

RFQ 6230
Scope of Work
Supply of Professional Services for the
Denton Energy Center Owner's Engineer and Testing Services

During the construction and startup and testing phases of the Project, the Owner's Engineer will provide technical support to Denton Municipal Electric (DME) for both the engine supplier and EPC Contractor as stated herein.

PROJECT DESCRIPTION:

The Denton Energy Center consists of twelve (12) natural gas-fired Wärtsilä 18V50SG engines, capable of producing a combined 18.8 MWe of electricity, each. Each engine's brake horsepower is 25,761 hp.

Task 1: Design and Construction Support

TASK 1.1 – EPC VENDOR MANAGEMENT

Black & Veatch will provide project management services to support DME with the administration of the EPC Contract. Our project management processes and procedures employed on this project are based on processes and procedures developed to manage our EPC projects where our success is determined by our ability to effectively manage the quality, schedule, and cost of each project. Our general approach to project management and a discussion of the tools and processes employed is listed below.

Project Meetings

The Black & Veatch project team will participate in a kick-off meeting at either the site or at DME's offices. The meeting will be attended by the project manager and key project team members from Black & Veatch, with other team members available via teleconference call. Prior to the meeting, Black & Veatch will develop a data request and meeting agenda in consultation with DME. The following main items will be addressed during the kick-off meeting.

- Introduction of team members.
- Review of communication procedures and contacts.
- Review of objectives, scope of work, and project deliverables.
- Discussion of current design and progress.
- Review of schedule.

In the kick-off meeting, the scope of services, deliverables, and schedule will be discussed with DME to confirm or modify as appropriate.

Kick-off meeting minutes will be prepared and submitted by Black & Veatch within one week of completion of the kick-off meeting.

In addition to the project kick-off meeting, Black & Veatch will participate in hour-long weekly phone calls with the engine supplier and EPC Contractor to status construction progress, and attend one-day monthly project design review meetings with DME. Black & Veatch expects the project manager and one discipline engineer to attend both the weekly phone calls and monthly project design review meetings for a project duration of 16 months.

Project Instruction Manual

Black & Veatch will prepare a Project Instruction Manual (PIM) to clearly define the roles and responsibilities for Black & Veatch and DME; establish project procedures; and communicate DME-specific requirements and procedures to all project participants. Topics to be included in this manual are as follows:

- Organization (project participants and overview of roles and responsibilities).
- Communications (lines of communications and procedures relative to correspondence distribution, including email, etc.).
- Document control/information management (procedures for engineering document receipt, management, review, and delivery to DME). Black & Veatch will use the EPC Contractor document management system.
- Quality Assurance/Quality Control program.
- Information management.
- Owner's Engineer scope of work.

Project Information Management

In order to avoid unnecessary duplication of work, Black & Veatch will be provided access to the EPC contractor's document management system and will use that system as a central repository for all reviews, comments and recommendations associated with the project. For internal processes, Black & Veatch may download files to its proprietary document management system.

Black & Veatch will review the EPC contractor's monthly project reports and provide comments as necessary.

Black and Veatch shall also:

- Attend weekly phone calls held with the EPC Contractor and other engineering meetings, as necessary.
- Determine whether the EPC Contractor is providing appropriate project control documentation.
- Inform DME in a timely manner of project status, trends, and observed potential problems; and suggest necessary actions.

TASK 1.2 – ENGINEERING AND DESIGN REVIEW

Black & Veatch will review engineering documents prepared by the EPC Contractor and vendor drawings for compliance with EPC specifications, applicable codes and standards, and prudent engineering practice. The review of documents provided by the EPC Contractor does not relieve the EPC Contractor of its responsibilities under its agreement with DME, but rather provides a method to review compliance with required specifications and to allow DME to correct issues of non-compliance and quality during the execution process. At this time, our review will encompass the following drawings:

- Fire protection plan (includes review of general arrangements).
- Hazardous area classification drawings.
- Piping and instrument diagrams (P&IDs).
- One-line electrical diagrams.
- Protective relaying and lockout relaying diagrams.
- Generator excitation including metering, synchronizing, and relaying diagrams.
- Control logic diagrams for critical systems.

Black & Veatch will provide a set of comments to each document within a mutually agreed upon schedule with DME and in compliance with the EPC project schedule. Each document would typically be reviewed a maximum of two times. It is our experience that an extended series of reviews could potentially delay the progress of engineering work for the EPC Contractor.

This scope assumes a maximum of 240 drawings for review, with the selection of drawings established from a mutual agreement between Black & Veatch and DME.

No site visits are anticipated for this task of work.

TASK 1.3 – CONSTRUCTION MONITORING

During the construction phase of the project, Black & Veatch will provide home office engineering support for monitoring the progress and quality of construction. The following items are included in Black & Veatch's scope of work.

- Review overall construction activities and schedules, and report any observed problem, deviation, nonconformance, or delay in construction progress and actions to be taken.
- Review the project's actual progress, and report to DME any observed delay that Black & Veatch believes will lead to the delay of project completion.
- Carry out site inspections to review the construction work to determine general compliance with the technical specifications and issue noncompliance reports for any observed deficiencies. These site inspections will be performed in addition to the monthly progress review meetings.
- Review and comment on testing, flushing, and cleaning procedures for compliance with specifications and prevailing safety rules and policies.
- Review Contractor's claims for completion of each construction stage. This includes claims of Mechanical Completion of systems as submitted by the EPC Contractor prior to turning over for pre-commissioning or commissioning activities.
- Confirm the attainment of project milestones and deliverables to facilitate approval of progress payments.
- Prepare and submit to DME a project closeout report after services have been successfully fulfilled.

Performance of activities by Black & Veatch to monitor construction is not intended to relieve the Contractor of its responsibilities under its contract with DME. Black & Veatch shall not have control or charge of and shall not be responsible for construction means, methods, techniques, sequences, or procedures of construction; for the acts or omissions of DME's Contractors, vendors, or suppliers; or for the safety or environmental precautions and programs in connection with the construction work performed by DME's Contractors. Black & Veatch shall not be responsible for the adequacy or completeness of any Contractor's safety or environmental programs, procedures, or precautions, and Black & Veatch shall not have the authority to stop work.

Black & Veatch has included 242 hours for activities related to construction monitoring, including one additional monthly site visit for a single professional in addition to attendance at the monthly progress review meetings.

TASK 1.4 – COMMISSIONING AND STARTUP REVIEW

The main objective of the support for commissioning, startup, and testing is to help DME confirm that the power plant is capable of safe operation in accordance with the applicable permits and specified operational requirements.

Black & Veatch will also undertake related tasks including the following:

- Review completed System Turnover Packages and advise DME of acceptance.
- Review all performance tests, reliability runs, etc., and recommend approval to DME.

Black & Veatch has included two (2) site visits for two (2) professionals to support the commissioning and startup activities.

CLARIFICATIONS

Black & Veatch has included the following clarifications to the services described herein in order to better delineate the responsibilities of Black & Veatch serving as the Owner's Engineer for this project:

- DME will assist Black & Veatch with obtaining information necessary to perform the Owner Engineer scope of services including but not limited to the following:
 - Information on the project site such as maps, topographical, surveys (if available), potential transmission line interconnection points, potential natural gas interconnection points, water and waste water connection points
 - Interface with the transmission and natural gas providers
 - Geotechnical report for selected site
 - Performance requirements for the Project
- Permit support is not required. However, Black & Veatch has assumed 12 hours related to permit questions and technical concerns related to emissions compliance.
- Procurement support is not required. If required, this can be added to the scope at DME's request.
- All Contracts Administration is the responsibility of DME.
- As the EPC Contractor project schedule has already been developed, schedule development support has not been included.
- The proposal cost is based on a 16 months schedule from time of OE contract award through Final Acceptance. If the project schedule exceeds this duration, the not to exceed (NTE) cost may need to be revised.
- EPC Contractor will obtain any local permits required for the project. The engineering cost associated with obtaining these permits is not included.
- The EPC Contractor will be responsible for the preparation of the start-up and check-out procedures. Black & Veatch will perform a review of the documents.
- The EPC Contractor will be responsible for the system check-out and turn-over package development. Black & Veatch will review the documentation and advise DME of acceptance.
- Onsite witness of the thermal performance test has not been included in the scope of this proposal. However, Black & Veatch will review the test procedures and final reports and advise DME of acceptance, and has included allocation for two site visits for one Black & Veatch professional.

- Support during the warranty period is not required. If required, this can be added to the scope at DME's request.
- Black & Veatch has not included the cost for any shop surveillance. If required, this can be added to the scope at DME's request.
- The travel expenses included in the proposal are limited to the following trips and included in the overall NTE cost as shown in the Commercial Terms Section. It is assumed that the majority of the meetings required will be conducted via conference call. No international travel has been included in the proposal cost.
 - Kick-off meeting at DME office and project site. Includes five (5) team members for one (1) day.
 - Monthly site meetings. Includes sixteen (16) visits with two (2) team members for one (1) day.
 - Construction on-site technical support includes sixteen (16) visits for one (1) team member for one (1) day. These site visits are in addition to the monthly site meetings.
 - Commissioning and start-up on-site walk down support has been limited to an allocation of two (2) site visits for two (2) day duration to support technical concerns during commissioning and start-up.

Task 2: Air Emissions Testing

AIR EMISSIONS TESTING EXECUTION:

As part of the overall Owner Engineer role, Black & Veatch will provide DME with air emissions testing services. Cooperation and coordination with Wärtsilä and their subcontractors will be required and facilitated by DME and Black & Veatch. Emission testing will be used to confirm the engines meet their emission guarantees, create baseline data for emission reporting and also to determine compliance with the air permit and air permit regulations. Black & Veatch will work with Wärtsilä and the EPC Contractor to complete tuning prior to test initiation. If further tuning is required after the completion of testing, performance of additional testing will add additional costs. Two separate testing protocols will be developed: one air permit regulation and permit requirements submitted to the Texas Commission on Environmental Quality (TCEQ), and one to determine compliance with emissions guarantees and for record keeping and reporting requirements.

For the purposes of this testing, the test ranges for each engine shall be defined as follows:

- Startup Range: Period from initial start of engine until the selective catalytic reducers (SCR) and oxidation catalyst achieves its design temperature range; period will not to exceed 30 minutes. No stack testing will occur during startups.
- 20% Range: 5,152 to 9,016 hp
- 50% Range: 9,017 to 16,101 hp
- 75% Range: 16,102 to 22,541 hp
- Maximum Range: 22,540 to 25,561 hp

Black & Veatch will perform the following in support of the emissions testing:

- Develop Emissions Testing Specifications
- Bid review and contract conformance
- Review emissions contractor test protocol
- Attend TCEQ meeting prior to testing (2 days total)
- Test coordination/contract supervision
 - Provide third party emissions testing
- Review emission test reports

TASK 2.1 – DEVELOP EMISSIONS TESTING SPECIFICATIONS

The Black & Veatch project team will develop emissions testing specifications based on the requirements of the Air Permit and EPC contract specifications. This includes reviews with DME necessary to develop a complete package which meets the obligations of the TCEQ and EPC specifications. Black & Veatch will coordinate with DME to develop a bid list of testing consultants. Once the bid list is finalized, Black & Veatch will solicit bids from the selected parties.

TASK 2.2 – BID REVIEW AND CONTRACT CONFORMANCE

Black & Veatch will review the bids from the selected parties for conformance with the specifications and scope. Scope modifications will be discussed and a technical log will be developed. Once the scope and specifications are agreed, Black & Veatch will contract with the emissions testing contractor.

TASK 2.3 – REVIEW EMISSIONS CONTRACTOR TEST PROTOCOL

Black & Veatch will coordinate with the emissions testing contractor to develop test protocols for both requirements of the TCEQ/Air Permit and EPC contract specifications.

- For the requirements of the TCEQ/Air Permit, a testing protocol shall be developed for submittal to the TCEQ at least 30 days prior to the actual testing date. A draft of the protocol shall be sent to DME for their review and comment prior to submittal to the TCEQ. This scope allows for the incorporation of a single review cycle using one (1) set of consolidated comments from DME before issuing final deliverables. It is expected that DME will submit the final testing protocol to the TCEQ.
- For the requirements of the EPC contract specifications, a testing protocol shall be developed for DME review at least 30 days prior to the actual testing date. A draft of the protocol shall be sent to DME for their review and comment. This scope allows for the incorporation of a single review cycle using one (1) set of consolidated comments from DME before issuing final deliverables.

TASK 2.4 – ATTEND TCEQ MEETING PRIOR TO TESTING

In preparation for emissions testing to meet the requirements of the Air Permit and the TCEQ, the TCEQ typically requires a meeting at the project site to understand the test protocol, anticipated testing dates, and to gather additional necessary information prior to test commencement.

Black & Veatch expects the meeting with TCEQ to be held over a period of two days, and will be attended by one Black & Veatch professional, as well as professionals from the emissions testing contractor.

TASK 2.5 – TEST COORDINATION/CONTRACT SUPERVISION

As Black & Veatch will contract for third party testing services, an on-site presence from Black & Veatch will be needed to direct the testing contractor and to field questions from DME.

Provide Third Party Emissions Testing

Tests will be performed on each of the twelve (12) engines, with each test conforming to the Air Quality Permit and New Source Performance Standards, Subpart JJJJ. Any methods employed shall be in accordance with USEPA-approved test methods and TCEQ requirements.

- All NO_x, CO, and VOC testing shall be in accordance with 40 CFR Part 60, Subpart JJJJ and the air construction permit for the site.
- NO_x testing shall use EPA Method 7E.
- CO testing shall use EPA Method 10.
- VOC testing shall use EPA Method 18 and 25A, and report non-methane, non-ethane hydrocarbons.
- All particulate matter (PM) testing shall be per Method 201A, or Method 5, and 202 (filterable and condensable).
- NH₃ testing will be conducted using Method CTM-027.

Documentation will be provided to show that the proposed methods meet these requirements.

The testing scope shall include:

- Testing shall be conducted at a uniform load for each test.
- Testing shall not be performed during startup.
- All emission test data shall be dated and time stamped and synchronized to the collection of system data.
- All emission data for each test shall be averaged per engine.
- Provide information as required by the Air Quality Permit and the proposed methods that are not specifically listed below.

TCEQ Testing

Testing will be performed with 36 separate test runs.

- 36 test runs – testing at 100% load range for NO_x, CO, and VOC emissions will be provided as follows on each of the twelve (12) engines:
 - Three (3) 100% load range tests: Individual testing of twelve engines within the 100% load range.

EPC Contract Testing

Testing will be performed with 144 separate test runs.

- 36 test runs – testing at 100% load range for NO_x, CO, VOC, PM₁₀, and NH₃ emissions will be provided as follows on each of the twelve (12) engines:
 - Three (3) 100% load range tests: Individual testing of twelve engines within the 100% Load Range.
- 108 test runs – testing at 75%, 50% and 20% load range for NO_x, CO, VOC, and PM₁₀ emissions will be provided as follows on each of the twelve (12) engines:
 - Three (3) 75% load range tests: Individual testing of twelve engines within the 75% load range.
 - Three (3) 50% load range tests: Individual testing of twelve engines within the 50% load range.
 - Three (3) 20% load range tests: Individual testing of twelve engines within the 20% load range.

Information and data collected during the specific engine test period for each engine report will include the following:

- Fuel sampling
- Fuel Flow data (one minute data)
- Engine horsepower values throughout the duration of the tests (one minute data)
- Air-fuel ratio
- Engine speed (one minute data)
- Reagent flow rate
- Oxidation catalyst inlet temperature
- Catalyst bed pressure drop
- Emissions reports in g/hp-hr as well as lb/hr

TASK 2.6 – REVIEW EMISSION TEST REPORTS

At the conclusion of testing, two separate reports will be prepared: one for air permit compliance and one for EPC contract specification verification. Each of the test reports will be reviewed and recommendations provided to DME regarding acceptance, comments, or changes to the draft report. Black & Veatch will incorporate up to one (1) set of consolidated comments from DME before issuing final deliverables. The final test reports will be presented as three signed hard copies and one electronic copy and are considered confidential information pursuant to Section 552 of the Texas Government Code.

CLARIFICATIONS

Black & Veatch has included the following clarifications to the emissions testing services described herein in order to better delineate the responsibilities of Black & Veatch:

- Expected duration of the separate TCEQ testing is 6 days.
- Expected duration of the combined TCEQ/EPC Contract testing is 24 days.
- Fuel sampling in accordance with ASTM D1945 and 6667 will be performed once each day during the expected duration of testing.
- This scope includes up to three mobilizations for the combined TCEQ/EPC contract specification testing during the expected duration of testing, and one mobilization for the separate TCEQ testing.
- Man lifts will be provided to access the test ports. Man lift access is not expected beyond 5 weeks.
- Testing duration will be 12 hours per day. Black & Veatch oversight will be 10 hours per day, and Black & Veatch requests the assistance of DME in monitoring testing hours through the help of the guard gate or operations.
- Rescheduling or cancellation (either with less than/equal to 10 days' notice prior to the scheduled mobilization date) by DME will result in additional fees per occurrence.

COMMERCIAL TERMS

Contract Terms and Conditions

Black & Veatch proposes to perform these scope of services on a time and material (T&M) basis under the terms and conditions of the Contract between the City of Denton, TX and Black & Veatch dated March 21, 2017 and attached for reference.

Pricing

Black & Veatch has prepared NTE pricing for each of the two tasks based on our estimate of the level of effort to support DME for the duration of the project. This estimate is based on the scope definition provided by DME on January 5, 2017, and further revised and clarified during subsequent discussions and correspondence, as well as our experience on similar previous assignments. Pricing is based on the 2017 Billing Rate and Expense Schedule included immediately following this page. The following table presents our estimate of the level of effort required for this project.

TASK	DESCRIPTION	HOURS	LABOR & OFFICE EXPENSES	TRAVEL & SUBCONTRACTS EXPENSES	TOTAL PRICE
1.1	EPC Vendor Management	1,354	\$260,215	\$26,800	\$287,015
1.2	Engineering and Design Review	432	\$77,412	\$0	\$77,412
1.3	Construction Monitoring	242	\$44,853	\$11,600	\$56,453
1.4	Commissioning and Startup Review	154	\$26,991	\$2,600	\$29,591
Subtotal		2,182	\$409,472	\$41,000	\$450,472
2.1 – 2.6	Air Emissions Testing (TCEQ and Owner Testing Combined, or Owner Testing Separately)	472	\$76,060	\$293,260	\$369,320
	Delay Contingency (30 percent)			\$85,338	\$85,338
Subtotal		472	\$76,060	\$378,598	\$454,658
2.1 – 2.6	Air Emissions Testing (TCEQ Testing Separately)	70	\$11,126	\$37,180	\$48,306

	Delay Contingency (30 percent)		\$10,494	\$10,494
Subtotal	70	\$11,126	\$47,674	\$58,800
Total	2,724	\$496,658	\$467,272	\$963,930
Notes:				

The cost of Owner Engineer services could be reduced if DME elects to directly contract the Air Emissions Testing. In addition to the subcontractor markup, we have included 250 hours in our estimate to cover the cost of test coordination for the combined TCEQ/Owner Testing, and 70 hours for the separate TCEQ testing.