RESOLUTION NO. 2017- 525

A RESOLUTION AUTHORIZING AWARD OF A CONTRACT TO CONCORD MANAGEMENT SERVICES, VOORHEES, NJ, TO CONDUCT A COMPUTATIONAL FLUID DYNAMICS (CFD) FLOW MODEL STUDY OF THE SCR SYSTEM AT THE VMEU DOWN UNIT 11, IN THE AMOUNT OF $36,400.00.

WHEREAS, there exists a need for a Computational Fluid Dynamics (CFD) Flow Model Study of the SCR System at the VMEU Down Unit 11; and

WHEREAS, the City of Vineland has a need to acquire such service as a Non-Fair and Open Contract pursuant to N.J.S.A. 19:44A-20.5; and

WHEREAS, the purchasing agent has determined and certified in writing that the value of said services will exceed $17,500.00; and

WHEREAS, the Director of Municipal Utilities has recommended that a contract be awarded to Concord Management Services, Voorhees, NJ, to conduct Computational Fluid Dynamics (CFD) Flow Model Study of the SCR System at the VMEU Down Unit 11, in the amount of $36,400.00; and

WHEREAS, Concord Management Services has completed and submitted a Business Entity Disclosure Certification for Non-Fair and Open Contract which certifies that Concord Management Services has not made any reportable contributions to a political or candidate committee in the City of Vineland in the previous one year and that the contract will prohibit Concord Management Services from making any reportable contributions through the term of the contract to a political or candidate committee in the City of Vineland; and

WHEREAS, the availability of funds for said contract to be awarded herein have been certified by the Chief Financial Officer; and

WHEREAS, the City of Vineland has certified that this meets the statute and regulations governing the award of said contracts.

NOW THEREFORE BE IT RESOLVED, by the Council of the City of Vineland that:

1. The Purchasing Agent be and the same is hereby authorized to issue contract to Concord Management Services, Voorhees, NJ, to conduct a Computational Fluid Dynamics (CFD) Flow Model Study of the SCR System at the VMEU Down Unit 11, in the amount of $36,400.00.

2. That the Business Disclosure Entity Certification, the Political Contribution Disclosure Form and the Determination of Value be placed on file with the Resolution.

3. That a Notice of this action shall be printed once in the Daily Journal.

Adopted:

_____
President of Council

ATTEST:

_____
City Clerk

REQUEST FOR RESOLUTION FOR CONTRACT AWARDS UNDER 40A:11-5 EXCEPTIONS

(PROFESSIONAL SERVICES, EUS, SOFTWARE MAINTENANCE, ETC)

November 13, 2017
(DATE)

1. Service (detailed description): A computational fluid dynamics flow model of the existing Unit 11 SCR is to be developed to optimize enviromental compliance.

2. Amount to be Awarded: $ 36,400

   ☐ Encumber Total Award
   ☐ Encumber by Supplemental Release

3. Amount Budgeted: $ 250,000

4. Budgeted: By Ordinance No. N/A
   Or Grant: Title & Year _____

5. **Account Number to be Charged: 002-0-55-90-9001-2-9022000, E342X-3

6. Contract Period: First quarter 2018

7. Date To Be Awarded: December 12, 2017

8. Recommended Vendor and Address: Concord Management Services
   520 S. Burnt Mill Rd.,Voorhees, NJ 08043

9. Justification for Vendor Recommendation:(attach additional information for Council review)
   Please see attached writeup.

   ☐ Non-Fair & Open (Pay-to-Play documents required)
   ☐ Fair & Open: How was RFP advertised?_____

10. Evaluation Performed by: Joe Colla and Lisa Fleming J.L. Colla LF DO

11. Approved by: John Lilla 11-27-17

12. Attachments:

    ☐ Awarding Proposal
    ☐ Other: _____

- **Send copies to:**
  Purchasing Division
  Business Administration

** **If more than one account #, provide break down**

Computational Fluid Dynamics Study

On a number of occasions during the past 18 months emissions from Down Unit 11 have temporarily exceeded New Jersey Department of Environmental Protection air permit limits. The exceedances were of short duration and have been for nitrogen oxides, carbon monoxide, and ammonia slip emissions. Although the exceedances were intermittent and brief, they are considered violations by NJDEP and must be corrected.

Nitrogen oxide and ammonia exceedances can result when ammonia does not become uniformly distributed in the flue gases exiting the combustion turbine. Ammonia reacts with the nitrogen oxides produced during the combustion of natural gas or oil to produce elemental nitrogen and water vapor. If the ammonia and nitrogen oxides are not adequately mixed and distributed uniformly over a catalyst, they will exit the stack in concentrations that may exceed emission limits.

The component of the Down Unit 11 generating unit in which flue gases are mixed with ammonia, passed through a catalyst, and discharged into a stack is the selective catalytic reduction unit. Unlike the other components of a combustion turbine generating unit the SCR represents new technology that has been developed to meet the requirements of recent regulations mandating low nitrogen oxide emission limits. It is standard practice for an SCR to exceed its emission allowable limits during initial startup. Corrective action typically consists of trial and error changes to achieve uniform velocity profile and ammonia flow distributions.

Down Unit 11 was the first Rolls Royce Trent 60 combustion turbine to have a Peerless SCR. We are experiencing emission exceedances because we do not have uniform velocity profiles over the SCR catalyst. It is recommended that a computational fluid dynamics (CFD) flow model study be performed in order to optimize the velocity and ammonia distribution at the SCR catalyst. CFD flow modeling is a relatively new method for determining velocity profiles in turbulent fluid flow and was used extensively to develop the design of the West Unit 1 SCR. We were able to demonstrate compliance with NJDEP emission limits during the initial startup of the West Unit 1 SCR. Air Nova, the firm conducting the emissions

testing said they had never seen compliance with emission limits demonstrated during the initial startup.

It is recommended that a CFD flow model study be performed on Down Unit 11 in order to optimize the velocity and ammonia distribution in the SCR catalyst. The study would be conducted by William Gretta who headed up the CFD study on the West Unit 1 SCR. The fixed price of the study, $36,400, is considerably less than the expected cost of penalties if exceedances continue.

J. L. Colla

Lisa Fleming

Jim Foster

CONCORD
MANAGEMENT SERVICES

November 9, 2017

Mr. Joseph Colla
Vineland Municipal Electric Utility
640 E. Wood Street
P.O. Box 1508
Vineland, NJ 08362-1508

Re: VMEU Down Unit 11 CFD Modeling Proposal
Ref: Concord Proposal No. MP17686.00

Dear Mr. Colla:

Concord Management Services (CMS) is pleased to provide the following proposal for conducting a CFD flow model study the SCR system at the VMEU Down Unit 11 SCR located in Vineland, NJ. A CFD flow study will be conducted for the unit to analyze the current system and develop design modifications to improve the gas flow distribution at the SCR catalyst. The model will also help shed light on other potential flow abnormalities in the system and recommendations for improvements. The model will extend from the Siemens Trent 60 exhaust to the stack exit.

CMS is an independent energy and power consulting engineering firm specializing in plant system optimization. Our personnel bring over 25 years of experience to the SCR industry and is aligned with SDG&E's current and long-term SCR management needs. Although the catalyst is the most important part of the SCR, CMS also provides consulting and design services on other critical SCR components and services such as ammonia storage and handling equipment, vaporization and dilution equipment, AIG design and AIG tuning, and gas flow modeling. We also provide a full array of turnkey services including catalyst replacements, cleaning and repacking, and ammonia equipment upgrades or replacements.

CFD MODEL STUDY

A computational fluid dynamics (CFD) flow model study will be performed on the existing SCR system. The objective of the modeling effort is to analyze the current system and develop design modifications to optimize the velocity and ammonia distributions at the SCR catalyst. CMS will utilize the services of Airflow Sciences Corp., who we have worked with on numerous SCR CFD modeling and flow study projects.

DESCRIPTION OF WORK

The purpose of the modeling will be to develop alterations to the existing system for optimal gas flow and ammonia distribution. This may include alterations or additions to the gas flow distribution devices (perforated plates, baffles, etc.) or other flow modifications.

Specific tasks to be provided are:

1. Obtain all input data required for the modeling. This includes geometry characteristics, inspection photos, pressure drop across the catalysts, turbine outlet velocity profile, tempering air flow rate, ammonia flow, and temperatures.

2. Create 3D CAD and CFD model of the system from the turbine outlet to the stack outlet.

3. Perform the baseline simulation for the full-load operating condition. Results will provide a detailed understanding of velocity, pressure, ammonia, and temperature distributions within the system. Discuss results with VMEU personnel and determine potential design modifications.

4. Perform design iterations to optimize velocity and ammonia profiles at the SCR catalyst face. For pricing purposes, up to three design modifications are included. Additional runs can be performed on a per-run basis.

5. Prepare a detailed report of the model results, with recommendations for improved performance. The report will include pressure, ammonia, and velocity statistics as well as color-contour plots at key planes of interest. CAD sketches of recommended fixes will also be provided.

A baseline case will be run for the model at a full load operating condition to provide an initial view of the flow patterns. A simulation of the Trent 60 turbine exit profile will serve as the inlet boundary condition.

Following completion of the baseline simulation, design modifications will be investigated at the full load operating condition in order to optimize the velocity and ammonia distributions.

The primary items to be quantified for the CFD models will include:

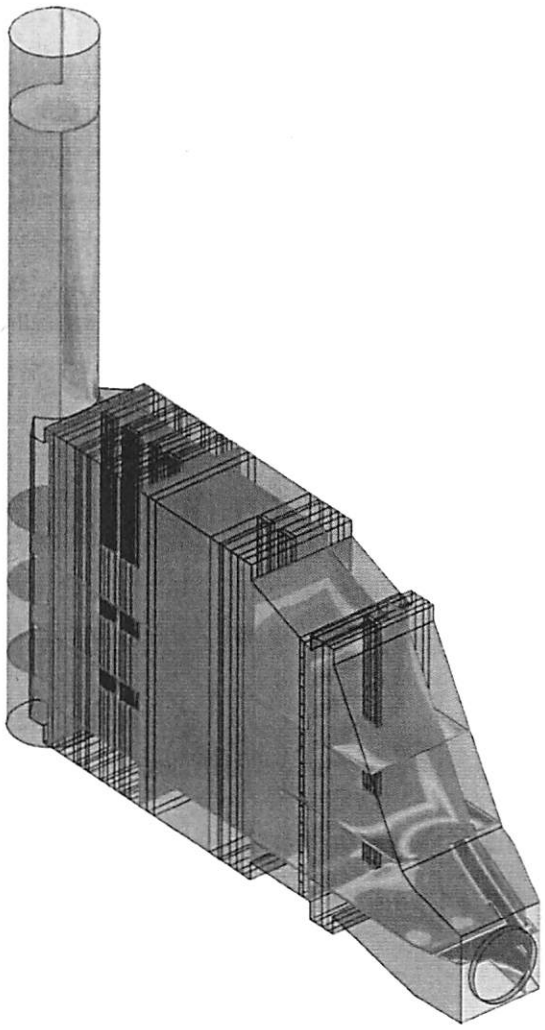
- Velocity distribution at CO catalyst face.
- Ammonia distribution at the SCR catalyst inlet face (distribution of ammonia between injection nozzles will be assumed equal).
- Flow uniformity at the SCR catalyst inlet and outlet faces.
- Pressure drop across the system.

The numerical models will have the following features:

- The SCR model will represent the full-scale three-dimensional geometry starting at the Siemens Trent 60 exhaust flange and ending at the stack exit. All internal features deemed to influence the flow characteristics will be included (catalyst, AIG, perforated plates, etc.).
- The catalysts will be modeled as distributed resistances.
- The model exit will be a pressure outlet condition at the stack exit.

Following the completion of the baseline simulation, design modifications will be investigated at the full load operating condition in order to optimize the velocity and ammonia distributions.

Figure 1 shows CFD images providing examples of a typical full system SCR model.



Full model of gas turbine system

Figure 1 – Typical Full System SCR Model

INFORMATION REQUIRED

- Detailed drawings or schematics to construct CAD and flow model
- Details of all internal components (SCR catalyst, AIG)
- System flow rates and temperatures (SCR gas conditions and ammonia/dilution air flow)
- Pressure drop across each internal component (or a reasonable approximation)

SCHEDULE

Modeling will be completed in 4-6 weeks after receipt of authorization to proceed and complete drawing information.

PRICING

The fixed price to perform the above flow modeling is **$36,400.00**. This includes all engineering and computer resources for the effort for up to three (3) design iterations on the gas side model and up to three (3) design iterations on AIG model. If additional CFD iterations are desired by VMEU, they can be completed at a price of $3,000 for design runs (involving a mesh change to the model) or $2,000 for parametric runs (no mesh changes).

CLARIFICATIONS

1. Terms and Conditions to be mutually agreed upon.
2. Taxes are not included.
3. The pricing above is considered lump sum and is dependent on the preliminary schedule noted herein or completion date of work. Any additional testing or tasks requested by VMEU above and beyond what is listed above will be billed as per the additional rate as noted under PRICING.
4. Pricing Validity: 30 Days from date of Proposal.

We look forward to working together on these important projects and thank you for the opportunity to provide our proposal. Please do not hesitate to call with any questions or comments you may have.

Sincerely,

William J. Gretta

William J. Gretta, PE
Senior Vice President, Concord Management Services