

- Revised -  
**FOR BOARD ACTION**

Agenda Item # 7c.

Meeting Date:

01/27/04

**SUBJECT:**

SLP Unit 2 Turbine Generator Overhaul

**PREPARED BY:**

Wally Schlink, Manager of Power Production

ITEM DESCRIPTION:

Bid specifications packages were distributed to nine turbine generator repair firms for the Unit 2 turbine generator overhaul. On January 13, 2004 five bids were received for the project.

SLP Unit 2 turbine generator is scheduled for a major maintenance overhaul beginning February 21 through March 26, 2004. The purpose of the inspection is to confirm machine integrity and to return the unit to as designed condition and efficiency. The inspection is an industry standard and is required by our insurance carrier and by prudent utility practices. The schedule was established to have the unit available for the summer generation season. The unit was last overhauled in 1990.

The bid specification was developed in two worksopes. The first comprised of the work that is known and identified. Firm bids were requested for Workscope I. The second workscope is comprised of a list of repairs that are anticipated and most likely will be encountered when the machine is disassembled and inspected. The second workscope is a mixture of firm bids and estimates as the work is not defined or the extent of damages known prior to disassembly.

Power Generation Services Inc. is the lowest evaluated bid when estimates of required work from both worksopes are evaluated. Staff estimates that the balance of work can be completed on a time & material basis not to exceed the total of approved funds. All bidders submitted hourly rates for various disciplines as part of the bid package for extra work.

Attached is a matrix comparing the bid packages for the combined worksopes. This is an approved 2004 Capital and Major Maintenance budget item. The City Attorney has previously approved the terms & conditions that govern the agreement.

UTILITY BOARD ACTION REQUESTED:

Staff recommends that the Board approve a purchase order agreement with Power Generation Services Inc. to provide services and materials for the SLP Unit 2 Turbine Generator Overhaul as defined in the specification, and request that the Mayor and City Clerk execute the agreement. The agreement will be for a firm price for Workscope I of the specification, and identified Workscope II items as determined by staff. The total amount is not to exceed \$250,000.

  
General Manager

  
Date

**ROCHESTER PUBLIC UTILITIES**

**BID EVALUATION - SLP UNIT 2 TURBINE GENERATOR OVERHAUL**

	Mechanical Dynamics and Analysis	Keystone Specialty Services Co.	Power Generation Services Inc.	GE International Inc.	Siemens Westinghouse
<b>WORKSCOPE I</b>					No Bid Bond
Grit Blasting	8,050.00	18,824.00	8,500.00	10,500.00	
Non-Destructive Testing	11,500.00	14,118.00	5,130.00	2,100.00	
Generator Testing	35,365.00	18,750.00	18,525.00	34,300.00	
Steam Path Audit	21,550.00	4,000.00	10,000.00	16,000.00	
Alignment		10,000.00		2,400.00	
Technical Assistance	63,925.00	23,333.00	34,300.00	41,800.00	
Bond Cost					
Freight		4,000.00			
Trade labor		68,000.00			
<b>WORKSCOPE I TOTAL</b>	140,390.00	161,025.00	76,455.00	107,100.00	-

	Mechanical Dynamics and Analysis	Keystone Specialty Services Co.	Power Generation Services Inc.	GE International Inc.	Siemens Westinghouse
<b>WORKSCOPE II</b>					
Weld repair & blending - 1st stage	12,825.00	6,588.00	4,750.00	7,000.00	
Weld repair & blending - intermediate	12,825.00	7,647.00	4,750.00	12,000.00	
Weld repair & blending - diaphragms	7,450.00		9,500.00	67,752.00	
Weld repair & blending - rotor	7,450.00		3,500.00	23,348.00	
Balance - Turbine rotor	16,500.00	12,000.00	3,250.00	5,500.00	
8" bearing	2,700.00	1,706.00	3,600.00	2,500.00	
9" bearing	3,000.00	1,941.00	3,800.00	2,750.00	
thrust bearing	3,900.00	4,705.00	2,750.00	2,800.00	
Micro finish bearing journals	12,000.00	11,764.00	13,000.00	9,000.00	
Balance - generator rotor	20,000.00	8,411.00	3,250.00	5,500.00	
Turbine run out data	1,280.00	2,176.00		3,800.00	
Spill Strips	16,320.00	47,072.00	62,650.00	45,000.00	
Stellite shields	58,980.00	45,800.00	45,000.00	31,500.00	
Transportation			10,000.00		
<b>WORKSCOPE II TOTAL</b>	175,230.00	149,810.00	169,800.00	218,450.00	-

\* Adjusted for 32 stages  
 \* Adjusted for 200 shields

<b>PACKAGE TOTAL</b>	<b>\$ 315,620.00</b>	<b>\$ 310,835.00</b>	<b>\$ 246,255.00</b>	<b>\$ 325,550.00</b>	<b>\$ -</b>
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	Lovegreen Turbine	Power Generation Services
<b>WORKSCOPE I</b>		
Grit Blasting	8,031.60	8,441.00
NDE	3,250.00	4,664.00
Generator Testing	18,810.00	16,660.00
Steam Path Audit	14,300.00	9,670.00
Alignment	6,400.00	6,400.00
Technical Assistance	39,655.00	46,800.00
Bond Cost		
<b>WORKSCOPE I TOTAL</b>	<b>90,446.60</b>	<b>92,635.00</b>

Based on tight wire alignment

	Lovegreen Turbine	Power Generation Services
<b>WORKSCOPE II</b>		
Weld repair & blending - 1st stage	9,225.00	9,070.00
Weld repair & blending - intermediate	9,225.00	9,070.00
Weld repair & blending - diaphragms	9,225.00	11,500.00
Weld repair & blending - rotor	9,225.00	9,070.00
Silver Solder - L-0		
Balance - Turbine rotor	20,272.00	3,250.00
Boroscope - Turbine rotor		
7" bearing	2,117.50	3,400.00
8" bearing	2,420.00	3,600.00
2 each - 9" bearing	5,445.00	7,600.00
2 each - 4" bearing	2,420.00	5,600.00
thruct bearing	2,117.50	2,750.00
H2 seals	3,630.00	15,800.00
Micro finish bearing journals	45,320.00	15,000.00
Balance - generator rotor	19,800.00	10,500.00
Turbine run out data		
Rewedge		
Spill Strip per diaphragm	72,175.00	75,750.00
Stellite shields		
<b>WORKSCOPE II TOTAL</b>	<b>212,617.00</b>	<b>181,960.00</b>

Using 100 hours as the average  
Using 100 hours as the average  
Using 100 hours as the average  
Using 100 hours as the average

<b>PACKAGE TOTAL</b>	<b>303,063.60</b>	<b>274,595.00</b>
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**ORIGINAL**

***P*OWER *G*ENERATION *S*ERVICE, INC.**

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**ROCHESTER PUBLIC UTILITIES  
4000 EAST RIVER ROAD NE  
ROCHESTER, MN**

**ATTN: Materials Manager**

**SLP UNIT No. 2 TURBINE GENERATOR OVERHAUL  
11.5 MW WESTINGHOUSE**

**Power Generation Service, Inc. Proposal #2814  
January 13, 2004**

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## **POWER GENERATION SERVICE, INC.**

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Bruce E. Roth  
Sales Manager

January 13, 2004

Rochester Public Utilities  
Materials Manager  
4000 East River Road NE  
Rochester, MN 55906-2813

Subject: SLP Unit No. 2 Turbine Generator Overhaul  
PGS Quotation # 2814

Power Generation Service, Inc. (PGS) is pleased to provide this quotation and have another opportunity to work with Rochester Public Utilities' (RPU) personnel. Over the last few years, PGS has provided services during your turbine-generator overhauls at the Silver Lake Power Plant. We believe these projects exceeded management expectations and that we delivered a cost effective and value added service for your organization. If awarded the contract for this maintenance overhaul, we know that the PGS team will perform the job safely, with quality work, and within your outage timeframe.

As you know, PGS is a full service turbo-machinery inspection and repair Service Company and we plan to support the Unit 2 overhaul with both of our facilities and engineering support. As a service for our customers, the PGS shop technicians and engineering support personnel can also reverse engineer and manufacture replacement parts such as rotor blades and shrouds, valve stems and bushings, strainer baskets, anti-rotation pins/dowels, bolting, and other turbine-generator components. Some additional points to keep in mind as you evaluate the quotations for the upcoming overhaul are as follows:

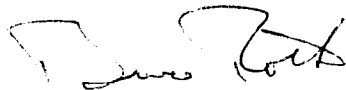
- PGS can provide full service project management for your outage. This includes a pre-outage meeting, parts planning and procurement support, coordination of outage vendors/contractors, specialized engineering services for inspection or repair evaluation, repair recommendations, start-up support, a post-outage meeting and the commitment of our management team to support RPU's outage needs. This single contact accountability ensures seamless project implementation resulting in superior communication, reduced project costs, and quicker return to service of your equipment.
- The Technical Field Advisors (TFA) at PGS have many years of project management and supervisory experience refurbishing Westinghouse/Siemens steam turbine-generators similar to your equipment. The person assigned to the project will have the technical expertise necessary to safely and efficiently overhaul your unit without the need to contract for additional Turbine Engineering Services. Our TFA's are also very familiar with your facility and personnel that should facilitate good communications and teamwork at your site.
- Our modern 25,000 square foot shop facility in Anoka, MN is located within a short drive of your power plant and is fully prepared for a quick turn-a-round of any equipment or parts repair. Our technicians are experienced in all aspects of steam path service and repairs including; blade ring refurbishment, nozzle partition weld repair, rotating blading replacement or "blending", stellite strip replacement, bearing inspection and re-babbiting, hydrogen seal refurbishment, and low speed balancing of the turbine and generator rotors.

- Turbine Masters, Inc., Tahlequah, OK, will perform the grit blast cleaning and non-destructive examinations. This Company has extensive experience and has earned an excellent reputation in the power generation industry throughout the country.
- Al Alberts from ADA Generator Services, Bethoud, CO will perform generator electrical testing. Mr. Alberts has over 33 years experience serving the power generation industry in several engineering capacities including: Generator Specialist at General Electric Co., Field Engineer for Siemens, and an Electrical Maintenance Technician for a utility. As you know, he has intimate knowledge of your Unit 3 because he tested the generator and re-wedged the stator during the 1994 outage and also performed the Unit 3 generator testing in 2002.
- PGS Technology Manager, Troy Gehrett, will perform steam path audit in conjunction with Bill Sanders Turbo-Technic Services, Aurora, Ontario, Canada. Mr. Sanders has over 40 years experience and is a nationally recognized steam path expert. He has been working with Mr. Gehrett on Steam path Audits for the past two years.
- E Squared Power Systems, Inc., Littleton, CO will be performing the inspection, cleaning and calibration of the regulators, current transformers, meters, and static excitation control system identified in the work scope. This Company has an excellent reputation and demonstrated field expertise in the Westinghouse Generator Control and Protections Systems for customers throughout the United States. This Company performed this work during the Unit 2 overhaul in 2002 so they are very familiar with your site equipment and operations/maintenance procedures.
- In response to Technical Specification Workscope I, item 5, PGS will provide tight wire alignment equipment and supervision as part of the base quotation for Technical Assistance. As an additional option for your consideration, we are also offering weekly rental of an Electronic Radial Alignment Gauge (ERAG) unit to perform this service.

This quote is valid for one hundred twenty (120) days, unless extended in writing by the undersigned. Our quotation is conditional on acceptance of Power Generation Service Terms and Conditions of Sale or as agreed upon. Terms of payment are net thirty (30) days after schedule delivery unless negotiated otherwise.

If you have any questions please call me at 763-421-1104.

Sincerely,



Bruce Roth  
Sales Manager

Cc: Carl Challgren – PGS Anoka Office  
Al Sveund – PGS Mandan Office

**BID PACKAGE SUMMARY SHEET  
RE: SLP UNIT NO.2 TURBINE GENERATOR OVERHAUL**

**BIDDER: POWER GENERATION SERVICE, INC. QUOTATION #2814**

**WORKSCOPE I - Based on technical specification**

1. Grit Blasting (Floor Covering included)	<u>\$8,500.00</u>
2. Non-Destructive Testing (Level II Personnel)	<u>\$5,130.00</u>
* Penetrant testing (PT) of generator retaining rings	
3. Generator Testing	<u>\$18,525.00</u>
4. Steam Path Audit	<u>\$10,000.00</u>
5. Alignment – “Tight Wire” method	<u>\$ Included in item #6</u>
6. Technical Assistance	<u>\$34,300.00</u>

**WORKSCOPE I TOTAL** **\$76,455.00**

**WORKSCOPE II - Based on technical specification**

***A detailed repair quotation is included in this tabbed section. Pricing below is the low cost option available to Rochester Public Utilities.***

1. Weld repair & blending – 1st stage nozzle: On Site	<u>\$4,750.00</u>
2. Weld repair & blending - intermediate nozzle: On Site	<u>\$4,750.00</u>
3. Weld repair & blending - diaphragms: PGS Anoka Shop	<u>\$9,500.00</u>
4. Weld repair & blending - rotor buckets: PGS Anoka Shop	<u>\$3500.00</u>
5. Low speed balance - turbine rotor: PGS Anoka Shop	<u>\$3250.00</u>
6. Restore bearings	
1 each - 8.000"	<u>\$3600.00</u>
1 each - 9.000"	<u>\$3800.00</u>
1 each thrust bearing	<u>\$2750.00</u>
7. Micro finish bearing journals: PGS Anoka Shop (per journal)	<u>\$3250.00</u>
8. Low speed balance - generator rotor: PGS Anoka Shop	<u>\$3250.00</u>
9. Turbine rotor run out data	<u>\$ Included in items #5 &amp; #8</u>
10. Spill strip replacement	
* Reaction Rows 1 – 28 (PGS Anoka Shop)	
- Each Carrier Ring; one diaphragm stage	<u>\$2250.00</u>
- Each additional diaphragm stage	<u>\$1600.00</u>
* Reaction Rows 29 – 32 (On Site)	
- One diaphragm stage	<u>\$8500.00</u>
- Each additional diaphragm stage	<u>\$2900.00</u>
11. Stellite Shield replacement – PGS Anoka Shop (per row)	<u>\$22,500.00</u>

**OPTIONS**

1. Electronic Radial Alignment Gauge (ERAG)	<u>\$1200.00 per week</u>
2. Ultrasonic Testing (UT) of generator retaining rings	<u>\$4025.00</u>
3. Generator core bolt torque check	<u>\$1000.00</u>
4. Round trip shipment of components to PGS Anoka Service Facility (Excludes specialty handling at the site)	<u>\$2000.00</u>





POWER GENERATION SERVICE, INC.

1160 McKinley Street  
Anoka, MN 55303  
United States of America  
(763) 421-1104  
Fax # (763) 421-3451

E-mail: [hughessc@powergensvc.com](mailto:hughessc@powergensvc.com)

January 13, 2004

Rochester Public Utilities  
4000 E. River Road N.E.  
Rochester, MN 55904  
Attention: Materials Manager  
Re: RFQ for SLP Unit #2 Turbine Generator Overhaul

Power Generation Service, Inc. (PGS) is pleased to offer the following proposal for the above noted request. The following are clarifications of the offerings for workscope items and related costs.

WORKSCOPE II

- 1.) Weld repair & blending – 1<sup>st</sup> stage nozzle: The cost is based on 1 PGS technician, estimated working 3 days on-site. Cost for mobilization/de-mobilization, subsistence charges, equipment rental charges, etc. have been included in the quoted amount.  
\$4,750.00
- 2.) Weld repair & blending – intermediate nozzle: The cost is based on 1 PGS technician, estimated working 3 days on-site. Cost for mobilization/de-mobilization, subsistence charges, equipment rental charges, etc. have been included in the quoted amount.  
\$4,750.00
- 3.) Weld repair & blending – diaphragm: For the purpose of this quotation PGS estimated cost is based upon 2 options. Option A is for the diaphragm work performed on-site. Option B is for the work performed at PGS; Anoka, MN repair facility. We have estimated 6 hours of technician work for each of the diaphragms. (Note: Cost related to the shipment of the turbine components is discussed later in this quotation.)  
OPTION A (On-site) \$12,500.00  
OPTION B (In shop) \$9,500.00
- 4.) Straighten and dress – rotor buckets: For the purpose of this quotation PGS estimated cost is based upon 2 options. Option A is for the blade work performed on-site. Option B is for the work performed at PGS; Anoka, MN repair facility. (Note: Cost related to the shipment of the turbine components is discussed later in this quotation.) We have estimated 32 hours of technician work for the blade work.  
OPTION A (On-site) \$4,500.00  
OPTION B (In shop) \$3,500.00

5.) Low speed balance – turbine rotor: For the purpose of this quotation PGS estimated cost is based upon 2 options. Option A is for the balance work performed on-site. Option B is for the work performed at PGS; Anoka, MN repair facility. (Note: Cost related to the shipment of the turbine components is discussed later in this quotation.)

OPTION A (On-site)	\$10,500.00
OPTION B (In shop)	\$3,250.00

6.) Restore bearings:

1 each – 8.000”	\$3,600.00
1 each – 9.000”	\$3,800.00
1 each trust bearing	\$2,750.00

7.) Micro finish bearing journals: For the purpose of this quotation PGS estimated cost is based upon 2 options. Option A is for the journal work performed on-site. Option B is for the work performed at PGS; Anoka, MN repair facility. (Note: Cost related to the shipment of the turbine components is discussed later in this quotation.)

OPTION A (On-site)	\$5,250.00 each journal
OPTION B (In shop)	\$3,250.00 each journal

8.) Low speed balance – generator rotor: For the purpose of this quotation PGS estimated cost is based on 2 options. Option A is for the balance work performed on-site. Option B is for the work performed at PGS; Anoka, MN repair facility. (Note: Cost related to the shipment of the turbine components is discussed later in this quotation.)

OPTION A (On-site)	\$10,500.00
OPTION B (In shop)	\$3,250.00

9.) Turbine run out data: This work will be performed in concurrence with balancing operations.  
Cost included in rotor balance work

10.) Spill strip replacement: Typically the spill strips (sometimes referred to as shroud tip seals) are located in the diaphragm carrier ring(s), this would apply to reaction stages 1 through 28. We would anticipate that there are 2 seals for each stage. Normally they are a continuous tooth held in place by a caulking strip. The tip seals for reaction stages 29 through 32 would be caulked into place directly in the turbine cylinder casing. The work for reaction stages 1 through 28 can be performed in shop and we would anticipate that is how they would be done. The work for reaction stages 29 through 32 must be done on-site. The upper shell must be assembled to allow boring bar machining of the seals to obtain proper clearance (providing there is sufficient room for the technician to safely enter the cylinder to operate the boring bar). If there is not room to accommodate this method the seals will need to be machined in each of the cylinder halves individually. We have assumed that the latter will be the case. We have broken down the cost of the work for in-shop and on-site activities. (Note: Cost related to the shipment of the turbine components is discussed later in this quotation.)

IN-SHOP - Reaction Rows 1-28: Remove seal teeth (2) for diaphragm stage, install new replacement teeth, assemble carrier ring, machine seal teeth to required dimension, disassemble carrier ring and de-burr seal teeth.

\$2,250.00 EACH CARRIER RING

Each additional stage of seal teeth replaced will be charged at \$1,600.00

ON-SITE - Reaction Rows 29-32: Remove seal teeth (2) for diaphragm stage, install new replacement teeth, set up boring bar on ½ shell, machine seal teeth to required dimension, remove boring bar and set on other ½ shell, machine teeth to required dimension, remove boring bar and de-burr seal teeth.

\$8,500.00 for one diaphragm stage

Each additional stage of seal teeth replaced will be charged at \$2,900.00

11.) Stellite Shield replacement: We have estimated 100 shields for “L-0” blade row, and 100 shields for the “L-1” blade row, each shield approximately 6 “ in length, and “J” type configuration. For the purpose of this quotation PGS estimated cost is based on 2 options. Option A is for the shield replacement work performed on site. Option B is for the work performed at PGS; Anoka, MN repair facility. (Note: Cost related to the shipment of the turbine components is discussed later in this quotation.)

OPTION A (On-site) \$27,100.00

OPTION B (In shop) \$22,500.00

Trucking related costs: Round trip shipment of turbine/generator components to PGS repair facility and return to SLP will be \$2000.00 (each occurrence), exclusive of specialty handling at the site.

In the case additional work is identified during the inspection process, PGS will either provide quoted pricing or perform the work on a time, material, and equipment rental basis, as further agreed upon by the parties. (See attached PGS repair group T & M, and equipment rental price sheets).

If you have any questions or require further information with regard to this or other matters please contact us.

Sincerely,

Scott Hughes  
Customer Service Manager  
Power Generation Service



## RESOLUTION

BE IT RESOLVED by the Public Utility Board of the City of Rochester, Minnesota, to approve a purchase order agreement with Power Generation Services Inc. for

SLP Unit 2 Turbine Generator Overhaul

The amount of the agreement to be based on services and materials as defined in the specification. The agreement will be a firm price for Workscope I of the specification, and identified Workscop II items as determined by staff. The total amount of the agreement not to exceed TWO HUNDRED FIFTY THOUSAND AND 00/100 DOLLARS (\$250,000.00).

Passed by the Public Utility Board of the City of Rochester, Minnesota, this 27<sup>th</sup> day of January, 2004.

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President

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Secretary