FOR BOARD ACTION

Agenda Item # 8.a. **Meeting Date:** 1/30/07

SUBJECT: Unit 3 Opacity Reduction and Precipitator Improvement Services
Bipolar Precharger

PREPARED BY: Wally Schlink, Director of Power Resources

ITEM DESCRIPTION:

Back in July of 2005, RPU staff presented to the Utility Board a recommended course of action for the reduction of emissions from the Silver lake Plant and the Board approved moving forward with the engineering and design phase based on the recommendation. Since that time the Unit 4 Emission Reduction Project has dominated the discussion and presentations to the Board but an additional critical reduction was in particulate emissions from Unit 3 to meet MACT requirements that take effect in Fall of 2007.

We have been in technical discussions with Neundorfer Inc., the supplier of our existing precipitator controls and the primary consultant to RPU for particulate emission performance, and an opportunity for RPU to participate in a beta project has been made available.

The overall scope of the project consists of a series of testing and modeling the existing equipment and then performing some performance optimization activities based on the results. Following the establishment of the baseline performance, the beta project would actually begin. We would install a bipolar precharger (BPPC), which creates high voltage plasma that the boiler exhaust gas stream is exposed to. It would precharge the ash particles and allow the existing precipitator to collect a higher percentage of the particulate especially in the smaller particle size. We are anticipating a significant improvement in particulate removal estimated in the range of 25% – 50%. There may also be some co-benefit removal of Hg due to the oxidizing effect. Following the installation of the BPPC we will conduct additional testing to determine the measure of success of the installation.

If we are successful with the application of this technology on Unit 3, staff feels that there is an distincte possibility of applying the same technology to Units 1 & 2, thus reducing additional particulate emissions from SLP at a very economical cost.

Attached are 3 of the slides from the June 2005 presentation that established the course of action and the professional services proposal from Neundorfer, Inc. defining the costs and terms. The cost of the physical equipment will be absorbed by Neundorfer but we will share in engineering, technical and site support costs.

Staff recommends that the Board approve participation in the project and approve of purchase orders totaling $248,705 to Neundorfer Inc. for professional services. Staff also recommends approval of an

Jamy Koshire
General Manager

1/26/07
Date

ROCHESTER PUBLIC UTILITIES

additional 10% or $24,871 for performance based pay if the system meets the defined performance in the proposal.

UTILITY BOARD ACTION REQUESTED:

Staff requests that the Board approves and recommends Council approval of a purchase order for $248,705 to Neundorfer, Inc. and an additional $24,871 contingency for performance pay based on the proposal terms.

General Manager Date

Compliance Based Strategy con't.

Unit 3

- Particulate control optimization program following modeling and engineering evaluation.
- Electrostatic precipitator expansion.

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Staff Recommendation

- Unit 3
  - Particulate Control Optimization and Expansion Program
  - Project cost up to $6,000,000
  - Incremental Annual O&M Costs - $75,000
  - Represents a range of options

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Board Action Requested

- Accept the recommendation of the Infrastructure Plan to be used as a guideline for power supply planning

- Proceed with staff recommendation for emission control projects to allow for permitting, engineering and design to proceed

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NEUNDORFER PRECIPITATOR KNOWLEDGE
www.neundorfer.com

440-942-8990
FAX 440-942-6824

December 22, 2006

Rochester Public Utilities
Attention Wally Schlink, Plant Manager

Subject: Opacity Reduction and Precipitator Improvement Services
Revision D

Dear Wally:

The following is a proposal for engineering and consulting services to evaluate, model, and improve the performance of your Unit 3 precipitator. The objective of this project is to reduce the Unit 3 opacity under all operating conditions.

Our proposed deliverables and benefits follow:

I. Evaluation of equipment and performance:

The benefit of this service is insight into precipitator and process opportunities for improvement. The creation of a computer performance model will be used to predict and understand future performance changes. These future changes may be due to fuel and other process changes.

A. Design and oversee a baseline unit efficiency and particle size distribution test: This test will be used to validate the computer performance model. The testing results will also provide a baseline performance for benchmarking results of any future improvement activities.

This phase includes a site visit to review and gather boiler, fuel, and precipitator current and historical performance data. We will use this information to:

1. Design a testing protocol for the efficiency testing and particle size distribution measurement, where each efficiency testing will include tests during load change, soot blowing, ash pulling, and static state at or near full load
2. Perform a combustion calculation and computer generated ash resistivity prediction
3. Collect an ash sample for use in the laboratory resistivity measurement
4. Perform laboratory resistivity measurement testing

B. Create and optimize 1:12 scale Precipitator flow model: This model will identify opportunities to improve gas flow uniformity. Flow improvement is often the most cost effective precipitator performance action available.

C. Engineering service to design and oversee an operating efficiency test after installation of flow modifications. The benefit of these tests will be to confirm and quantify performance improvement resulting from changes and to provide information to further validate the model.

D. Design and supply, install technical direction and start-up of a bipolar precharger (BPPC) module including installation technical direction: The bipolar precharger will enhance precipitator performance and reduce precipitator outlet penetration by 25%-50%. It also will likely oxidize Hg for higher percentage of removal. Opacity will be significantly lower as a result. (See attached concept of BPPC)

E. Engineering service to design and oversee efficiency and particle size tests after installation of flow modifications and the BPPC. This will include a start-up precipitator efficiency test and a six month operating efficiency test: The benefit of these tests will be to confirm and quantify performance improvement resulting from changes and to provide information to further validate the model

The following is proposal detail and pricing:

Part of this proposal for performance improvement engineering and services is the Beta installation of the performance enhancing bipolar pre-charger (BPPC) for Unit 3 precipitator. As you know, this technology was developed and successfully tested by EPRI in the 1970's. Based on that testing and our understanding of your installation, we expect the BPPC will reduce precipitator outlet penetration by 25% to 50%. We expect the BPPC will create an even more dramatic reduction in opacity since there will be a disproportionate reduction of small particles.

The BPPC creates high voltage plasma that the entire gas stream is exposed to. We expect that this exposure to HV plasma will oxidize mercury making it more collectable. We may want to discuss including Hg testing in the baseline and post installation efficiency tests.

Responsibility:
Although Neundorfer, Inc. will take responsibility for the installation as outlined in this proposal, we have partnered with Jim Parsons and Marlin Anderson of APCO Services for design and testing of the installation. Jim and Marlin were deeply involved with the early testing and continue to make design improvements.

Scope:
Our proposal has six (6) phases including performance modeling, baseline and post installation efficiency tests, a gas flow model and improvement recommendations, supply of the BPPC, installation technical direction, and start-up and report documentation. Each efficiency testing will include tests during load change, soot blowing, ash pulling, and steady state at or near full load.

Permanence:
This will be a beta installation but all equipment and controls will be designed and supplied to high industrial standards. The installation is considered permanent and will be made to last for many years of service.

Performance Expectation:
We expect the precipitator efficiency to improve significantly with the installation of the BPPC. Based on that testing and our understanding of your installation, we expect the BPPC will reduce precipitator outlet penetration by 25% to 50%. We expect the BPPC will create an even more dramatic reduction in opacity since there will be a disproportionate reduction of small particles. We will be prepared to make efficiency improvement guarantees after we have results from the Consulting phase of the project.

NEUNDORFER PRECIPITATOR KNOWLEDGE

BPPC Proposal

Phase 1: Baseline Efficiency Test design and oversight, Consulting and performance modeling of the existing precipitator alone and with the BPPC

This phase will include a two day engineering site visit to review boiler and precipitator performance, gather historical operating information and information necessary to create a physical flow model and a performance model.

Neundorfer will write a scope of work for a baseline precipitator efficiency test including particle size distribution measurement. We will witness the test, make sure all salient boiler and precipitator data is taken concurrent to the tests and write a report.

Ash resistivity will be calculated using a computer program as well as a laboratory ash resistivity test with the addition of representative SO3

After the site visit, we will develop a combustion calculation and a computer performance model. We will use the performance model to predict the precipitator performance with and without the BPPC. This will be used for our performance guarantee.

Customer Responsibility:
There may be some recommendation for precipitator improvement made as a result of phase one. Customer and Neundorfer will decide together whether it is cost effective to make these improvements before the BPPC is installed. Customer will be responsible for the cost of any improvements made.

The customer will be responsible for the final selection of the testing company to do the Phase 3 testing and will be responsible for the cost.

Price Phase 1 Inclusive: $42,375

Phase 2: Gas Flow Modeling

This phase of the project will create a 1:12 scale physical model of the precipitator, inlet duct, and the BPPC. The purpose of this phase is to make sure that velocities through the precipitator will be acceptably uniform. We will also predict the pressure drop through the BPPC. (We expect about 0.5" wg). The BPPC array installation should improve precipitator gas flow distribution by its presence and configuration.

Customer Responsibility:
There may be recommendations made for installing flow improvement devices in the duct or precipitator. Customer and Neundorfer will decide together whether it is cost effective to make these improvements before the BPPC is installed. Customer will be responsible for the cost of any improvements made

Price Phase 2 Inclusive: $30,320

Phase 3: Design and Oversight of operating Efficiency test and Particle Size Test after installation of gas flow modifications

Neundorfer will write a scope of work for a precipitator efficiency test after installation of flow modifications. This test will include particle size distribution measurement. Each phase of the test will be done with and without the BPPC energized. We will witness the test, make sure all salient boiler and precipitator data is taken concurrent to the tests and write a final report.

Customer Responsibility:
The customer will be responsible for the final selection of the testing company to do the Phase 3 testing and will be responsible for the cost.

Price Phase 3 Inclusive: $13,240

Phase 4: Design and Supply, Install Technical Direction and Start-up of BPPC

Neundorfer and APCO will design, manufacture, and supply a BPPC configured to fit into the existing customer precipitator inlet duct. The unit will be about 4' long in the direction of gas flow and cover the complete height and width of the duct. We will provide components shop assembled and wired to the extent possible for ease of installation

BPPC components will include high voltage power supply equipment and automatic controls for operating the power supplies. The controls will be factory wired in a control cabinet. We will provide the pre-charger drop-in array with both positive and negative emitter electrode bus sections and support and alignment insulators. The high voltage duct from the power supply to the electrodes will be supplied as well as a weather cover, if necessary for the support insulators

We will include all design engineering, drawings, and an installation scope and instructions.

We will provide a construction service engineer to support the installation of the BPPC We have assumed that this will take two weeks although we are confident that with good planning and preparation, the installation could be done in only a few days. We base this phase on 80 hours of straight time and 20 hours of overtime plus travel time and travel and living expense.

Customer Responsibility:
There may be some structural analyses and duct structural modification required to support the BPPC The customer will take responsibility for the design, fabrication, and installation of any required structural modification.

Price Phase 4 Inclusive: $133,190

Phase 5: Design and Oversight of Start-up Efficiency and Particle Size Test

Neundorfer will write a scope of work for a precipitator efficiency test to be performed within one month or BPPC start-up. The tests will be performed both with and without the BPPC energized. They will include particle size distribution measurement. We will witness the test, make sure all salient boiler and precipitator data is taken concurrent to the tests and write a report.

Customer Responsibility:
The customer will be responsible for the final selection of the testing company to do the Phase 3 testing and will be responsible for the cost.

Price Phase 4 Inclusive: $16,340

Phase 6: Design and Oversight of Six Month operating Efficiency and Particle Size Test

Neundorfer will write a scope of work for a six month operating precipitator efficiency test including particle size distribution measurement. This tests will be performed both with the BPPC energized and with it de-energized. We will witness the test, make sure all salient boiler and precipitator data is taken concurrent to the tests and write a final report.

Customer Responsibility:
The customer will be responsible for the final selection of the testing company to do the Phase 3 testing and will be responsible for the cost.

Price Phase 6 Inclusive: $13,240

Pricing Summary:

Phase 1 Inclusive:	**$ 42,375**
Phase 2 Inclusive:	**$ 30,320**
Phase 3 Inclusive:	**$ 13,240**
Phase 3 Inclusive:	**$133,190**
Phase 4 Inclusive:	**$ 16,340**
Phase 5 Inclusive:	**$ 13,240**
Total Project Price	**$248,705**

General Terms:

The Customer can terminate the project at the end of any of the Phases with notice before the next phase work is commenced and with payment for all of the completed phases.

Pay for performance:

If customer performs all recommendations as agreed between Neundorfer and Customer; the following payment applies:

Outlet mass emission reduced by 0-10% Customer pays all invoices (except travel and living expenses which are paid in full): using a multiplier of: 0.78

Outlet mass emission reduced by 10-20% Customer pays all invoices (except travel and living expenses which are paid in full): using a multiplier of: 0.9

Outlet mass emission reduced by 20-30% Customer pays all invoices (except travel and living expenses which are paid in full): using a multiplier of: 1.0

Outlet mass emission reduced more than 30% Customer pays all invoices (except travel and living expenses which are paid in full): using a multiplier of: 1.1

Payment terms:

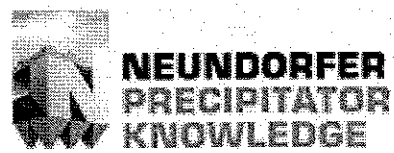
20% paid with the order
Site service time and expenses billed as performed and due on receipt
Equipment invoiced when shipped; invoice due net 30 days

Delivery:

Based on customer schedule needs and backlog at time of order.
We will expedite mechanical information on the BPPC so customer can do structural design: We expect this information to be submitted 4-6 weeks after receipt of drawings and internal inspection.

We are enthusiastic about the performance benefit the BPPC will create for Unit 3 precipitator. We will be pleased to share with you the engineering and field time we have estimated for each phase. We are also willing to make performance guarantees after the completion of Phase 1 and we are willing to take economic penalties if the guarantee is not met. We have included comprehensive pre and post installation testing so that performance improvement can be quantified. We look forward to working with you.

Sincerely,



Michael Neundorfer
President
Neundorfer, Inc
www.neundorfer.com
440 942 8990

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RESOLUTION

BE IT RESOLVED by the Public Utility Board of the City of Rochester, Minnesota, that the Common Council of the said City is requested to approve a purchase order agreement with Neundorfer, Inc. for

Silver Lake Plant Unit 3 Opacity Reduction and Precipitator Improvement Services
Bipolar Charger

The amount of the agreement to be TWO HUNDRED FORTY-EIGHT THOUSAND SEVEN HUNDRED FIVE AND 00/100 DOLLARS ($248, 705.00) and an additional $24,871 contingency for performance pay based on the proposal terms.

Passed by the Public Utility Board of the City of Rochester, Minnesota, this 30th day of January, 2007.

_____
President

_____
Secretary