Per Thousand Pounds of Steam	$12.43	$14.69	$15.09	$15.53	$15.99	$16.48	$17.00	$17.55	$18.13

Year	19	20	21	22	23	24	25		Present
Component of Cost	2010	2011	2012	2013	2014	2015	2016	Total	Value
Per MMBTU Charge	$26,965,252	$28,630,008	$30,398,064	$32,275,885	$34,270,345	$36,388,753	$38,638,883	$269,563,011	$99,174,047
Capacity Charge	10,100,000	10,100,000	10,100,000	10,100,000	10,100,000	10,100,000	10,100,000	106,325,932	41,561,186
Additional Charge for Tunnel Roof Repairs	169,257	178,684	188,631	199,126	210,198	221,880	234,205	266,291,481	99,033,773
Capacity Repacement Charge	3,909,347	3,909,347	0	0	0	0	0	184,292,152	85,811,618
Additional Distribution Cost									
Capacity Replacement in 2016	0	0	0	0	0	0	135,000,000	135,000,000	22,137,173
Total Cost to University	$41,143,857	$42,818,040	$40,686,695	$42,575,011	$44,580,543	$46,710,633	$183,973,088	$961,472,577	$347,717,797
Price Per Thousand Pounds of Steam	$18.75	$19.41	$18.34	$19.09	$19.89	$20.73	$81.21		

Scenario Assumptions

Steam Use	UBEEP	1992 Gas	$2.75
Financial	Scenario A	1992 E. Coal	$1.46
Efficiency	E1	1992 W. Coal	$2.00
Inflation	5.00%	1992 # 6 Fuel	$6.00
Coal Escalation	5.50%	1992 #2 Fuel	$3.06
Gas/Oil Escal.	7.00%	Fuel Factor	1.00
Discount Rate	7.50%	Labor Factor	1.00
Const. Fact	NA	O&M Factor	1.00

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PUBLIC SERVICE OF INDIANA PSI/PRO

Summary Spreadsheet

Year	1	2	3	4	5	6	7	8	9
Component of Cost	1992	1993	1994	1995	1996	1997	1998	1999	2000
Capacity Charge	$11,282,520	$11,846,646	$12,438,978	$13,060,927	$13,713,974	$14,399,672	$15,119,656	$15,875,639	$16,669,421
Variable O&M Charge	4,732,357	4,753,871	4,710,267	4,646,048	4,559,041	4,815,100	5,085,367	5,370,623	5,671,691
Fuel Charge	7,888,337	7,980,387	7,963,533	7,911,204	7,818,910	8,317,774	8,848,479	9,413,065	10,013,701
University Structuring Fee	2,000,000	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0
Total Cost to University	$25,903,214	$24,580,904	$25,112,778	$25,618,178	$26,091,925	$27,532,546	$29,053,502	$30,659,327	$32,354,813
Price Per Thousand Pounds of Steam	$10.13	$10.04	$10.87	$11.81	$12.87	$13.50	$14.16	$14.86	$15.59

Year	10	11	12	13	14	15	16	17	18
Component of Cost	2001	2002	2003	2004	2005	2006	2007	2008	2009
Capacity Charge	$17,502,892	$18,378,036	$19,296,938	$20,261,785	$21,274,874	$22,338,618	$23,455,549	$24,628,326	$25,859,743
Variable O&M Charge	5,989,440	6,324,784	6,678,689	7,052,173	7,446,308	7,862,226	8,301,120	8,764,248	9,252,937
Fuel Charge	10,652,700	11,332,521	12,055,782	12,825,271	13,643,955	14,514,995	15,441,754	16,427,814	17,476,987
	0	0	0	0	0	0	0	0	0
Total Cost to University	$34,145,032	$36,035,341	$38,031,409	$40,139,228	$42,365,137	$44,715,839	$47,198,424	$49,820,389	$52,589,667
Price Per Thousand Pounds of Steam	$16.36	$17.17	$18.02	$18.91	$19.85	$20.83	$21.87	$22.96	$24.10

Year	19	20	21	22	23	24	25		Present
Component of Cost	2010	2011	2012	2013	2014	2015	2016	Total	Value
Capacity Charge	$27,152,730	$28,510,366	$29,935,884	$31,432,679	$33,004,313	$34,654,528	$36,387,255	$538,481,947	$200,697,391
Variable O&M Charge	9,768,583	10,312,662	10,886,727	11,492,417	12,131,459	12,805,674	13,516,982	192,930,793	71,886,406
Fuel Charge	18,593,335	19,781,179	21,045,125	22,390,074	23,821,247	25,344,204	26,964,864	358,467,198	129,813,962
University Structuring Fee	0	0	0	0	0	0	0	2,000,000	0
Additional Distribution Cost									
Capacity Replacement in 2016	0	0	0	0	0	0	47,408,969	47,408,969	7,774,078
Total Cost to University	$55,514,647	$58,604,207	$61,867,736	$65,315,170	$68,957,019	$72,804,406	$124,278,070	$1,139,288,908	$410,171,838
Price Per Thousand Pounds of Steam	$25.30	$26.57	$27.89	$29.29	$30.76	$32.31	$54.86		

Scenario Assumptions

Steam Use	UBEEP	1992 Gas	$2.75
Financial	Scenario A	1992 E. Coal	$1.46
Efficiency	E1	1992 W. Coal	$2.00
Inflation	5.00%	1992 # 6 Fuel	$6.00
Coal Escalation	5.50%	1992 #2 Fuel	$3.06
Gas/Oil Escal.	7.00%	Fuel Factor	NA
Discount Rate	7.50%	Labor Factor	NA
Const. Fact	NA	O&M Factor	NA

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UNIVERSITY INTERNAL OPTION – NEW PLANT

Summary Spreadsheet

Component of Cost	Year	1 1992	2 1993	3 1994	4 1995	5 1996	6 1997	7 1998	8 1999	9 2000
Fuel		$7,472,259	$7,460,651	$7,101,050	$6,468,194	$6,394,567	$6,717,462	$7,148,048	$7,606,219	$8,290,440
Labor		4,037,880	4,239,774	4,451,763	3,839,645	4,031,628	4,233,209	4,444,869	4,667,113	2,911,873
Operations & Maintenance		4,630,434	4,861,956	5,105,053	4,451,708	3,340,731	3,507,768	3,683,156	3,867,314	3,790,294
Capital Capacity Charge		2,865,597	2,530,191	2,259,585	3,899,985	4,543,169	4,880,044	5,147,860	5,428,938	7,786,132
Electricity Savings		0	0	0	0	0	0	0	0	0
Total Cost to University		$19,006,170	$19,092,572	$18,917,451	$18,659,532	$18,310,095	$19,338,482	$20,423,934	$21,569,584	$22,778,739
Price Per Thousand Pounds of Steam		$7.43	$7.80	$8.19	$8.60	$9.03	$9.48	$9.96	$10.45	$10.98

Component of Cost	Year	10 2001	11 2002	12 2003	13 2004	14 2005	15 2006	16 2007	17 2008	18 2009
Fuel		$8,828,148	$9,400,782	$10,010,618	$10,660,085	$11,351,770	$12,088,430	$9,991,767	$10,688,231	$11,435,755
Labor		3,057,466	3,210,340	3,370,857	3,539,399	3,716,369	3,902,188	3,597,627	3,777,508	3,966,384
Operations & Maintenance		3,770,232	3,958,744	4,156,681	4,364,515	4,582,741	4,811,878	4,830,327	5,071,843	5,325,435
Capital Capacity Charge		8,399,039	8,831,835	9,284,904	9,759,050	10,255,101	10,773,904	14,919,374	15,661,535	16,434,220
Electricity Savings		0	0	0	0	0	0	0	0	0
Total Cost to University		$24,054,886	$25,401,701	$26,823,060	$28,323,050	$29,905,982	$31,576,400	$33,339,094	$35,199,117	$37,161,794
Price Per Thousand Pounds of Steam		$11.53	$12.10	$12.71	$13.34	$14.01	$14.71	$15.45	$16.22	$17.03

Component of Cost	Year	19 2010	20 2011	21 2012	22 2013	23 2014	24 2015	25 2016	Total	Present Value
Fuel		$12,238,213	$13,099,780	$14,024,951	$15,018,572	$16,085,865	$17,232,456	$18,464,406	$265,278,720	$101,576,799
Labor		4,164,703	4,372,938	4,591,585	4,821,164	5,062,222	5,315,333	5,581,100	$102,904,936	$44,846,019
Operations & Maintenance		5,591,707	5,871,292	6,164,857	6,473,100	6,796,755	7,136,592	7,493,422	$123,638,536	$50,971,150
Capital Capacity Charge		17,238,118	18,073,869	18,942,056	19,843,194	20,777,719	21,745,974	22,748,195	$152,450,357	$91,375,385
Electricity Savings		0	0	0	0	0	0	0	0	0
Total Cost to University		$39,232,741	$41,417,879	$43,723,448	$46,156,030	$48,722,561	$51,430,356	$54,287,123	$644,272,549	$288,769,353
Price Per Thousand Pounds of Steam		$17.88	$18.78	$19.71	$20.70	$21.73	$22.82	$26.47		

Scenario Assumptions

Steam Use	UBEEP	1992 Gas	$2.75
Financial	Scenario A	1992 E. Coal	$1.46
Efficiency	E1	1992 W. Coal	$2.00
Inflation	5.00%	1992 # 6 Fuel	$6.00
Coal Escalation	5.50%	1992 #2 Fuel	$3.06
Gas/Oil Escal.	7.00%	Fuel Factor	1.00
Discount Rate	7.50%	Labor Factor	1.00
Const. Fact	1.00	O&M Factor	1.00

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Table VI – 10

Financial Scenarios

	Base Case	High O&G Supply	Disruption	Extreme Oil Disruption
	Scenario A	Scenario B	Scenario C	Scenario D
Inflation	5.00%	4.00%	7.00%	10.00%
Gas	7.00%	3.00%	11.00%	16.00%
#2 Fuel	7.00%	2.00%	12.00%	18.00%
#6 Fuel	7.00%	2.00%	12.00%	18.00%
W. Coal	5.50%	4.00%	8.00%	12.00%
E. Coal	5.50%	4.00%	8.00%	12.00%
Discount Rate	7.50%	5.60%	8.00%	10.40%
Debt–Exempt	7.50%	5.60%	8.00%	10.40%
Debt–Taxable	9.00%	7.00%	10.00%	13.00%
Prime Rate	10.00%	9.00%	12.00%	14.00%
Probabilities	30.00%	20.00%	16.00%	3.00%

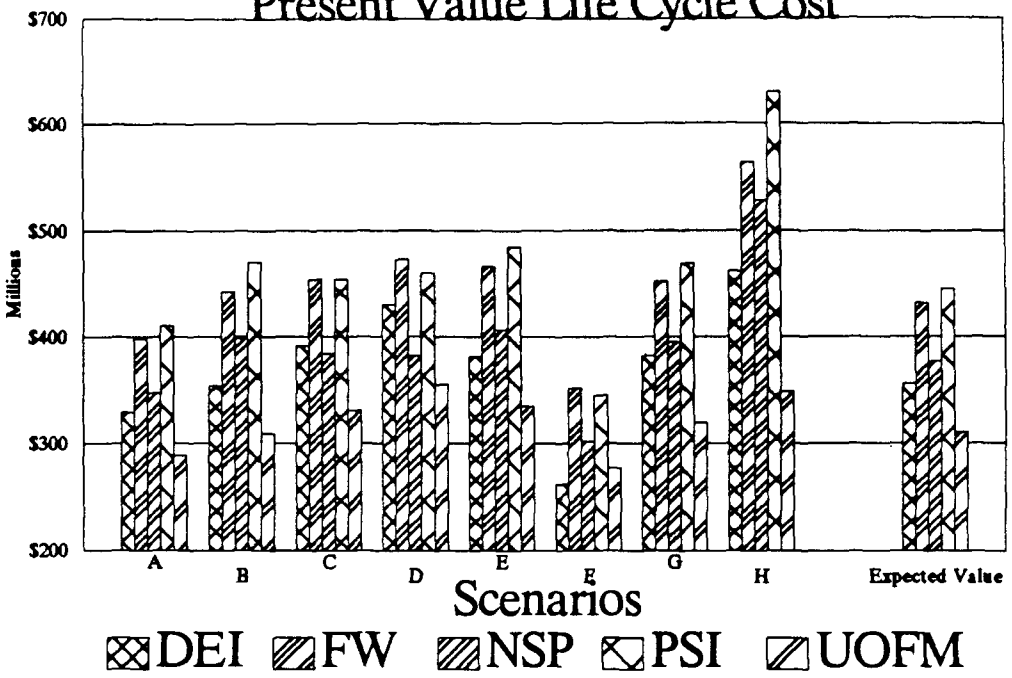
	Environment Concerns	Stagflation & Tight Money	Oil Security Measures	Depression
	Scenario E	Scenario F	Scenario G	Scenario H
Inflation	5.00%	8.00%	5.00%	2.00%
Gas	7.50%	7.00%	7.50%	0.00%
#2 Fuel	7.40%	7.00%	8.00%	0.00%
#6 Fuel	7.40%	7.00%	8.00%	0.00%
W. Coal	6.80%	8.00%	5.50%	1.50%
E. Coal	6.80%	8.00%	5.50%	1.50%
Discount Rate	6.40%	10.40%	6.40%	2.40%
Debt–Exempt	6.40%	10.40%	6.40%	2.40%
Debt–Taxable	8.00%	13.00%	8.00%	3.00%
Prime Rate	9.00%	12.00%	11.00%	4.00%
Probabilities	10.00%	8.00%	10.00%	3.00%

Discussion

The Utilities Committee retained the services of Dr. William Nordhaus, a specialist in energy economics, to assist in assessing the relative risk of relying on certain fuels. Dr. Nordhaus developed a set of scenarios which would affect the price of steam under each proposal. The assumptions (or financial factors) underlying each of those scenarios are detailed above.

The Scenarios consider a range of possibilities from depression to extreme oil disruption. The probabilities include Dr. Nordhaus's estimate of the likelihood that each scenario would occur. The Base Case, with a probability of 30%, is considered the most likely. Depression, with a probability of 3%, is considered least likely.

Graph VI – 2



SCENARIO	PROBABILITY
Scenario A	30.00%
Scenario B	20.00%
Scenario C	16.00%
Scenario D	3.00%
Scenario E	10.00%
Scenario F	8.00%
Scenario G	10.00%
Scenario H	3.00%
Expected Value	

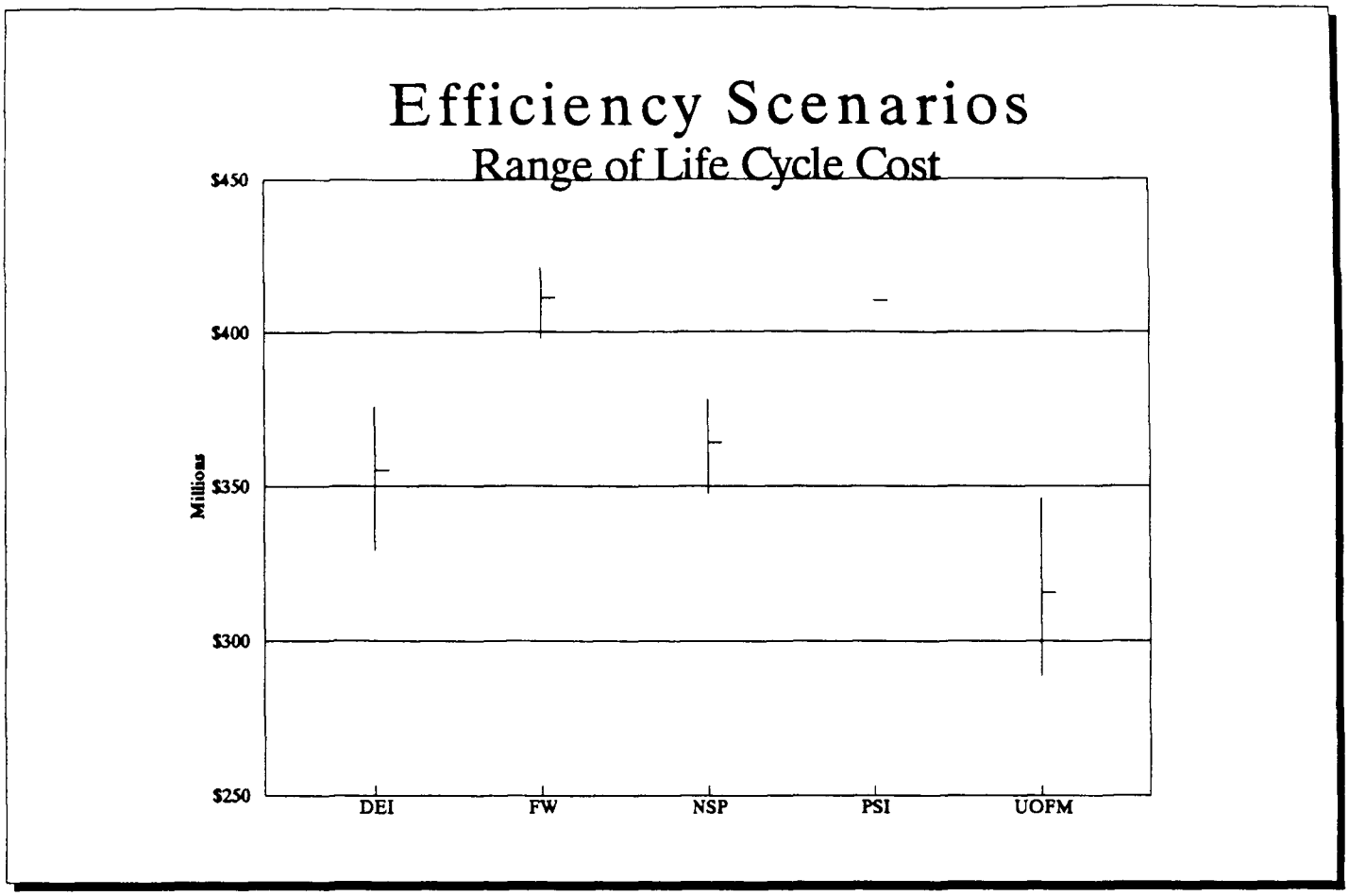
DEI	FW	NSP	PSI	UOFM
$329,109,477	$397,898,429	$347,717,797	$410,171,861	$288,769,353
$353,977,463	$441,768,173	$398,154,922	$469,614,254	$309,040,848
$391,429,472	$453,686,463	$383,718,144	$453,590,780	$331,513,129
$429,619,252	$472,345,566	$382,453,088	$459,531,001	$355,223,846
$381,397,735	$465,745,145	$406,300,978	$484,205,558	$335,036,723
$261,592,371	$351,515,268	$301,978,864	$345,105,735	$277,002,657
$382,575,572	$451,773,482	$395,227,365	$468,588,829	$319,356,058
$461,315,280	$563,520,937	$527,988,720	$629,584,965	$348,723,708
$356,209,807	$431,262,077	$376,965,624	$445,110,310	$310,198,993

Discussion

The variability in price for each proposal was analyzed under each of the eight financial scenarios developed by Dr. William Nordhaus, a specialist in energy economics. As can be seen from the graph above, DEI has the lowest Life Cycle Cost for steam of the external proposals under six of the eight scenarios. A composite value for each proponent which incorporates all eight financial scenarios was developed by Dr. Nordhaus. This composite value is called the "expected value" in the graph.

DEI has the lowest expected value of the external proposals.

Graph VI – 3

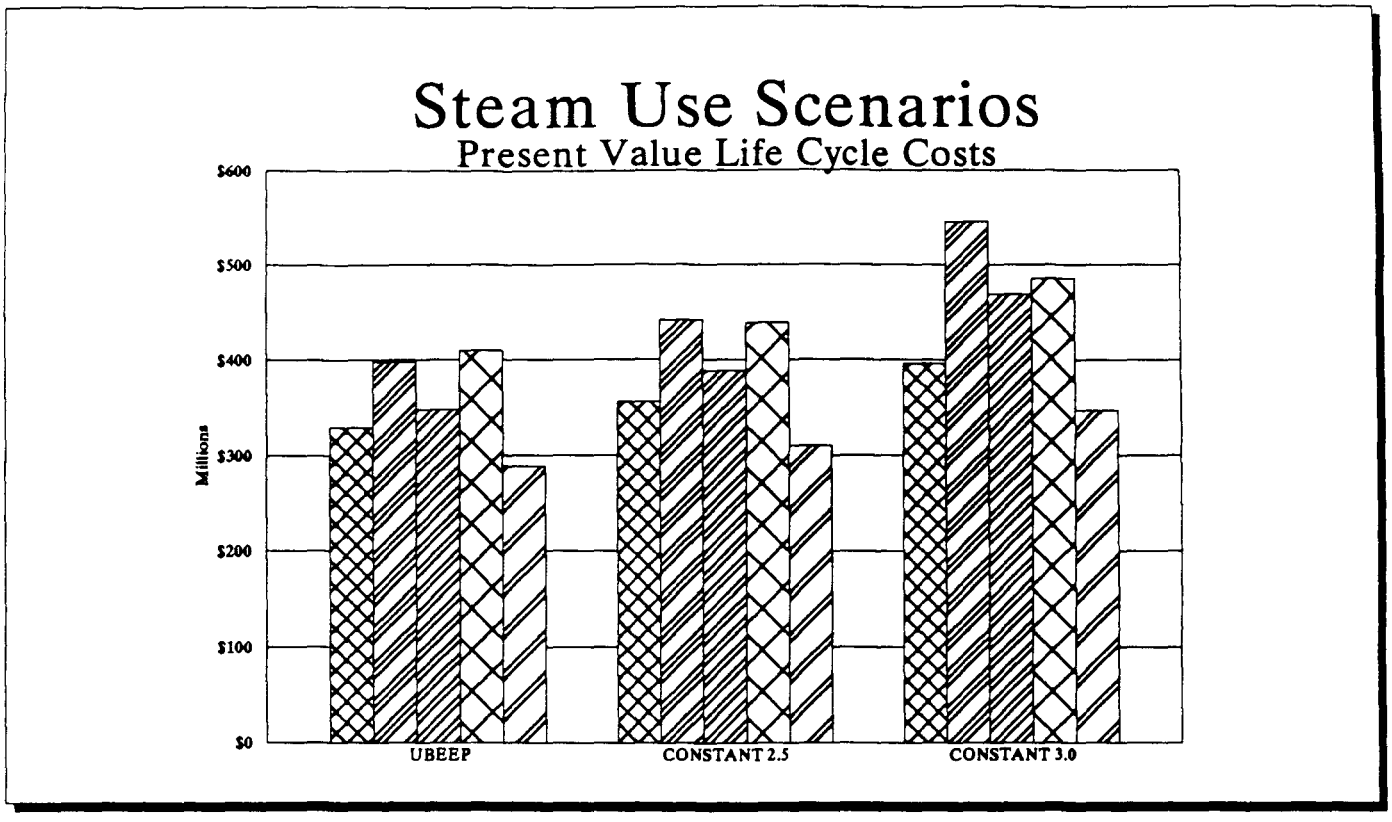


EFFICIENCY SCENARIO	DEI	FW	NSP	PSI	UOFM
E1	$329,109,477	$397,898,429	$347,717,797	$410,171,861	$288,769,353
E2	$360,268,871	$420,811,905	$366,541,096	$410,171,861	$309,084,713
E3	$335,555,703	$397,898,429	$347,717,797	$410,171,861	$297,738,557
E4	$338,103,308	$397,898,429	$359,142,862	$410,171,861	$298,963,583
E5	$329,109,477	$397,898,429	$347,717,797	$410,171,861	$306,672,337
E6	$371,273,110	$420,811,905	$372,358,485	$410,171,861	$323,151,032
E7	$375,831,122	$420,811,905	$378,175,874	$410,171,861	$328,248,147
E8	$375,831,122	$420,811,905	$378,175,874	$410,171,861	$346,151,130
HIGH	$375,831,122	$420,811,905	$378,175,874	$410,171,861	$346,151,130
LOW	$329,109,477	$397,898,429	$347,717,797	$410,171,861	$288,769,353
AVERAGE	$355,138,959	$410,991,844	$364,261,398	$410,171,861	$315,715,642

Discussion

The Life Cycle Cost of each proposal was also calculated under each of the eight efficiency scenarios. The efficiency scenarios were design to see the effect of increasing fuel costs, labor costs, operations and maintenance costs or construction costs by 20% for each year over the 25 year term. The graph above indicates the highest, lowest and average Life Cycle Cost under the eight efficiency scenarios for each proposal. The average calculated for DEI is the lowest of the external proposals. DEI's variability from highest to lowest is generally lower than that of the other external proposals.

Graph VI – 4



Life Cycle Present Value Costs

	DEI	FW	NSP	PSI	UOFM
Assuming steam use projected by the University Building Energy Efficiency Project	$329,109,477	$397,898,429	$347,717,797	$410,171,861	$288,769,353
Assuming constant steam usage of 2.5 billon pounds of steam per year	$355,702,569	$441,555,927	$388,284,863	$439,365,581	$310,751,928
Assuming constant steam usage of 3.0 billon pounds of steam per year	$395,999,478	$545,577,807	$469,057,899	$485,544,399	$346,910,342

Discussion

The graph above is based on three steam use scenarios. In each scenario the amount of steam used by the University was assumed to be different. Specifically, the steam use scenarios are as follows:

- UBEEP – steam use assumptions based on projections from the University Building Energy Efficiency Project.
- Constant 2.5 – assumed University steam use of 2.5 billion pounds of steam per year throughout the 25 year term.
- Constant 3.0 – assumed University steam use of 3.0 billion pounds of steam per year throughout the 25 year term.

The DEI proposal had the lowest Life Cycle Cost of the external proposals under each of the efficiency scenarios. This means that DEI's cost to the University is lowest among the external proposals irrespective of whether the University's steam use decreases because of conservation or increases as a result of growth.

VII. ENGINEERING AND TECHNICAL EVALUATION

VII. ENGINEERING AND TECHNICAL EVALUATION

A. INTRODUCTION

This chapter includes the results of the technical reviews completed for each of the four external proposals and for the University's Internal Option. Each review consists of the following seven technical aspects:

1. Capacity Evaluation - Consists of a review of boiler plant capacity as it relates to boiler equipment either maintained or installed by the proponent, and a review of the ability of this equipment to meet the firm distribution capacity required by the RFP. Firm distribution capacity is defined as steam available for export to the University distribution systems, while allowing for the single largest boiler being off line, and for ten percent (10%) of the steam generated being consumed within the boiler plant.

   Pursuant to the maintenance of adequate boiler plant capacity, it is the obligation of the proponent to obtain and maintain air emission permits. Any modification or addition to boiler equipment will require repermitting of the equipment and/or the facility. Conditions placed on the revised operation permits will have a positive or negative impact on the future operating flexibility related to fuel selections.

2. Fuel Use Evaluation - Consists of a review of the fuel consumption relative to steam consumption. A review of the fuel flexibility offered by the proponent, a review of the proposed modifications or upgrades for fuel storage and handling systems currently in place at the University's heating plants, and an evaluation of lime usage and costs proposed by the proponent.

   Where quantities or costs are significantly different than those currently experienced or proposed by the University, significant risks may exist for greater future costs unless the proponent will guarantee the performance or costs contained in its proposal.

3. Ash Disposal Evaluation - Consists of a review of ash disposal costs, quantities, and potential risks to the University regarding future operations. Coal ash currently is not considered a hazardous material, and changes through legislation are not anticipated at this time.

4. Steam and Condensate Issues - Consists of a review of each proposal relative to meeting the requirements for steam conditions and acceptance of condensate return criteria (quantity and quality) as stated in the Request for Proposal.

   The utility study completed by CRS Sirrine recommended significant improvements to the condensate treatment systems at Minneapolis to reduce corrosion and improve boiler efficiencies. However, the University physical plant personnel have been unable to commit to the use of corrosion preventing amine in the steam, because Health Science and Academia require "pure" steam for experimentation and sterilization.

5. Labor Use Evaluation - Consists of a review of staffing as proposed by each proponent. Staffing criteria generally are based on the number of steam heating plants operated and the type of fuel used.

   Where labor quantities and/or costs are not guaranteed by the proponents, the University could risk additional future costs due to unrealistic estimates. Labor costs also must be differentiated to clarify permanent on staff payroll versus contract labor required for general maintenance of the facility.

6. Connection Line Evaluation - Consists of a review of each proposal relative to meeting the requirements of meter accuracy, meter locations, and connection line maintenance as stated in the Request for Proposal.

   A meter accuracy allowance of $\pm$ 1% could equate to additional costs or savings of $100,000 to $250,000 per year depending on the final price structure negotiated with the proponent. Costs associated with upgrading or maintaining connecting lines, and the resulting impact on capital cost guaranteed and final allowances with a third party must be defined clearly to avoid future misunderstandings in contract compliance.

7. Asset Evaluation - Consists of a review of maintenance and capital expenditures proposed. Each proponent was given summary sheets outlining system upgrade and replacement summaries. Where modifications or clarifications were indicated, they have been included in this final review documentation.

   Because the University will require steam service beyond the 25 year term of the contract, the facilities should be capable of operating efficiently and economically well beyond year 25. If aged plant equipment is not replaced systematically over the 25 year contract term, the University will be at substantial risk concerning major cost increases during

subsequent renewal terms and/or during the return of the operation to internal University departments.

B. PSI TECHNICAL EVALUATION

1. Capacity Evaluation

PSI proposes to provide firm plant capacity of 525,000 lbs/hr for the Minneapolis Campus and 225,000 lbs/hr for the St. Paul Campus.

Through the year 2001, the Minneapolis operation will continue to use all six boilers at the Minneapolis Main Plant, providing for 570,000 lbs/hr total capacity, and the two existing boilers at Minneapolis Southeast providing 230,000 lbs/hr total capacity. This will provide for a firm capacity for the Minneapolis Campus of 563,000 lbs/hr through the year 2001 based upon internal steam usage of approximately 10%.

By 2001, PSI anticipates completing installation of two (2) 150,000 lb./hour pulverized coal boilers at Minneapolis Southeast, at which time Boilers #3 and #4 at Southeast and Boilers #1 and #2 at Minneapolis Main would be retired and decommissioned. Firm plant capacity for the Minneapolis Campus then would drop to 513,000 pph.

A summary of boiler capacity and age for Minneapolis follows:

Boiler Number	Capacity (1000 lbs.)	Year Installed	Fuel Used	Years in Use 1992	2001	2017 (age)
Minneapolis Main						
1	60	1949	WC	X	R	R
2	60	1951	WC	X	R	R
3	70	1953	WC/O	X	X	X(64)
4	80	1963	WC/O	X	X	X(54)
5	120	1964	WC/O	X	X	X(53)
6	180	1972	O/G	X	X	X(45)
Minneapolis Southeast						
3	110	1941	WC	X	R	R
4	120	1948	WC	X	R	R
5	150	2001	WC		X	X(16)
6	150	2001	WC		X	X(16)

Firm Distribution Capacity

1992: 563,000 lbs.
2001: 513,000 lbs.
2017: 513,000 lbs.

Through the year 2000, PSI will use all seven boilers at St. Paul providing for a total installed capacity of 320,000 lbs/hr. This will provide for total firm plant capacity of approximately 216,000 lbs/hr given an allowance for 10% internal usage.

By the year 2000, PSI anticipates completing installation of one (1) 60,000 lbs/hr oil-gas fired boiler at St. Paul, at which

time Boilers #3 and #4 would be retired and decommissioned:

Boiler Number	Capacity (1000 lbs.)	Year Installed	Fuel Used	Years in Use 1992	2001	2017 (age)
St. Paul						
1	30	1955	EC/G	X	X	X(62)
2	30	1955	EC/G	X	X	X(62)
3	30	1940	O/G	X	R	R
4	30	1940	O/G	X	R	R
5	60	1971	EC/O/G	X	X	X(46)
6	60	1975	EC/O/G	X	X	X(42)
7	80	1991	O/G	X	X	X(26)
8	60	2000	O/G		X	X(17)

Firm Distribution Capacity

1992: 216,000 lbs.
2001: 216,000 lbs.
2017: 216,000 lbs.

At or near the end of the 25 year contract term, additional capital will be required at both the Minneapolis and St. Paul Campuses to replace boilers which have exceeded 60 years of age. Moreover, althrough PSI's proposal includes adequate equipment to meet the RFP's team capacity requirements when using PSI's 7% estimate of internal steam usage, if internal steam usage runs at ten percent (10%), PSI's proposal appears inadequate. PSI would not be able to provide greater firm capacity above that required in the RFP without significant capital expenditure. Though total capital expenditure schedules are not provided by PSI, PSI has indicated that $30 million is included for condition assessment and capital replacement including capital costs for two new boilers at Minneapolis and one new boiler at St. Paul.

PSI's proposed operating plan will require permitting of two new 150,000 pph coal fired boilers at Minneapolis Southeast and one new 60,000pph gas/oil fired boiler at St. Paul. Based upon available emission offsets, the Minneapolis installation should not present any difficulty in permitting for the installation. Depending on the actual use of Boilers #3 and #4 at St. Paul prior to permitting and installation of new Boiler #8, some operating limitations for flue gas emission control systems may be required to permit this installation. Overall, the permitting risk should be low for PSI's proposal.

2. Fuel Use Evaluation

a. Combustion Efficiency

PSI's proposal is based on 1,584 BTU per pound of steam distributed to the University, given 85% condensate return. Return condensate temperature was not given but assumed to be based on 160°F. This fuel consumption rate assumes 75% plant efficiency, this probably being the greatest efficiency achievable with the large number of boilers used by PSI. PSI, through their pricing structure for fuel, has guaranteed the fuel consumption rate (i.e. efficiency) for the facility.

b. Fuel Type

PSI proposes to use a fuel mix of 65% Western Coal, 24% Eastern Coal, 9% Natural Gas and 2% Fuel Oil. Fuel mix capabilities of the heating plant remain consistent with the current operations. Costs used for cost calculations are consistent with those expected. Costs for fuel projected by PSI are approximately $300,000 below those projected internally by the University for year 1.

c. Fuel Storage Systems

Coal storage and handling systems will not be changed per PSI's proposal. PSI is proposing to upgrade all underground oil storage systems to meet EPA criteria by 1998. PSI requires that the University test all tanks, and that the University accept all costs to repair and remediate contamination related to the current equipment.

d. Lime Usage

PSI will use lime for flue gas scrubbing from the Minneapolis Southeast Plant. PSI's costs for lime of $44,000 in 1992 are lower than that currently experienced by the University. Further, there is no corresponding increase in lime costs associated with new boilers being added to the Southeast heating plant. Boiler Plant revisions being proposed will increase the quantity of coal combusted and subject to scrubbing and improve scrubber removal efficiency all resulting in an increase in lime consumption. This may result in greater future costs to the University than proposed by PSI unless PSI guarantees Operation and Maintenance (O&M) costs.

3. Ash Disposal Evaluation

PSI assumes ash disposal rates begin at $25/ton and escalate at the rate of inflation. Total annual ash disposal costs are approximately 15% below those used in the University plan and, probably are understated. Future costs could be effected by PSI's ability to secure contracts for ash disposal. If the University were to site and construct an ash disposal facility for use by PSI, capital costs of $1 to $2 million would be required and which are not accounted for. When these capital costs are accounted for, ash disposal costs could be expected to increase by 25% to 50% above that currently considered by PSI.

4. Steam and Condensate Issues

PSI does not take exception to the original RFP requirements for steam conditions or potential return quantity or quality. Their response also indicates that the existing water treatment systems would be maintained as is throughout the term of the contract. PSI does indicate that upgraded water treatment systems could be added at Minneapolis to improve overall efficiency and reduce operating costs, if they were cost effective and if they were funded by the University.

5. Labor Use Evaluation

PSI proposes to use a majority of the existing staff at the current heating plants, with a staff reduction of 83 to 75 people shortly after takeover by PSI. Significantly higher labor costs appear to be charged to the University than that currently realized by physical plant, which may account for support staff charges at PSI corporate.

6. Connecting Lines

PSI proposes to use connecting lines and connecting points indicated on the documents included with the Request for Proposal. PSI will provide meters accurate to plus or minus 1%. PSI is in agreement, essentially, with the billing concept, except that revenues associated with understated meter quanities if the meters result in understanding steam consumption are due PSI.

7. Asset Evaluation and Summary

PSI proposes to maintain and operate the plant as required through the 25 year life of the contract. Except for specific modifications and additions made to the boiler equipment which fall within their projected maintenance and capital expenditure, future

major costs could be passed on directly to the University if these costs are identified in the original plant assessment conducted by PSI over the first six years of the contract term.

Maintenance cost allocation indicated by PSI is $1.68/1000 lbs. of steam supplied to the University in 1990 dollars. This allocation includes all utilities, water treatment chemicals, periodic maintenance supplies, contract labor, coal handling and ash hauling. This allocation is approximately 35% to 40% lower than currently experienced by the University for this category. Under PSI's revised pricing spreadsheet submitted as part of Addendum #2, ash disposal costs have been reallocated to fuel charge components and removed from the variable O&M charge. Given some continuance beyond the year 2017, these maintenance costs allocations for continuance of the three existing heating plants through the 25 year term may be understated, and could pose a risk in terms of adequately maintaining the facilities for operation beyond year 25.

The remaining plant assets at the end of PSI's contract probably would be relatively low compared to the other proposals. Operating and maintenance costs probably would continue beyond the year 2017, including requirements for additional capital expenditure to maintain reliability and availability of steam from the three heating plants in the near term following the close of the contract.

In summary, except for specific boiler replacements cited, PSI is proposing only to repair or replace equipment as required to maintain service through the 25 year contract. At the end of the contract, buildings and systems will have aged 25 years without a total replacement of all major subsystems. Only the coal boilers at Minneapolis Southeast will be "new;" all other coal systems will be subject to significant future expenditures.

Plant modification and resulting plant assets are summarized in the following chart:

REMAINING PLANT ASSET SUMMARY

PROPONENT PSI

ASSET	MODIFICATION
BUILDING AND FACILITY	
Basic Building	o Miscellaneous repairs
	o Section of new roof and facilities will be provided to meet the needs of new boilers
Electrical Distribution and Service	o Repair and/or replaced on an as needed basis through life of contract
Standby Power System	o No mention of modifications
Compressed Air System	o Repair, and/or replaced on an as needed basis through life of contract
Water/Sewer Service	o No change
Exterior Fire Protection	o No change
Interior Fire Protection	o No change
HVAC	o No modification anticipated
FUEL HANDLING	
Coal Storage Bunkers	o Maintained as required to operate over this 25-year period
Coal Unloading and Transfer	o Maintained as required to operate over this 25-year period

Interior Coal Conveyor System	o Repair or replace as applicable over life of contract
Oil Transfer/Supply Systems	o Replacement and upgrade anticipated to meet EPA requirements in 1998
	o No costs given--assumed covered under capital

STEAM GENERATING FACILITIES

Boilers	o 2 new 150 mph coal boilers year 9 at Minneapolis, 1 new 60 mph gas/oil St. Paul year 9
Control System	o No specifics, repair as required. new systems provided with new boiler equipment.
Deaerator System	o No specifics, repair as required
Boiler Feed/Condensate System	o No specifics, repair as required
Water Treatment Sytems	o No specifics, repair as required
	o Consider changes if cost effective and paid for by the University
Pollution Control Equipment	o No specifics, repair as required
	o Upgraded emission control system most likely provided with the new coal boiler equipment
Emission Monitoring Equipment	o No specifics, repair as required
Stacks and Fans	o Repair stacks--new at Southeast with new boilers
	o Repair or replace as required through life of contract
Ash Load Out Facilities	o Repair and/or replaced as required

DISTRIBUTION SYSTEM

Tunnels	o No modifications
Steam and Condensate Piping	o No major modifications--only to maintain integrity of system

C. DEI TECHNICAL EVALUATION

1. Capacity Evaluation

DEI proposes to provide firm plant capacity of 525,000 lbs/hr for the Minneapolis Campus and 225,000 lbs/hr for the St. Paul Campus.

Minneapolis operation will use no boilers at the Minneapolis Main Plant after year 3. DEI will install three new 200,000 lb./hour-gas/oil boilers in addition to retrofitting the two existing boilers at Minneapolis Southeast to provide 830,000 lbs/hr total capacity through the contract term. This arrangement will provide for a firm capacity for the Minneapolis Campus of 567,000 lbs/hr through the term of the contract based upon internal steam usage of approximately 10%. A summary of boiler capacity and age for Minneapolis follows:

Boiler Number	Capacity (1000 lbs.)	Year Installed	Fuel Used	Years in Use 1992	1994	2017 (age)
Minneapolis Main						
1	60	1949	WC	X	R	R
2	60	1951	WC	X	R	R
3	70	1953	WC/O	X	R	R
4	80	1963	WC/O	X	R	R
5	120	1964	WC/O	X	R	R
6	180	1972	O/G	X	R	R
Minneapolis Southeast						
3	110	1941	G/O	X	X	X(76)
4	120	1948	G/O	X	X	X(69)
5	200	1994	G/O		X	X(23)
6	200	1994	G/O		X	X(23)
7	200	1994	G/O		X	X(23)

Firm Distribution Capacity

1992: 563,000 lbs.
1994: 567,000 lbs.
2017: 567,000 lbs.

DEI will use all seven boilers at St. Paul providing for a total installed capacity of 320,000 lbs/hr. Through the year 1994, this will provide for total firm plant capacity of approximately 216,000 lbs/hr given an allowance for 10% internal usage.

By the year 1994, DEI anticipates completing installation of one (1) 80,000 lb/hour oil-gas fired boiler at St. Paul. Boilers #1 and #2 or #3 and #4 would be retired and decommissioned. DEI's

latest response indicates that sufficient capital is available to replace all boilers if required. This must be clarified through further negotiation since no major capital expenditures are scheduled after year 16.

A summary of boiler capacity and age for St. Paul follows:

Boiler Number	Capacity (1000 lbs.)	Year Installed	Fuel Used	Years in Use 1992	1994	2017 (age)
St. Paul						
1	30	1955	G/O	X	X	X(62)
2	30	1955	G/O	X	X	X(62)
3	30	1940	G/O	X	R	R
4	30	1940	G/O	X	R	R
5	60	1971	G/O	X	X	X(46)
6	60	1975	G/O	X	X	X(42)
7	80	1991	G/O	X	X	X(26)
8	80	1994	G/O		X	X(23)

Firm Distribution Capacity

1992: 216,000 lbs.
2001: 234,000 lbs.
2017: 234,000 lbs.

At or near the end of the 25 year contract term, additional capital may be required at the St. Paul and Minneapolis Campus to replace boilers which have exceeded 60 years of age. Further, the capacity installed and maintained under DEI's proposal appears to have increased in DEI's latest addendum. Discussions to confirm issues with respect to firm capacity and equipment age, including allowing for 10% internal steam usage, should be completed by the

University. DEI appears able to provide 4% to 8% greater firm capacity above that required in the RFP without significant additional capital expenditure.

Total capital expenditure schedules are provided by DEI for the proposal. These schedules indicate that $70 million is included for capital replacement, including capital costs for three new boilers at Minneapolis and at least one new boiler at St. Paul. These expenditures would be made over the term of the contract and, based on a 7.5% discount factor, equate to a $39.6 million present value. Further clarification of expenditure schedules, equipment being replaced, and grade of equipment being installed will be required. DEI's expenditure schedule includes several years where capital expended is significantly less than $750,000.

DEI's proposed operating plan will require permitting of three new boilers at Minneapolis, one new boiler at St. Paul, and fuel conversions at the remaining Minneapolis and St. Paul boilers. Based upon available emission offsets, the conversion and installation should not present significant difficulty in permitting the installation. Given that 600,000 pph of new equipment is being permitted at Minneapolis while 570,000 pph of existing equipment, with a utilization factor of less than 35%, is being decommissioned, DEI may be forced through a PSD and non-attainment review process. Similar permitting issues may be encountered at St. paul for any new equipment installed after offsets from coal boilers are no longer available.

Of greater risk to the University is the loss of ability to bank coal emission credits and the potential that conversion back to coal would not be allowed or permittable. If conversion from coal to gas based fuels occurred after reclassification of the region to "Attainment" status by the EPA, banking of coal emission credits available prior to conversion to gas fuel might be possible. The University should take an active role in the

permitting of the new facility to assure that restrictive stipulations are not placed on the new operating permits relative to the type, rate and quantity of fuel oil that could be burned in the equipment.

2. Fuel Use Evaluation

a. Combustion Efficiency

DEI's proposal is based on 1,420 BTU per pound of steam distributed to the University given 90% condensate return and return condensate temperature of 160°F. This fuel consumption rate assumes 80% plant efficiency and 3.5% unaccounted internal usage. However, these figures are not guaranteed under DEI's current proposal and efforts should be made to receive such guarantees. If actual fuel consumption were consistent with the University's projection, the present value for DEI's proposal could increase by more than 8%, or approximately 14 million dollars over the term of the contract

b. Fuel Type

DEI proposes to use a fuel mix of 90.8% Natural Gas and 9.2% Fuel Oil after the first year. Fuel prices are guaranteed through year 15 based on a cost per million BTU input and a maximum annual fuel consumption of 3.85 million MMBTU. Optimal fuel mix is left to the discretion of DEI.

Fuel mix capabilities of the heating plant will mean that future coal use may not be possible without significant modifications and permit expenses. Permit emission offsets and limits may be lost through the plant modification process. DEI stated orally that banking of the current coal emissions could be accomplished, potentially allowing the University to return to coal in the future. This has not been confirmed, and it should be left

to DEI to provide when plant modifications are permitted.

DEI's fuel use figures for 1992 have been equalized to the University's projection with the exception that pricing is based on DEI's guaranteed costs.

c. Fuel Storage Systems

Coal storage and handling systems will not be used. DEI is proposing to use all existing oil storage systems. Costs to upgrade to meet EPA criteria by 1998 may not be included. DEI requires that the University accept all costs to remediate contamination related to current equipment and operation.

DEI also stated that an additional $500,000 will be required of the University if the oil storage facility at the Minneapolis Main Heating Plant can not be retained and new facilities must be constructed at the Southeast Heating Plant. Continual use of oil storage facilities at Minneapolis Main may mean that the entire site could not be decommissioned and turned over to the University for further development.

d. Lime Usage

Because DEI will use little lime for flue gas scrubbing due to fuel base changes, there is no corresponding lime cost included. It is anticipated such costs would be small and of little risk to the University. In any case, future costs for lime should be included in guaranteed O&M figures provided by DEI.

3. Ash Disposal Evaluation

DEI assumes that current ash disposal rates will continue through 1993, and that no coal or ash disposal will be used or required thereafter. Ash disposal rates are approximately 5% below

that used in the University plan for 1992 and probably are understated for the single year of use.

4. Steam and Condensate

DEI does not take exception to the original RFP requirements for steam conditions or potential return quantity and quality. Their response also indicates that existing water treatment systems would be maintained as is throughout the term of the contract at St. Paul, and that a new condensate cleaning and water treatment system would be installed at Minneapolis. DEI does not specify the exact type of upgraded water treatment system to be added at Minneapolis. Though capital costs are guaranteed by DEI, future operating costs are proposed as a pass through to the University and could be effected by the type of system selected by DEI.

5. Labor Use Evaluation

DEI proposes to use a majority of the existing staff at the current heating plants for 1992, with a staff reduction of 83 to 56 people by year 2, and to 40 people by year 4. Labor costs included in the initial response for year 1 are lower than currently experienced by the University. The total DEI labor charge for 1992 for heating plant personnal (not including administrative staff) equals approximately $3.3 million. The projected labor costs by the University for year 1992 is $4.0 million, or approximately 0.7 million dollars more than included in DEI's 1992 cost of steam.

All future labor costs should be guaranteed against an accepted inflation index in terms of both average salary costs and total staff requirements. In general, labor quantities listed are consistent with that expected in gas fired steam plants of similar size.

6. Connecting Lines

DEI proposes to use connecting lines and connecting points indicated on the documents previously included with the Request for Proposal. DEI will provide meters accurate to plus or minus 2%. DEI is in agreement, essentially, with the billing concept, except that, if the meters result in understated steam consumption, DEI will be reimbursed for actual lost revenues. DEI will make, at its own expense, make all modifications to piping at plants to incorporate metering for steam and condensate. Further, DEI has stated orally that it will modify steam and condensate connecting line piping from Minneapolis Southeast as required to meet capacity requirements for the upgraded steam plant within the capital structure proposal. No boiler equipment will be located in Minneapolis Main, thus allowing the University to decommission the boiler equipment within the building. (See Fuel Storage Review)

7. Plant Asset Evaluation and Summary

DEI proposes to maintain and operate the Minneapolis Southeast and St. Paul heating plant as required through the 25 year life of the contract. Minneapolis Main will be shut down and decommissioned by the University, except that oil storage facilities must remain. Specific modifications and additions will be made to the boiler equipment which fall within DEI's projected capital expenditure of approximately $70 million. Future costs not anticipated could be passed on directly to the University as increased operating and maintenance costs if not guaranteed by DEI.

Overall, DEI proposes spending the most capital at Minneapolis Southeast for new boilers, retrofitted boilers, water treatment, boiler feed, etc. While this plant will be in reasonable condition in terms of new equipment, the average age of the boilers will still be in excess of 40 years at the end of the 25 year contract. St. Paul appears to have limited capital expenditure guaranteed,

with an average boiler age of 50 years at the end of the contract. Only two plants will remain at the end of the contract.

Plant modifications and remaining plant assets are summarized in the following chart.

REMAINING PLANT ASSET SUMMARY

PROPONENT DEI

ASSET	MODIFICATION
BUILDING AND FACILITY	
Basic Building	o Miscellaneous repair--tuck pointing, new windows, doors
Electrical Distribution and Service	o New MMC and unit substation for new equipment at Minneapolis
	o No modifications to St. Paul
Standby Power System	o No upgrade
Compressed Air System	o No upgrade
Water/Sewer Service	o No upgrade
Exterior Fire Protection	o No upgrade
Interior Fire Protection	o No upgrade
HVAC	o New combustion air ventiliation system at Minneapolis
FUEL HANDLING	
Coal Storage Bunkers	o Decommissioned
Coal Unloading and Transfer	o Decommissioned
Interior Coal Conveyor System	o Decommissioned--removed at Southeast and St. Paul

Oil Transfer/Supply Systems	o Use oil facilities at Minneapolis Main--no upgrades o No upgrades to St. Paul oil systems except as required to use heavy oil o Cost to move above ground system at Main to Southeast--add $500,000+ o Added capital will be required to meet EPA tank criteria in 1998

STEAM GENERATING FACILITIES

Boilers	o Southeast Plant--600,000 pph gas/oil new capacity, 50 year life o St. Paul--1 new 60 mph boiler provided if needed unclear whether included o DEI has stated that adequate capital exists for replacement of all St. Paul boilers during the term of the contract
Control System	o New system for new boiler
Deaerator System	o New system by Year 3, Minneapolis
Boiler Feed/Condensate System	o New system at Minneapolis
Water Treatment Systems	o New system (not defined by type, options given) at Minneapolis
Pollution Control Equipment	o Low NO_x Burners and SO_2 scrubbers as required by permits
Emission Monitoring Equipment	o New as required by permit at Minneapolis
Stacks and Fans	o New stacks if required
Ash Load Out Facilities	o Decommissioned with gas usage

DISTRIBUTION SYSTEM

Tunnels	o Repair from Southeast to Main--tunnel roof only to $1.2 million
Steam and Condensate Piping	o No major modifications
	o Has committeed orally to covering any required upgrades to meet capacity for flow from Southeast Main

D. NSP TECHNICAL EVALUATION

1. Capacity Evaluation

NSP proposes to provide firm plant capacity of 525,000 lbs/hr for the Minneapolis Campus and 225,000 lbs/hr for the St. Paul Campus.

Minneapolis operation will use all six boilers at Minneapolis Main Plant providing 570,000 lbs/hr total capacity, the two existing boilers at Minneapolis Southeast providing 230,000 lbs/hr total capacity and Metropolitan Medical Center boilers providing 140,000 lbs/hr total capacity. This will provide firm capacity for the Minneapolis Campus of 684,000 lbs/hr through year 2017 based upon internal steam usage of approximately 10% with MMC continuance, and 558,000 lbs/hr firm plant capacity with MMC off line.

NSP anticipates no new boiler installations at Minneapolis. All on campus boilers except one will have an age of more than 50 years by the end of the contract leaving the University vulnerable to significant future capital costs.

A summary of boiler capacity and age for Minneapolis follows:

Boiler Number	Capacity (1000 lbs.)	Year Installed	Fuel Used	Years in Use 1992	1995	2017 (age)
Minneapolis Main						
1	60	1949	WC	X	X	X(68)
2	60	1951	WC	X	X	X(66)
3	70	1953	WC/O	X	X	X(64)
4	80	1963	WC/O	X	X	X(54)
5	120	1964	WC/O	X	X	X(53)
6	180	1972	O/G	X	X	X(45)
Minneapolis Southeast						
3	110	1941	WC	X	X	X(76)
4	120	1948	WC	X	X	X(69)
Off Campus						
MMC	140	1970	O/G		X	X(46)

Firm Distribution Capacity

1992: 563,000 lbs.
1995: 684,000 lbs.
2017: 684,000 lbs.

NSP will use all seven boilers at St. Paul providing for a total installed capacity of 320,000 lbs/hr. In addition, steam will be supplied to the campus from High Bridge Power Plant at a capacity of 150,000 lbs/hr. This will provide total firm plant capacity of approximately 288,000 lbs/hr, given an allowance for 10% internal usage and with High Bridge continuance, and 216,000 lbs/hr with High Bridge disconnected.

NSP anticipates no new boiler installations at St. Paul. All on campus boilers except one will have an age of more than 40 years by the end of the contract, leaving the University vulnerable to significant future capital costs.

A summary of boiler capacity and age for St. Paul follows:

Boiler Number	Capacity (1000 lbs.)	Year Installed	Fuel Used	Years in Use 1992	1995	2017 (age)
St. Paul						
1	30	1955	EC/G	X	X	X(62)
2	30	1955	EC/G	X	X	X(62)
3	30	1940	O/G	X	X	X(76)
4	30	1940	O/G	X	X	X(76)
5	60	1971	EC/O/G	X	X	X(46)
6	60	1975	EC/O/G	X	X	X(42)
7	80	1991	O/G	X	X	X(26)
Off Campus						
	150		C		X	X

Firm Distribution Capacity

1992: 216,000 lbs.
1995: 288,000 lbs.
2017: 288,000 lbs.

NSP anticipates capital expenditure to total $6.5 million plus some amount for extra maintenance. Total maintenance allowances are not apparent in NSP's submittal. At or near the end of the 25 year contract term, additional capital will be required at both the Minneapolis and St. Paul Campuses to replace boilers which have exceeded 50 years of age (this would apply to 11 of the 15 on

campus boilers). Consequently, without significant capital expenditure, NSP would not be able to provide firm plant capacity above that required in the RFP without continuance of the off campus steam capacity. Total capital or major maintenance expenditure schedules are not clearly defined by NSP in the proposal. At the end of the contract, the University is left with the plants it currently has except that all equipment had aged an additional 25 years.

NSP's proposed operating plan will not require significant changes in operating permits. Because more than 75% of St. Paul steam and, potentially, up to 50% of Minneapolis steam could be generated off campus, in the future few emission offsets may exist for permitting new upgraded facilities. Banking of credits would be advisable should the region be classified "attainment" prior to completion of the steam network system.

2. Fuel Use Evaluation

a. Combustion Efficiency

NSP's proposal is based on approximately 1,526 BTU per pound of steam distributed to the University before steam line networking and 1,499 BTU per pound of steam distributed to the University after networking, given 90% condensate return. Return condensate temperature was not given but assumed to be based on 160°F. Though NSP discusses issues of steam line losses, they do not appear to be accounted for in their proposal. If NSP does not guarantee fuel rates, the University risks significant increases in operating costs.

b. Fuel Type

NSP proposes to use a fuel mix including 90% Western Coal and Eastern Coal (until completion of the High Bridge to St. Paul steam

line) and 10% Natural Gas.

Fuel mix capabilities of the heating plant remain consistent with current operations. Fuel costs used for operating cost calculations are consistent with those expected. All costs for fuel are proposed as pass through to the University. NSP's fuel costs for 1992 are approximately $400,000 below the University's projection.

c. Fuel Storage Systems

Coal storage and handling systems will remain essentially unchanged, though off site storage of coal may be used by NSP.

NSP also is proposing to use all existing oil storage systems. Costs to upgrade to meet EPA criteria by 1998 appear not to be included in the proposal. NSP requires that the University accept all costs to remediate contamination related to current equipment and operation.

d. Lime Usage

NSP will use lime for flue gas scrubbing from the Minneapolis Southeast Plant and at High Bridge. NSP's cost for lime of $68,470 in 1992 is slightly higher than currently experienced by the University. Further, there is no corresponding increase in lime costs associated with future revisions made to the network. Unless O&M costs are guaranteed by NSP, this may actually result in greater future costs to the University than those proposed.

3. Ash Disposal Evaluation

NSP assumes ash disposal rates consistent with the University's plan. Ash will be disposed of at NSP owned and operated landfills and should pose little risk to the University

relative to interruption of disposal site availability or unanticipated cost increases.

4. Steam and Condensate

NSP does take exception to the original RFP requirements for steam conditions and potential return quantity or quality. Their response further indicates that existing water treatment systems must be upgraded and that the University must accept amines. If the University continues to require "pure" steam at both Minneapolis and St. Paul, reboilers may be required where steam is brought in from separate steam sources such as off campus plants. This approach could increase capital and maintenance costs significantly for the NSP proposal.

5. Labor Use Evaluation

NSP proposes to use a majority of the existing staff at the current heating plants during the initial term of the contract. Total staffing will be reduced from 83 to 51 people by year 1995. Their response did not indicate what amount of off campus heating plant labor costs are charged to the University through other pricing means. The total labor charge identifiable is consistent with the University's.

7. Connecting Lines

NSP proposes to use connecting lines and connecting points indicated on the documents previously included with the Request for Proposal. NSP will provide meters accurate to plus or minus 2% and is in agreement, essentially, with the billing concept, except that NSP will be reimbursed for lost revenues associated with the understated meter quantities if meters result in understating steam consumption. NSP will provide secondary network steam line connections to the distribution systems from off campus heating

plants. All connection, metering and modification costs will be carried by NSP. It appears that no change in plant efficiencies or increase in transportation heat loss is accounted for in NSP's cost projections. Technically, no data are provided on steam source separation, water treatment compatibility, use of reboilers, condensate balance, and return systems, nor on the costs associated with each of these items.

7. Plant Asset Evaluation and Summary

NSP proposes to maintain and operate the plant as required through the 25 year life of the contract. Except for specific modifications and additions made to the boiler equipment which fall within NSP's projected maintenance and capital expenditures, future major costs could be passed on directly to the University if these costs are required to maintain capacity after year 10.

NSP anticipated maintenance costs are described in some detail, however, the final impact of maintenance allocations on NSP's steam charge is unclear. Total O&M expenses, including labor of $10.6 million for 1992, is consistent with the $9.4 million contained in the University plan. This amount includes all utilities, water treatment chemicals, periodic maintenance supplies, contract labor, coal handling and ash hauling. Reductions to the base year costs occur as steam load is transferred to off campus heating plants. NSP, however, also stated in their November 9th correspondence that $1.5 million for extraordinary maintenance was included in year 1,2 and 3 to cover life extension issues, placing NSP's annual costs at the same level as the University's internal plan. Consequently, NSP's maintenance cost allocations for continuance of the three existing heating plants through the 25 year term may be understated, particularly given that some continuance probably will be expected beyond the year 2017. If NSP does not guarantee some combination of capital and maintenance costs, this situation poses a risk to the

University.

Remaining plant asset, at the end of NSP's contract probably would be relatively low when compared to the other proposals. Operating and maintenance costs would continue beyond the year 2017, including requirements for additional capital expenditure to maintain reliability and availability of steam from the three heating plants.

In summary, NSP proposes little or no expenditure in the existing plants under their current fixed capacity charge. Total estimated expenditures over years 1 through 3 are $6,512,837. All other repair and maintenance charges through year ten are a variable pass through cost. After year ten, all capacity replacement costs are guaranteed at $2.4 million additional annual charge for 10 years, not including "repair." The average boilers which remain University property at year 25 is 61 years at Minneapolis and 52 years at St. Paul.

REMAINING PLANT ASSET SUMMARY
PROPONENT NSP

ASSET	MODIFICATION
BUILDING AND FACILITY	
Basic Building	o Miscellaneous repair only
Electrical Distribution and Service	o Miscellaneous repair only
Standby Power System	o No upgrade
Compressed Air System	o No upgrade
Water/Sewer Service	o No upgrade
Exterior Fire Protection	o No upgrade
Interior Fire Protection	o No upgrade

HVAC	o No upgrade
FUEL HANDLING	
Coal Storage Bunkers	o No upgrade
Coal Unloading and Transfer	o No upgrade
Interior Coal Conveyor System	o No upgrade
Oil Transfer/Supply Systems	o No upgrade
STEAM GENERATING FACILITIES	
Boilers	o Life extension only--no specifics provided on expenditures or costs
Control System	o No upgrade
Deaerator System	o No upgrade
Boiler Feed/Condensate System	o No upgrade
Water Treatment Systems	o No upgrade
Pollution Control Equipment	o No upgrade
Emission Monitoring Equipment	o No upgrade
Stacks and Fans	o No upgrade
Ash Load Out Facilities	o No upgrade
DISTRIBUTION SYSTEM	
Tunnels	o Tunnel roof repaired approximately $1,000,000 per Addendum No. 2.
Steam and Condensate Piping	o No major modifications

E. FWPS TECHNICAL EVALUATION

1. Capacity Evaluation

FWPS proposes to provide firm plant capacity of 525,000 lbs/hr for the Minneapolis Campus and 225,000 lbs/hr for the St. Paul Campus.

Minneapolis operation will to use all six boilers at Minneapolis Main Plant providing 570,000 lbs/hr/total capacity, along with one new 250,000 lb/hour gas oil boiler at Southeast until such time as new coal boilers are operational at the Southeast Heating Plant. This will provide firm capacity for the Minneapolis Campus of 513,000 lbs/hr through year 1996, based upon internal steam usage of approximately 10%. By year 1996, FWPS anticipates completing the installation of two (2) 200,000 lb./hour fluidized bed coal boilers at Minneapolis Southeast, at which time Boilers #3 and #4 at Southeast and Boilers #1, #2 and #3 at Minneapolis Main would be retired and decommissioned. Firm plant capacity for the Minneapolis Campus then would increase to 702,000 pph.

A summary of boiler capacity and age for Minneapolis is anticipated as follows:

Boiler Number	Capacity (1000 lbs.)	Year Installed	Fuel Used	Years in Use 1993	1996	2017 (age)
Minneapolis Main						
1	60	1949	WC	X	R	R
2	60	1951	WC	X	R	R
3	70	1953	WC/O	X	R	R
4	80	1963	WC/O	X	X	X(54)
5	120	1964	WC/O	X	X	X(53)
6	180	1972	O/G	X	X	X(45)
Minneapolis Southeast						
3	110	1941	WC	R	R	R
4	120	1948	WC	R	R	R
5	250	1993	G/O	X	X	X(23)
6	200	1996	WC	X		X(21)
7	200	1996	WC	X		X(21)

Firm Distribution Capacity

1993: 513,000 lbs.
1996: 702,000 lbs.
2017: 702,000 lbs.

FWPS will to use all seven boilers at St. Paul providing for a total installed capacity of 320,000 lbs/hr through the year 1996. This will provide total firm plant capacity of approximately 216,000 lbs/hr, given an allowance for 10% internal usage.

By year 1996, FWPS anticipates completing installation of one 250,000 lbs/hr oil-gas fired boiler at St. Paul. Boiler #1 and #2 would be retired and decommissioned.

A summary of boiler capacity and age for St. Paul is as follows:

Boiler Number	Capacity (1000 lbs.)	Year Installed	Fuel Used	Years in Use 1992	1996	2017 (age)
St. Paul						
1	30	1955	EC/G	X	R	R
2	30	1955	EC/G	X	R	R
3	30	1940	O/G	X	X	X(77)
4	30	1940	O/G	X	X	X(77)
5	60	1971	EC/O/G	X	X	X(46)
6	60	1975	EC/O/G	X	X	X(42)
7	80	1991	O/G	X	X	X(26)
8	250	1996	O/G	X		X(21)

Firm Distribution Capacity

1992: 216,000 lbs.
1996: 234,000 lbs.
2017: 234,000 lbs.

At or near the end of the 25 year contract term, additional capital will be required at both the Minneapolis and St. Paul Campuses to replace boilers which have exceeded 50 years of age. FWPS would be able to provide significantly greater firm capacity above that required in the RFP without significant capital expenditure for the Minneapolis Campus. Total capital expenditure schedules provided by FWPS indicate that $102.6 million is included for capital replacement, including capital costs for three new

boilers at Minneapolis and one new boiler at St. Paul.

FWPS's proposed operating plan will require permitting of the three new boilers at Minneapolis and the one new boiler at St. Paul. Because significantly less boiler capacity is being shut down than installed, and because emission offsets are compared based on actual boiler usage versus potential to emit for new units, FWPS may experience some restrictions and/or scrutiny regarding the new permits, especially at St. Paul where installed plant capacity is doubled under FWPS's plant proposal.

2. Fuel Use Evaluation

a. Combustion Efficiency

FWPS's proposal is based on approximately 1,465 BTU per pound of steam distributed to the University, given 90% condensate return. Return condensate temperature was not given but assumed to be based on 160°F. This fuel consumption rate assumes 80% plant efficiency. Certain fuel consumption rates are based on internal electrical generation and would require adjustment to consider only expected steam export to the University. Fuel consumption rates would be guaranteed for all new boilers provided by FWPS.

b. Fuel Type

FWPS proposes to use a fuel mix including 80% Western Coal and 20% Natural Gas and Fuel Oil. Greater flexibility is available because of the equipment being installed and remaining in place.

Fuel mix capabilities of the heating plant remain consistent with current operations utilizing a range of fuels. Fuels costs used for annual cost calculations are consistent with those expected. Fuel use would be based on the least costly fuel available.

c. Fuel Storage Systems

Coal storage and handling systems will remain as is. No significant upgrades to material storage, fuel storage or material handling systems are anticipated as part of FWPS's proposal. FWPS is proposing to upgrade all underground oil storage systems to meet EPA criteria by 1998. FWPS requires that the University test all tanks and accept all costs to repair and remediate contamination related to current equipment.

d. Lime Usage

FWPS will use lime for sulfur control in association with operation of the new CFB boilers at the Minneapolis Southeast Plant. FWPS's costs for lime are consistent with that expected. These costs are included as part of FWPS's guaranteed O&M costs and are of no risk to the University.

3. Ash Disposal Evaluation

FWPS assumes ash disposal rates are included in their estimated fuel charge and appear to assume 7% coal weight as ash disposal. Ash disposal quantities may increase to accommodate lime disposal from the CFB boilers. FWPS does not indicate where ash would be disposed of after current landfill facilities is no longer available. If a long term disposal facility is constructed, these costs could be passed through to the University.

4. Steam and Condensate

FWPS does not take exception to the original RFP requirements for steam conditions or potential return quantity or quality. Their response further indicates that existing water treatment systems would be upgraded at Minneapolis Southeast and St. Paul.

5. Labor Use Evaluation

FWPS Proposes to use a majority of the existing staff at the current heating plants. Labor costs are part of FWPS's guaranteed O&M costs. First year labor costs appear to be slightly higher than that currently realized by Physical Plant. Review of the numbers indicate a total labor charge approximately 17% above the projected labor costs by the University in the year 1992. This amount equates to approximately 500,000 dollars in 1992 which also is escalated consistently through the term of the contract. Since FWPS is not shutting down any of the three power plants, significant savings in labor is not available to the University. Labor use is consistent with that expected and should not pose significant risk to the University.

6. Connecting Lines

FWPS proposes to use connecting lines and connecting points indicated on the documents included with the Request for Proposal. FWPS will provide meters accurate to plus or minus 1% and is in agreement, essentially, with the billing concept, except that FWPS will be reimbursed for lost revenues associated with understated meter quantities, if meters result in understating steam consumption. All costs associated with connecting to University distribution system, including meters, are included with FWPS's proposal. FWPS has not included costs to repair the tunnel roof from Southeast to Main.

7. Asset Evaluation and Summary

FWPS proposes to maintain and operate each plant as required through the 25 year life of the contract. Specific modifications and additions would be made to the Minneapolis Southeast and St. Paul Heating Plant, including boiler equipment and auxiliary equipment to provide for proper firm plant capacities.

The maintenance cost allocation indicated by FWPS is approximately $2.64/1000 lbs. of steam supplied to the University in 1992 dollars. This amount includes all utilities, water treatment chemicals, periodic maintenance supplies, and contract labor, and is approximately 32% higher than currently experienced by the University. FWPS's maintenance costs increase by 21% in 1996 to accommodate the new equipment then on line. These maintenance costs allocations for continuance of the three existing heating plants through the 25 year term appear adequate, given that new equipment is installed and that expectations exist that some continuance will be expected beyond the year 2017. They would not pose a significant risk to the University.

Remaining plant assets at the end of the contract probably would be relatively high when compared to the other proposals. Operating and maintenance costs would continue beyond the year 2017, including requirements for additional capital expenditure to maintain reliability and availability of steam from the three heating plants in the near term following the close of this contract. This additional capital would be required to replace the six boilers which would be nearing or would have exceeded 50 years of life.

In summary, the Southeast Heating Plant building would be approximately 100 years old at the end of the contract, and though extensive modifications would have been made to the exterior, the structure might not have significant remaining useful life. Oil storage systems would be 40 years old and have 10 years remaining life. The boilers for Minneapolis would be new, essentially with signficiant remaining life at the end of the contract. FWPS will depend on some equipment at Minneapolis Main to provide firm plant capacity, though the systems of this plant will be aged at the end of the contract. Finally, the boilers at St. Paul, except for #7 and new #8, would have an average age in 2017 of 47 years.

Plant modifications and remaining plant assets are summarized in the following chart.

REMAINING PLANT ASSET SUMMARY

PROPONENT FWPS

ASSET	MODIFICATION
BUILDING AND FACILITY	
Basic Building	o Miscellaneous repair
	o In addition, building remodeling and addition is provided to accommodate new boilers and equipment and Minneapolis Southeast
Electrical Distribution and Service	o Modified to accept new equipment at Southeast and St. Paul--New Turbogenerator set provided
	o New MCC for all new equipment
Standby Power System	o No upgrade
	o Relocated and reused
Compressed Air System	o New instrument and plant air system supplied for Minneapolis Southeast
	o Retain--use existing at St. Paul and Minneapolis Main
Water/Sewer Service	o No upgrade
Exterior Fire Protection	o No upgrade
Interior Fire Protection	o Total system consideration for Minneapolis Southeast and St. Paul Plants are described and assumed installed
	o No new systems at Minneapolis Main

HVAC	o No upgrade to existing--capacity may be short
FUEL HANDLING	
Coal Storage Bunkers	o Used as is--unload at Main--store at Main and Southeast
Coal Unloading and Transfer	o Retained, no upgrade
Interior Coal Conveyor System	o Upgraded and new as required by new system at Minneapolis Southeast
	o No changes at St. Paul or Minneapolis Main
Oil Transfer/Supply Systems	o Use oil facilities at Minneapolis Main--no upgrade
	o No upgrades to St. Paul oil systems
Coveraged Ash Storage for St. Paul	o Addition of covered ash storage
STEAM GENERATING FACILITIES	
Boilers	o New 400 mpph coal at Southeast
	o New 250 mpph gas/oil at Southeast
	o New 250 mpph gas/oil at St. Paul
	o Retain equipment at Minneapolis Main as required for firm plant capacity
Control System	o New system suitable for new facilities at Southeast
Deaerator System	o New system at Minneapolis Southeast
	o New dearators at St. Paul

Boiler Feed/Condensate System	o New system at Minneapolis Southeast
Water Treatment Systems	o New system of Minneapolis Southeast--continuation of new sytem currently being installed at St. Paul--new treated water storage tank at St. Paul
	o New softeners, dealkalizer and degassifier at St. Paul
Pollution Control Equipment	o New equipment at Minneapolis Southeast and St. Paul as required by permit
	o No new equipment planned at St. Paul or Minneapolis
Emission Monitoring Equipment	o New as required by permit for new equipment at Minneapolis Southeast and St. Paul Plants
Stacks and Fans	o Reuse the current unutilized stacks
	o Provide new stack for new gas/oil boilers
Ash Load Out Facilities	o Reuse existing facility
	o Modified to be suitable to new system
	o Add new ash load out silo at Minneapolis Southeast

DISTRIBUTION SYSTEM

Tunnels	o Tunnel roof repair not included
Steam and Condensate Piping	o No major modifications
	o Some may be required--cost unknown

F. U OF M TECHNICAL EVALUATION

1. Capacity Evaluation

U of M proposes to provide firm plant capacity of 525,000 lbs/hr for the Minneapolis Campus and 225,000 lbs/hr for the St. Paul Campus. The campuses would eventually be interconnected and served from a single steam plant.

Minneapolis operation will continue to use all six boilers at Minneapolis Main Plant providing for 570,000 lbs/hr/total capacity along with the two existing coal oil boilers at Southeast until such time as new coal boilers are operational at the new site. This arrangement will provide for a firm capacity for the Minneapolis Campus of 558,000 lbs/hr through year 2000 based upon internal steam usage of approximately 10%.

By year 2000, U of M anticipates completing installation of two (2) 300,000 lb./hour coal boilers and one 300,000 lb./hour gas/oil boiler at a new site at Minneapolis, at which time all existing Minneapolis boilers would be retired and decommissioned. Firm plant capacity for the Minneapolis Campus would then increase to 600,000 pph.

A summary of boiler capacity and age for Minneapolis is anticipated as follows:

Boiler Number	Capacity (1000 lbs.)	Year Installed	Fuel Used	Years in Use 1993	1995	2000(age)	2017(age)
Minneapolis Main							
1	60	1949	WC	X	X	R	R
2	60	1951	WC	X	X	R	R
3	70	1953	WC/O	X	X	R	R
4	80	1963	WC/O	X	X		R
5	120	1964	WC/O	X	X		R
6	180	1972	O/G	X	X		R
Minneapolis Southeast							
3	110	1941	WC	R	R	R	R
4	120	1948	WC	R	R	R	R
New Plant							
1	300	2000	G/O	X	X	X	X(17)
2	300	2000	WC	X		X	X(17)
3	300	2000	WC			X	X(17)
4	300	2006	G/O				X(11)

St. Paul/Minneapolis Interconnect

Firm Distribution Capacity

1993: 558,000 lbs.
1995: 558,000 lbs.
2000: 600,000 lbs.
2017: 900,000 lbs.

U of M will continue to use all seven boilers at St. Paul providing for a total installed capacity of 320,000 lbs/hr through the year 1995. This arrangement will provide for total firm plant capacity of approximately 216,000 lbs/hr given an allowance for 10% internal usage. By year 1995, U of M anticipates completing installation of interconnecting line between Minneapolis and St. Paul.

A summary of boiler capacity and age for St. Paul is as follows:

Boiler Number	Capacity (1000 lbs.)	Year Installed	Fuel Used	Years in Use 1992	1996	2017 (age)
St. Paul						
1	30	1955	EC/G	X	X	R
2	30	1955	EC/G	X	X	R
3	30	1940	O/G	X	X	
4	30	1940	O/G	X	X	
5	60	1971	EC/O/G	X	X	
6	60	1975	EC/O/G	X	X	
7	80	1991	O/G	X	X	

Firm Distribution Capacity

1992: 216,000 lbs.
1996: 234,000 lbs.
2017: 300,000 lbs.

2. Fuel Use Evaluation

a. Combustion Efficiency

U of M's proposal is estimated to be based upon approximately 1524 BTU per pound of steam distributed to the University given 90% condensate return after completion of the new plant. Return condensate temperature was not given but assumed to be based on 160°F. This fuel consumption rate assumes 80% plant efficiency.

b. Fuel Type

U of M proposes to use a fuel mix including 90% Western Coal and 10% Natural Gas and Fuel Oil.

Fuel mix capabilities of the heating plant would remain consistent with the current operations in that a range of 100% coal to 100% gas/oil could be used by the University.

Costs used for cost calculations are consistent with those expected.

c. Fuel Storage Systems

Coal storage and handling systems will remain as is until completion of the new plant. To reduce first costs, the existing coal unloading system could be used for the first 25 year term of the contract.

All oil storage systems would be new by year 2000 at the new plant.

d. Lime Usage

U of M will use lime for sulfur control in association with

operation of the new boilers. U of M's cost for lime are shown and are consistent with that expected.

3. Ash Disposal Evaluation

U of M assumes ash disposal rates increasing from approximately $25/ton currently to $40/ton in year 1995. in addition, 1.5 million dollars is included for siting and constructing a new ash landfill.

4. Steam and Condensate

U of M does not take exception to the original RFP requirements for steam conditions or potential return quantity or quality. Total new water treatment systems would be provided at the new facility

5. Labor Use Evaluation

U of M Proposes to use the existing staff at the current heating plants. As plants are retired or modified form coal to gas/oil, labor would be reduced from the current 84 to 36 by year 2006.

6. Asset Evaluation

U of M proposes to maintain and operate each plant as required through the 25 year life of the contract. Specific modifications and additions are made to the St. Paul Heating Plant until such time as all capacity can be provided from the new Minneapolis plant. Total anticipated capital expenditure is $151 million for the proposal.

Maintenance cost allocation indicated by U of M is approximately $1.85/1000 lbs. of steam supplied to the University

in 1992 dollars. This number includes all utilities, water treatment chemicals, periodic maintenance supplies and contract labor. U of M's maintenance costs decrease by 25% in 1996 to accommodate the reduction in St. Paul usage. These maintenance cost allocations for continuance of the heating plants through the 25 year term, given that new equipment is installed and that expectations exist that some continuance will be expected beyond the year 2017, appear adequate and would not pose a significant risk to the University.

Remaining plant asset at contract end associated with U of M steam service agreement would be expected to be the greatest when compared to the other proponents. It is expected that normal operating and maintenance costs would continue beyond the year 2017 with no additional requirements for capital expenditure in the near term following close of this contract. Summary of remaining plant assets is as follows:

REMAINING PLANT ASSET SUMMARY
PROPONENT U OF M

ASSET	MODIFICATION
BUILDING AND FACILITY	
Basic Building	o New year 2000
Electrical Distribution and Service	o New year 2000
Standby Power System	o New year 2000
Compressed Air System	o New year 2000
Water/Sewer Service	o New year 2000
Exterior Fire Protection	o New year 2000
Interior Fire Protection	o New year 2000
HVAC	o New year 2000 may be short
FUEL HANDLING	
Coal Storage Bunkers	o New year 2000
Coal Unloading and Transfer	o New year 2000
Interior Coal Conveyor System	o New year 2000
Oil Transfer/Supply Systems	o New year 2000
STEAM GENERATING FACILITIES	
Boilers	o New year 2000
Control System	o New year 2000
Deaerator System	o New year 2000

Boiler Feed/Condensate System	o	New year 2000
Water Treatment Systems	o	New year 2000
Pollution Control Equipment	o	New year 2000
Emission Monitoring Equipment	o	New year 2000
Stacks	o	New year 2000
Ash Load Out Facilities	o	New year 2000

DISTRIBUTION SYSTEM

Tunnels	o	New year 2000
Steam and Condensate Piping	o	New year 2000

G. CONCLUSION - TECHNICAL EVALUATION

Table VII-1 displays the conclusions of the technical evaluation of the proponents proposals. Each proponent has offered a significantly different solution in responding to the University's Request for Proposal for Steam Supply. The critical points to be noted include the following:

- All proponents except PSI exceed firm plant capacity required in the proposal. The University should be able to negotiate guaranteed firm delivery capacity above the 525,000 pph and 225,000 pph capacity requirements for Minneapolis and St. Paul respectfully.
- NSP and PSI are most dependent on existing equipment for the supply of steam over the term of the contract. DEI and FWPS are dependent on the Southeast plant remaining structurally sound for 50+ years.
- Current and future permitting issues for DEI, NSP and FWPS must be carefully addressed in order to not jeopardize the University's future fuel flexibility.

- Fuel efficiency is most ambitious in DEI's plan, due, in part, to the fuel type and in part, to less reliance on steam turbine driven in-plant equipment. When equipment is not steam turbine driven, the required electric drives increase electric utility costs to the University.

- NSP, and PSI fuel rates may be understated considering that the University has been unable to achieve such rates when operating multiple steam plants.

- Only DEI relies totally on gas/oil based fuels, a situation which must be carefully considered in terms of fuel supplies and future permit flexibility.

TABLE VII-I
SUMMARYOF TECHNICAL REVIEW

	PSI	DEI	NSP	FWPS	U of M
Capacity Required					
MPLS.	525,000				
ST. PAUL	525,000				
Capacity Actual					
MPLS.	513,000	567,000	*684,000	702,000	600,000
ST. PAUL	216,000	234,000	*288,000	234,000	300,000
Permitability	Good	Concern over future flexibility	Concern over future Flexibility	Issues of adequate offsets	Good
Combustion Efficiency BTU/lb	1585	1420	1500	1465	1524
Type	coal/oil/gas	gas/oil	coal/oil/gas	coal/oil/gas	coal/oil/gas
Storage	As is to code	As is to code	As is to code	As is to code	New
Lime Costs	Low	Low	Low	Included	Included
Ash Disposal	Low	None Required	Included	Included	Included
Steam Condensate Quality/Quantity	Accepted	Accepted	In question	Accepted	Accepted
Labor Use	Adequate	Adequate	Adequate	Adequate	Adequate
Connection lines & Meters	Accepted	Accepted	Concern	Accepted	Accepted
Remaining Asset	Low	Good Gas Based	Low	Good Coal/Gas Based	Good Coal/Gas Based

*NSP's Firm Distribution Capacity is based on availability of off-campus steam sources. If off-campus steam sources were not available, capacity would drop to 563,000 and 216,000pph with average boiler age of 59 years.

- o For all cases except the University's internal plan, proponents are depending on the integrity and continued use of existing fuel storage systems.

  - In addition to the University retaining risk for pre-existing site contamination, the University may be faced with capital replacement of these systems should a leak develop for both DEI and NSP.

  - FWPS and PSI have guaranteed both capital and O&M as it pertains to the storage tanks after integrity has been tested and proven.

- o Lime costs and ash disposal costs have been covered to varying degrees by all proponents.

  - DEI's program will require no ash disposal after year 1 and less lime than that used by coal based systems given that oil usage is limited to less than 10% and gas remains available.

- o Other than for NSP, the coal based system proposals will face the with difficulty of locating and maintaining ash disposal facilities into the future.

- o Labor quantities appear adequate from all proponents for the operations they are suggesting.

  - The University should consider fixing quantities and costs against accepted indexes to limit its exposure to cost increases.

  - Further, the use of outside contractors could increase and be passed through as O&M costs. Guarantee of such O&M costs would reduce this risk to the University.

- o Steam and condensate quality and quantity and connecting line and the metering criteria generally have been met by all proponents except NSP.

  - NSP's use of off-campus steam plants which may not provide a "pure" steam supply free of amines and other non-compatiable

additives may complicate the interconnection. Avid result in increased costs or decreased efficiencies for the University.

o At the end of the 25 year contract term, the University will be required either to continue the contract of the selected proponent at terms acceptable to the proponent, or to resume operation of the remaining steam plant assets.

- NSP and PSI's proposals present the greatest risk for significant future cost increases due to minimal capital investment and replacement over the first 25 year term.

- FWPS would leave the plants in reasonable condition, with the possible exception of the the St. Paul plant.

- DEI would leave both Minneapolis and St. Paul in good condition suitable for continued operation on gas and oil well beyond the 25 year term. However, DEI projects that by year 26, annual fuel costs for the gas based system will be $28 million dollars more than that for a coal based system.

- The University's internal plan proposes that, by year 26, all debt is retired, and the University is left with a new plant suitable for 40+ years of additional operation.

VIII.
ENVIRONMENTAL ASSESSMENT

VIII. ENVIRONMENTAL ASSESSMENT

The evaluation process explored the long term contribution to environmental improvement to the Twin Cities area for each of the proposals. The proposals were compared to the current University Steam Plant operations. Current air emissions, ash disposal and fugitive dust concerns were considered.

Currently, all three steam plants operate within permit guidelines required by the Minnesota Pollution Control Agency. Approximate annual emission rates for the combined facilities currently are:

1074 tons SO2	1,710 tons NO_x	153 tons PM
292 tons CO	8.6 tons VOC	

In all cases where facilities are modified and/or replaced such that new boilers or combustion systems are installed, a decrease in emissions is desirable to allow uncontested permitting of the modification.

Fugitive dust has been an issue at the St. Paul heating plant where residential are located near the facility. The University has begun using a more expensive coal to reduce the dust. If long term plans call for continued operation of the facility on coal, more permanent, costly modifications will most likely be required.

Any proposal which uses a coal fueled system will require long term ash disposal. At present, it appears that coal ash will not be classified as a hazardous waste. Siting and contracting for ash disposal could be laborious at best, requiring significant time and effort by the University.

NSP's proposal will result in the lowest decrease in overall emissions from the three heating plants. St. Paul will see a majority of the reduction because coal will no longer be burned at the facility. The High Bridge plant, which is well equipped to control combustion emissions, will consume all coal fuel used for supplying steam to St. Paul.

Fugitive dust issues caused by coal and ash handling systems at St. Paul will be eliminated since coal will not be used at this facility following completion of the network system. This would continue as long as the steam line from High Bridge was intact and operational.

NSP does not anticipate any other upgrades to the pollution control equipment at St. Paul.

NSP does not propose to replace or upgrade pollution control equipment at Minneapolis. Based on anticipated coal consumption for Minneapolis, emission levels will presumably remain constant at Minneapolis for the term of the contract.

NSP's proposal will significantly reduce ash disposal concerns because all ash will be disposed of at NSP's own lined ash monofil sites. This would eliminate the University's need to site and construct a new landfill or to contract for disposal services from outside vendors.

PSI's proposal will result in some reduction in air emissions upon completion of installation of the new boilers in year eight. The proposal will result in improved sulphur scrubbing, NO_x control and CO control. All other boiler equipment at Minneapolis Main and St. Paul heating plants, however, would continue to operate without SO_2 removal or NO_x control.

Fugitive dust issues related to the coal and ash handling systems at Minneapolis and St. Paul will continue at some level, dependant on operating techniques used by PSI at the facilities. PSI has not identified a site or contract for long term ash disposal in its proposal.

The proposals of Foster Wheeler, DEI and the University offer the greatest reduction in air emissions (Graph VIII-1). Based on data presented by each proponent, equalized to 2.5 million Mlbs of steam annually, estimated annual emissions in tons/year are:

PROPONENT	SO_2	NO_x	PM	CO	VOC
FWPS	137	240	21	148	6
DEI	124.9	284.92	6	70	2
U of M	164	283	26	180	7

DEI's estimates assume 90% fueled by natural gas and no emission control systems in place at the St. Paul heating plant. Adding 90% sulphur removal and low NO_x combustion systems to St. Paul, DEI's emissions could drop as low as 35 and 248 tons/year for SO_2 and NO_x respectively. More critical to the review is the potential increase in emissions if gas should become less available and more oil is used. If #6 oil usage increased from 9% to 18%, SO_2 emissions would double from each of the previous estimates. This becomes very critical if scrubbers have not been employed at all facilities.

DEI offers the greatest improvement for fugitive dust concerns from coal and ash handling systems at the heating plants and ash disposal concerns relative to siting and contracting for long term ash disposal. A site suitable for 60 years of ash disposal would require approximately 50 acres of active cell area. Under the

University and Foster Wheeler proposals, these issues would have to be addressed within the first five years of the contract.

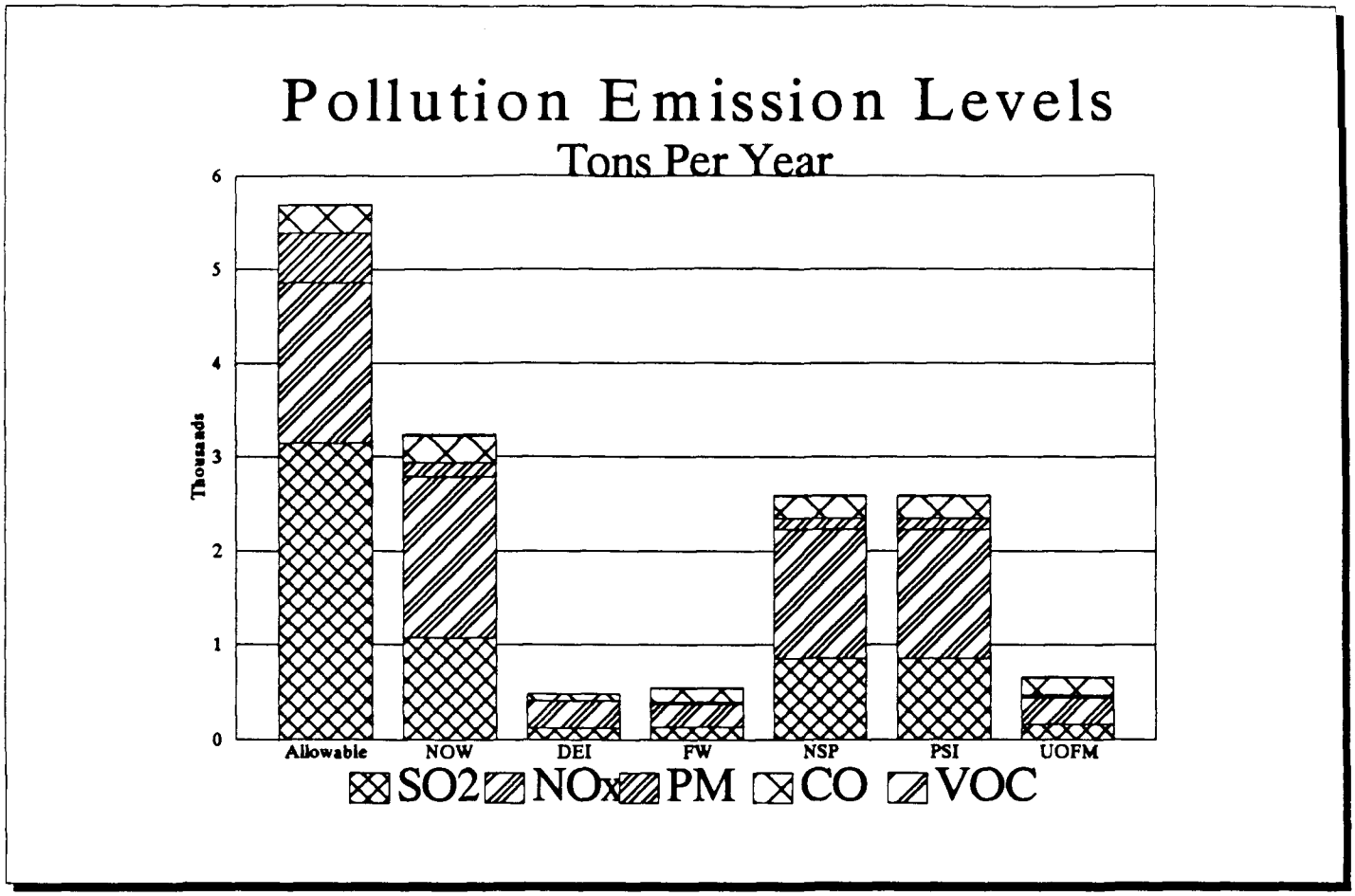
The impact of the proposals on the overall campus environment was also evaluated. University's Opportunity to deal with such issues as (1) elimination of the coal piles at the plants along the Mississippi River and at the St. Paul Campus; (2) improvements in the appearance of the campus by possibly reducing the dominance of coal stacks and other steam plant features on the campus and neighboring communities; and (3) avoiding negative effects on other neighborhoods resulting from the siting of a new plant, were all considered desirable.

DEI's proposal offers the flexibility of the external proposals, to construct a new gas/oil plant in a new location. This option offers the greatest potential for improving the campus environment. DEI's proposal would eliminate the coal piles within the first two years of the contract. This would provide a very early benefit to the campus overall and to specific areas on campus, such as the campus student housing neighborhood on the St. Paul Campus. Additionally, if the University chose to construct a new plant in a new loss conspicuous location, as DEI proposes, the University could potentially reclaim the riverfront area now occupied by the Southeast and Main plants for other purposes. Removing aging coal plants from the river area would dramatically improve the appearance of that area and positively impact the campus and surrounding community environment.

The benefits of the DEI proposal are less likely to be realized under the other external proposals which use coal as a principal fuel. The Internal Option would involve constructing a new coal/gas/oil plant. Under this option, the University would encounter siting issues which would have a significant impact on

the environment of a new neighborhood.

Graph VIII – 1



Discussion

A preliminary evaluation of the long term contribution to environmental improvement for the Twin Cities was made relative to each of the proposals presented. The proposals were compared to emissions currently allowable under the University's permits ("Allowable" in the graph above) and to current emissions of the combined University plants ("Now" in the graph above).

The aggregate emission level is lowest for DEI, followed by Foster Wheeler and then the University's Internal Option. Emission levels for NSP and PSI were assumed to be 80% of current levels since no specific emissions data were presented by those two proponents.

"SO2" refers to Sulfur Dioxide; "NOx" refers to Nitrogen Oxides; "PM" refers to particulate matter; "CO" refers to Carbon Monoxide and "VOC" refers to volatile organic compounds.

IX. EVALUATION OF LEGAL STRUCTURE

IX. EVALUATION OF LEGAL STRUCTURE

REVIEW OF BASIC CONTRACT REQUIREMENTS

The University's RFP requested that each proponent specifically address "Basic Contract Requirements" desired by the University. The RFP included Basic Contract Requirements for a "Steam Service Agreement," a "Lease" in the event the proponent intended to lease the University's steam production facilities, and a "Purchase Agreement" in the event the proponent intended to purchase existing equipment and inventories from the University. The Basic Contract Requirements were intended to serve as a model within which a proponent's commitments could be evaluated.

The proponents were advised that the Basic Contract Requirements were not intended to stifle creativity. If a proponent could not accept a basic contract requirement, the proponent was directed to state the reasons for its exception and to clearly propose an alternative. The proponent was further advised that the University may consider alternative legal structures.

The following is a review of the more significant differences between the responses of the proponents. The actual contractual commitments and governing contract language will be subject to extensive negotiations between the University and the proponent selected. This review is intended only as an overview of the legal framework proposed by each proponent, and the willingness of each proponent to commit to the contract requirements desired by the

University.[1]

Legal Structure

Since the submission of responses to the University's Request for Proposal, DEI has merged with Arkla, Inc. The merger became effective November 29, 1990. Arkla is a publicly traded natural gas exploration and distribution company based in Little Rock, Arkansas. Under the DEI proposal, Arkla would contract directly with the University to manage and operate its steam production facilities.

The Steam Service Agreement would be assigned to Minneapolis Energy Center, Inc. ("MEC"), which currently manages and operates the downtown Minneapolis district heating system for its owner, Energy Center Partners. MEC is a wholly owned subsidiary of DEI. The assignment of the Steam Service Agreement would be without novation, meaning DEI would remain directly obligated on the agreement. No parent company guarantees would be involved.

Foster Wheeler Power Systems, Inc. ("Foster Wheeler") is a wholly owned subsidiary of Foster Wheeler Corporation, a publicly

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[1]Three of the proponents, DEI, Foster Wheeler and NSP, proposed to enter into an agreement with the University to manage and operate the University's steam production facilities, rather than lease the facilities. The reason for this approach relates to potential property tax liabilities which may exist under a lease arrangement. Since the leasing approach does not appear feasible given the property tax issues, the following overview will not address the proponent responses to the basic contract requirements contained in the Lease Agreement. Further, the differences in the responses to the basic contract requirements contained in the Purchase Agreement were not of particular note. For this reason, only those Basic Contract Requirements contained to the Steam Service Agreement are reviewed.

traded engineering, construction and manufacturing company based in Perryville, New Jersey. Foster Wheeler intends to establish a wholly owned subsidiary to execute the Steam Service Agreement. The operating subsidiary would subcontract with various subsidiaries of Foster Wheeler Corporation to assist in implementing the Steam Service Agreement. Foster Wheeler Corporation would unconditionally guarantee all obligations of Foster Wheeler under the Steam Service Agreement.

NSP proposes to contract directly with the University. NSP intends to establish a wholly owned subsidiary, NRG Group, on January 1, 1991. NSP's current wholly owned subsidiary NORENCO would become a wholly owned subsidiary of NRG Group and be renamed NRG Thermal. NSP would assign the Steam Service Agreement to NRG Thermal as the operating subsidiary without novation, again meaning NSP would remain unconditionally obligated on the Steam Service Agreement.

PSI Power Resource Operations, Inc. ("PSI-PRO") is a wholly owned subsidiary of PSI Resource, Inc., which is a publicly traded company based in Plainfield, Indiana. PSI Resources, Inc. is the holding company for Public Service of Indiana, recently renamed PSI Energy. PSI-PRO intends to contract directly with the University as the operator responsible for executing the Steam Service Agreement. PSI Resources, Inc. would unconditionally guarantee all obligations of PSI-PRO under the Steam Service Agreement.

Structuring and Closing Costs

As a Basic Contract Requirement, the University requested that the proponents pay $2 million in structuring costs associated with soliciting proposals for a Steam Service Agreement and preparing the necessary transactional documents. In addition, the University requested that the proponent pay all costs associated with closing the transaction.

All proponents generally agreed to pay structuring and closing costs. DEI indicated that it has budgeted $2.2 million for both structuring and closing costs in developing its steam rate calculations. Foster Wheeler agreed to pay $2 million in structuring costs and has provided an allowance of $500,000 for the University's closing costs. NSP agreed to pay $2 million in structuring costs and up to $200,000 in closing costs. PSI agreed to $2 million in structuring costs, however, its total dollar commitment towards payment of the University's closing costs is not clear.

Commencement Date and Term of Agreement

The University requested a term of 25 years for the Steam Service Agreement and a commencement date of on or before January 1, 1992. All proponents agreed to both the term and commencement date. In its proposal DEI indicated a preference for a July 1, 1991, commencement date. The earliest possible commencement date would also be on July 1, 1991. Foster Wheeler indicated preference for a July 1, 1991, commencement date and March 1, 1991, as the earliest possible commencement date. NSP indicated a preferred commencement date of July 1, 1991, and an earliest possible commencement date of 30 days after the contract's execution. Finally, PSI indicated a preferred commencement date of January 1,

1992, and an earliest possible commencement date of six months after notice to proceed.

Use of University Facilities

All proponents propose to utilize existing University steam production facilities. DEI, Foster Wheeler and NSP propose to utilize the steam production facilities under an agreement to manage and operate the University's steam production system. NSP additionally plans to deliver steam to the University from its High Bridge electric generating plant in St. Paul and the Metropolitan Medical Center steam production facility in Minneapolis. PSI proposes to lease the University steam production facilities. PSI, however, has indicated a willingness to consider an alternative legal structure in recognition of the property tax issue.

Each of the proponents offers its own plan for utilization of the steam production facilities as discussed in the Engineering and Technical Evaluation.

Contract Capacity

Each proponent assumes the contract capacity of 525,000 lbs./hour for the Minneapolis campus and 225,000 lbs./hour for the St. Paul campus. Under each of the proposals, there would be no change in the capacity charge in the event of a reduction in contract capacity after the contemplated capital improvements are completed. All proposals include commodity charges based upon actual steam usage. Consequently, any reduction in steam usage would result in a reduction in commodity charges.

Under each of the proposals, any increase in the contract capacity necessitating new capital improvements would require a

renegotiation of the pricing structure. A discussion of each proponent's pricing structure as it relates to changes in contract capacity may be found in the Financial and Economic Evaluation.

Rates and Charges

Each proponent has proposed a pricing structure based upon contract demand and actual steam usage. Capacity charges are based upon capital costs and other fixed costs associated with providing the facilities necessary to meet the contract demand. Capacity charges do not vary with the volume of steam usage. Commodity charges, or variable charges, are based upon the costs incurred in providing the steam actually consumed. The commodity charges will vary with the volume of steam usage. A complete discussion of each proponent's pricing structure is included in the Financial and Economic Evaluation.

Steam Sales to Third Parties

The Basic Contract Requirements provided that steam could be sold to third parties in the event steam was available in excess of the contract capacity. The University, however, would have the right of first refusal to purchase the excess steam. No proponent objected to third party steam sales in the event of excess capacity. DEI and NSP suggested a possible reduction in charges to the University in the event of such sales.

Right to Purchase Steam from Other Sources

The Basic Contract Requirements provided that the University may purchase steam from other suppliers to the extent that steam is required in excess of the University's contract capacity. DEI did not specifically object to such purchases. Foster Wheeler

indicated that the University must first take steam under the Steam Service Agreement which is available in excess of its contract capacity prior to purchasing from other sources. The NSP proposal is based upon total system requirements which would preclude any purchases from other sources. PSI indicated that purchases of steam from other sources would be subject to negotiation.

Failure to Perform, Remedies and Damages

The Basic Contract Requirements provided that steam rates would be adjusted to reflect any interruption of service due to the failure to deliver steam in accordance with the Steam Service Agreement. Further, performance guarantees and engineering and technical specifications would have to be satisfied. Any failure to meet these guarantees and specifications would be considered a material breach of the Steam Service Agreement.

The Basic Contract Requirements also provided that any failure to meet performance guarantees and specifications would result in payment to the University of all costs, direct, indirect and consequential, resulting from such failure to perform. In addition, payment of liquidated damages would be required in recognition of damages not readily ascertainable.

DEI agreed to rate adjustments in the event of interruption of service and the establishment of performance guarantees. DEI limits the recovery of damages to direct costs incurred by the University as a result of interruption of steam service caused by its negligence in managing and operating the steam production facilities. In its response to the Basic Contract Requirements, DEI took exception to any requirement for liquidated damages. In its responses to clarifying questions, however, DEI indicated a willingness to negotiate liquidated damages as part of its

willingness to negotiate commercially reasonable performance guarantees.

Foster Wheeler indicated that a damage formula should be negotiated in the event of an interruption of service. Foster Wheeler indicated a willingness to provide for performance guarantees and engineering and technical specifications for newly constructed facilities. It also indicated that a "material breach" should be defined, and that a breach of any obligation under the Steam Service Agreement should be excused if caused by uncontrollable circumstances. Foster Wheeler is willing to be responsible for payment of liquidated damages to be negotiated by the parties. In response to clarifying questions, Foster Wheeler indicated that liquidated damages would constitute its sole liability with respect to any failure to perform.

NSP is agreeable to adjusting charges in the event of an interruption of services. NSP is also agreeable to performance guarantees to be negotiated by the parties. NSP limits the damages recoverable from a breach of the Steam Service Agreement to the direct costs incurred by the University. NSP further limits recoverable damages to damages specifically covered by insurance. In the event NSP fails to perform its obligations under the Steam Service Agreement and damage results to the University, the University would be required to pay all deductibles not covered by insurance and would be responsible for any excess damages over insurance policy limits. NSP would remain liable for damages not covered by insurance in the event the damage was caused by "intentional and wanton misconduct of NSP and its employees." NSP also adds the additional remedy of specific performance, which specifically requires a party to perform its obligations under an agreement. Finally, NSP proposes a duty to mitigate damages, or in other words to make reasonable efforts to limit one's own damages.

PSI agreed to an adjustment in rates in the event of an interruption of service caused by its failure to supply steam. PSI also agrees to performance guarantees which would be negotiated between the parties. PSI indicated that recoverable damages in the event of a failure to perform would be subject to negotiation between the parties.

Termination of Agreement

The Basic Contract Requirements included a provision under which the University may terminate the Steam Service Agreement. Termination by the University may occur in the event of default which, at a minimum, includes failure to meet obligations under the Steam Service Agreement, circumstances under which the University deems itself insecure by reason of pending insolvency or litigation, or by reason of default upon any obligation arising under a related agreement.

DEI reserved the right to negotiate a reasonable period of time to cure an event of default. In addition, DEI suggested that the events of default triggering termination would have to be more clearly defined. Finally, DEI indicates that termination by the University should not relieve the University's obligation to make payments relating to demand charges.

Foster Wheeler suggests the right to terminate should not be triggered until there is a "substantial" failure to meet an obligation under the Steam Service Agreement. Further, Foster Wheeler suggests a need to better define the events triggering default. Foster Wheeler also indicated that any termination provision should provide for a right to cure, as well as relief in the event the failure to perform is related to uncontrollable circumstances.

NSP's response to the termination provision provides for a 30 day period to cure a material breach of an obligation. In the event 30 days is not a reasonable period of time within which to cure, additional time would be made available to cure the default prior to triggering the right to terminate. NSP's response further identifies specific circumstances under which the University would have an immediate right to termination, including pending insolvency or failure to deliver steam for a continuous period of more then five days (except in the event of force majeure).

NSP added a force majeure provision which would relieve it from its obligations under the Steam Service Agreement. NSP specifically identifies certain circumstances under which its obligations under the Steam Service Agreement would be relieved, including but not limited to acts of God, orders or judgments by governmental authorities, changes in law, inability to secure fuel and electrical power, damage to facilities, unforeseeable acts or omissions by third parties, and under certain circumstances labor disputes.

NSP further provides that in the event of force majeure which results in damages to the University's facilities, the University would be required to proceed with repair and reconstruction if proceeds from insurance were adequate. NSP would be excused from its obligation to perform during such repair and reconstruction. If the proceeds from insurance were not adequate to pay for the necessary repair and reconstruction, and if the University did not agree to pay any deficiency, then NSP would have the option of terminating the Steam Service Agreement with 30 days written notice.

In its response to the termination provision, PSI suggests that the right to terminate should not be triggered until there has

been a substantial failure to meet an obligation under the Steam Service Agreement. Further, PSI suggests that termination should not be triggered by pending insolvency unless the University "in good faith" deems itself insecure. Finally, PSI suggests that litigation should not trigger termination unless it "materially" impairs its ability to perform under the Steam Service Agreement.

Dispute Resolution

The Basic Contract Requirements did not specifically address dispute resolution. No party other than NSP addressed this particular issue. NSP proposes binding arbitration with the exception of matters pertaining to contribution, indemnification or damages based upon tortious conduct.

TAX-EXEMPT FINANCING

Foster Wheeler has proposed utilizing tax-exempt municipal lease financing for future capital improvements. The purpose of the proposed financing structure is to obtain a substantial cost savings in connection with new capital improvements through the use of low interest tax exempt financing.

Under Foster Wheeler's proposal, a Minnesota not-for-profit corporation would be created ("nominal lessor"). The existing University steam production facilities and underlying real estate would be transferred or leased to the nominal lessor and leased back to the University.

The nominal lessor would enter into an indenture of trust with a trustee. The trustee would likely be a commercial trust company. The trustee would issue certificates of participation. Investment banks would underwrite the certificates of participation and offer

them publicly to investors.

The proceeds resulting from the sale of the certificates of participation would be used to finance the new capital improvements. New facilities and equipment would be purchased by the nominal lessor. The nominal lessor would then immediately transfer a security interest in the assets to the trustee in exchange for the proceeds of the tax-exempt debt. The new facilities and equipment would then be leased to the University.

The trustee, on behalf of the certificate holders, would hold a first lien on the entire project. The trustee would likely be assigned the Steam Service Agreement as additional security and would take a leasehold interest in the lease of the new facilities to the University.

The University's lease payments would be equal to the principal and interest repayment on the outstanding certificates of participation. The principal and interest components of the lease payments would be separately calculated and the interest component would be tax exempt to the investors. Upon expiration of the lease, and assuming no default on the lease, the University would have the option to purchase the facilities and equipment for a nominal sum.

The legal authorities relied upon by Foster Wheeler in making its proposal have been analyzed. Based upon these legal authorities, it appears that Foster Wheeler has provided a structure under which the financing of new capital improvements could be made on a tax exempt basis. If the municipal lease financing structure is to result in tax-exempt financing, the University must be a qualified issuer under IRC Section 103. All other Code requirements for tax-exempt financing must also be

satisfied. Based upon letter rulings issued by the IRS, it appears that the University may be a qualified issuer. These letter rulings, however, analyze specific facts relating to other institutions and cannot be used as definitive authority for this specific transaction. The facts of each case must be examined separately. The facts specific to the University must be further analyzed to ensure that the University is in fact a qualified issuer. An advance private letter ruling from the IRS on the issue of whether the University is an "political subdivision" may be appropriate. Finally, the proposed financing will be subject to the opinion of bond counsel.

No other proposal provides for a specific financing structure which would result in tax exempt financing. Each proponent did, however, indicate that steam prices may be reduced in the event tax-exempt financing is available. The municipal lease financing vehicle might also be utilitized by other proponents. The leaseback arrangements, and possibly the nominal lessor, would have to be incorporated into the structure of the project. The pricing structure would have to reflect lease payments from the University separated into principal and interest on the debt.

PROPERTY TAXES

Each of the proponents assume that property taxes will not become payable under the legal structure which it proposes. In the event that property taxes are assessed on the steam production facilities, however, all four proponents proposed to pass through those property taxes to the University.

Property owned by the University of Minnesota is exempt from state property taxation under the Minnesota Constitution and by statute. If the University retains title to the steam production

facilities, the facilities will remain tax exempt as long as the property is used for the accomplishment of the purpose for which the University was organized. As long as the facilities are used to provide heat to the University to enable it to carry out its purpose of providing education, the property should remain tax exempt. Under state statute, however, if an exempt entity leases property to a private third party, the tax exempt status of the property can be extinguished. Generally, a leasehold interest in exempt property is taxed as if the property were owned by the lessee.

DEI proposes a legal structure under which the University would retain title to its steam production facilities and the underlying real estate and enter into an agreement with DEI to manage and operate the facilities. Under DEI's proposal, the facilities themselves would likely retain their tax exempt status as long as the property is used in connection with the University's educational purposes.

Similarly, Foster Wheeler avoids the lease structure and proposes to enter into an agreement to manage and operate the University's steam production facilities. Foster Wheeler, however, proposes to finance the steam service project through a municipal lease/purchase financing arrangement. Under its proposed arrangement, the University will convey and/or lease the existing steam production facilities and the land upon which those facilities are located to a nonprofit entity and then lease them back from that entity. Title to any new facilities would be held by the nonprofit entity and those new facilities would be leased to the University.

Under this structure, it appears that both the underlying real estate and the steam production facilities would retain their tax

exempt status. The fact that legal title to the existing steam production facilities would be held by a separate legal entity and leased back to the University should not affect the tax exempt status of the property as long as the separate legal entity would be owned and controlled by the University. The property would be used to provide heat to the University, in furtherance of the University's exempt educational purposes, just as if the University owned and operated the facilities on its own.

In its proposal, NSP likewise avoids the lease structure. Under NSP's proposal the University would retain title to its existing facilities and enter into an agreement with NSP to operate and manage the facilities. Under this structure, the University facilities would, in all probability, remain exempt from property taxation.

NSP, however, proposes to bring new steam supply to the University from existing NSP-owned or controlled production facilities. New steam transmission lines would be constructed to deliver steam from these facilities. Property taxes would be assessed upon these steam transmission lines. NSP estimates that property taxes on these transmission lines would total $1.5 million per year. Under NSP's proposal, all property taxes would be a passthrough to the University.

PSI proposes that the University retain title to the facilities and lease them to PSI. By statute, the facilities would be taxed as the property of PSI, a private entity not exempt from taxation. Under PSI's proposal, property taxes would likely be assessed against the facilities and the cost would be passed through to the University. PSI, however, has indicated a willingness to explore an alternative legal structure.

COMPARISON OF BASIC CONTRACT REQUIREMENTS

	DEI	FW	NSP	PSI
Contracting Parties	Contract with DEI with assignment to operating subsidiary	Contract with operating subsidiary with guarantee by parent company	Contract with NSP with assignment to operating subsidiary	Contract with operating subsidiary and guarantee by parent company.
Contract Form	Management and Operating Agt.	Management and Operating Agt.	Management and Operating Agt.	Lease of facilities and sale of steam.
Financing of Capital Improvement	Internal financing	Tax-exempt financing	Internal financing	Internal financing
Structuring and Closing Costs	$2 million for structuring cost, $200,000 budgeted for closing costs	$2 million for structuring cost, $500,000 allowance for closing costs	$2 million for structuring up to $200,000 for closing costs	$2 million for structuring cost, total commitment to closing cost unclear

	DEI	FW	NSP	PSI
Commencement Date and Term	* Term of 25 years * 7/1/91 preferred commencement date * 7/1/91 earliest * commencement date	* Term of 25 years * 7/1/91 preferred commencement date * 3/1/91 earliest * commencement date	* Term of 25 years * 7/1/91 preferred * commencement date * 30 days after * contract execution	* Term of 25 years * 1/1/91 preferred commencement date * 6 months after notice to proceed earliest commencement date.
Use of University Facilities	Utilize existing facilities	Utilize existing facilities	Utilize existing facilities	Utilize existing facilities
Contract Capacity	525,000 lbs./hr. Minneapolis 225,000 lbs./hr. St. Paul	525,000 lbs./hr. Minneapolis 225,000 lbs./hr. St. Paul	525,000 lbs./hr. Minneapolis 225,000 lbs./hr. St. Paul	525,000 lbs./hr. Minneapolis 225,000 lbs./hr. St. Paul

	DEI	FW	NSP	PSI
Decreases in Contract Capacity	* No reduction in capacity charges * Reduction in commodity charges based on reduction in steam consumption	* No reduction in capacity charges * Reduction in commodity charges based on reduction in steam consumption	* No reduction in capacity charges * Reduction in commodity charges based on consumption in steam consumption	* No reduction in capacity charges. * Reduction in commodity charges based on reduction in steam consumption
Increases in Contract Capacity	Renegotiate pricing structure	Renegotiate pricing structure	Renegotiate pricing structure	Renegotiate pricing structure
Rates and Charges	* Capacity charge based on fixed cost. * Commodity charge based on steam usage.	* Capacity charge based on fixed cost. * Commodity charge based on steam usage.	* Capacity charge based on fixed cost. * Commodity charge based on steam usage.	* Capacity charge based on fixed cost. * Commodity charge based on steam usage.
Steam Sales to Third Parties	Excess steam may be sold to third parties subject to the University's right of first refusal.	Excess steam may be sold to third parties subject to the University's right of first refusal.	Excess steam may be sold to third parties subject to the University's right of first refusal.	Excess steam may be sold to third parties subject to the University's right of first refusal.

Right to Purchase Steam from Other Sources	May purchase steam in excess of contract capacity from other sources	Must first purchase excess steam under Steam Service Agreement prior to purchase from other sources	All steam must be purchased under Steam Service Agreement	Steam purchase from other sources subject to negotiation
Failure to Perform and Damages	Recovery of damages limited to direct costs and liquidated damages to be negotiated	Recovery of damages limited to liquidated damages only	* Recovery of damages limited to direct costs only. * Recovery of damages further limited to those damages covered by insurance	Recoverable damages subject to negotiation
Termination	Termination provisions subject to negotiation	Termination provisions subject to negotiation	Termination provisions subject to negotiation	Termination provisions subject to negotiation

X.
Conclusions
And
Recommendation

X. CONCLUSIONS AND RECOMMENDATION

As stated in the RFQ and in the RFP, four basic criteria served as the starting point for the evaluation of the external proposals and the Internal Option. Many other related factors set out in the RFP were also considered during the evaluation process, including

- financial condition of proponent
- operating experience of proponent
- overall project viability
- public acceptability
- facility residual value
- impact on existing University employees
- location and configuration of steam production facilities
- fuel type, supply and diversity

Additionally the University places considerable importance upon the environmental assessment. The DEI option does offer the University an opportunity to take an affirmative to improve the environment and become a better leader. A comprehensive consideration of all of these factors and the information presented during the evaluation process has lead to the recommendation contained in this report. The presence of this opportunity further supports the recommendation contained in this report.

RECOMMENDATION

The competition among the external proponents and Internal Option has been intense and has yielded creative proposals which all have merit. Each of the proposals and Internal Option have been critically evaluated with the goal of making a recommendation that will best serve the University of Minnesota. All of the information presented in the proposals, by the proponents and

provided by the experts has been considered. Based upon an evaluation which spanned nearly one and one-half years, the Senior Vice President for Finance and Operations and the Utilities Committee make the following recommendation:

> **The University of Minnesota should commence the negotiation of a definitive Steam Service Agreement with Diversified Energies, Inc. ("DEI") which will provide the University with 100% of its steam requirements for the Twin Cities Campus. If negotiations do not result in an agreement satisfactory to the University, then it is recommended that the University pursue the Internal Option.**

DEI PROPOSAL

DEI has exceeded by a wide margin the minimum financial and technical requirements of the RFQ. The DEI proposal demonstrates the lowest life cycle costs in almost all of the financial scenarios. From an engineering and technical perspective, DEI is an experienced, highly regarded steam supplier with a consistently superior track record. Finally, the DEI proposal, environmentally, is the cleanest solution of all external and internal alternatives.

The major considerations behind the DEI recommendation may be summarized as follows:

* A simple, straightforward plan for reliable steam for the University. After the first year, DEI plans to have converted the University's coal facilities to gas/oil facilities. The Southeast Plant will be renovated, the Main Plant will be closed and the St. Paul heating plant converted to natural gas/oil.
* Improvement in Environmental Quality. The DEI proposal will result in far lower emissions than the current plants. In addition, issues of fugitive dust, ash disposal, and unsightly

coal piles are eliminated. All of these environmental benefits would be achieved in the immediate future.

* Full Availability of Options. With a fully renovated facility (or the option provided by DEI to construct a new facility), the University will own all improvements at the end of the 25 year contract. Accordingly, the University at the end of this contract will have a full range of options available including the options of resuming ownership, management and operation of the facilities without the prospect of having to make major capital expenditures at the end of 25 years, or contracting for service for another term.

* Flexibility of DEI's proposal to meet the changing needs of the University. DEI's proposal provides incentives for energy conservation, which effectively coordinate with the University's Building Energy Efficiency Project (UBEEP). DEI's natural gas fired steam option has a much lower embedded capital cost and a higher delivered fuel cost compared to a new coal fired steam plant. As a result, the greater the amount of energy conserved by the University, the greater the savings to be realized by the University relative to the coal option.

* Flexibility of Location. DEI's proposal to construct a new natural gas plant at another site as an alternative to using existing facilities provides additional benefits. It would allow the University the flexibility to place a new plant in a less conspicuous location and to eventually reclaim the riverfront now occupied by the Southeast and Main plants for other purposes. The impact on the campus environment and surrounding community would be extremely positive.

* Life cycle cost. The DEI proposal has the lowest life cycle cost of all proposals and will have a life cycle cost within 15% of the internal option.

* Price Sensitivity. Because 58% of DEI's costs are

guaranteed or indexed, its overall price is relatively less sensitive to changes in labor rates, operating or maintenance costs.

* Competitive prices. DEI's estimated rate for steam in 1992 is $7.98 per thousand pounds of steam. In 1989, steam rates paid by customers of District Energy in St. Paul were approximately $10.30 for equivalent units; customers of the Minneapolis Energy Center paid on average approximately $8.70 per thousand pounds of steam.
* Stable, predictable steam prices. DEI has structured its price so that the rate will increase slightly above the rate of inflation, or approximately 5.25% per year based upon inflation of 5% per year.
* Price Guarantees. DEI will guarantee the price and supply of fuel for 15 years and the transportation cost of fuel for 25 years. DEI will guarantee that all capital requirements to supply steam for the next 25 years will be borne by DEI.
* Capital requirements. Because DEI is guaranteeing all capital requirements for 25 years, there is no risk of project cost overruns due to inflation or delays in construction.
* Extensive Experience. DEI has decades of experience operating a large and diverse district heating system. There is no question about its ability to operate and maintain a gas/oil fueled steam plant.
* Financial Soundness. DEI and Arkla, Inc. are both financially sound with senior debt of DEI's subsidiary Minnegasco rated AA- by Standard & Poor's, and Arkla rated A-.

OTHER EXTERNAL ALTERNATIVES

While each have their own merits, the other external alternatives raise important concerns regarding a long-term solution to the University's steam needs. These concerns may be summarized as follows:

NSP Proposal

- o Insufficient residual value and remaining useful life for facilities after 25 years.
- o Potentially a wide variability in cost for steam due to most costs not guaranteed or indexed.
- o Relatively slight positive impact regarding environmental issues.

Foster Wheeler Proposal

- o High life cycle cost of proposal versus DEI and Internal Option.
- o Potential permitting risks in connection with the new coal boiler construction.

PSI Proposal

- o High life cycle cost of proposal versus DEI and Internal Option.
- o Insufficient residual value and remaining useful life to facilities after 25 years.
- o Relatively slight positive impact regarding environmental issues.

It should be clear that all of these proponents exceeded by a wide margin the minimum standards. All are highly experienced, competent and successful steam suppliers. The concerns that have been raised in this report are concerns relating to the proposals, not of the proponents.

INTERNAL OPTION

The Internal Option has the advantage of providing the University with a new highly reliable coal plant at an apparently lower cost than the external alternatives. There exist, however, substantial risks with this approach which include:

- The difficulties of siting a new coal plant in a new neighborhood within an increasingly environmentally conscious community.
- The difficulties of obtaining permitting for a new coal plant if regulations and clean air standards were to further tighten or to become more restrictive.
- The potential for significant cost overruns due to any delays resulting from siting and permitting issues.
- The lack of sufficient debt capacity on the part of the University to generate the approximately $153 million of total capital needed for construction.
- The potential for cost overruns resulting from construction or operating cost underestimates. Such reservations were expressed by the external proponents regarding the cost and feasibility of this option.

These are significant risks. For this reason, it is concluded that, DEI's proposal overall represents the least risky, most cost effective, and most environmentally sound solution. In the event the University is unable to conclude successful negotiations with DEI, the Internal Option provides the only other acceptable alternative. Further, research on the Internal Option should proceed simultaneously with negotiations with DEI.

CONCLUSION

The University, first through the Sirrine Report and continuing with the work of the Utilities Committee, has spent countless hours evaluating all external and internal solutions to

providing the University long-term, reliable, and cost effective steam service. This recommendation is based on the research of, interaction with, and proposals from top utility, engineering, finance, and economic experts in the country. It is a course of action that is not only economically sound, but also results in a positive impact on the community and the environment. It is an approach that is strongly and respectfully recommended to the Board of Regents.

APPENDICES

APPENDIX II-A

OVERVIEW

Background.

The University represents both a significant customer, a supplier, and a distributor of various utilities. Considering each building as a customer, the University provides heat (steam), electric service, and air conditioning services.

The methods of utility supply and distribution are inter-dependent on the end uses, as steam can provide both building heat and air conditioning. The purpose of this study is to evaluate these utility facilities:

- Evaluate the present condition and capacities of the existing air conditioning, electrical distribution, and steam plant facilities.
- Evaluate the impact of University planned growth thru year 2010 on the existing facilities.
- Make appropriate recommendations to assure the energy demands can be supplied thru the year 2010 and beyond, including supporting information to allow the University to establish a long term air conditioning policy.

Present Systems.

The following summarizes the existing configuration of the three, main energy distribution facilities:

- Building heat is primarily supplied by steam from three steam plants with fourteen boilers. The boilers burn primarily coal and natural gas, and small quantities of No. 2 fuel oil. The University owns and operates both the steam plants and the steam distribution network.
- Electricity is purchased from Northern States Power and is distributed to each building via a University owned power grid.
- Air Conditioning is provided by a combination of individual units consisting of window units, and small electric and steam chiller units.

RECOMMENDATIONS

The following summarizes the recommendations by utility type including a steam plant environmental summary:

Air Conditioning Facilities.

- By the Year 2010, the planned air-conditioned square feet will increase by 43 percent inclusive from 11.9 million feet to 17.1 million square feet.
- A very large percentage of the presently installed air-conditioning capacity (40 percent Minneapolis and 50 percent St. Paul) is at or beyond its expected service life-time.
- Based on life cycle analysis, continuing the present policy of diversified installed capacity has the highest life cycle of all alternatives, if continued to the year 2010.
- In order to minimize steam plant life cycle costs, no air-conditioning case should be selected which creates a summer peak steam demand greater than the peak steam winter demand. This case includes "Present Practice" and any cases converting to "all steam".
- Establish a long term air conditioning plan and policy which results in four central chiller plants :

	Chiller Plant			
Campus	No. of Units	Drive Type	Capacity Each, Tons	Firm Cap. Total, Tons
East Bank [1]	3	Steam Turbine	5,500	11,000
Health Sciences [1]	2	Electric	5,500	5,500
West Bank	3	Electric	1,500	3,000
St. Paul	3	Steam Turbine	3,000	6,000

[1] East Bank and Health Sciences should be interconnected.

Steam Plant Facilities.

Short Term Actions and Existing Steam Plants: Continued.

- Significant improvements are required in the present arrangement for keeping steam plant records. Steam plant logs should be expanded to document causes of forced outages, and precise unit availability and operating hours. Major equipment should be uniquely tagged. Presently, maintenance records are kept in a manual form that is difficult to use for failure analysis, repair history or preventative maintenance planning. A new computerized system should be added to allow management, operating, and maintenance personnel to implement the above activities.

- Based on limited nondestructive, metals testing of two coal fired boilers (of 14 boilers), approximately ten years life is remaining in the boiler tubing for Minneapolis Plant/No. 4 and Southeast/No. 3 boiler, assuming 8,500 hr/yr operation. A complete nondestructive, metals testing program should be implemented.

- Neutralizing amines should be added to the steam leaving the boilers to protect the existing district heat exchangers and piping from additional corrosion. Steam generators or special hot water heaters should be added to those individual uses (contact with milk products) that cannot tolerate steam containing amines.

- Significant equipment improvements are required in both water treatment and condensate supply to the boilers at all steam plants.

- Present capital projects under consideration should be reviewed with respect to the recommendations in this report. For example, a coal silo is proposed for the St. Paul Steam plant. These same funds could be used to implement a portion of the air conditioning or steam plant benefits and recommendation included in this report.

Environmental - Steam Plant Facilities.

- As soon as a long-term plan is selected, air permitting should begin linking both the short-term and long-term plans. This is necessary so that air emissions off-sets can be used by the University or a third party.
- Before any major construction can begin on the existing, or a new steam plant facility, an air permit must be issued. The typical air permit could require between 18 and 24 months to obtain.
- Any new steam plant facilities should be build on University-owned land contiguous to the present campuses, to take advantage of the available air emissions off-sets. In a practical way, any steam line right-of-way connecting a new steam plant facility to any of the existing campuses or transportation corridor would meet the contiguity requirements.

Thermal Distribution System.

- Both corrosion coupon and ultrasonic thickness testings indicate corrosion is occurring in the piping systems.
- Based on return condensate chemical analysis, there is raw water in-leakage into the condensate system. A program should be initiated to locate and repair these leaks. the in-leakage adds to the corrosion problem and adds minerals to the condensate which must then be removed before supplying the boilers.
- Both the district steam and condensate system need a comprehensive nondestructive testing program to completely pin point their condition.
- Detailed engineering drawings do not exist for most of the tunnel. Many parts have been in existence for more than 40 years. Benchmarks and detailed mapping of the tunnels should be completed.
- System distribution: Flow model is under development and will be provided to the University for use in capacity evaluation.

OVERVIEW

Background.

The University represents both a significant customer, a supplier, and a distributor of various utilities. Considering each building as a customer, the University provides heat (steam), electric service, and air conditioning services.

The methods of utility supply and distribution are inter-dependent on the end uses, as steam can provide both building heat and air conditioning. The purpose of this study is to evaluate these utility facilities:

- Evaluate the present condition and capacities of the existing air conditioning, electrical distribution, and steam plant facilities.
- Evaluate the impact of University planned growth thru year 2010 on the existing facilities.
- Make appropriate recommendations to assure the energy demands can be supplied thru the year 2010 and beyond, including supporting information to allow the University to establish a long term air conditioning policy.

Present Systems.

The following summarizes the existing configuration of the three, main energy distribution facilities:

- Building heat is primarily supplied by steam from three steam plants with fourteen boilers. The boilers burn primarily coal and natural gas, and small quantities of No. 2 fuel oil. The University owns and operates both the steam plants and the steam distribution network.
- Electricity is purchased from Northern States Power and is distributed to each building via a University owned power grid.
- Air Conditioning is provided by a combination of individual units consisting of window units, and small electric and steam chiller units.

Report Topics.

The report presents the utility topics thru the following:

- HVAC or air conditioning
- Electrical Facilities
- Steam Plant Facilities
- Thermal Distribution System
- Environmental Overview (Steam plant facilities)

Study Contributors.

CRS Sirrine, Inc. is the primary consultant with overall responsibility for the study. Major assistance was provided by Orr, Schelen, Mayerson & Associates, Inc. for the evaluation of the air conditioning facilities. Additional assistance was received from Enviroscience, Inc. for the environmental assessment of steam plant options and from Conam Inspection, Inc. for life evaluation and metallurgical testing of steam plant facilities and tunnel condensate systems.

RECOMMENDATIONS

The following summarizes the recommendations by utility type including a steam plant environmental summary:

Air Conditioning Facilities.

- By the Year 2010, the planned air-conditioned square feet will increase by 43 percent inclusive from 11.9 million feet to 17.1 million square feet.
- A very large percentage of the presently installed air-conditioning capacity (40 percent Minneapolis and 50 percent St. Paul) is at or beyond its expected service life-time.
- Based on life cycle analysis, continuing the present policy of diversified installed capacity has the highest life cycle of all alternatives, if continued to the year 2010.
- In order to minimize steam plant life cycle costs, no air-conditioning case should be selected which creates a summer peak steam demand greater than the peak steam winter demand. This case includes "Present Practice" and any cases converting to "all steam".
- Establish a long term air conditioning plan and policy which results in four central chiller plants :

	Chiller Plant			
Campus	No. of Units	Drive Type	Capacity Each, Tons	Firm Cap. Total, Tons
East Bank [1]	3	Steam Turbine	5,500	11,000
Health Sciences [1]	2	Electric	5,500	5,500
West Bank	3	Electric	1,500	3,000
St. Paul	3	Steam Turbine	3,000	6,000

[1] East Bank and Health Sciences should be interconnected.

Electrical Facilities.

Based on a review of the existing facilities, and considering future natural growth, building additions, and the long term air-conditioning facilities, the following recommendations are made:

Minneapolis Campuses

- Establish a new service point for the Health Sciences Campus.
- If a new steam plant is constructed, establish a new service point at a location convenient to the plant.
- Improvements are required in the NSP equipment at both 4th Street and West Bank Switch Stations.
- Initiate a comprehensive metering and a scheduled calibration program that are required at the present (and future) switching stations.

St. Paul Campus

- Re-cable two feeders (SPA1Y and SPA2Y) when future loads are added.
- Initiate a comprehensive metering and scheduled calibration program for the switch station.

Steam Plant Facilities.

The following short term and long term activities should be implemented to assure an adequate steam supply thru the year 2010 and beyond:

Short Term Actions and Existing Steam Plants.

- Considering the age of the present steam plants, a boiler safety and performance (conservation) audit program should be implemented to continually confirm the condition of the present facilities.

Steam Plant Facilities.

Short Term Actions and Existing Steam Plants: Continued.

- Significant improvements are required in the present arrangement for keeping steam plant records. Steam plant logs should be expanded to document causes of forced outages, and precise unit availability and operating hours. Major equipment should be uniquely tagged. Presently, maintenance records are kept in a manual form that is difficult to use for failure analysis, repair history or preventative maintenance planning. A new computerized system should be added to allow management, operating, and maintenance personnel to implement the above activities.

- Based on limited nondestructive, metals testing of two coal fired boilers (of 14 boilers), approximately ten years life is remaining in the boiler tubing for Minneapolis Plant/No. 4 and Southeast/No. 3 boiler, assuming 8,500 hr/yr operation. A complete nondestructive, metals testing program should be implemented.

- Neutralizing amines should be added to the steam leaving the boilers to protect the existing district heat exchangers and piping from additional corrosion. Steam generators or special hot water heaters should be added to those individual uses (contact with milk products) that cannot tolerate steam containing amines.

- Significant equipment improvements are required in both water treatment and condensate supply to the boilers at all steam plants.

- Present capital projects under consideration should be reviewed with respect to the recommendations in this report. For example, a coal silo is proposed for the St. Paul Steam plant. These same funds could be used to implement a portion of the air conditioning or steam plant benefits and recommendation included in this report.

Short Term Actions and Existing Steam Plants: Continued.

- Considering the factors of existing steam plant age and condition, the time required for legislative approvals, pollution permitting, and project construction, the University should implement the short term boiler capacity reserve plan. The reserve steam capacities should be 180,000 lbs./hr. for the Minneapolis Campuses and 60,000 lbs./hr for the St. Paul Campus. The reserves should be implemented on an 'as demanded' basis, as described in this report.

- With the reserves described above, the present facilities at the Main (Building No. 034) and Southeast (Building No. 059) steam plants have adequate firm and installed capacity to meet present and future district steam demands thru the year 2000.

- With the reserves described above and with the No. 7 Boiler project complete, the St. Paul Steam Plant (Building No. 380) will have adequate capacity, firm and installed, to meet the present and future district steam demands thru the year 2000.

Long Term Recommendations.

- For the long-term with University ownership, a new combined steam plant using coal and gas fuels and no electric generation provides the optimum life cycle costs. The plant should consist of a minimum of four boilers with a total installed capacity of 1,200,000 lbs./hr. The new plant should be fully operational by the year 2,000. The Minneapolis and St. Paul Campuses should be interconnected with steam and condensate lines via the transportation corridor.

- Two, third parties have expressed an interest in supplying the University's energy needs. This is a viable option for the University, provided certain steps are taken by the University to assure contractually that an economical and reliable energy supply is provided.

Environmental - Steam Plant Facilities.

- As soon as a long-term plan is selected, air permitting should begin linking both the short-term and long-term plans. This is necessary so that air emissions off-sets can be used by the University or a third party.
- Before any major construction can begin on the existing, or a new steam plant facility, an air permit must be issued. The typical air permit could require between 18 and 24 months to obtain.
- Any new steam plant facilities should be build on University-owned land contiguous to the present campuses, to take advantage of the available air emissions off-sets. In a practical way, any steam line right-of-way connecting a new steam plant facility to any of the existing campuses or transportation corridor would meet the contiguity requirements.

Thermal Distribution System.

- Both corrosion coupon and ultrasonic thickness testings indicate corrosion is occurring in the piping systems.
- Based on return condensate chemical analysis, there is raw water in-leakage into the condensate system. A program should be initiated to locate and repair these leaks. the in-leakage adds to the corrosion problem and adds minerals to the condensate which must then be removed before supplying the boilers.
- Both the district steam and condensate system need a comprehensive nondestructive testing program to completely pin point their condition.
- Detailed engineering drawings do not exist for most of the tunnel. Many parts have been in existence for more than 40 years. Benchmarks and detailed mapping of the tunnels should be completed.
- System distribution: Flow model is under development and will be provided to the University for use in capacity evaluation.

THIRD-PARTY SUPPLIED UTILITIES

As part of the study effort, third-party interest in supplying the University utility needs were to be reviewed. Two groups (letters included in the appendix) have expressed an interest in supplying the utility needs of the University, as a third-party supplier. Utility as being defined as steam electric power and chilled water, either collectively or separately. The steam plants have a remaining life to allow the University the necessary time to make a careful decision between University supply and third-party supply. The air conditioning and steam plant solutions should be linked together to allow the University or a third-party to implement the most efficient approach.

Purchase of utility services from a third party offers many advantages to the University. Among these advantages are no facility completion or cost overrun risks are borne by the University. Likewise, operating risks are also borne by third parties. A traditional third party utility supply will have the costs for utility services based on : Capital Recovery, Fuel Costs, and Operating Costs. Capital Recovery is typically in the form of a demand charge to compensate the third party utility supplier for its cost for financing the facility. Fuel costs will mirror the fuel consumed by the facility and are generally in the form of a base price plus an agreed upon escalator over the term of the Utility Services Contract. Finally, operating expenses which take the form of fixed and variable expenses for operations and maintenance include labor, water, consumables and major maintenance reserves and are also paid on a base price plus escalator basis. The University pays for utilities and therefore the cost of the facility, on "as used" basis; consequently, no capital funding appropriations are required from the State Legislature. The third party utility supplier has the ultimate responsibility of arranging for any debt and equity financing. Thus, the University pays for the investment in the facility through third party utility charges over the life of the Utility Supply Contract.

In an effort to develop the best overall third party utility supply, the University can greatly assist developers with their projects. Several areas in which the University can provide significant benefits to development process include, assistance to the third parties in the development of a site for the new utility facility on University property or property

contiguous to the University in an effort to take advantage of favorable zoning and air emissions permits.

Third party utility services can provide the University many advantages in the form of lower cost steam as a result of operating efficiencies, paying for the facility over the life of the Utility Supply Contract, as well as having the third party assume responsibility for the development, design, construction, and operation of the facility. As a trade-off, the University must come to grip with the operation of its utility steam plant by a third party. The University will no longer have direct control over the operation and maintenance of the plant. However, performance provisions may be included in the Utility Service Contract which will provide the University a great measure of protection and influence.

IMPLEMENTATION OVERVIEW

The following presents an overview of the four utility facilities. The overview presents a summary of each utility facility including: present systems and equipment, basic conditions, impact of present situation, major recommendations, and total estimated project capital costs.

Utility Service - Air Conditioning.

Present Systems/Equipment.

- Existing needs are supplied by individual units. The equipment consists of window units, individual absorption and small electric chiller units.
- Planned building area growth for air conditioning is to increase 50% by the year 2010, and will increase from 10.2 to 15.3 million gross-square-feet.
- Service Life: The percent of existing installed chiller capacity near or beyond expected service life, Minneapolis = 40%, St. Paul = 50%. A detailed list is provided of the estimated condition of each chiller.

Impact.

- Continuation of the present policy will result in inefficient operation, and by year 2010 the installation of 22,963 tons more capacity than the case recommended.
- Capacities of existing chillers, steam plants, and electrical systems will be exceeded in the future if the present policy is not altered.

Recommendations.

	Timing	Duration
Short Term Recommendations:		
-Initiate building conservation program study	Immediately	As Req'd
-Initiate engineering design for central chillers	mid-1990	12mo.
-Begin looping buildings into groups	Immediately	As Req'd
-Review present buildings under re-modeling and design for compliance with new policy	mid-1990	6mo.

Utility Service - Air Conditioning.

Recommendations: Continued.

	Timing	Duration
Long Term Recommendations:		
-Initiate phased implementation of the four, recommend chiller plants	1992	3 to 5yr.
Total Estimated Project Costs.	$ 67,230,000	

Utility Service - Electrical Distribution.

Present System/Equipment.

- The Minneapolis campuses are served by two, University owned distribution systems, one serves the East Bank and Health Sciences campuses and the other serves the West Bank campus. The East Bank and Health Sciences side is served by four Northern States Power (NSP), dedicated feeders. The West Bank side is served by two NSP feeders, not wholly dedicated to the West Bank service.

- The St. Paul campus is served by one University owned distribution system. The switch station is served by three NSP feeders. At the present time, none of the three feeders is a dedicated feeder. In the near future, two of the feeders will be converted to dedicated feeders, and the third feeder is lightly loaded by other users.

- Each major building or complex on campus has a substation. Each substation is connected to two radial feeders. If primary power fails, the individual substations are manually switched to the standby power source.

- East Bank/Health Sciences: The NSP firm capacity of 60MVA is adequate for future load growth. The duct bank leaving the switch station is close to full capacity. The reduction in University feeder cable sizes will be the limiting factor in determining the new load capability. Continuation of the status quo will result in eventual distribution system overload, increasing frequency of power outages, and significantly increased manual switching times to re-establish an alternate power supply.

- West Bank: The existing distribution feeders are lightly loaded and will support the future growth. The system will require modification when a new central electric air conditioning plant is added.

Utility Service - Electrical Distribution: Continued.

Basic Condition & Impact.

- The St. Paul Campus electrical distribution system, as a whole is lightly loaded. Larger feeder cables will be required in the future as loads are added.

Recommendation(s).

	Timing	Duration
Short Term Recommendations:		
-Install feeder cables full size thru out a run	As Req'd	-
-Install comprehensive metering at switch stations	Immediately	-
-Increase size NSP, 4th St. bus tie	Immediately	-
-Establish service point at Southeast steam plant	Immediately	-
Long Term Recommendations:		
-Establish a new service point for Health Sciences	1992	18mo.

Total Estimated Project Capital Costs.

-Establish a new service point for Health Sciences .	$ 2,800,000
-Establish service point & re-cable at Southeast steam plant	$ 500,000

(Short term activities are maintenance items.)

Utility Service - Steam Plant Facilities.

Present System/Equipment.

- Existing steam needs are supplied by three steam plants, with fourteen boilers. The average age of the boilers is approximately 34 years. The present installed capacity is 990,000 lbs-steam/hr and will expand to 1,080,000 lbs-steam/hr with the addition of No. 7 boiler at the St. Paul Campus.

Basic Conditions.

- Future building growth thru the year 2010 will be moderate (compared to past growth) and will increase from 17.3 to 19.7 mil.-GSF by the year 2010.

- The building growth will increase the plant daily peak winter steam demand (coldest day) from 780,000 lbs-steam/hr. to 850,000 lbs-steam/hr.

Utility Service - Steam Plant Facilities.

Basic Conditions: Continued.

- During the '87-'88 heating season, the steam plants had an estimated availability of 82%. During a portion of the season, firm capacity available fell below the steam demand. Reserve boilers were required.
- Because of a number of factors, fuel consumption is much higher than original boiler design. This results in higher fuel costs, and higher wear on flue gas and ash handling equipment.
- There is no treatment of condensate and limited treatment of boiler make-up water supply to the boilers. Steam is not treated with amines.

Impact.

- Continuation of status quo will result in higher operating costs and unpredictable availability and reliability of the plants.
- Continued air permitting and use of natural gas fired, packaged boilers for added steam supply, without a link to a long term coal boiler plan, will result in negating the future use of coal fired boilers and loss of air emissions off-sets.
- Without improvements in water treatment, boiler fouling and condensate line corrosion will continue.

Recommendation(s).

	Timing	Duration
Short Term Recommendations:		
-Implement building conservation program	Immediately	As Req'd
-Implement improved records program	Immediately	As Req'd
-Implement the steam plant safety and performance audit programs, including metals testing	Immediately	As Req'd
-Initiate short-term Case A to provide back-up steam supply for Minneapolis & St.Paul	1990	24mo.
-Select long term Case GF11 or Third-party	1990	12mo.
-Initiate initial engineering to support air permitting of short and long term plans and preserve air emissions off-sets	1990	18-24mo.
-Initiate boiler water treatment program	1991	12mo.

Utility Service - Steam Plant Facilities.

Recommendation(s): Continued.

Long Term Recommendations:

• Acquire land for new,central steam plant	1992	24 mo
• Implement long term, central steam plant using combined fuels of coal and gas	1995	5yr.

Total Estimated Project Capital Costs.

-Boiler Water Supply Treatment	$ 4,600,000
-Short term Case	$ 8,100,000
-Long term Case GF11, New central steam plant	$ 170,000,000

Utility Service - Steam Distribution.

Present System/Equipment.

- Minneapolis: The Main and Southeast steam plants supply the steam distribution system. The East Bank and Health Sciences campuses are supplied by a multiple loop arrangement of high and low pressure headers. The headers extend into the campus via an under ground tunnel system. Portions of the header system have been in existence since the early 1900's. The majority of the buildings have metered steam flow. The West Bank is supplied by a single, high pressure, non-looped header (crossing the Mississippi River). Condensate is returned by gravity flow, to the steam plants.

- St. Paul: The St. Paul steam plant supplies a multiple loop arrangement of high and low steam pressure headers via a tunnel system . Condensate is returned, by gravity flow, to the steam plants.

Basic Conditions.

- A total of twelve condensate locations were tested at the Minneapolis campus, Scott Hall, and the St. Paul by nondestructive techniques. Some of the pipes show a reduction in wall thickness of up to 40%. Recent corrosion coupon testing (not part of this study) demonstrated corrosion in the condensate piping. The condensate has been tested to be acid in nature.

- The flow model for the steam distribution network for Minneapolis and St. Paul is under development. The model will be supplied to the University for their use in determining the impact of future district steam demands.

Utility Service - Steam Distribution: Continued.

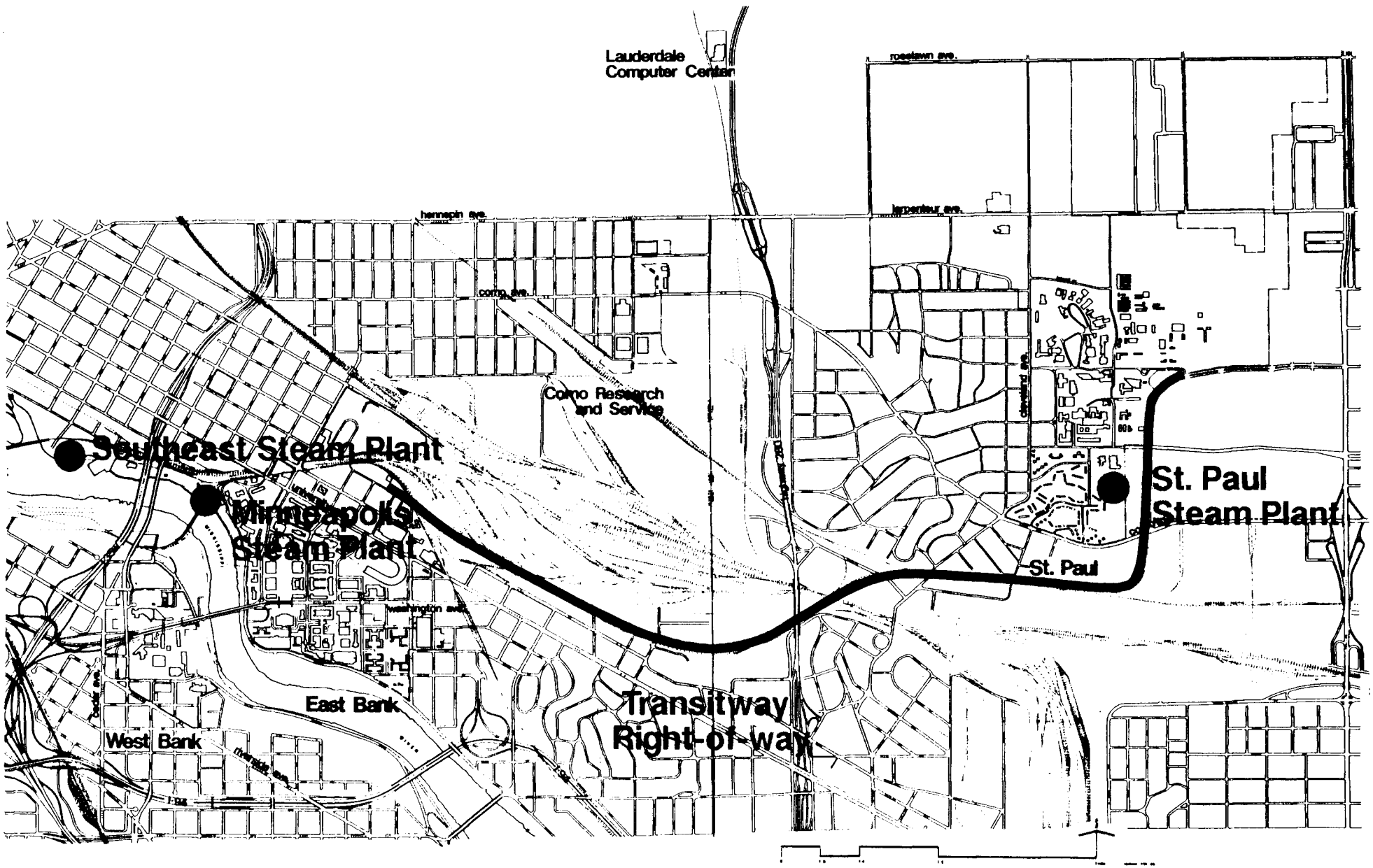
Impact.

- Continuation of the present policy will result in the continued corrosion of the condensate system.

Recommendations:

	Timing	Duration
Short Term Recommendations:		
-Initiate building survey to identify amine-sensitive users and install steam separator heat exchangers	1990	6 to 12 mo.
-Initiate amine addition to steam	Follows Above	
-Initiate condensate main nondestructive test program	Immediately	
Total Estimated Projects. (Exclusive of individual building additions.)	See Water Treatment Above	

APPENDIX II-B



Twin Cities Campus

Steam Plant Location

APPENDIX II-C

UTILITIES COMMITTEE

University of Minnesota:

Larry Anderson, Director of Physical Planning, 503 Morrill Hall
624-5758
Otis Anderson, Director of Engineering & Architecture, 100 Shops Bldg.
625-5851
Carolyn Hall, Attorney, General Counsel's Office, 330 Morrill
624-4100
Sue Markham, Asst. Vice President of Physical Plant, 200 Shops Bldg.
625-6599
Mike Nagel, Asst. Director, Physical Plant, 200 Shops Bldg.
625-0597
Roger Paschke, Treasurer and Director of Asset Management
625-4555

Peter Grills, Attorney, O'Neill Burke O'Neill Leonard O'Brien Ltd.,
800 Norwest Center, 55 E. 5th Street, St. Paul, MN 55101
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Ev Kalambokidis, President, GAMMA Institute, 5522 Meister Road,
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574-1569

Benjamin Oehler, Vice President, Piper, Jaffray & Hopwood Inc.
Piper Jaffray Tower, P. O. Box 28, Minneapolis, MN 55440
342-6341

James Sebesta, Vice President, Orr-Schelen-Mayeron & Associates Inc.
2021 E. Hennepin Avenue, Suite 238, Minneapolis, MN 55413
378-6360

APPENDIX II-D

CALENDAR FOR REVIEW OF STEAM PLANT ALTERNATIVES

1990

January 15	Issue Request for Qualifications (RFQ) to determine qualified respondents.
February 27	Informational meeting for parties interested in responding RFQ.
March 15	Deadline for RFQ responses.
April 4	Selection of qualified respondents.
May 1	Walk through tour of heating plants for RFP respondents .
June 18	Circulate draft of Request for Proposal (RFP).
June 19-29	In depth plant inspections for RFP respondents.
July 9	Deadline for RFP respondents to submit written questions and comments regarding RFP draft.
July 17	Preproposal meeting and information sessions for RFP respondents.
July 20	Issue RFP.
August	Further plant inspections by RFP respondents.
September 11	Deadline for proposals.
September 11- December 14	Evaluation report on proposals, comparative analysis of all options, and recommendation prepared and presented to Board of Regents.
January 11, 1991	Decision for University utility (steam) options.

APPENDIX II-E

UTILITIES OPTIONS FOR CONSIDERATION BY THE UNIVERSITY OF MINNESOTA

The University of Minnesota's short-term and long-range utilities needs are generally outlined in the Utilities Study prepared by CRS Sirrine, Inc. in July 1989. Copies of relevant sections of the report are available upon request.

Generally, the University may consider any combination of one, none, or several of the following major options:

- turnkey development of new University utility facilities to be owned and/or operated by the University, the developer or another third party
- purchase of all or some of the University's steam, chilled water or electrical needs under contracts to provide the product on either a firm basis or on an interruptible basis
- participation by the University in a thermal energy use network
- production of steam, chilled water and/or electricity in facilities owned by a third party, such facilities to be operated by the University or a third party
- sale of some or all of the existing University utilities facilities to a third party
- other reasonable options which provide economical and reliable solutions to the University's long-term utility needs

The University is currently in the process of identifying all reasonable options to provide University utilities on a long-term basis on terms and conditions which are reliable, cost effective, and consistent with the University's mission.

APPENDIX II-F

November 12, 1990

UNIVERSITY OF MINNESOTA PROJECT
RFQ RECIPIENTS

	Sent RFQ	Sent DOCS
Thomas R. Hewitt, P.E. Director, Business Development CRS Sirrine Capital, Inc. Suite 500 5511 Capital Center Drive Raleigh, North Carolina 27606 919/859-5000 (H) 919/493-4410 Fax 919/859-5151	X	X
Ken Linwick Minneapolis Energy Center, Inc. 1060 IDS Center Minneapolis, MN 55402	X	X
Douglas Coleman Dain Equity Partners, Inc. 100 Dain Tower Minneapolis, MN 55402	X	X
Joseph L. Wolf Director Environmental/Regulatory Activities Department Northern States Power Company 414 Nicollet Mall, 2nd Floor Minneapolis, MN 55401	X	X
Tom Casten Trigen Energy Corp. One Water Street White Plains, New York 10601 914/948-9150 Fax 914/948-9157	X	X
Joel Canino President CNF Industries, Inc. One Research Parkway Meridan, CT 06405	X	X
Bruce Labno Labno Environmental 151 W. Burnsville Parkway Burnsville, MN 55337 895-9100	X	X

November 12, 1990

	Sent RFQ	Sent DOCS
John F. Kattner Marketing Management 368 Century Plaza 1111 Third Avenue South Minneapolis, MN 55404	X	X
Karl E. Marietta HDR Engineering, Inc. 300 Parkdale 1 Building 5401 Gamble Drive Minneapolis, MN 54416-1518	X	X
Dennis Quinn OnSite Energy, Inc. 306 S.W. 1st Avenue Portland, Oregon 97204 Quinn 503/464-7000		X
Peter Yogman Vice President Finance OnSite Energy, Inc. 306 S.W. 1st Avenue Portland, Oregon 97204	X	
Mr. Ray Pasteris Vice President, Engineering Catalyst Thermal Energy Corp. 245 Park Avenue New York, New York 10167 212/949-0040	X	X
Rick Grubb Plant Manager Hennepin Energy Resource Co. 505 Sixth Avenue North Minneapolis, MN 55405 333-7303	X	
David Jones Health One Corporation Senior Vice President Business Development 2810 57th Avenue North Minneapolis, MN 55430 574-7800	X	

November 12, 1990

	Sent RFQ	Sent DOCS
Alex Urguhart Vice President TIFC GECC 1600 Summer Street Stamford, CT 06905	X	
Hans O. Nyman President District Energy St. Paul, Inc. 76 West Kellogg Boulevard St. Paul, MN 55102-1611	X	X
Ms. Sheree L. Brown Saffer Utility Consultants, Inc. 3655 Maguire Boulevard Suite 150 Orlando, Florida 32803 407/898-8531 office 407/894-2975 FAX	X	
Carl Avers Lewis A. Mahoney President Thermal Ventures P.O. Box 701 Youngstown, Ohio 44501 216/747-4604 29 East Front Street Youngstown, Ohio 44503	X	
Mr. Ingolf Herman Independent Hydro Developers Ridge Hill Professional Building 2000 Plymouth Road Minnetonka, MN 55343	X	
Mr. Stephen Houghton Hadson Corporation P.O. Box 26770 Oklahoma City, Oklahoma 73116	X	
Potomac Capital Investment Corp. c/o W. Reid Thompson, Chairman Potomac Electric Power Company 1900 Pennsylvania Avenue N.W. Washington, D.C. 20068	X	

November 12, 1990

	Sent RFQ	Sent DOCS
Mr. James V. Wittich Prudential Capital Corporation 12 Three Gateway Center 100 Mulberry Street Newark, New Jersey 07101	X	
Mr. P. Scott von Fischer Vice President, Corporate Finance Prudential Capital Corporation 2930 Norwest Center 90 South 7th Street Minneapolis, MN 55402-3901	X	
Mr. Donald F. Rieger CIGNA Investments, Inc. South Building S307 Hartford, CT 06252	X	
Mr. David I. Newton Executive Vice President Facilities Resource Management Co. Meigswood Park P.O. Box 1515 Madison, CT 06443	X	
Mr. N.W. Atwater Chief Executive Officer Foster Wheeler International Corp. 666 Fifth Avenue New York, New York 10009	X	
Mr. Arthur M. Hansen Chief Executive Officer Foster Wheeler Energy Corp. Perryville Corporate Park Clinton, New Jersey 08809	X	
James Kennedy District Sales Manager Foster Wheeler Energy Corp. 20 North Oak Street Suite 1503 Chicago, Illinois 60602		X
Mr. William Stitt Chief Executive Officer ICF Kaiser Engineers Inc. 1800 Harrison Street Oakland, California 94612	X	

November 12, 1990

	Sent RFQ	Sent DOCS
Mr. Riley Bechtel Chief Executive Officer Bechtel Group, Inc. P.O. Box 3965 San Francisco, California 94119	X	
Mr. William J. White Chief Executive Officer Guy F. Atkinson Company of California Walsh Construction Co. 101 Oakview Drive Trumbull, Connecticut 06611	X	
Mr. Cordell Hull Chief Executive Officer Bechtel Power Corp. 15740 Shady Grove Road Gaithersburg, Maryland 20877	X	
Mr. C.E. Hugel Chief Executive Officer Combustion Engineering, Inc. 900 Long Ridge Road Stamford, Connecticut 06904	X	
Mr. R.E. Morris Chief Executive Officer Energy Factors, Inc. 401 B Street, #1000 San Diego, California 92101	X	
Chief Executive Officer Allied Maintenance Corp. c/o Ogden Corporation 277 Park Avenue New York, New York 10172	X	returned no forwarding
Mr. Steve Zawadzki Energy Factors, Inc. 401 B Street, #1000 San Diego, California 92101	X	
Mr. Joe Gustin Vice President Ipalco Enterprises Indianapolis Power & Light P.O. Box 1595 Indianapolis, Indiana 46206-1595	X	

November 12, 1990

	Sent RFQ	Sent DOCS
Mr. Thomas C. Kosvic 18100 Honeysuckle Lane Deephaven, MN 55391	X	
Eugene Hickok Montgomery Engineering 545 Indian Mound Road Wayzata, MN 55391 473-4224	X	
Mr. Kenneth W. Bell Jerry Monson Chief Financial Officer Bonneville Pacific Corp. 257 E. 200 South, Suite 800 Salt Lake City, Utah 84111	X	
Mr. Marshall Braman EnviroScience Suite H 8951 West 36th Street Minneapolis, MN 55426 932-9757	X	
Frank DeRosa Director of Business Development Pacific Gas & Electric/Bechtel Energy Corp.		
Jeffrey Young Business Development Manager Bechtel Power Corporation 50/14/C16 P.O. Box 193965 San Francisco, CA 94119-3965 415/768-8670	X	X
Kerry S. Ramsey Besgas Company 1050 17th Street Suite 2000 Denver, Colorado 80265 303/825-3500	X	

November 12, 1990

	Sent RFQ	Sent DOCS
William Watt Lazard Freres & Co. One Rockefeller Plaza New York, New York 10020 212/632-6564	X	
David M. Lebedoff, Esq. Lindquist & Vennum 4200 IDS Center Minneapolis, MN 55402	X	
Ted Dageford Pipefitters Local 539 312 Central Avenue N.E. Minneapolis, MN 55414	X	
John Frank Dominion Energy, Inc. P.O. Box 26532 Richmond, VA 23261	X	
Mr. William F. Connell Connell Limited Partnership One International Place Fort Hill Square Boston, MA 02110 617/737-2700	X	
Mr. Robert F. Wright Business Development Analyst Cogeneration Partners of America 3 Executive Campus P.O. Box 2910 Cherry Hill, New Jersey 08034-0258 609/482-4820 Fax 609/482-4850	X	
Mr. A. C. Autera Financial Analyst Rockefeller Center Station P.O. Box 1126 New York, New York 10185 212/614-1450	X	

November 12, 1990

	Sent RFQ	Sent DOCS
Mr. Craig P. Murphy Director, Development American Resource Recovery 219 North Main Street River Falls, Wisconsin 54022 414/784-9200	X	
Robert L. Daileader, Jr., Esq. Nixon, Hargrave, Devans & Doyle Suite 800 One Thomas Circle Washington, D.C. 20005 202/223-7200 Fax 202/223-7212	X	X
Mr. David W. Wade, P.E. President RDA Engineering, Inc. 134 South Avenue Marietta, Georgia 30060 404/421-0870	X	X
Mr. Kevin J. Gray Project Development Specialist Energy Initiatives, Inc. One Gatehall Drive Parsippany, New Jersey 07054 201/292-9630 Fax 201/292-0528	X	
Kenneth E. Bodell II 1792 Walnut Street Lauderdale, MN 55113	X	Sirrine
Frederick J. Machinchick Industrial Marketing Representative Enron Northern Natural Gas Company 7901 Xerxes Avenue South Suite 209 Minneapolis, MN 55431 887-1782	X	
John R. Seitz President CoEnergy, Inc. 31382 Island Drive Evergreen, Colorado 80439 303/670-3814 Fax 303/670-3805	X	

November 12, 1990

	Sent RFQ	Sent DOCS
Mr. Dan Swanson Powerlink Services 121 S.W. Salmon MS/1WTC14 Portland, Oregon 97204	X	
Mr. Gary Lukas Powerlink Services 121 S.W. Salmon 1WTC14 Portland, Oregon 97204		X
Mr. Norm Bather Metcalf & Eddy 612 Dorbert Drive Munith, Michigan 49259 517/596-2579	X	X
William Kaufmann J. Makowski Associates One Bowdin Square Boston, MA 02114-2910 617/227-8080	X	X
H. Mark McKinney Harbert Cogen, Inc. P.O. Box 1297 Birmingham, Alabama 35201 205/985-5414 100 Concourse Center Birmingham, Alabama 35244	x	x
Kal Schon Marketing Director Heavy Industrial Division P.O. Box 710 Minneapolis, MN 55440 522-2100 x 513	X	
Mr. Bernard Strait Nordic Power Inc. 4831 Crowfoot Road Merryville, PA 15668 412/327-0287	X	
Ms. Marilyn Jason Houghton & Company Incorporated 40 Wall Street New York, New York 10005	X	

November 12, 1990

	Sent RFQ	Sent DOCS
Jude R. Rolfes General Manager Project Development Enron Power Corp. P.O. Box 1188 Houston, Texas 77251 10077 Grogan's Mill Road, Suite 475 The Woodland, Texas 77380 713/364-3200	X	X
L.J. Romano, Jr. Gulf Shores Diversified, Inc. Waste Disposal Specialists Sutton Towers, Suite 1019C Collingwood, New Jersey 08107	X	
Mr. Chris Phillips Fluor Daniel 200 West Monroe Street Chicago, Illinois 60606 312/368-3516	X	X
Mr. Mack Torrent Fluor Daniel 200 West Monroe Street Chicago, Illinois 60606		
Donald R. Backstrom Rider Bennett Egan & Arundel Lincoln Center Minneapolis, MN 55402	X	
Robin Thorne Empire Energy Building 970 Corner of A Street and Zemke MacDill AFB, Florida 33608 813/840-0100	X	
Charles Monteith Empire Energy Building 970 Corner of A Street and Zemke MacDill AFB, Florida 33608		X

November 12, 1990

	Sent RFQ	Sent DOCS
Wallace Turbeville Goldman Sachs & Co. 26th Floor 85 Broad Street New York, New York 10004 212/902-6455	X	
Dave Bloom Goldman Sachs & Co. 26th Floor 85 Broad Street New York, New York 10004	X	
Mr. K. A. Roe Chairman Burns & Roe Enterprises 700 Kinderkamack Road Oradell, New Jersey 07649	X	
Steve Remen Thermal Electron P.O. Box 9047 Waltham, MA 02254 617/622-1182	X	
Jeffrey L. Pierce, P.E. Department Manager Independent Power Engineering Schneider Engineers 98 Vanadium Road Bridgeville, PA 15017 412/221-1100	X	X
Ludger Wehebrink Regional Vice President ABB Energy Ventures Inc. CN5210 Princeton, New Jersey 08543-5210 609/243-7575 Fax 609/243-9168	X	X
Steve Smith Executive Vice President Philadelphia Thermal Energy Corp. 2600 Christian Street Philadelphia, PA 19146		X

November 12, 1990

	Sent RFQ	Sent DOCS
Mr. Richard E. Willis PSI Investments 1000 East Main Street Plainefield, Indiana 46168	X	X
Laura Rittenhouse Roger McDaniel Utility Finance Shearson Lehman Brothrs, Inc. American Express Tower World's Financial Center New York, New York 10025	XXX	
Ronald J. Calise Electric & Gas Utilities Salomon Brothers, Inc. One New York Plaza New York, New York 10004	XXX	
Donald T. Lake Energy & Natural Resources Salomon Brothers, Inc. One New York Plaza New York, New York 10004	XXX	
Roger H. Goodspeed Project Financing Shearson Lehman Brothers, Inc. American Express Tower World's Financial Center New York, New York 10025	XXX	
Barry S. Lindquist Citicorp (USA), Inc. 3025 Multifoods Tower Minneapolis, MN 55402	XXX	
Christopher W. Beale Project & Lease Finance The First Boston Corporation Park Avenue Plaza New York, New York 10055 new address: Beale Lunch & Co. 599 Lexington Avenue New York, New York 10022 212/935-6640	XXX	

November 12, 1990

	Sent RFQ	Sent DOCS
Ronald A. Zanoni Project Finance Kidder, Peabody & Co. 10 Hanover Square New York, New York 10005	XXX	
John Stokes Vice President ESI Energy, Inc. 100 Australian Avenue Suite 304 West Palm Beach, Florida 33406 407/687-4943	X	
C.F. Goff President Destec Energy, Inc. P.O. Box 4411 Houston, Texas 77210-4411 713/974-8268 (Mr. Wright) 2500 Citiwest Blvd., Suite 1700 Houston, Texas 77042	X	
Hal Finkelstein Empire Energy 12 Maple Street Ramsey, New Jersey 07446	X	X
Albert M. Bliss Manager, Business Development MK-Ferguson Company One Erieview Plaza Cleveland, Ohio 44114 216/523-5600 Fax 216/523-5922	X	
Robert Anderson Senior Vice President Project Development Cogentrix, Inc. 9405 Arrowpoint Blvd. Charlotte, N.C. 28217	X	
Royal Newman Arkel Industrial Contracting Services P.O. Box 2128 5110 Maryland Way Brantwood, Tennessee 37027 615/371-7354	X	

November 12, 1990

	Sent RFQ	Sent DOCS
Tom Tribone Applied Energy Systems 1001 North 19th Street Arlington, Virginia 22209	X	
Gary F. Greaves Vice President Chrysler Capital Funding Corporation Greenwich Office Park One Greenwich, CT 06836-6900 203/629-3162	X	
John R. Pettipher Manager-Capital Equipment/Financing Ford Motor Credit Company P.O. Box 1729 Deerborne, MI 48121 313/322-4435	X	
Gary V. Hayward Pacific Corp. Financial Services, Inc. 111 S.W. Fifth Avenue, Suite 2800 Portland, OR 97204 503/222-7920	X	
John Cornwall President Met Life Capital Corporation 10900 N.E. 8th Street Bellevue, WA 98004 206/451-2715	X	
Doug Black McDonnell Douglas Finance Corporation 100 Ocean Gate Long Beach, CA 90802 213/593-8391	X	
Gary Merker Westinghouse Credit Corporation 1 Naperville Plaza, Suite 220 Naperville, IL 60540 312/416-2365	X	

November 12, 1990

	Sent RFQ	Sent DOCS
Thomas Gordhammer Account Officer-Asset Based Lending Xerox Credit Corporation 100 First Stamford Place Stamford, CT 06904-2347 203/325-6667	X	
Evelyn Lopez Daneco Incorporated 450 Park Avenue Suite 2104 New York, New York 10022 212/582-8150	X	
Mr. Jack Sanderson ABB Incorporated 900 Long Ridge Road Stamford, CT 06904	X	
Mr. William B. Palmer Vice President, Business Development Altresco Financial, Inc. 10 Mott Drive Burnt Hills, New York 12027 518/399-2081	X	
William Howarth Director of Project Development		X
Edward Geehan Director, Plant Operations Riley Energy Systems P. O. Box 187 Worcester, MA 01613-0187 508/852-7100	X	
E. J. Hlopak Manager, Market Development PSE Inc. P.O. Box 19398 Houston, Texas 77224 713/464-9451 FAX 713/464-1315	X	

November 12, 1990

	Sent RFQ	Sent DOCS
Mr. Kent Larson Senior Vice President, Finance Energy America, Incorporated 9171 Towne Centre Drive Suite 400 San Diego, California 92122	X	X
Mr. Harry Bradley Owner/Operator P.O. Box 73 Washington, WV 26181	X	
Phil Lasarsky Sverdup Corporation 801 N. 11th Street St. Louis, MO 63101 314/436-7600	X	
Raphael Ramsey SREE EBASOC 1) 900 NE 8th Street Bellevue, WA 98004	X	
Jim Lynn American Energy Suite 600 1900 19th Street N.W. Washington, D.C. 20006 202/457-6616		X
Tuncay Aydinalp Assistant Vice President Facilities Planning University of New York Suffolk Building, Room 120 Stony Brook, New York 11794-6210 516/632-6434	X	
Shoza Sakon Accounting Manager American Universities League 6-13-31-301 Kiklina Komoku-Ku Yokohama 222 Japan	X (too late)	

UNIVERSITY OF MINNESOTA

November 12, 1990

Luther Towner
Lavair & Co.
1770 S. Humboldt Avenue
Minneapolis, MN 55403

X (too late)

Allan Baumgarten
Citizens League
708 S. 3rd Stret
Suite 500
Minneapolis, MN 55415
338-0791

X (too late)

APPENDIX II-G

SUMMARY

General

The University of Minnesota (the "University") is soliciting qualifications from proponents interested in providing up to 100% of the University's annual steam requirements for its Twin Cities campuses. Currently the University produces all its steam requirements in three University owned and operated plants. The University's annual steam requirement is approximately 2.8 billion pounds of steam at the head of the University's steam distribution system. The steam is produced at a pressure of 180 psig in Minneapolis and 150 in St. Paul. The steam distribution system is designed for up to 250 psig.

In July 1989 a Utilities Study was completed by CRS Sirrine, Inc., consulting engineers. The Sirrine Study evaluated existing and future University facilities for the production and distribution of steam as well as other utilities. The Sirrine Study outlined various long term options available to the University and gave preliminary cost estimates for 14 options which would involve facilities developed, owned and operated by the University. Sirrine also indicated that it may be cost effective for the University to purchase steam from third parties rather than produce steam in University-owned plants.

RFQ

This Request for Qualifications ("RFQ") is issued by the University to solicit qualifications from companies ("Respondents") which have the technical and financial capabilities to furnish up to 100% of the annual steam requirements (for heating and other uses) at the Minneapolis and St. Paul campuses of the University.

It is the intent of the University to prepare a Request for Proposals ("RFP") described below and to invite proposals from only those Respondents determined to be qualified by this RFQ process. The University will evaluate the proposals submitted to determine the technical and economic viability of the proposals and to determine the most advantageous option for the University. If, after the RFP process, the University determines that a third party option is in its best interest, then it is the intent of the University to enter promptly into negotiations with that Respondent whose proposal is deemed best by the University. Should the University determine that, after a pre-established period of time, the negotiations are not achieving satisfactory progress, the University will reserve the right to extend the negotiation period, negotiate with another Respondent, negotiate with a party other than a Respondent, or terminate the negotiations. Termination of negotiations will be at the University's sole option and discretion. The University will not be liable for any expenses incurred by the Respondent whether as part of the RFQ or RFP process, negotiations of contracts, or otherwise.

The University reserves the right to accept or reject, with or without cause, any offer and to delay, amend or cancel the RFQ or RFP procedures if there are not adequate responses.

RFP

In May 1990 the University plans to issue an RFP for a steam service agreement (the "Service Agreement") to purchase up to 100% of its annual steam requirements under a long term contract with a third party steam supplier (the "Steam Supplier"). Under the contemplated Service Agreement, steam will be purchased by the University at two delivery points, one in Minneapolis and one in St. Paul. Proponents may propose delivery at a single point (or alternative points) by agreeing to bear the cost(s) of the connecting line(s) and recovering that cost through the steam price. The University will distribute steam via a University owned and operated system of steam lines and tunnels.

Analysis of RFP Responses

The RFP responses along with other options will be analyzed by the University according to various criteria, including the following:

* cost (including lifecycle cost)
* variability of cost
* reliability (financially and technically)
* flexibility

Steam Production Facilities

It is anticipated that the RFP will stipulate that the Steam Supplier may at its option provide steam from any combination of the following:

* facilities now owned by the University which would be sold or leased to the Steam Supplier
* existing or new facilities owned (or controlled) and operated by the Steam Supplier
* a limited amount of steam purchased by the Steam Supplier from other steam suppliers

Other Local Steam Facilities

The University of Minnesota is located between the downtowns of Minneapolis and St. Paul. It is also strategically located between several independent sources of steam supply and could be a vital link in a thermal energy network.

Future Steam Consumption and Demand

The University's future steam consumption and future steam demand may vary depending on:

* conservation plans now under consideration;
* improvements to the steam distribution system;
* decisions about future use of steam for air conditioning;
* future decisions about cogeneration of electricity, if any;
* growth in square footage served; and
* other uses of steam.

The University recognizes that under a long term steam service agreement it may be necessary to compensate the steam supplier appropriately if steam demand is reduced and/or to give the steam supplier appropriate notice if steam demand is to be increased.

Conservation

The University has established a Building Energy Efficiency Project to lower the current and future energy use in University buildings. The goal of the Project is to increase energy efficiency of the buildings of the Twin Cities campuses by 30% within the next five years. The Project is a collaborative effort of the staff of the Minnesota Cold Climate Building Research Center, and the Physical Plant Operations and Physical Planning Departments of the University, with energy audit assistance from Northern States Power Company. The Project also includes a University-wide Energy Committee which is responsible for recommending building energy policy to the administration of the University. A report on the Project dated November 9, 1989 is available upon request.

Steam Distribution System

The University is also planning a systematic program to repair, replace, and improve existing steam distribution tunnels and lines as well as condensate return lines. Given the age and condition of this system, opportunities exist to improve the efficiency of the system.

Cogeneration

If a Respondent believes that steam can be produced more economically by cogenerating with electricity, the University will consider proposals that include the production of both steam and electricity. Respondents may be required to demonstrate at the time that the proposal is submitted that all permits and contracts necessary to produce and sell electricity have been, or can reasonably be expected to be, obtained.

There are three University owned electrical distribution systems that serve the Twin Cities campuses. Northern States Power Company ("NSP") provides 13.8 kilovolt ("KV") power at each of three switch stations. The 13.8 KV level is distributed through the campus via radial feeder systems installed in underground duct banks.

The University Twin Cities campuses purchase approximately 307 million kilowatt hours per year at a cost of approximately $12 million per year.

Chilled Water

Currently the University's air conditioning is supplied through University owned and operated units including window units (6.2%), individual absorption units (73.2%) and small electric chiller units (20.6%). The University is exploring plans to begin looping buildings into groups and initiating a phased implementation of four central chiller plants.

Assistance to the Steam Supplier

The University is prepared to consider providing certain types of ongoing assistance to the Steam Supplier, including but not limited to:

* lease of land for new facilities
* easements (including rights of way for a steam line - if necessary - connecting the Minneapolis and St. Paul campuses)
* permitting
* construction of certain new facilities by the University for lease to the Steam Supplier

Informational Meeting

On Tuesday, February 27, 1990 from 1:00 p.m. to 4:00 p.m., there will be an informational meeting in the University's Physical Planning conference room at 503 Morrill Hall on the Minneapolis campus of the University of Minnesota. The purpose of the meeting will be for entities interested in responding to the RFQ to meet University personnel and advisors and to learn more about the University's plans and needs. If you intend to participate in that meeting, please call (612)342-6345 to so indicate.

PRELIMINARY SCHEDULE

University of Minnesota
Steam Service Agreement
RFQ/RFP Process

January 15	Issue Steam Service Agreement RFQ
February 27	Informational meeting for parties interested in responding to RFQ
March 15	Deadline for RFQ responses
March 30	Selection of qualified Respondents
April 2	Circulate draft of Steam Service Agreement RFP
May 1	Issue RFP
May 15	Information session for RFP Respondents
May 22-24	Opportunity to inspect University facilities
June 29	Deadline for proposals
August 24	Evaluation report on proposals and comparative analysis of all options
September	Decision point on long-term steam options for the University

QUALIFICATIONS OF RESPONDENTS

Intent

It is the intent of the University to solicit proposals only from prequalified Respondents which have such expertise in the design, development and operation of large scale heating plants to be an effective long-term provider of steam to the University. It is also the intent of the University to solicit proposals only from pre-qualified Respondents which have the financial resources to assure that any commitments made to the University can be met throughout the term of the contract.

Approach

Because the University desires to minimize its risks associated with the implementation of a Service Agreement, the Respondent must meet the "Minimum Financial Qualifications" and the "Minimum Technical Qualifications" (described below) to be further considered for this process. If the Respondent meets the minimum technical and financial qualifications then its qualifications will be evaluated in detail by the University to determine which respondents will receive the RFP, if any. The University reserves the right to reject any Respondent. All decisions by the University are final.

Minimum Financial Qualifications

The Respondent must demonstrate to the University's satisfaction that its financial capabilities will enable the Respondent to fulfill all its obligations under the agreements, including providing the required steam over the term of the Service Agreement. At a minimum, the Respondent must have shareholders' equity of at least $50,000,000 or the Respondent's obligations under the Agreements with the University must be unconditionally guaranteed to the University's satisfaction at the time of the response to this RFQ by means of a letter in the form of Exhibit C, or otherwise, by an entity with shareholders' equity of at least $50,000,000 (the "Guarantor").

Measurement of shareholders' equity is to be according to generally accepted accounting principles as of the end of Respondent's latest quarterly financial reporting period, or if unavailable, as of the end of Respondent's latest fiscal year.

The Respondent must state financial qualifications in United States dollars. Any conversion from foreign capital should be at foreign exchange rates in effect at December 31, 1989.

Financial Information to be Submitted by Respondents

The following information must be provided for the Respondent and for all companies, subsidiaries, and/or parent companies making up the Respondent's Project Team, and for the Respondent's Guarantor, if any. Information shall be prepared in accordance with generally accepted accounting principles.

1. Copies of most recent Annual Reports on Form 10-K filed with the U.S. Securities and Exchange Commission (SEC) and all Quarterly Reports on Form 10-Q since the latest Form 10-K; or, if a Form 10-K is not filed with the SEC, the following:

   a. Audited financial statements for the past three fiscal years to include at a minimum, income statements, balance sheets and statements of cash flow. If less than three years of financial statements are available, this information should be provided to the fullest extent possible.

   b. Copies of the latest quarterly financial reports.

   c. A copy of the latest annual report to shareholders, if any.

   d. Information on any material changes in the mode of conducting business, any bankruptcy or reorganization proceedings, and any merger, acquisition or restructuring within the past three years, including comparable information for related companies and principals of such companies; information concerning any pending litigation in which the Respondent is involved.

2. A copy of the prospectus or offering statement, if any, for the Respondent's latest security offering or offerings.

3. The rating on the Respondent's outstanding corporate debt, if any, with copies of the rating agency reports on that debt.

Minimum Technical Qualifications

The Respondent must also meet the "Minimum Technical Qualifications" to be considered further for this project.

The Respondent must demonstrate to the University's satisfaction that its technical capabilities will enable the Respondent to fulfill all its obligations under the agreements, including providing the required steam over the term of the Service

Agreement. At a minimum, the Respondent must have previous experience in operating a steam (or hot water) generating plant with installed capacity of at least 500,000 pounds per hour.

Technical Information to be Submitted by Respondent

To document the Respondent's capabilities, the following types of information must be submitted for five (or less if the Respondent has less than five) of the Respondent's owned and/or operated steam (or hot water) generating plants:

a. Location of plant(s).

b. Contracting parties.

c. Name, address, and telephone number of plant owner.

d. Name, address, and telephone number of plant operator.

e. Name, address, and telephone number of each contact person designated by Respondent to handle inquiries from or on behalf of the University.

f. Description of project, including capital cost and year completed.

g. Design capacity of plant.

h. Fuel type(s).

i. Listing of plant staff, including number of persons by job classifications.

j. Major maintenance schedule for a year.

k. Reasons for unscheduled down time (e.g., equipment repair, etc.).

l. Provide list of operation and maintenance services that are performed by subcontractors.

m. Describe major efforts used to comply with air pollution regulations, indicate appropriate standards, and whether or not plant is in compliance.

n. For each of Respondent's plants, indicate percentage of involvement of the Respondent in each of the following areas:

1) Conceptual design of plant and process layout.

2) Detail design of plant process.

3) Architectural design.

4) Site preparation.

5) Building construction and equipment installation.

6) Financing.

7) Ownership.

8) Permitting and regulatory matters.

9) Operations.

10) Maintenance.

11) Evaluation of older facilities and execution of plans to extend the useful life of such facilities.

12) Fuel procurement.

NOTE: Respondents may also provide a written description of their experience in the twelve areas listed above in item "n".

Project Teams

If two or more organizations intend to submit qualifications as a Project Team all of the required information described above (to the extent the same is relevant) must be submitted for each member of the Team plus the following additional information should be provided::

- o intended legal relationship between each organization in the Project Team;
- o responsibilities of each Team member in providing service to the University; and
- o delineation of which entity will sign the Lease or Purchase Agreement and the Steam Service Agreement.

Evaluation of Qualifications

The Respondent's technical and financial qualifications will be evaluated from the documentation submitted by the Respondent plus other evaluations conducted by the University and the University's consultants. All evaluations and decisions concerning qualifications will be made at the sole discretion of the University, and the University's determinations will be final. By submitting evidence of qualifications each Respondent will be considered to have accepted the terms and conditions set forth in this paragraph.

APPENDIX II-H

RFQ RESPONDENTS

Catalyst Thermal Energy Corp.	New York, New York
CRS Sirrine, Inc.	Houston, Texas
Diversified Energies Inc.	Minneapolis, Minnesota
Empire Energy Management Systems, Inc.	MacDill AFB, Florida
Energy America, Inc.	San Diego, California
Energy Factors, Inc.	San Diego, California
Enron Power Corporation	The Woodlands, Texas
Foster Wheeler Power Systems, Inc.	Clinton, New Jersey
Harbert International, Inc.	Birmingham, Alabama
Jones Capital Corp.	Charlotte, North Carolina
Northern States Power Company	Minneapolis, Minnesota
Ogden Projects, Inc.	Fairfield, New Jersey
Pacific Gas & Electric	San Francisco, California
Portland General Holdings, Inc.	Portland, Oregon
PSI Power Resource Operations & Kiewit Energy Co.	Plainfield, Indiana
Riley Energy Systems Corp.	Worcester, Massachusetts
Trigen Energy Corp. Joint Venture with Compagnie Parisienne De Chauffage Urbain and Union Financiere pour L'Industrie et l'Energie	White Plains, New York

APPENDIX II-I

FIRMS QUALIFIED TO RECEIVE RFP

CRSS Capital, Inc.
Tom Hewitt
5511 Capital Center Drive, Suite 500
Raleigh, North Carolina 27606

Diversified Energies, Inc.
Gary N. Petersen, Senior Vice President,
201 South Seventh Street
Minneapolis, MN 55402

Enron Power Corporation
Jude R. Rolfes, Vice President
10077 Grogan's Mill
Suite 475
The Woodlands, Texas 77380

Foster Wheeler Power Systems, Inc.
Richard J. Swift, Chairman and Chief Executive Officer
Perryville Corporate Park, Frontage Road
Clinton, New Jersey 08809-4000

Northern States Power
Doug Mertz, Director, Energy Services
414 Nicollet Mall
Minneapolis, MN 55401-1927

Pacific Gas & Electric
Douglas W. Buchanan, P. E., Manager
Business Development
444 Market Street, Suite 1900
San Francisco, California 94106

PSI Power Resource Operations
Richard E. Willis, 1000 East Main Street
Plainfield, IN 46168

Trigen Energy Corporation
Michael Weiser
One Water Street
White Plains, New York 10601

Joint Venture with:
Chauffage Urbain Union
Financiere pour L'Industrie
et L'Energie

APPENDIX III-A

UNIVERSITY OF MINNESOTA
TWIN CITIES

University Building Energy Efficiency Project
Minnesota Building Research Center
330 Wulling Hall
86 Pleasant Street S.E.
Minneapolis, Minnesota 55455
(612) 626-7419

31 October 1990

MEMO

To: Roger Paschke

From: David Grimsrud, Charlie Huizenga

Re: Projections of steam consumption and demand on the Twin Cities campus of the University .

We have examined several strategies that are under consideration for reducing steam consumption on the University campus. After examining the impact of each of the strategies on steam consumption and demand we project savings at the University to be those shown in the schedule attached to this memo. The maximum steam consumption savings is projected to be 30% while the maximum demand savings is 15%.

The strategies considered fall into the general categories. A description of the categories and their impact on demand are:

- ❒ operating changes such as night setbacks in temperature, reduced fan use, and scheduling efficiencies, each of which requires modest capital expenditures. Demand is little affected and may actually increase.

- ❒ capital-intensive changes such as the replacement of the bypass fume hoods that are currently used throughout the University with variable air volume fume hoods. Percentage reductions in demand could track percentage reductions in consumption.

- ❒ upgrading existing systems used in the buildings and instituting regular maintenance. Again, percentage reductions in demand could track percentage reductions in consumption.

- ❒ a change in the management responsibilities for the energy used in each building. Here we expect reductions in demand to lag behind reduction in consumption.

We have discussed this issue with energy coordinators at the University of Massachusetts [Jason Burbank (413)545-0600], the Massachusetts Institute of Technology [George Kilmark (617)253-0509], the University of Michigan William Verge (313)764-2492, and Iowa State University [Gary Reynolds (515)294-8079]. Results from the other campuses are mixed depending on the measures that were used to achieve the savings in total consumption that were observed. Total consumption savings ranged up to 25% while decreases in steam demand ranged up to 21%.

Based on these considerations we are projecting steam use and steam demand to drop during the initial parts of this effort and then gradually increase as new space is added to the building stock.

The assumptions used in generating the table are:

1. The building stock increases by 120 000 ft^2 per year.

2. The steam demand reduction is 50% of the reduction in steam consumption.

3. The electricity demand reduction is 80% of the reduction in electrical consumption.

A final issue that was asked about was the estimate of \$3/ft^2 for retrofit costs. It is difficult to comment on this estimate in detail since the costs are tied so closely to the present condition of the buildings.

Another way of estimating these costs is to assume (for simplicity) a static campus. If a 30% reduction in a \$30M utility bill is our goal on an annual basis, one can expect savings of \$9M/yr. To justify investments to achieve savings of this magnitude, one would like investments having a simple payback of six years or less. This would imply an upper bound to investments of \$54M or a value of \$3.10/ft^2 based on present building area.

This simple estimate shows that the \$3/ft^2 figure has the correct scale for the level of conservation we are trying to achieve.

University of Minnesota 25 year Energy Use Projection

16-Nov-90

Campus Growth 120,000 sq ft/year

Steam Demand Reduction 50% of Ubeep Reduction Ubeep Goal 30% Non Univ use 220,000 Mlbs
Electric Demand Reduction 80% of Ubeep Reduction

			Steam				Outside	Outside	Electricity			
Year	Building Area (Gross Sq Ft)	Ubeep Reduction	Norm. Use (lbs/sq ft)	Norm. Demand (lbs/hr-sq ft) x1000	Energy Use (Mlbs)	Demand (lbs/hr)	Energy Use	Demand	Norm. Use (kWh/sq ft)	Norm. Demand (W/sq ft)	Energy Use (Mwh)	Demand (kw)
1989 - 90	17,500,000	N/A	142	38.6	2,700,000	750,000	220,000	75,000	17.3	3.0	303,179	53,000
1990 - 91	17,620,000	3%	137	38.0	2,642,096	744,434	220,000	75,000	16.8	3.0	296,100	52,083
1991 - 92	17,740,000	7%	132	37.2	2,558,031	735,308	220,000	75,000	16.1	2.9	285,823	50,718
1992 - 93	17,860,000	12%	125	36.3	2,447,295	722,553	220,000	75,000	15.2	2.7	272,286	48,898
1993 - 94	17,980,000	18%	116	35.1	2,309,379	706,098	220,000	75,000	14.2	2.6	255,426	46,612
1994 - 95	18,100,000	24%	108	33.9	2,169,422	689,366	220,000	75,000	13.2	2.4	238,316	44,292
1995 - 96	18,220,000	30%	99	32.8	2,027,424	672,356	220,000	75,000	12.1	2.3	220,957	41,937
1996 - 97	18,340,000	30%	99	32.8	2,039,328	676,290	220,000	75,000	12.1	2.3	222,412	42,213
1997 - 98	18,460,000	30%	99	32.8	2,051,232	680,224	220,000	75,000	12.1	2.3	223,867	42,490
1998 - 99	18,580,000	30%	99	32.8	2,063,136	684,159	220,000	75,000	12.1	2.3	225,323	42,766
1999 - 00	18,700,000	30%	99	32.8	2,075,040	688,093	220,000	75,000	12.1	2.3	226,778	43,042
2000 - 01	18,820,000	30%	99	32.8	2,086,944	692,027	220,000	75,000	12.1	2.3	228,233	43,318
2001 - 02	18,940,000	30%	99	32.8	2,098,848	695,961	220,000	75,000	12.1	2.3	229,688	43,594
2002 - 03	19,060,000	30%	99	32.8	2,110,752	699,896	220,000	75,000	12.1	2.3	231,144	43,871
2003 - 04	19,180,000	30%	99	32.8	2,122,656	703,830	220,000	75,000	12.1	2.3	232,599	44,147
2004 - 05	19,300,000	30%	99	32.8	2,134,560	707,764	220,000	75,000	12.1	2.3	234,054	44,423
2005 - 06	19,420,000	30%	99	32.8	2,146,464	711,699	220,000	75,000	12.1	2.3	235,509	44,699
2006 - 07	19,540,000	30%	99	32.8	2,158,368	715,633	220,000	75,000	12.1	2.3	236,965	44,975
2007 - 08	19,660,000	30%	99	32.8	2,170,272	719,567	220,000	75,000	12.1	2.3	238,420	45,252
2008 - 09	19,780,000	30%	99	32.8	2,182,176	723,501	220,000	75,000	12.1	2.3	239,875	45,528
2009 - 10	19,900,000	30%	99	32.8	2,194,080	727,436	220,000	75,000	12.1	2.3	241,330	45,804
2010 - 11	20,020,000	30%	99	32.8	2,205,984	731,370	220,000	75,000	12.1	2.3	242,786	46,080
2011 - 12	20,140,000	30%	99	32.8	2,217,888	735,304	220,000	75,000	12.1	2.3	244,241	46,357
2012 - 13	20,260,000	30%	99	32.8	2,229,792	739,239	220,000	75,000	12.1	2.3	245,696	46,633
2013 - 14	20,380,000	30%	99	32.8	2,241,696	743,173	220,000	75,000	12.1	2.3	247,152	46,909
2014 - 15	20,500,000	30%	99	32.8	2,253,600	747,107	220,000	75,000	12.1	2.3	248,607	47,185
2015 - 16	20,620,000	30%	99	32.8	2,265,504	751,041	220,000	75,000	12.1	2.3	250,062	47,461
2016 - 17	20,740,000	30%	99	32.8	2,277,408	754,976	220,000	75,000	12.1	2.3	251,517	47,738

UNIVERSITY OF MINNESOTA
TWIN CITIES

University Building Energy Efficiency Project
Minnesota Building Research Center
330 Walling Hall
86 Pleasant Street S.E.
Minneapolis, Minnesota 55455
(612) 626-7419

Date: December 5, 1990

To: Roger Paschke

From: David Grimsrud and Charlie Huizenga

Re: Response to Jim Sebasta's Comments on Ubeep Energy Forecast

We have reviewed Jim Sebasta's comments of November 2, 1990 on the Ubeep 25 year Energy Use Projection. He raises some valid considerations concerning projected energy use. However, it is important to realize that our forecast is based on Ubeep targets, and there is certainly a great deal of uncertainty in what will actually be achieved. We could certainly develop a more sophisticated model which included a great deal more detail, but with the level of uncertainty in the base assumptions, a model such as this is probably not appropriate. As we gain more experience with campus buildings and begin to collect data regarding conservation efforts, a more detailed model will begin to evolve.

With that in mind, we offer the following response to Jim's comments:

1. We have modified the forecast to separate steam usage for Augsburg, St. Mary's, and Fairview. (They represent 1.8 million sq ft and 220,000 Mlbs/year). Do they have any conservation/expansion plans that would affect these numbers?

2. We have assumed that air conditioning will not be added to any existing space, only to new construction. The addition of the central chiller loop could have a big impact on summer demand and overall use, particularly if electric compressors are used preferentially to steam absorption units.

3. We agree, yet we do not feel that this changes our forecast. We are targeting both heating and cooling steam use. Since heating and baseline (such as domestic hot water, laundry, etc) use is responsible for the peak demand, it is only the heating and baseline demand reduction which will impact overall steam demand.

4. Based on the CRS Cirrine data, the steam baseline is about 25% of the total demand. Ubeep is targeting baseline use as well as heating and cooling use, and we hope to achieve a 30% reduction here as well.

5. We are targeting demand reduction based on a percentage basis. Certainly the achievable demand reduction will decrease as the HVAC systems are pushed to the extremes of their capacity. We would project that demand reduction at an extreme temperature such as -30°F would be on the order of 5% to 10%.

cc: Jim Sebasta

APPENDIX III-B

Biosketch of WILLIAM NORDHAUS

August 1990

William Nordhaus is currently the John Musser Professor of Economics at Yale University and is on the staff of the Cowles Foundation for Research in Economics. He was born in 1941 in Albuquerque, New Mexico. He received his B.A. degree from Yale in 1963 and his Ph.D. degree from M.I.T. in 1967.

Professor Nordhaus has been a member of the Yale faculty and the staff of the Cowles Foundation for Research in Economics since 1967 and became Professor of Economics in 1973. He has also visited several other research universities, including the Institut d'Etudes Politiques in Paris (1961), University of Cambridge (1970), the International Institute for Applied Systems Analysis in Vienna (1974), and Delhi University (1986).

From 1977 to 1979, Nordhaus was a member of President Carter's Council of Economic Advisers. In that position he had special responsibilities for regulatory reform, international economic affairs, and energy policy.

From 1986 to 1988, he served as the Provost of Yale University, as the chief administrative and academic officer of the University after the President. As Provost, he was responsible for the operating and capital budgets, for overseeing buildings and grounds, as well as for academic affairs.

Professor Nordhaus has engaged in economic research on a wide range of problems. His early work centered on productivity, inflation, and economic growth, and included "Is Growth Obsolete?"

Since then, his work has focussed primarily on problems of energy, natural resources, and the environment. His Brookings study, "The Allocation of Energy Resources", studied the question of how energy resources should be allocated and priced. A fuller treatment was presented in a Yale Press Book, The Efficient Use of Energy Resources. These techniques were extended to materials in a co-authored book, Toward a New Iron Age?. More recently, he has engaged in studies of the "greenhouse effect," or the problem of global warming due to industrial activity.

He has performed a number of "risk analyses," including an analysis of the risks involved in university and college finances, the uncertainties in different power generation options, the risks of nuclear accidents, and an uncertainty analysis of different scenarios for carbon dioxide emissions.

Professor Nordhaus's studies in macroeconomics have investigated the problem of the productivity slowdown which has plagued industrial countries since 1973; the impact of oil prices upon macroeconomic performance in the United States and other countries; and the sources of inflation. His studies include a book, Reforming Federal Regulation, that examines a "regulatory budget" and other proposals for regulatory reform.

In addition, in 1985 Professor Nordhaus joined Paul Samuelson as co-author of ECONOMICS, the classic introductory textbook on economic theory and policy which is now in its 13th edition.

Nordhaus has served as consultant to or member of several committees of the National Academy on Sciences, including the Committee on Nuclear and Alternative Energy Systems, the Carbon

Dioxide Assessment Committee, the committee on Alternative Energy Strategies, the Committee on the Policy Implications of Greenhouse Warming, and the Committee on the Human Dimensions of Global Change. He has served as a consultant to the Departments of Treasury, State, and Labor, and the Environmental Protection Agency. He is a member of the Brookings Panel on Economic Activity and a research associate of the National Bureau of Economic Research. He has received research grants from the National Science Foundation, the Sloan Foundation and the Ford Foundation, as well as other groups.

Professor Nordhaus' past and present professional activities include: fellow of the American Academy of Arts and Sciences; fellow of the Econometric Society; executive committee of the American Economic Association and the Eastern Economic Association; and present or past member of the editorial board of several leading economic journals including The American Economic Review.

APPENDIX III-C

Report on Risk Analysis on Fuel Prices and Other Economic Variables

William D. Nordhaus
Yale University
December 4, 1990
Final Report

The enclosed report considers the risks of alternative future scenarios for fuel prices and economic conditions in the context of a large steam plant under consideration at the University of Minnesota (UM). The approach of this report is to construct both a baseline scenario and to hypothesize a number of plausible "shocks" to the economy that might lead to significantly different alternative paths. As is the nature of all such risk analysis, the limitation is largely due to the lack of imagination of the investigator, who cannot imagine all possible future "shocks" or risks. In addition, a number of qualitative questions are considered in the final section.

I. Baseline scenario

A. UM assumptions

For a baseline scenario, I have examined both the assumptions in the recent analysis performed for UM, the recent long-term forecasts made for DRI, the leading U. S. economic forecasting firm, and forecasts of leading energy experts.

In a preliminary report, a comparison of assumptions about fuel prices was made between the UM study and the assumptions of other groups. Certain suggestions were made and are largely reflected in the current study, and this question is therefore omitted in this final report. I simply reiterate the necessity to ensure that the baseline assumptions are consistent with the projections of the growth of fuel prices.

B. Proposed Baseline Run

For purposes of this report, I have examined recent energy forecasts of DRI, the Energy Department, and other energy experts. On the basis of those studies, I propose a baseline run as follows:

o I assume that world crude oil production is at levels slightly higher than before the invasion of Kuwait. According to most long-term studies, this is consistent with crude prices in the $20 to $25 per barrel range for the early 1990s.

o For the longer term, oil and gas price forecasts differ markedly among forecasters. The consensus of groups like DRI or

the International Energy Workshop are for a oil price in 2000 in the range of $25 to $40 per barrel (or $4.30 to $7.00 per MMBtu) in 1990 prices. The middle range of these estimates, which is the projection I propose, is that the baseline be tied to an oil price of $30 per barrel (in 1990 prices) for 2000, $35 for 2010, and $40 for 2015.

o Historically, over the medium run, gas prices have moved almost 1-for-1 with oil prices per unit energy. Assuming that the initial price of gas is what is available from suppliers in the local area, I propose using the same price increase for gas as for oil.

o Estimates for long-term coal prices (with transportation costs but excluding any future tax increases) are to rise in the order of 0 to ½ percent per annum. Here again, the estimate is close to the UM baseline. On the initial level of prices, I have no independent information and assume that the estimates reflect local market conditions.

o The general inflation forecast, 5 percent per annum, is a shade higher than the DRI long-term estimate, which has been around 4½ percent per annum, but this is close enough to current estimates for a baseline.

o In terms of interest rates, the long-term trend for interest rates is for interest rates on taxable U. S. governments securities to be 0 to 1 percent above inflation for short rates and 1 to 2 percent above inflation for long rates. In general I would choose the higher end of these as assumptions from which to derive the cost of capital for the University.

II. Alternative scenarios

In considering alternative scenarios, the methodology used here is two-fold. I first look at historical variation in inflation and real fuel prices. Second, a number of structural scenarios are employed to consider specific shocks to the energy-economic system as a way of generating alternative trajectories.

1. Historical variability

To begin with, we examined the historical variability of inflation and real fuel prices. Figure 1 below shows the real producer (wholesale) prices of crude oil, natural gas, and coal, deflated by the GNP deflator. The following table shows the standard deviation of 10-year rates of inflation and real fuel price changes during the last few years:

Variable	Mean	Standard deviation
Inflation (1947-89) (GNP deflator)	4.4 percent per annum	2.0 percent per annum
Rate of change of real fuel prices:		
Oil (1947-89)	1.2	6.0
Natural gas (1968-89)	8.7	5.5
Coal (1947-89)	1.5	4.2

We can interpret these as follows: The mean is the average rate of change of the variable over the period 1957-89. The standard deviation represents the average dispersion of the variable around its historical trend. For normal variables, the mean plus or minus the standard deviation would include about two-thirds of the observations. For example, the average rate of inflation was 4.4 percent per annum, while the standard deviation is 2.0 percent for ten-year averages.

Using these data as a guide, we can estimate the frequency of different changes in our scenarios. In the past, for example, the real oil price has varied by more than plus or minus 6 percent per annum for a decade about one-third of the time.

In addition, I have examined the co-movements of inflation and fuel prices to construct scenarios in which different fuel prices move together. The following shows the correlation coefficients between the decadal real fuel-price movements of different fuels over the 1957-89 period:

	Coal	Oil	Gas
Coal	1.00	.90	.67
Oil		1.00	.85
Gas			1.00

Clearly, the correlation between longer term price movements has been extremely high.

2. Alternative scenarios

Using judgment as well as the historical variability, I suggest the following scenarios.

A. Baseline

The baseline scenario has been described above. For concreteness, I assume the following:

Fuel	Average annual increase
Oil	7.0 percent per annum
Gas	7.0 percent per annum
Coal	5.5 percent per annum
Item:	
Inflation*	5.0 percent per annum
Interest rate**	6.0 percent per annum

*GNP deflator **Treasury-bill rate

B. **High oil and gas supply case**

A first alternative scenario would be one similar to the response to the first and second oil-price shocks: that high fuel prices trigger both increased supply and a breakdown of OPEC cartel behavior. This scenario might be occasioned, as well, by increased supply in the Soviet Union as well as much higher energy prices and conservation in socialist countries. It is worth noting, for example, that oil production today without Iraq and Kuwait is higher than before the invasion of Kuwait.

For this scenario, I assume that real oil prices decline to an average of $15 per barrel in the early part of the next century. This would produce a decline of real oil prices of about 2.0 percent per annum, and slightly less decline in gas prices. Inflation would also be lower. Hence the outcome would be:

Fuel	Average annual increase
Oil	2.0 percent per annum
Gas	3.0 percent per annum
Coal	4.0 percent per annum
Item:	
Inflation	4.0 percent per annum
Interest rates	5.0 percent per annum

C. **Disruption scenario (Reasonably Likely)**

A less happy outcome would be enhanced oil-supply disruptions. There are no end of political or economic outcomes that could lead to this outcome, such as a destructive war in the mideast, chaos in the Soviet Union, dollar depreciation, and so forth. Coal prices would be likely to increase because of the upward pressure on oil and gas prices. The high oil prices would lead to higher inflation as well. We can take the case of a one-

standard deviation upside outcome in real oil prices spread over 20 years as the assumption, and this would lead to oil prices of $85 per barrel in 2015. This would lead to the following assumptions:

Fuel	Average annual increase
Oil	12.0 percent per annum
Gas	11.0 percent per annum
Coal	8.0 percent per annum
Item:	
Inflation	7.0 percent per annum
Interest rate	8.0 percent per annum

D. **Extreme Oil Disruption Case**

An apocalyptic scenario would envision a more extreme version of the supply interruption case. This could occur because of more intensive (and more unlikely) supply interruptions or a combination of supply interruptions, demand increases, and environmental concerns. It might include Mideast disruptions, nuclear meltdowns, Soviet civil war, and/or failure of production in some oil-supply regions.

For this case, we take a two-standard deviation increase in real oil price over the 20-year period. This yields the (fantastic?) figure of $170 per barrel of oil in 2015 and produces the following scenario:

Fuel	Average annual increase
Oil	18.0 percent per annum
Gas	16.0 percent per annum
Coal	12.0 percent per annum
Item:	
Inflation	10.0 percent per annum
Interest rate	11.0 percent per annum

E. **Environmental Concerns**

There are increasing concerns about the social and environmental costs of coal burning. Some of these have recently been incorporated in the 1990 Clean Air Act, but others, such as greenhouse-warming issues, have yet to be addressed in the United States.

This scenario considers an outcome that has severe constraints on CO_2 emissions that take the form of a carbon tax (as in the Stark bill introduced in the last Congress). Some recent proposals would include a tax of $25 per ton of carbon in fossil-fuel emissions. This would lead to about $17.5 per ton of coal, or about $0.70 per MMBtu of coal, $0.60 per MMBtu of oil, and $.35 per MMBtu of methane. The following would then be the environmental scenario:

Fuel	Average annual increase
Oil	7.4 percent per annum
Gas	7.5 percent per annum
Coal	6.8 percent per annum
Item:	
Inflation	5.0 percent per annum
Interest rate	6.0 percent

F. Stagflation and Tight Money

A further possibility is that events external to the energy sector will trigger inflation, tight money, and recession of the kind seen in the early part of the 1980s. This syndrome is very unlikely to persist for more than a decade but might be considered nonetheless. In this case, inflation would increase sharply, but tight money would drive down oil and gas prices. Such as scenario would be as follows:

Fuel	Average annual increase
Oil	7.0 percent per annum
Gas	7.0 percent per annum
Coal	8.0 percent per annum
Item:	
Inflation	8.0 percent per annum
Interest rate	11.0 percent per annum

G. Oil Security Measures

It is possible that the heightened concerns about oil security will impel the United States to take serious steps to

reduce oil imports. The most likely steps would be an oil-import tariff and domestic subsidies. This might well drive up oil prices more than gas prices. Suggested oil tariffs have been as high as $10 per barrel. If these are added to the baseline and assume no substantial domestic or foreign reaction, along with a fifty percent gas response, we get the following scenario:

Fuel	Average annual increase
Oil	8.0 percent per annum
Gas	7.5 percent per annum
Coal	5.5 percent per annum
Item:	
Inflation	5.0 percent per annum
Interest rate	6.0 percent per annum

H. **Depression**

A few, but not many, economists believe that the economy might slide into a recession, financial breakdown, and depression. This could be triggered by massive bankruptcies, a flight from the dollar, and a breakdown in the international financial system. While most mainstream economists would rate this as unlikely, it would seem worth considering. A possible outcome would be the following:

Fuel	Average annual increase
Oil	0.0 percent per annum
Gas	0.0 percent per annum
Coal	1.5 percent per annum
Item:	
Inflation	2.0 percent per annum
Interest rate	1.0 percent per annum

III. Likelihood of the Scenarios

In weighing the different scenarios, it might be useful to give very rough estimates of the likelihood of the different scenarios laid out above. It must be emphasized that we are likely to underestimate the likelihood of surprises, but the following will at least be useful to decisionmakers in deciding how to weigh the different scenarios:

Scenario	Likelihood
Baseline	.3
High oil and gas supply	.2
Disruption	.16
Extreme disruptions	.03
Environmental concerns	.1
Stagflation	.08
Oil security	.1
Depression	.03

The weights are clearly based largely on intuition, although they are partially based upon the statistical measured presented above. In addition, we should be mindful of the finding of behavioral psychologists that people always underestimate the uncertainty of their environment.

IV. Further Concerns

Before concluding, a few miscellaneous points, not necessarily related to the scenarios, are made for the record:

1. The issue of availability of gas is difficult for me to judge, and a local expert in clearly needed on this question. My judgment is that in the newly deregulated market, the most likely case is that the question of interruptibility will mainly be part of the contract. Even in the worst crises of the 1970s, gas was available at a price, and this is likely to hold in the future as well. The premium on non-interruptible gas is $1.00 to $1.50 per MMBtu in the Connecticut area. Therefore, in general, the price risk (or rather the price premium to avoid non-availability) is the appropriate one to focus on.

For the most part, gas supply interruptions have been highly localized and temporary (like brownouts or blackouts). The kinds of questions that may identify whether you have a potential problem are: Is the supplier reliable? A bankrupt supplier poses the problem of scrambling to fulfill the contract, which could drive the price up considerably. What is the nature of the contract between your vendor and the actual gas producer and pipeline, and what are the reserves of the gas supplier? What are the penalties for failure to supply? What has been the experience in your area?

2. There are another set of options in the nature of postpone or opt-out that should be thought about. For example, if the operation becomes extremely costly (because the fuel price is astronomical or because of invention of an alternative fuel), the plant can be retrofitted or at worst scrapped. This scenario

could be tested by comparing projects for 10, 15, and 20 year lifetimes to see if the ranking changes significantly.

In a similar line, I am not clear whether the postponement option has been thoroughly explored. Particularly given the uncertainties of oil prices in the Mideast in light of possible hostilities, it might be worth considering waiting for a year before making the decision.

3. There is no discussion of bankruptcy of the different proposers. Is it clear that a worst case scenario for the operator would not leave the University with a Chapter 11 litigation to contend with?

4. The interest-rate variations raise immensely complicated issues for the sensitivity analyses. Many of the scenarios would have quite different interest-rate trajectories. Depending upon the financing, the impacts could be important for the University debt service and operating budget.

In principle, if the University is financing its borrowings with floating rate debt and is unconstrained in capital markets, with a flat demand curve for its debt, then the interest rates in each scenario, modified to reflect the interest rate on the appropriate interest rate on the University's debt instrument, should be used as a discount rate in the present-value calculation.

Other financing approaches would lead to other treatments. If the University were to finance all its capital needs now at fixed-rate debt and invest that in fixed-rate securities until the actual expenses were incurred, then the fixed interest rate used in the actual borrowing would be appropriate rate, rather than the actual interest rates used in the scenarios.

This is, however, a very complex issue of high finance theory (for which three economists just got a Nobel prize!). The easiest way to handle for these analyses are to use the base interest rate and then to do sensitivity analyses using the changes proposed above.

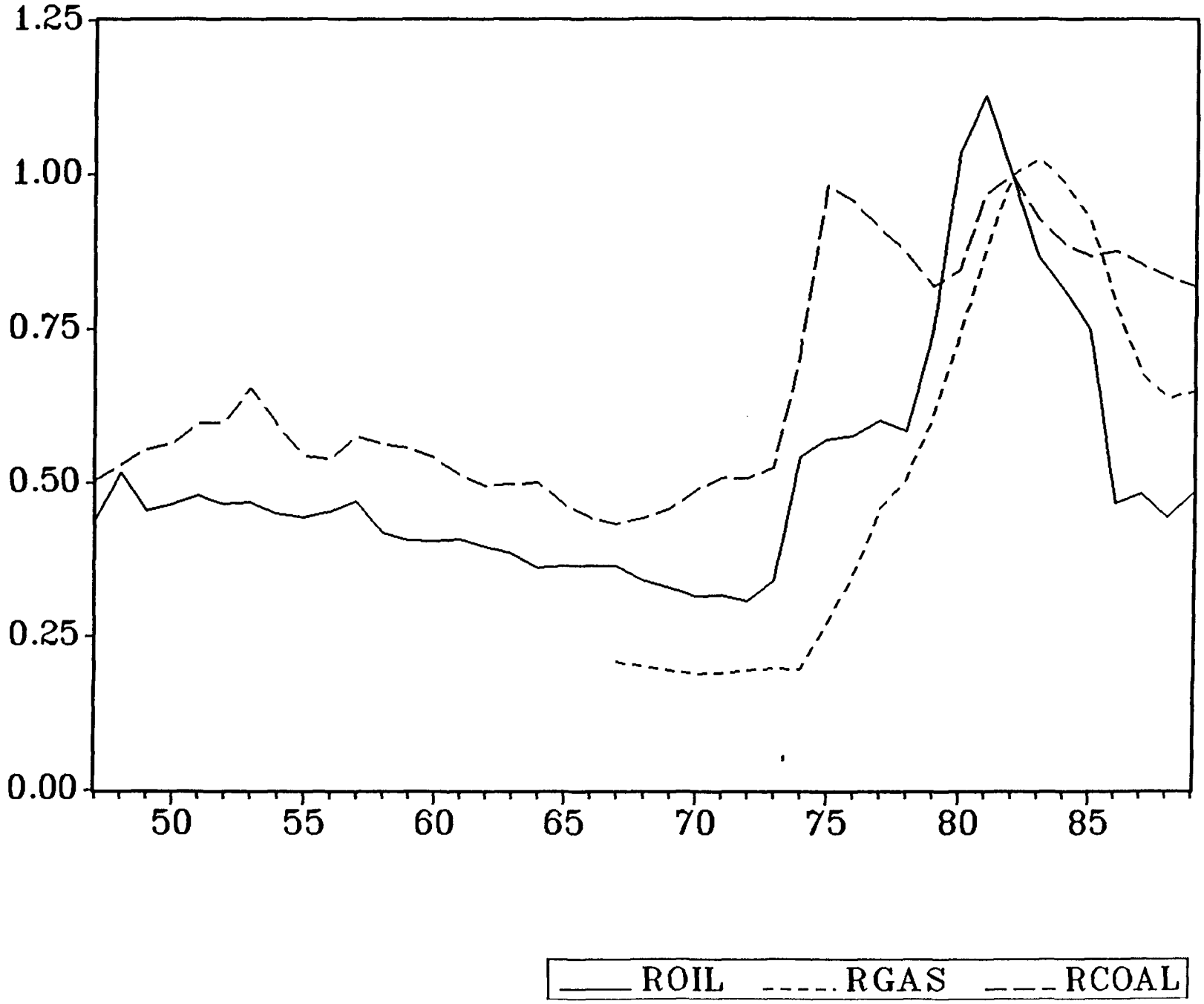
5. I have no information on the trends in disposal and O&M costs. My guess would be that labor costs would rise at inflation plus 1.5 percent. Disposal costs have been rising sharply, and it might be worth comparing local costs with those in other areas (New York or California) to see how much higher costs could get.

6. This analysis has not dealt with the possibility of emissions taxes on different fuels. Recent proposals in California and Massachusetts would have substantial effects upon the cost of operation of different plants if they were imposed in

Minnesota and if they were to apply to fuel use. No state so far does this, so this risk is probably a number of years into the future. In addition, the 1990 Clear Air Act will probably set up an entitlement system for sulfur emissions. These may have a major impact upon the costs depending upon the fuel (especially for coal). At the same time, the complexity of the rules regarding the University's existing entitlements and Minnesota rules are so far outside my knowledge that I can do no more than flag this issue.

7. The internal option is of quite a different nature from the external options. For this, the major issue is probably a cost overrun. If the University resembles other institutions, it would be difficult to enforce an internal cost estimate. For example, a 20 percent overrun would be par in most university capital projects. Before proceeding with this option, therefore, historical cost overruns should be examined and cost overrun scenarios should be evaluated.

Real Oil, Coal, and Natural Gas Prices



APPENDIX IV-A

S&P Debt Rating Definitions:	
AAA	Debt rated 'AAA' has the highest rating assigned by Standard & Poor's. Capacity to pay interest and repay principal is extremely strong.
AA	Debt rated 'AA' has a very strong capacity to pay interest and repay principal and differs from the higher rated issues only in small degree.
A	Debt rated 'A' has a strong capacity to pay interest and repay principal although it is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than debt in higher rated categories.
BBB	Debt rated 'BBB' is regarded as having an adequate capacity to pay interest and repay principal. Whereas it normally exhibits adequate protection parameters, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity to pay interest and repay principal for debt in this category than in higher rated categories.

APPENDIX IV-B

TECHNICAL QUALIFICATIONS SUMMARY

- Boiler Steam Capacity - 950,000 pounds per hour
- Chilled Water Capacity - 25,500 tons
- Square Footage Heated - 30,000,000
- Square Footage Cooled - 12,000,000
- Steam Distribution System - 20,000 feet
- Chilled Water Distribution System - 8,000 feet
- Number of Plants Operated - 6
- Total Number of Employees - 31
- Number of Outages in 18 years - 3 None over one hour

UNIVERSITY OF MINNESOTA
STEAM SERVICE AGREEMENT
REQUEST FOR QUALIFICATIONS

DIVERSIFIED ENERGIES, INC. AND
MINNEAPOLIS ENERGY CENTER, INC.

The following paragraphs will respond to the information requested in the Request for Qualification document issued by the University of Minnesota and dated January 15, 1990. The answers will be in the order the questions were asked using the letter designation on the question.

Minneapolis Energy Center, Inc. is a wholly owned subsidiary of Diversified Energies, Inc. and is the operator of the district heating and cooling facilities in downtown Minneapolis. The primary plant operated by Minneapolis Energy Center, Inc. was originally constructed by IDS Properties and Minnegasco under a partnership doing business as Third Avenue Development Company. The partnership sold the physical assets of the business to a limited partnership on July 31, 1984, and Minneapolis Energy Center, Inc. entered into a fifteen year Management Agreement to manage and grow the business.

Answers to the specific questions pertaining to technical qualifications are as follows:

a. Location of Plant(s)

The primary plant operated by Minneapolis Energy Center, Inc. is located at 816 - 4th Avenue South, Minneapolis, Minnesota.

In addition to the primary plant the system includes two leased heating plants, the first, in the block bounded by Marquette and 2nd Avenues and 7th and 8th Streets known as the Baker Block Plant and the second in the Soo Line Building located at the corner of Marquette and 5th Streets in downtown Minneapolis.

A fourth unattended plant serves the buildings of the Star and Tribune facility and is known as the Minneapolis Energy Center North Riverfront Plant located at 801 Second Street North.

We also have a satellite chilled water cooling facility located adjacent to the Minneapolis Convention Center and are in the process of designing a plant on First Avenue North and 7th Street.

b. Contracting Parties

The primary plant was originally constructed in 1971 with Nystrom Constructors as the primary contractor, Lamb Plumbing and Heating as the mechanical contractor and Kvalsten Electric was the electrical contractor.

c. Name, Address and Telephone Number of Plant Owner

The plant facilities are presently owned by:

Energy Center Partners, A Minnesota Limited Partnership
c/o Dain Equity Partners, General Partner
Douglas Coleman, President
100 Dain Tower
Minneapolis, Minnesota 55402.

Telephone (612) 371-2761

d. Name, Address and Telephone Number of Plant Operator

Minneapolis Energy Center, Inc.
1060 IDS Center
80 South 8th Street
Minneapolis, Minnesota 55402

Telephone: (612) 349-6070

e. Name, Address and Telephone of Contact Persons

Ken Linwick - (612) 349-6070
Steve Johnson - (612) 342-4749

f. Description of Project

The primary plant was constructed in 1971 as the primary production facility for district heating and cooling in downtown Minneapolis.

The original plant with two 200,000 #/hr steam generating units and approximately 10,000 tons of cooling was completed in 1971 at a cost of $13 million including limited distribution system additions.

This plant has grown over time to 600,000 pounds of steam and 24,000 tons of cooling.

g. Design Capacity of Plant

The primary plant equipment consists of three -200,000 lbs/hr gas/oil fired boilers operating at pressure of 250 psig and related auxiliaries.

h. Fuel Types

Natural gas - #6 fuel oil (1 1/2% sulphur), #2 fuel oil

i. Listing of Plant Staff Including # of Persons By Job Classifications

See list attached

j. Major Maintenance Schedule

See data attached

k. Reasons for Unscheduled Down Time

The outages of the Minneapolis Energy steam system during the past year were as follows:

1. On December 21, 1989, the main plant tripped at 3 PM while maintenance personnel were in the process of removing a defective flame safety device. The Plant was back in service within 15 minutes and back to normal operation in one hour. No other unscheduled shutdowns occurred during calendar 1989. During the December 21st shutdown, the Baker Block & Soo Line Plants continued to operate as did the North Riverfront Plant. Over the past 18 years the plant has had no more than three shutdowns and all were of from fifteen minutes to one hour in length.

l. Operation and Maintenance Services Provided by Sub-Contractors

The plant carries no certified welder and no licensed electrician as a member of its staff. We therefore sub-contract for minor system repairs that are needed. Piping and electrical contractors are used for this service. We also need occasional repairs on our boilers and we use a local boiler repair company and a refractory company for these repairs.

We also use the Carrier Corporation to provide supervisory personnel during the annual inspection and alignment checks on our centrifugal chillers.

m. The Minneapolis Energy Center has had no difficulty to date complying with air pollution regulations and operating within the limits of the plant permit. We are now in the process of renewing our permit for a five year period and the Minnesota Pollution Control Agency has instituted tougher restrictions on the operation than were included in the prior permit. We are contracting for a series of emission tests which we

anticipate will invalidate the modeling standards utilized for the State of Minnesota in establishing their one hour standard. We have a two year period with which to complete our testing and install any necessary modifications to comply with their rulings.

n. Main Plant

The original plant was designed by two engineering firms Michaud, Cooley, Hallberg & Erickson and Joseph V. Edeskuty and Associates. Architecture was handled by Baker and Associates and structural engineering by Clark Engineering Company. Michaud, Cooley, Hallberg & Erickson were primarily responsible for the chilling plant additions and Joseph V. Edeskuty and Associates handled the boiler and auxiliary equipment design. The plant was originally equipped with two 200,000 #/hr steam generating units together with related auxiliaries and 10,000 tons of refrigeration capacity in four absorption machines and one non-condensing turbine driven centrifugal. Mr. Linwick, the President and CEO, arrived in 1972 (NOTE: please refer to the biographical sketch for Mr. Linwick's experience profile). At that time the plant served 12 buildings for heating and 2 for cooling. This system, which initially served 6,000,000 sq.ft., over the past 18 years has grown to a system serving 100 buildings with 30 million square feet for heating and 23 cooling customers with a gross area in the neighborhood of 12 million square feet. Substantial customer additions are now requiring the need for two satellite cooling facilities that will be tied to the main system. Since his arrival in 1972, Mr. Linwick has had direct control of all of the design concepts and has directed the engineering through either in-house staff or hired consultants for expansion of the system. This expansion has included the addition of one - 200,000 lbs/hr gas oil boiler, three turbine driven condensing centrifugal refrigeration machines with total capacity of 14,000 tons of cooling together with all related auxiliaries as well as 15,000 feet of steam distribution system additions and 6,000 feet of chilled water system additions.

In addition, during this time, a new electronic control system was selected for the entire plant replacing the original pneumatic controls on all boilers and the new refrigeration systems.

Mr. Gary Gustafson joined the Energy Center as Director of Engineering in 1980 (NOTE: His profile can be found following this narrative.) and has assumed the duties of the general contractor for all of our installations and has supervised the growth of the

plant additions as well as the distribution system additions. Generally speaking we bid all of the major equipment as well as the auxiliaries required for the system and then take separate bids for the general construction work, the mechanical work, and the electrical work. All work is coordinated by Mr. Gustafson. Financing of equipment prior to the sale of the assets to Energy Center Partners was handled by Diversified Energies, Inc. and subsequently by the Finance Department of Dain Equity Partners, the General Partner for the current owners, Energy Center Partners, a Minnesota Limited Partnership.

All permit modifications resulting from the addition of new equipment have been handled directly by the President and Director of Engineering together with consulting engineering support as needed. Operations were originally handled directly by the President through the Chief Engineer and Assistant Chief Engineer but with the recent growth in the system as a whole, we have now added a Director of Operations headed by Mr. Michael Carroll (Educational and biographical profile attached).

Maintenance of the system is handled by Minneapolis Energy Center maintenance personnel where possible and where more specific skills are required outside contractors are hired and supervised by Energy Center personnel. Mr. Linwick, Mr. Gustafson and Mr. Carroll are all Registered Professional Engineers in the State of Minnesota.

Fuel procurement has been handled entirely by Mr. Linwick and bids are taken as frequently as necessary to assure competitive prices on both natural gas and heavy fuel oil. During the past year substantial quantities of #3 oil were burned in addition to the heavy fuel oils as a result of the Pollution Control Agency Permit modifications.

Minneapolis Energy Center, Inc. also manages two leased plants. One in the Baker Block with a capacity of 200,000 lbs/hr and one in the Soo Line Building with a capacity of 150,000 lbs/hr. These plants are designed to operate on natural gas and #6 fuel oil but are currently being converted to burn distillate fuel oil as well. These plants do not contain new boiler equipment but it is part of the MEC plant responsibility to keep all boilers in proper working order including modifications which upgrade the equipment. It is also MECI's responsibility to train personnel to run boilers in all three of our primary plants.

SATELLITE FACILITIES

NORTH RIVERFRONT PLANT

The North Riverfront Plant is a remote plant that currently serves the heating and cooling needs of the Minneapolis Star & Tribune Heritage Center facility located in north Minneapolis. The concept of such a plant, the design of the heating and cooling process, architectural design, site preparation, land purchases, building construction, equipment installation, etc. was all handled by MECI personnel primarily Mr. Linwick and Mr. Gustafson. The financing was through Dain Equity Partners for Energy Center Partners and the financing was obtained through Prudential. Energy Center Partners maintains ownership of the plant. The plant is designed for a total of 30 million BTU's of hot water capacity, 3,000 lbs. of steam capacity for humidity control and 1500 tons of electric driven refrigeration machines. The plant operates on an unattended basis and is checked once daily during normal weather and once per shift during periods of extreme weather. All maintenance is carried out by Minneapolis Energy Center personnel. Fuel procurement for this plant is handled by the Director of Operations as a part of our normal fuel purchase responsibilities. This plant has operated extremely successfully for the past three years with a minimum of difficulty and no extended interruptions of any kind to the customer. Electronic Network 90 controls are used to handle the plant operations and can be operated from graphic panels located in the control room of our primary plant.

CONVENTION CENTER CHILLER PLANT

In 1988, a contract was signed with the Minneapolis Convention Center to provide cooling. This included the purchase of the Convention Center chiller plant. The building proper was designed by Leonard Parker and Associates and the Convention Center Collaborative and no control was given to the Minneapolis Energy Center for the building exterior. All of the interior design, however, was handled entirely by Energy Center personnel and its consulting engineers. The plant is designed for an eventual capacity of 5,000 tons of cooling that is presently tied to the Energy Center primary plant. As system loads grow, we will eventually add up to four 1250 ton electrically driven chillers in this plant. For the present, however, excess capacity in the primary facility is serving the Convention Center.

FIRST AVENUE CHILLER PLANT

The second satellite chilling plant will be added to the Minneapolis Energy Center's system with construction commencing in May, 1990. This plant will contain two 3,000 ton turbine driven centrifugal refrigeration machines. The plant is designed for eventual capacity of up to 10,000 tons of refrigeration and the piping from this plant will serve major new loads in the area and will also tie back to the main distribution grid. This will greatly extend the capacity of the plant in the heart of downtown Minneapolis and allow it to continue to expand in a productive and economical manner. All of the concepts, piping layouts, machine sizing, drives, economics, and architectural design were under the direction of Minneapolis Energy Center personnel. Since it will be for district cooling only, it will require a Conditional Use Permit but will not require the permitting and regulation on the part of the Minnesota Pollution Control Agency. Operations of this plant will be on a peaking basis as needed with anticipated use only during the four summer months. The plant will be staffed when operated and will be maintained by MECI personnel. No separate fuel needs exist for this plant since the energy to drive the chillers will be obtained from steam delivered from the primary facility.

APPENDIX IV-C

5. TECHNICAL AND OPERATING EXPERIENCE

Foster Wheeler is an international corporation that has been in business for many decades providing goods and services in the following areas:

- Engineering and design of cogeneration plants, refineries, chemical plants, fertilizer plants, industrial power plants, utilities and infrastructures for these plants.

- Design and fabrication of heat transfer equipment, power utility and industrial boilers, waste heat boilers and fired heaters.

- Start-up, operation and maintenance of refineries, chemical plants, industrial, utility and cogeneration plants.

- Manufacture of products and supply of services related to the production of steam and power such as water treatment, emission control equipment, combustion control instruments, etc.

- Construction of cogeneration plants, refineries, chemical plants and industrial utility plants.

- Engineering and design of oil and gas production facilities both onshore and offshore.

- Developer as owner/operator or venture partner of cogeneration plants and industrial power plants that sell energy to participating industrial clients.

In Volume II of this Qualifications document, we have provided a vast amount of experience data to demonstrate both the breadth and depth of Foster Wheeler's capabilities and expertise. We believe this information shows unequivocally that we are uniquely qualified to provide the University of Minnesota with its steam generation needs. Simply put, we developed the technology, we design the plant and equipment, we provide the major equipment, we build the plant, we operate and maintain the plant or train others to do so, we finance the plant and we guarantee its performance. And, just as important, we have a successful track record of doing so.

Note again, that Foster Wheeler has been a manufacturer and worldwide supplier of utility, industrial and heat recovery steam generators for many decades, tracing it's history back to the founding of the company in 1891. Boilers have been supplied firing almost every known fuel: from low BTU waste gases such as blast furnace gas through many liquid fuels and oils to coals, anthracites, wood waste, rice hulls and bagasse. These units range in size from package boilers of 25,000 pph steam flow up to very large central station boilers in excess of 6,000,000 pph operating at supercritical steam pressures.

Foster Wheeler manufacturers boilers at its Dansville, New York and St. Catharine's, Ontario Facilities. The company also manufactures ball tube pulverizers, vertical spindle pulverizers, burner systems, condensers and feedwater heaters and, through subsidiary companies and vendors, also provides much of the auxiliary equipment necessary for these steam generators.

Although, in general, Foster Wheeler is not the final user and operator of the equipment supplied to industrial and utility customers, the company provides the services and expertise necessary to train the customers' personnel in the efficient and safe operation of the equipment supplied. In the case of large central station equipment, this training

may continue for 5 years or longer. In some cases, especially in developing countries, it is necessary to train personnel with little formal education and no knowledge of power plant operation and maintenance practice. The normal scope of services provided by Foster Wheeler in the O&M area includes:

- Formal classroom training of operation and maintenance staff
- Simulator training either at the plant or on Foster Wheeler's power plant simulator in the home office
- Development of operating procedures
- Development of maintenance procedures
- Supply of complete volumes of O&M instructors. Some of these run up to 15 volumes
- Control room, hands on instruction for the plant operators
- Initial check out and commissioning of the equipment
- Emphatic instruction on plant safety procedures
- Demonstration of maintenance procedures
- Inspection and testing services
- Instruction on operating the equipment most efficiently
- Post contract follow-up and improvement services

The following pages describe some diverse units supplied in recent years which represent a small faction of units sold. A list of central station steam generators supplied in the last 25 years is provided in Section D of Volume II of this document.

FOSTER WHEELER POWER SYSTEMS

SUMMARY OF PROJECTS

		MW	PPH LBS/STEAM	FUEL	TPD	STATUS
1.	Norfolk	--	100,000	Res & Comm Waste	(360)	Operational 67
2.	Wierton	--	700,000	Waste Gas		Operational 79
3.	Lihue	20	320,000	Ag. Waste	(1280)	Operational 80
4.	Occidental	50	600,000	Res & Comm Waste	(2000)	Operational 80
5.	Commerce	10	115,000	Res & Comm Waste	(400)	Operational 86
6.	Martinez	90	390,000	Waste Gas		Operational 87
7.	Chapleau	7	70,000	Wood Waste	(360)	Operational 87
8.	Charleston	15	175,000	Res & Comm Waste	(600)	Operational 89
9.	Mt. Carmel	40	385,000	Waste Coal	(2300)	Operational 89
10.	Camden	21	260,000	Res & Comm Waste	(1050)	Construction 88
11.	Hudson Falls	14	185,000	Res & Comm Waste	(400)	Construction 88
12.	Passaic	40	425,000	Res & Comm Waste	(1500)	Permitting
13.	Broome	18	185,000	Res & Comm Waste	(600)	Permitting
14.	Knoxville	30	317,000	Res & Comm Waste	(900)	Permitting
15.	Morris	39	415,000	Res & Comm Waste	(1340)	Permitting
16.	Montreal	39	415,000	Res & Comm Waste Recycling Composting	(2200)	Negotiation

(1750H)

FOSTER WHEELER ENERGY CORPORATION
EXPERIENCE LIST - MINNEAPOLIS AND
MIDWEST AREA

1943

Start-up of ball pulverizers on Units #9 and #10 at Northern States Power's High Bridge Station.

1949

Start-up of two Foster Wheeler, stoker-fired, 125,000 Lb/Hr steam generators at Northern States Power's Red Wing Station.

1954

Start-up of Black Dog Unit #2 for Northern States Power, 83 MW coal-fired, reheat, steam generator with Foster Wheeler ball pulverizers.

1957

Start-up of Foster Wheeler ball mills on Black Dog Unit #3.

1959

Start-up of Foster Wheeler ball mills and burners for Northern States Power's Riverside Units #6 and #7.

1965

Installation of Foster Wheeler STOIC gasifier (20 ft. size) at University of Minnesota (Duluth).

1979

Installation of MB medium speed pulverizer at University of Minnesota Power Plant.

1981

Start-up of 42,000 Lb/Hr., sunflower seed hull-fired, steam generator at Cargill's Fargo, North Dakota facility.

(1303Q)

1983

Life extension study for Wisconsin Electric Power's Oak Creek Units #5 and #6 (800,000 Lb/Hr PC - Fired, Foster Wheeler steam generators)

1986

Life extension study of two Foster Wheeler, PC-fired, 300,000 Lb/Hr steam generators at Indianapolis Power and Lights' Perry "K" station.

1988

Start-up of fluid bed conversion project (1,034,000 Lb/Hr) at Northern States Power's Black Dog Unit #2.

1990

Fabrication of two gas-and oil fired, 250,000 Lb/Hr package units for Cargill's Sydney, Ohio and Eddyville, Iowa Plants.

APPENDIX IV-D

TECHNICAL QUALIFICATIONS

THERMAL ENERGY SALES

With several large steam plants in Minnesota and surrounding states, NSP is the largest steam supplier in the metropolitan area.

NSP plants produce more than 4" million pounds of steam per hour. Most of this output is used to generate electric power. However, NSP does provide nearly one million pounds of steam per hour under direct sales agreements to others.

Key Customer Strategy Through NORENCO, a wholly owned NSP subsidiary, NSP acts as a "partner" working with several key steam customers to provide total steam services. Our strategy in retail steam delivery has been to create a niche in the market, concentrating our efforts on the large-scale user of steam. We feel that this strategy allows us to be more focused and more responsive to the unique requirements of each customer.

Currently we have separate contracts to provide steam to three customers:

- **Andersen Corporation** — receives 110,000 lbs/hr peak demand and a minimum of 226,000 million Btu annually of 120 psig, 355°F steam from NSP's Allen S. King Plant in Bayport.
- **Minnesota Correctional Facility** — receives 50,000 lbs/hr peak demand and 126,000 million Btu annually of 130 psig, 355°F steam from the NSP's King Plant.
- **Waldorf Corporation** — receives 350,000 lbs/hr peak demand and 2,520,000 million Btu annually of 610-650 psig, 700-760°F steam from the NSP's High Bridge Plant in St. Paul.

New Plant to Serve Air Base NSP's Gas Utility is also designing and constructing a new steam plant to serve the U.S. Air Force Base in Grand Forks, North Dakota. The plant, which is scheduled to begin operation October 1, 1990, will provide 180 million Btu/hr of hot water peak demand and 456,000 million Btu annually at 125 psig, 220°F.

Incremental Expansion Because NSP has the capacity and wide-ranging capabilities to meet increased energy requirements, our customers can expand their steam use incrementally. As your needs expand, NSP has the resources to provide exactly the amount of increased capacity you require. With other suppliers, you may have to pay higher costs to cover the large capital expenditure for new plants or facilities that may be unneeded or underutilized for several years.

NSP'S POWER SUPPLY DIVISION

NSP's Power Supply Division is responsible for designing, engineering, constructing, operating, maintaining, and managing NSP's power plants. Power Supply provides the base steam that NSP markets to its retail steam customers through NORENCO.

Steam Generating Experience NSP relies on steam power in most of its electric generating plants. NSP plants use coal, natural gas, fuel oils, refuse-derived fuel and wood waste to produce more than 4" million pounds of steam per hour for steam turbine-powered electric generators.

We also own and operate three nuclear reactors with a combined steam production capacity of over 15 million pounds per hour. These large and complex facilities are located at our plants in Monticello and Prairie Island. Power Supply uses the resources and expertise developed at our nuclear facilities to support the other plants it operates.

Power Supply uses additional technologies in several power plants it runs. These include: hydro power, combustion turbines, jet engines, diesels, and wind turbines. These activities provide a wealth of human resources and expertise that will allow us to provide flexible and innovative energy services to the University of Minnesota.

Plant Engineering and Construction NSP has, over the past 50 years, been its own project manager for the construction of all its major generating units and modification projects, including Sherco, King, Black Dog, Riverside and High Bridge. *Plant Engineering and Construction* is the department within NSP's Power Supply Division whose mission it is to manage projects and complete them on time, within budget and at the highest level of quality.

SHERBURNE COUNTY GENERATING PLANT (SHERCO)

NSP's Sherburne County (Sherco) Plant is the company's largest power plant in terms of square feet, power generation, number of employees, capital expenditures, coal purchases, deliveries and combustion. The plant is located on a 4,510 acre site on the Mississippi River about 45 miles northwest of the Twin Cities.

Sherco is the only NSP plant not owned entirely by the company. Southern Minnesota Municipal Power Agency owns 41 percent of the power output of the plant's third and largest unit. NSP operates the plant for both owners.

Sherco 3 was the largest construction project ever completed in the state of Minnesota. Sherco also is NSP's most modern plant. One of the most notable features is Unit 3's dry scrubbing system — the world's largest dry scrubber air-quality system for a single plant unit.

The first two Sherco units began operation in 1976 and 1977. Each can produce 700 megawatts of electricity. Unit 3 can produce 855 megawatts. Together, Sherco's three units can generate enough electricity for 2,255,000 homes.

Sherco is a highly efficient, well-operated plant. Between 1983 and 1987, Units 1 and 2 were available for service an average of 90 percent of the time. Unit 3 was available 95 percent of the time during the first three months of operation. The national average for coal-plant availability is 78 percent. All three Sherco units use sub-bituminous Western coal from Montana and Wyoming.

Technical Details

Unit 1: 702 megawatts, pulverized coal-fired boiler. (1976) 5,000,000 lbs/hr @ 2,520 psig, 1,007°F

Unit 2: 700 megawatts, pulverized coal-fired boiler. (1977) 5,000,000 lbs/hr @ 2,520 psig, 1,007°F

Unit 3: 855 megawatts, pulverized coal-fired boiler. (1987) 6,125,000 lbs/hr @ 2,520 psig, 1,007°F

Original Capital Cost: $1,442,000,000 (all units)
NSP Portion of Cost: $ 942,139,610

BLACK DOG GENERATING PLANT

NSP's Black Dog Plant uses the latest technology to deliver clean, dependable energy to NSP customers. The plant's Unit 2 uses the largest fluidized bed combustion boiler in the world. This new technology allows emissions to be trapped and controlled at the time of combustion. No scrubber system is required.

NSP's Black Dog unit produces 130 megawatts. Unit 2 can burn a variety of fuels, including low-grade coal and mixtures of peat or wood chips with coal.

NSP has steadily improved the plant efficiency and pollution control and made changes in its coal handling and storage.

Environmental NSP's Black Dog Plant is an excellent example of how our plants can co-exist with nature. The company has taken several measures to ensure that Black Dog is compatible with the extensive wildlife area that surrounds the plant. In fact, NSP leases 1,500 acres of land it owns around the plant to the U. S. Fish and Wildlife Service for use as a public nature park and refuge.

Coal All four Black Dog boilers use sub-bituminous Western coal from Montana and Wyoming. Because of a new rail system, the plant no longer has to stockpile a winter supply of coal. Black Dog receives 80 to 120 cars — each holding 100 tons of coal — per week. These rail shipments save NSP $850,000 annually in handling and storage costs.

Technical Details

Unit 1: 71 megawatts, pulverized coal-fired boiler. (1952) 650,000 lbs/hr @ 900 psig, 900°F

Unit 2: 96 megawatts, atmospheric fluidized bed, coal-fired boiler. (1954) 900,000 lbs/hr @ 1,450 psig, 1,000°F

Unit 3: 99 megawatts, pulverized coal-fired boiler. (1955) 800,000 lbs/hr @ 1,460 psig, 1,000°F

Unit 4: 174 megawatts, pulverized coal-fired boiler. (1960) 1,400,000 lbs/hr @ 1,800 psig, 1,000°F

Original Capital Cost: $59,441,260 (all units)
Conversion Cost, Unit 2: $66,558,264 (1988 conversion from pulverized coal boiler to atmospheric fluidized bed)

RIVERSIDE GENERATING PLANT

Riverside was the company's first fossil-fuel plant when it began generating electricity in 1911. Over the years, Riverside has grown to meet the electrical needs of the community. The original 35-acre site on the Mississippi River in northeast Minneapolis has grown to 84 acres.

With the capability of producing 360 megawatts of electricity — enough for 360,000 typical homes — the plant is an important part of NSP's plan to add to its generating system through modifications and equipment improvements in existing plants.

On unit 7, two boilers produce the heat to run the turbine-generator. At full load, the unit burns about 2,000 tons of coal a day. A recently completed capacity-recovery project has extended the plant's operating life approximately 30 years. Thanks to new, more-efficient equipment, the same amount of coal now produces more electricity.

Unit 8 contains the first pressurized boiler in the NSP system. Pressurization blows combustion gases out of the boiler, eliminating the need for induced draft fans for exhaust. Unit 8 also uses cyclone furnaces, which burn crushed, not powdered coal. Ninety percent of the ash drops to the bottom of the boiler as molten slag, rather than rising up through the boiler as fly ash.

Coal The low-sulfur, sub-bituminous coal comes from Western mines by rail. The cars unload directly into the dumper building for immediate use, or in the coal yard, where about 90,000 tons are stored. The trains that supply Riverside are coordinated by NSP to serve the current needs of the University of Minnesota.

Environmental The Riverside Plant has the first dry scrubber of its size and was the leading technology of its day. NSP used its experience at Riverside to prove this new technology before it built Sherco 3 — a much larger application.

Technical Details

Original Capital Cost: $45,753,591 (all units)
Unit 7 Capacity Recovery: $50,329,136

Unit 7: 113 megawatts, pulverized coal-fired boiler.
(1987) 1,140,000 lbs/hr @ 950 psig, 1,000°F

Unit 8: 224 megawatts, coal-fired cyclone boiler.
(1963) 1,600,000 lbs/hr @ 2,400 psig, 1,000°F

HIGH BRIDGE GENERATING PLANT

In addition to generating electricity, NSP's High Bridge Plant supplies process steam to St. Paul's Waldorf Corporation through the longest steam line in the United States, more than five miles of steel pipe. Waldorf uses the steam to generate electricity and in the paper-making process.

Environmental The High Bridge Plant uses the latest technology in electrostatic precipitators to reduce emissions from the plant.

Coal All four boilers at the plant use sub-bituminous Western coal from Montana and Wyoming. The plant receives shipments by rail and barge on the adjacent Mississippi River. Montana coal is delivered in unit trains of 70 cars, each holding 100 tons of coal. Each 15-barge load contains approximately 21,000 tons. The High Bridge coal yard stores up to 600,000 tons of coal.

Technical Details

Unit 3: 50 megawatts, pulverized coal-fired boiler.
(1942) 500,000 lbs/hr @ 850 psig, 900°F

Unit 4: 41 megawatts, pulverized coal-fired boiler.
(1944) 500,000 lbs/hr @ 850 psig, 900°F

Unit 5: 99 megawatts, pulverized coal-fired boiler.
(1956) 800,000 lbs/hr @ 1,450 psig, 1,000°F

Unit 6: 175 megawatts, pulverized coal-fired boiler.
(1959) 1,400,000 lbs/hr @ 1,800 psig, 1,000°F

Original Capital Cost: $43,712,371 (all units)

ALLEN S. KING GENERATING PLANT

The Allen S. King Plant is NSP's second-largest coal-burning plant. The plant is wholly owned by NSP and provides steam under two separate contracts to the Andersen Corporation and to the Minnesota Correctional Facility in Oak Park Heights.

The King Plant makes up about nine percent of the NSP system capability. Its one turbine-generator unit can produce 560 megawatts of electricity. That's more than enough to serve all the residential customers in Minneapolis and St. Paul.

Coal The King Plant burns as much as 300 tons of coal an hour, or 7,200 tons a day. That's about two and one-half railroad carloads an hour.

Technical Details

Unit 1: 560 megawatts, coal-fired, cyclone boiler. (1968) 3,800,000 lbs. hr @ 3,600 psig, 1,000°F

Original Capital Cost: $81,306,151

PLANT MAINTENANCE ACTIVITIES

NSP has developed some of the most sophisticated maintenance programs in the utility industry today. Effective plant maintenance management helps increase plant life and reduces unscheduled downtime. Regular maintenance can involve hundreds of individual tasks to maintain the thousands of parts that make up today's sophisticated power plant. NSP's plant maintenance generally falls into four categories: preventive maintenance, lubrication schedules, maintenance work requests and outage planning.

Preventive Maintenance The purpose of preventive maintenance is to ensure that routine inspections, calibrations and maintenance of the various plant equipment and systems are completed. The preventive maintenance program includes electrical, mechanical equipment and instrumentation. The program consists of those activities that are done routinely and at regular intervals — ranging from daily, weekly, monthly, annual or extended periods. Each activity is defined in a work procedure and tracked in a computerized or manual data file.

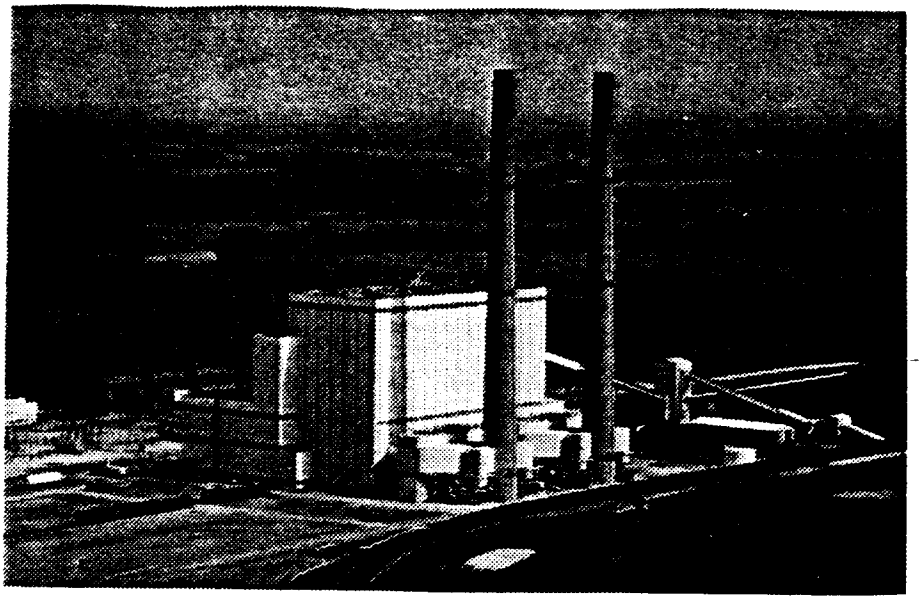
Lubrication Schedules The lubrication schedules consist of lubrication and cleaning activities that are done routinely and at regular intervals. Each activity defines the kind and amount of lubricant to be used and each is managed in a computerized or manual data file.

Maintenance Work Requests The maintenance work request system provides a method for identifying, processing and managing the non-routine maintenance requirements at a plant. Maintenance work programs are managed with computerized and manual data files.

Outage Planning Outage planning and scheduling are important factors in ensuring the reliability of any operating system. NSP has many years of experience using both in-house and outside craft labor to maintain our diverse group of plants.

Responding to forced outages in a timely manner is essential to maintain customer confidence in an energy supplier. Because NSP maintains a local presence, including three major facilities and its corporate headquarters, it can respond quickly to any outage situation.

APPENDIX IV-E



CAYUGA STATION
CAYUGA, INDIANA

Description:

Electric generating station with 2 units each consisting of a pulverized coal fired Combustion Engineering boiler supplying steam to a Westinghouse turbine-generator system. The station also supplies approximately 180,000 lbs/hr of steam to a nearby Inland Container paper plant.

Capital Cost: $152.7 million
Fuel: Pulverized coal at 2.54 million tons/yr
Completion date: 2 units 1970 and 1972

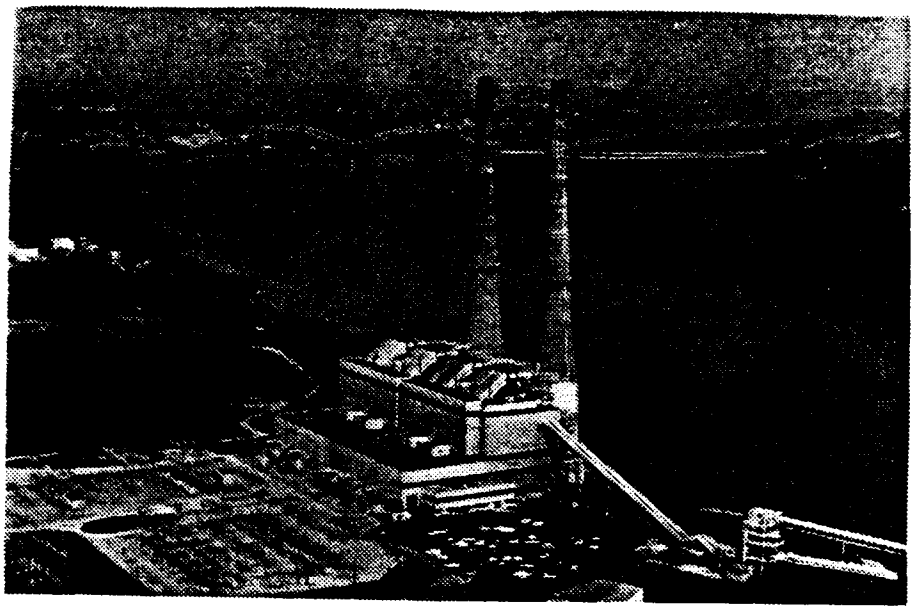
Station Capacity - Steam: 6.94 million lb/hr
Electrical: 995 MW

Manning -

Bargaining Unit:	108
Administrative Technical:	6
Management:	34
Total	148

Air Pollution Control Equipment:

Electrostatic dust collection on all units. The station maintains compliance with federal regulations 40CFR51 and 40CFR60 and with state regulation 326IAC.



GALLAGHER STATION
NEW ALBANY, INDIANA

Description:

An electric generating facility with 4 units. Each unit consists of a Riley Stoker boiler and an Allis Chalmers turbine-generator system.

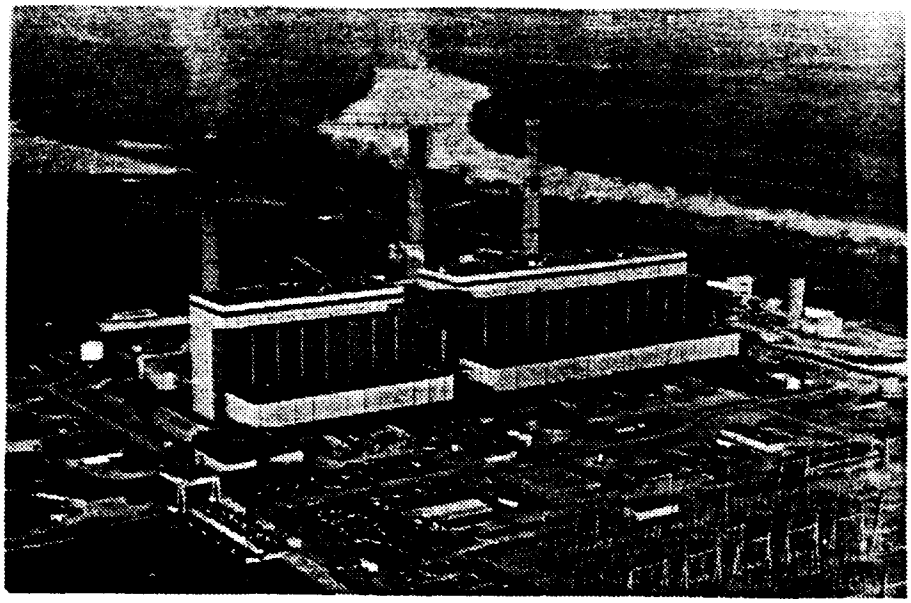
Capital Cost: $92.1 million
Fuel: Pulverized coal at 1.16 million tons/yr
Completion date: January 1961

Station Capacity - Steam: 3.88 million lb/hr
Electrical: 560 MW

Manning -		
	Bargaining Unit:	110
	Administrative/Technical:	10
	Management:	43
	Total	163

Air Pollution Control:

Each unit is equipped with an electrostatic dust collector and complies with federal regulations 40CFR51 and 40CFR60 and with state regulations 326IAC.



GIBSON STATION
OWENSVILLE, INDIANA

Description:

This station consists of 5 units each comprising a Foster Wheeler boiler and a General Electric turbine-generator system.

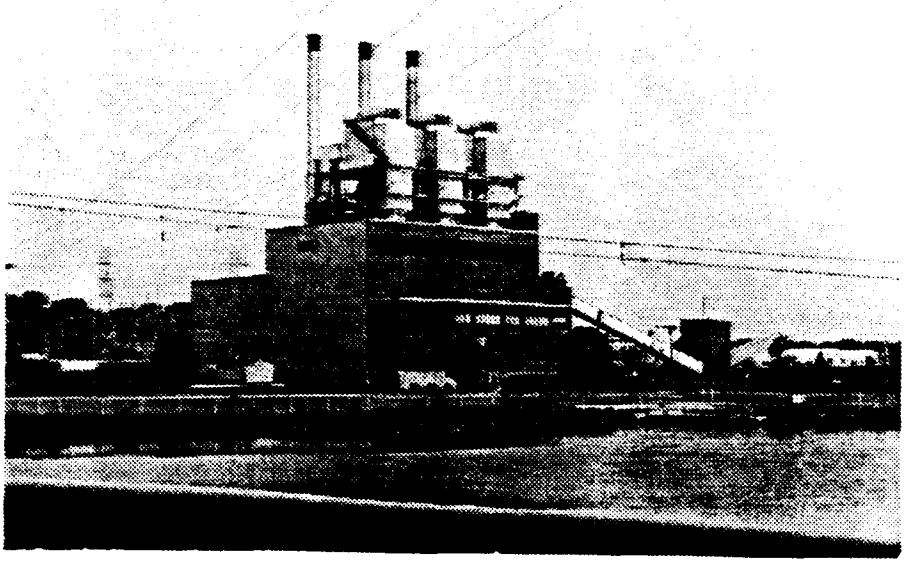
Capital Cost: $1.07 billion
Fuel: Pulverized coal at 7.17 million tons/yr
Completion date: First unit in 1976
Last unit (#5) in 1982

Station Capacity - Steam: 21.5 million lb/hr
Electrical: 3165 MW

Manning -		
	Bargaining Unit:	443
	Administrative Technical:	30
	Management:	126
	Total	599

Air Pollution Control Equipment:

Each unit is equipped with an electrostatic dust collector. A flue gas desulfurization system is also in operation on unit #5. This station complies with federal regulations 40CFR51 and 40CFR60 and with state regulations 326IAC.



NOBLESVILLE STATION
NOBLESVILLE, INDIANA

Description:

This station consists of 3 Riley Stoker boilers all sharing a common header. These boilers supply steam to 2 Westinghouse turbine-generator systems.

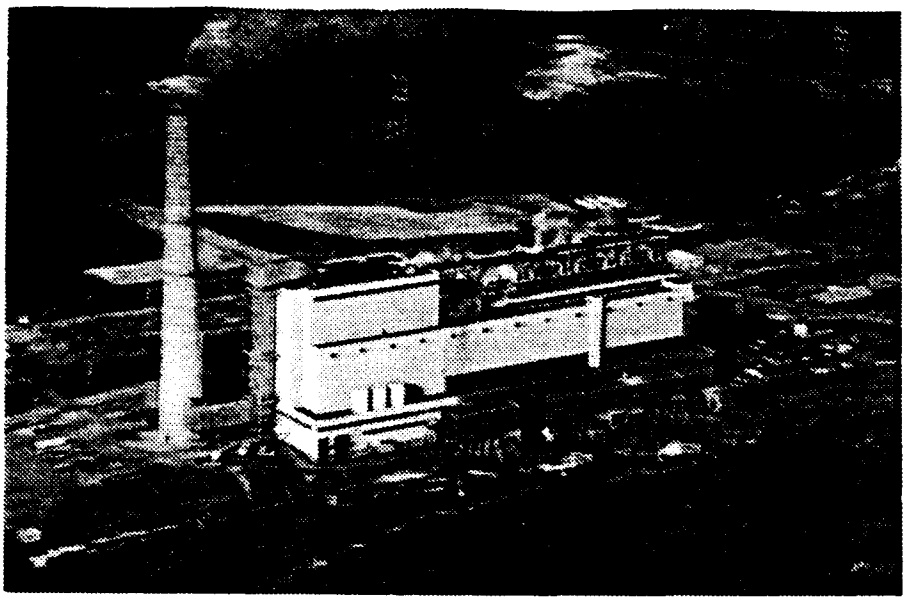
Capital Cost: $15.7 million
Fuel: Pulverized coal at approximately 13,000 tons/yr
Completion date: December 1950

Station Capacity: - Steam: 900,000 lb/hr
Electrical: 90 MW

Manning -	Bargaining Unit:	22
	Administrative/Technical:	2
	Management:	10
	Total	34

Air Pollution Control Equipment:

Each unit is equipped with an electrostatic dust collector and complies with federal regulations 40CFR51 and 40CFR60 and with state regulations 326AIC.



WABASH RIVER STATION
TERRE HAUTE, INDIANA

Description:

An electric generating station with six pulverized coal fired units. The six units are a combination of Foster Wheeler, Riley Stoker and Combustion Engineering boilers and the turbine-generator systems are General Electric and Westinghouse.

Capital Cost: $113.7 million
Fuel: Pulverized coal at 1.09 million tons/yr
Completion date: The first 5 units by May 1956 and unit 6 in 1968.

Station Capacity - Steam: 5.7 million lb/hr
Electrical: 753 MW

Manning -		
	Bargaining Unit:	158
	Administrative/Technical:	11
	Management:	44
	Total	213

Air Pollution Control Equipment:

All units are equipped with electrostatic dust collectors. This station maintains compliance with federal regulations 40CFR51 and 40CFR60 and with state regulations 326IAC.

MALDEN MILLS
Lawrence, Massachusetts

Background

Malden Mills Industries, Inc. owns and operates a textile mill located in Lawrence, Massachusetts. Malden Mills has an opportunity to separate the mill from its current supplier of steam and develop the cogeneration potential of its industrial complex. As such, Malden Mills has requested proposals to develop, finance, own and operate a cogeneration facility on its site.

Project Proposal

On January 12, 1990, PSI Investments, Inc. (PSII) in conjunction with Burns & McDonnell (design engineers) and Blount (constructors) submitted a proposal to develop, design, construct, operate and maintain a cogeneration facility at the Malden Mills site. As proposed, the project will produce approximately 120 MW of electricity and 65,000 pounds per hour of steam. In the initial phases of the project, PSII will be responsible for environmental and site permitting work, fuel procurement, interconnection and power sales agreements with the area electric utility, and the steam supply agreement with Malden Mills. Upon completion of the projects, PSII, or its subsidiary, would be the operator of this facility.

Status

On March 4, 1990, PSII made the "short list" and was invited to continue discussions, possibly leading to an exclusivity agreement at the Lawrence site.

INDIANA UNIVERSITY
Bloomington, Indiana

Background

Indiana University operates a central heating plant at its Bloomington campus which produces approximately 1.3 billion pounds of steam annually. The plant consists of six (6) coal-fired stoker boilers that were installed from 1955 to 1970. The total design steaming capacity is approximately 660,000 pounds per hour (pph). The University is in need of a master plan that will provide a reliable, long-term supply of steam and chilled water for the campus.

Feasibility Study

At the request of the University, PSI Investments, Inc. (PSII) conducted an independent, central heating plant study which included the development and review of more than fourteen (14) alternatives for a 30-year steam supply plan. The alternatives were compared on a life-cycle cost basis and included various technology, fuel and siting options.

Following the study, the two least-cost alternatives were further developed for University consideration.

Steam Supply Proposal

On February 24, 1989, PSII submitted a proposal to Indiana University to privatize the University central heating steam plant. The proposal contained a specific plan to develop either of two alternatives selected by the University. The proposal detailed information regarding technical descriptions, pricing, schedules, qualifications and sample agreements.

Authorization for Detailed Design

As a result of the privatization proposal, PSII was authorized to proceed with the development and detailed engineering of the alternative that included a 25 MW cogeneration plant, the installation of a 150,000 pph boiler and the condition assessment of four existing 150,000 pph boilers.

Status

As of February 1990, this work is approximately 20% complete.

INDIANA STATE UNIVERSITY
Terre Haute, Indiana

Background

Indiana State University operates distributed cooling systems that have a total installed cooling capacity of approximately 9000 tons. Due to aging systems and an aggressive plan to renovate and expand the campus, the University may have a one-time opportunity to economically convert to a central chilled water system and obtain the benefits of diversity and reduced maintenance.

Master Plan Review

PSI Investments, Inc (PSII) conducted a review of the base master plan study and recommended refinements that would allow the University to reduce the life cycle costs and enhance the plan to convert to a central chilled water system.

Chilled Water Supply Proposal

On December 13, 1989, PSII presented a proposal to Indiana State University to supply chilled water to the University for an initial term of 20 years with provisions to extend. The proposal included technical and operational descriptions, pricing, qualifications, schedules and a sample contract.

Status

As of February 1990, the proposal is in its first revision and is being reviewed against University ownership and operation of a central plant or the continued operation of the distributed systems.