**CITY OF AUSTIN**
**PURCHASING OFFICE**
**SCOPE OF WORK**
**LARGE MOTOR REPAIR FOR AUSTIN ENERGY**
**SOLICITATION NUMBER: RFP 1100 SMB3010**

1. **PURPOSE**

The purpose of the contract is for the maintenance, repair, overhaul and rewind of Austin Energy's large motors, up to and including 4160 Volt motors. Austin Energy, at its discretion, may utilize this contract to purchase replacement motors if existing motors cannot be economically repaired, upgrade existing motors, or for additional motors that are part of a planned capital improvement effort.

The contract covers motors at Austin Energy's Sand Hill Energy Center (SHEC), Decker Creek Power Station (Decker), and District Cooling and Energy locations. This agreement will also cover other large motors that Austin Energy may acquire during the term of a resulting contract.

2. **TERM OF CONTRACT**

This Contract shall remain in effect for 60 months or the City terminates the Contract.

3. **BACKGROUND**

Austin Energy is an enterprise department within the City of Austin and is the nation's eighth largest publicly owned electric utility. Unlike many other municipal utilities, Austin Energy owns and operates power plants. It owns natural gas fueled power generation facilities and owns interests in a coal plant and a nuclear-powered plant.

Austin Energy serves more than 448,000 customers and more than a million residents within a service area covering over 437 Square miles, including all of Austin and Travis County, as well as 15 square miles of Williamson County. Austin Energy's mission is to safely deliver clean, affordable, reliable energy and excellent customer service.

4. **WORK SPECIFICATION**

A. CONTRACTOR RESPONSIBILITIES

1. Contractor shall ensure that work performed on this contract is conducted by experienced, qualified staff. Applicable certifications or licenses should be submitted with project as well as prior performance records for similar projects.
2. Contractor shall perform all work in accordance with all federal, state, local codes and City of Austin terms and conditions and the following references:
   - National Electrical Manufacturers Association (NEMA), MG-1 Motors and Generators
   - Institute of Electrical Electronics Engineers, Inc. (IEEE) 112B Standard Test Procedure for Polyphase Induction Motors and Generators
   - American National Standards Institute (ANSI) MW 1000 Magnet Wire
   - Electrical Apparatus Service Association (EASA) Guidelines
   - American Bearing Manufacturers Association (ABMA) Standard 7 Shaft and Housing Fits for Metric Radial Ball and Roller Bearings (Except Tapered Roller Bearing) Conforming to Basic Boundary Plan
3. Contractor shall perform all services authorized in writing by Austin Energy according to the agreed upon project scope of work.
4. Contractor shall submit a quote for all work, per project work scope, including all transportation/shipping charges to the City of Austin specified Austin Energy location. Sample classifications for bid are included in Solicitation documents.
5. Contractor shall perform maintenance and repairs of large electric motors for Austin Energy using the model procedure described in this document and on the attached, applicable form(s). When using the model procedure found in this document, Section6.E

Procedural Requirements, the Contractor shall modify with appropriate model numbers, tolerances, etc., for the specific equipment.

6. Contractor shall return the motor to the point of origin within 14 calendar days from the time of pickup or as agreed upon in the project work scope.
7. Contractor shall provide a warranty on repairs for a period of not less than one (1) year from the date the motor is placed into service.
8. Contractor shall have access to and the ability to provide original equipment manufacturer (OEM), approved equal parts (i.e. aftermarket, or other-than OEM parts), or upgraded parts/equipment as requested by Austin Energy per each specific project scope of work.
9. Contractor shall adhere to each plant's specific Contractor Work Requirements and Guidelines, attached as Exhibit A.

B. AUSTIN ENERGY RESPONSIBILITIES

1. Austin Energy will provide a site-specific contact to coordinate work, scheduling and planning.
2. Austin Energy will provide a Contract Administrator who will monitor contract compliance of terms and conditions and serve as a resource for all contract related matters.

## 5. WORK REQUEST, WORK ACCEPTANCE, AND CHANGE ORDERS

A. Work Requests:

1. Austin Energy will submit a written scope of work (SOW), work schedule/timeline, and a request for a lump-sum quote to Contractors to initiate services for each work request. Austin Energy reserves the right to request a Time and Materials quote for onsite troubleshooting to determine a SOW
2. Contractors shall conduct a site-review of the work to be completed and submit a lump sum quote to Austin Energy. A quote that includes personnel and craft categories utilized by the Contractor but not included in the Price Rate Sheet shall not be billed unless approved by Austin Energy in writing prior to work completion.
3. Austin Energy will review quotes and select the Contractor that best meets its needs according to price or other factors. Contractor shall begin work only after receipt of the written notice to proceed and purchase order. If Contractor elects to initiate work prior to receiving a written notice to proceed and purchase order, all work performed is done so at the Contractor's risk. Neither the City nor Austin Energy is obligated to pay for work that was not authorized or for which was conducted without Contractor having a purchase order in-hand.

B. Work Acceptance

1. Any and all work or parts supplied by the Contractor shall be considered complete and acceptable only after submittal review and written acceptance by Austin Energy, and successful installation, start-up and testing of the equipment upon which the work or parts was repaired, maintained or overhauled at the Austin Energy plant site.
2. Acceptance or approval by Austin Energy of Contractor's work shall not constitute nor be deemed a release of responsibilities and liabilities of the Contractor for the accuracy, completeness and competency of the work performed under the contract.
3. No approval or acceptance by Austin Energy shall be deemed to be an assumption of such responsibility by Austin Energy for any defective, erroneous, incomplete, or substantial work performed by the Contractor.

C. Change Orders

Change Orders are defined as a change to a specific project work scope that has already been accepted in writing by the Contractor. A Change Order may be requested before any work has begun or after any amount of work has been completed for a specific project work scope. When a Change Order has been requested by either party, the Contractor shall not perform any work for the specific project work scope until Austin Energy has issued a Revised Notice to Proceed as Original Notice to Proceed will no longer be valid.

1. Process for Change Orders requested BEFORE any work has begun.
    a. Either Austin Energy site staff or the Contractor may submit a request for a Change Order before any work on a specific project work scope has begun.
    b. Once a written request for a Change Order has been received, Austin Energy site staff will provide an amended project scope of work to the Contractor for review and creation of a revised quote and timeline.
    c. Contractor shall begin work only after receipt of the written notice to proceed with the revised project scope of work and revised purchase order.
    d. If Contractor elects to initiate work prior to receiving the revised written notice to proceed and revised purchase order, all work performed is done so at the Contractor's risk. Neither the City nor Austin Energy is obligated to pay for work that was not authorized, or for which was conducted without Contractor having a purchase order in-hand.

2. Process for Change Orders requested AFTER any amount of work has been completed for a specific project work scope
    a. Either Austin Energy site staff or the Contractor may submit a request for a Change Order after any work on a specific project work scope has begun.
    b. Once a written request for a Change Order has been received, Austin Energy site staff will provide an amended project scope of work to the Contractor for review and creation of a revised budget and timeline.
    c. Contractor shall begin work only after receipt of the written revised notice to proceed with the revised project scope of work and revised purchase order.
    d. If Contractor continues to work prior to receiving the revised written notice to proceed and revised purchase order, all work performed is done so at the Contractor's risk. Neither the City nor Austin Energy is obligated to pay for work that was not authorized.

3. Required Information for a Change Order Request:
    a. The Contractor shall include with a Change Order Request, the following information:
        1) Change Order Number – A sequential number/identifier that includes the original Austin Energy DO or DOM (delivery order) number.
        2) The date that the Change Order Request is submitted and the name and affiliation of the Party requesting the Change Order.
        3) Project Description – A description of the necessity for the Change Order Request to the project scope and the proposed work to be performed, including change in timeline, price, completion date, and/or implementation method, as well as how the proposed change will benefit the specific project.
        4) Scope of Work for Proposed Change Order – A list of the specific tasks to be performed, the obligations/responsibilities of the Contractor and Austin Energy that are required to implement the Proposed Change Order and permitting requirements (if applicable).

Additionally, information regarding progress reports, test plans (if applicable) and other technical information relating to the Proposed Change Order must also be included.

5) Schedule – A milestone and resource schedule that includes and identifies the proposed changes/steps by which work is initiated and completed, and the personnel, equipment, and sub-contractors (if applicable) needed to complete the specific project. This document shall also include dates of required Austin Energy Project Management interface and support with the Contractor.

6) Breakdown of Proposed Cost to Austin Energy – A detailed line item breakdown of proposed costs for the proposed change order, even if the initial quote is provided in lump sum. NOTE: terms of payment for the Proposed Change Order shall follow the Invoicing and Payment terms and conditions included in a resulting contract.

7) Signature of the Contractor's project lead for change orders up to $50,000.00 or Contractor's Authorized Corporate Officer for change orders exceeding $50,000.00.

## 6. TASK/PERFORMANCE REQUIREMENTS

The work/performance specifications described in this section of this document are not intended to replace, minimize, or reduce the quantity or frequency of the tasks recommended in the applicable codes and standards. Any additional services or equipment not specified in this Scope of work will only be allowed through written Amendment to a resulting contract**.**

A. Contractor shall provide Austin Energy personnel access to Contractor's facilities and subcontract facilities to enable inspection of work in progress.

B. Contractor shall ship materials, parts, and supplies FOB work site and shall maintain ownership of all items until Austin Energy accepts the items in writing.

C. Contractor shall be responsible for receiving goods and shall maintain sturdy, weatherproof storage facilities for warehousing and staging of received goods.

D. Contractor shall ensure that the acceptance of parts shipped to the Contractor from any source shall be established by written confirmation to Austin Energy project lead, or designated plant contact, that the part is suitable, received in good condition, appropriate for the intended purpose, and required by the authorized project work scope.

### E. Procedural Requirements

#### a. General Procedures

1. Austin Energy shall provide Attachment A (Section 14) with each motor. Repair actions and measurements shall be recorded on this form. Copies of the completed form are to be submitted to the Austin Energy plant contact in the format(s) required by the project SOW. Contractor may substitute the attached forms with shop specific, like kind forms when supplying all final repair reports, as long as the Contractor has received written approval by the Austin Energy project lead before submitting the form. The substitute form must contain same line item detail as Attachment A. Contractor must supply one electronic copy and one written copy of procedure documentation, inspection, and test reports upon return of motor.

2. Vertical motors shall be shipped in a vertical position, properly blocked and supported to protect against rough motion during transportation. Horizontal motors shall be shipped in a horizontal position, properly blocked, and supported to protect against rough motion during transportation.

3. Austin Energy or its designated representative reserves the right of access to the repair Contractor's shop for the purpose of performing inspections of any motor repair, documentation reviews, and witnessing selected testing activities in progress. All motors returned to Austin Energy will be inspected and tested by Contractor or by the Austin Energy representative. All

repair material shall be new, and workmanship shall be guaranteed from failure for a period of one year from date of reinstallation and energizing at plant.

4. Contractor shall clean and spray paint external surfaces of motor with an industrial gray epoxy paint (or site-selected color) before delivery, being careful not to paint motor nameplate or equipment number tag.
5. Contractor shall install all air filters in the motor frame before delivery. Replacement disposable filters shall be equal to original filter. Permanent filters shall be cleaned.
6. Contractor shall repair explosion proof, totally enclosed, fan-cooled, and weather-protected motors and maintain special features. A "UL Listing Mark for Rebuilt Motors for Hazardous Locations" is required for explosion proof motors. UL repair standards for explosion proof motors shall be followed.
7. In the event that the repair cost of a motor exceeds 65% of the cost of a new motor, the Contractor shall notify the Austin Energy plant contact for a written decision prior to proceeding with repairs.

**b. Motor Stator Windings**

1. Recondition: Contractor shall steam clean, inspect then place stator in a bake oven that has been preheated to 302°F (150°C) ±10% and cure for 6 to 8 hours. Remove the stator from the bake oven and allow it to cool to approximately 104°F (40°C), repeat the process for a second dip and bake. If grease is found in the windings, then a citrus base degreaser should be used before steam cleaning is done.
2. Contractor shall rewind stators with the same wire size, number of turns per coil, number of coils, and coil connections as found in the failed winding unless otherwise directed by Austin Energy engineers. Exceptions will be considered but must be approved by the Austin Energy plant contact. Exceptions will be allowed in order to change the motor characteristics or when identical replacement wire size is not available. The Contractor shall indicate the original and replacement wire size and coil connections on the repair form and any characteristic changes on the tag.
3. Contractor shall remove stator windings in accordance with the wording in this section (6.E.b). A variance from this procedure shall be submitted in writing and approved by the Austin Energy plant contact prior to implementing the procedure. Old coils are to be removed without damaging stator lamination or frame and minimizing changes to the magnetic characteristics of the motor. A "burn out" removal method must be done at less than 650°F (343°C) for cast iron frame motors. A "burn out" by exposing the motor directly to an open torch is not acceptable for any motor. A positive temperature control device must be in service on the Contractor's "burn out" oven. A high temperature water or steam quench must be installed on the "burn out" oven to prevent an insulation varnish fire from momentarily driving the oven temperature more than 25°F (14°C) above the burn out limits noted above.
4. Contractor shall clean and examine for damage removed stator coils. Contractor shall grind flush burrs in the slot and burrs at slot ends.
5. Contractor shall notify the Austin Energy plant contact for approval for repair or replacement of damaged or defective parts found during the inspection noted in numbers 6 and 7, immediately following this number.
6. Contractor shall make a hot spot check on the stator lamination in accordance with instructions found in Section 14, Attachment B. A hot spot that is 18°F (10°C) above the surrounding lamination temperature requires corrective action. Damage in a slot with welding of lamination also requires corrective action. Rotor rubbing of lamination that has removed the top stick (wedge) slots requires corrective action. After corrective action is completed, a hot spot check in accordance with Attachment B shall be repeated. The use of epoxy to hold the top stick in

place is not acceptable. Restacking requires the approval of the Austin Energy plant contact.

7. Contractor shall clean all air cooling passages in the motor frame. Contractor shall inspect the motor frame, end shields, conduit boxes, filter frames and other parts for damage with particular attention given to machined surfaces and corrosion damage. Contractor shall inspect motor frame mounting feet for cracks, flatness and soft foot. Contractor shall repair cracked motor frame feet and mill true the feet and base of the motor.
8. All stator winding, lead wire and winding supply insulation shall be rated NEMA Class F (155°C max. temp) or Class of greater value. Contractor shall select materials, particularly lead wire insulation, so that damage by a coating of hydrocarbon oils will be minimized.
9. Contractor shall check coil end turns for clearance from the installed end bell, air baffle or other obstruction that is a part of the assembled motor when a compete motor has been received.
10. Contractor shall limit random wound coils to motors rated 600 volts or less. Random wound coil end turns shall have adjacent phase coil groups separated by phase insulation paper. The motor should be wound properly with the windings reinforced.
11. Contractor shall ensure magnet wire used for random wound motors is insulation rated for a nominal 600 VAC. The wire film insulation shall pass ANSI/NEMA Standards Publication No. MW1000.
12. Contractor shall double dip and bake all non-VPI motors that have been rewound. Random wound windings shall have an environmental coating consisting of a varnish dip if specified. All stators must be preheated to 225ºF (107ºC) before dipping.
13. Contractor shall use form wound coils on all motors with a voltage rating of over 600 VAC. Coils shall be insulated to fit tightly in the slot. Coil end turns shall be supported per the original equipment design. Contractor shall receive approval from the Austin Energy plant contact prior to implementing any deviations from these requirements.
14. Contractor shall ensure magnet wire for form wound coils is square or rectangular in shape. The wire shape shall be selected so that the finished coil, with required insulation, will fill the stator slot. The magnet wire shall be insulated with a film or fibrous cover with a nominal rating of 600 VAC. When winding the coil, the first and third winding layer shall have a six-inch-long fiberglass sleeve added over the magnet wire at each loop post (it will become the coil knuckle). The formed coil insulation shall be composed of layers of half-lapped tape that is compatible with the Vacuum Pressure Impregnation (VPI) varnish system.
15. Contractor shall ensure form wound coils have a phase insulation wedge between the top and bottom coil and at the top of the slot. The top wedge shall be capable of holding the coil firmly in the slot.
16. Contractors shall apply an appropriate varnish system treatment on all form wound coils. Refer to Attachment C for VPI treatment, which is one of the appropriate methods.
17. Contractor shall silver solder or braze all coil connections. Contractor shall clean and remove all sharp edges from the coil ends, prior to make-up. The leads for coil-to-coil connections in the same phase shall be triple insulated. All coil connections shall be effectively lashed to the coil end turns for support.
18. Contractor shall ensure insulated lead wires installed in all oil mist lubricated motors are Hypalon insulated.
19. If motor lead wires are changed or the motor is rewound, the Contractor shall contact the plant contact to determine the correct lead length.
20. Contractor shall protect the lead wires from mechanical damage and sharp edges within the

motor frame and connection box. For TEFC (Totally Enclosed Fan Cooled) explosion proof motors, the Contractor shall encase the lead wires in “Chico” or EY compound between the frame and connection box. For all other type motors, Contractor shall use lead washers. Lead wires shall terminate in the connection box with an appropriately sized crimp-on NEMA connector lug. Wide wire size range connectors are not approved.

21. Contractor shall install winding temperature detectors in all rewound form wound stators for motors 500hp and larger, unless instructed otherwise by the purchase order. Contractor shall install six Resistance Temperature Detectors (RTD) in each motor, two per phase between top and bottom coils. Unless directed otherwise, RTDs shall be of the same type and resistance value as originally found in the motor. If the RTDs are a new addition to the motor, they shall be 100 OHM, platinum, International (E curve) unless directed otherwise by the Austin Energy plant contact. If they are replacement detectors, Contractor shall install and wire them in accordance with the original installation and extend the leads to the original junction box. If no box exists, Contractor shall install a box, with the necessary terminal strips.
22. Contractor shall clean stator windings that are dirty but have not failed. When cleaning, Contractor shall remove all dirt from the windings and stator cooling slots without damage to the winding insulation. Insulation shall be oven dried and tested in accordance with paragraph 6.E.b of this document.
23. Contractor shall replace heaters of motors with space heaters when repairing windings, unless otherwise specified in the repair order. Contractor shall wire new space heaters for the same 115 or 230 VAC as the original and wires connected to the original heater junction box. The space heater external metal sheath temperature shall not exceed 225°F (107°C) at a 104°F (40°C) ambient temperature. The wattage rating of the replacement heaters shall equal the replaced heaters.

**c. Motor Rotor**

1. Contractor shall clean and examine motor rotors for damage. Bearings, coupling, and normally removable fans shall be removed from the shaft. Shaft run-out shall be checked both journals and center of the rotor. Contractor shall check shaft run-out and limit the run-out at journals to 0.001 in. and limit the run-out at the center of the rotor to 0.005 in. Contractor shall clean and remove burrs from motor shaft. The shaft dimensions shall be measured with a calibrated micrometer caliper at the journals, coupling and fan fits. The acceptable tight tolerance for journals for anti-friction bearings shall be in accordance with ABMA Std. 7, Fit J5. The acceptable tolerance for a fan fit is 0.000 to + 0.002 in. Key ways and keys shall be cleaned and inspected for looseness and damage. The rotor bars and end rings shall be inspected for cracks. The rotor lamination shall be checked for hot spots upon the request of the Austin Energy plant contact. The rotor spider fit on the shaft shall be checked for looseness and broken tack welds. Any damage to the rotor found by this inspection shall be brought to the plant contact’s attention before any further repair work is undertaken. All rotor repairs shall be pre-approved by the Austin Energy plant contact prior to implementation.
2. Contractor shall replace bent motor shafts with approval of the Austin Energy plant contact. New shafts should be manufactured from heat tempered AISI #4140 steel or Type 316 stainless steel when required. Short stubbing is not acceptable, nor is welding to build up a worn shaft without Austin Energy plant contact’s approval. The total maximum permissible run out of the output shaft when the motor is fully assembled is 0.001 in.
3. Contractor shall remove all burrs from motor rotors that have rubbed the stator lamination. Contractor shall review hot spots found in the rotor lamination with the Austin Energy plant contact for repair or replacement of the rotor.
4. Contractor shall review motor rotors with cracked rotor bar connections or cracked end rings with the Austin Energy plant contact for repair or replacement. Cracked rotor bar connection

repairs shall be in accordance with this procedure or the Contractor's shop procedure, approved by the Austin Energy plant contact before commencement of any repair work.

5. Contractor shall review motor shaft journals that are damaged or undersized with the Austin Energy plant contact for agreement on an acceptable repair. Hard chrome plating and grinding is an acceptable method. Stainless steel metallizing is not acceptable for load bearing areas.
6. Contractor shall check centering of the rotor within the stator, whenever possible by design, by both stationary gap and rotating gap feeler gage readings at both ends of the rotor. In the "stationary check", feeler gages are inserted at four points on each end of the rotor, 90° apart and recorded. In the "rotating check" method, the feeler gage is held stationary and the rotor turned. Readings should fall within a +/- 10% deviation from the average at each end, except for a two-pole induction motor, where the limit is +/- 5%.
7. Keyway seats in new shafts shall have a minimum of 1/16 in. radius for shafts up to 2.999 in. diameter and a minimum of 3/32 in. radius for shafts equal to or greater than 3.000 in. diameter to reduce stress concentration.
8. Contractor shall adjust bearing assemblies to provide shaft end play in accordance with the motor's design limits. For horizontal shaft anti-friction bearing motors, the end play must allow for thermal expansion of the shaft without damage to the bearings. For vertical motors, locknut adjustments, spacer rings, and installation thrust bearing support rings shall be in accordance with motor manufacturer's recommendations.
9. Contractor shall assemble sleeve bearing motors by adjusting bearing or rotor position so that the rotating assembly will "float" at its magnetic center position within the normal endplay limits. Contract shall identify the magnetic center by a pointer and a scribe on the shaft.

**d. Motor Bearings**

1. Contractor shall replace all anti-friction bearings with new bearings. New anti-friction bearings shall match the motor nameplate. New radial ball bearings shall have a C3 loose internal clearance. All new bearings shall be measured for tolerance to specification. Bearings in greased service shall have a single shield installed on the grease pocket side.
2. Contractor shall solvent clean all sleeve bearings and inspect for wear, grooves and wipe babbitt. The mounting surfaces for the bearing shell shall be cleaned and inspected for looseness and all burrs removed. Acceptable sleeve bearing clearance tolerances are shown in Attachment D. Sleeve bearing clearance shall not exceed the maximum tolerance over the measured journal dimension measured in section 6.E.d.1. Sleeve bearings should be reused unless damage or excessive wear is evident.
3. Contractor shall rebabbit or replace sleeve bearings that are damaged or exceed the maximum clearance tolerance with approval by the Austin Energy plant contact. The new or rebabbitted bearing shall then be bored to a tolerance limited by a minimum/maximum clearance stated in Attachment D. Oil grooves and dams found in the old bearing shall be duplicated in the rebabbited bearing. All replaced or rebabbitted bearings shall be blued and checked in place. The bearing shall be hand scraped until shaft contact is evident along at least 75% of the length of the bearing. Contractor shall perform a final clearance check all sleeve bearings with plastic gage using the tolerances noted in Attachment D and the clearance recorded on the repair card.
4. On insulated bearings, Contractor shall install the temperature detector in a manner as to prevent bridging or shorting across the insulating material. A rebabbitted bearing that had a temperature detector embedded in the bearing shall be bored to accept a temperature detector in the same location and the replacement detector shall be installed.

5. Contractor shall install lip type seals for open type oil mist lubricated motors on the inboard side of the motor bearing housings whenever possible. A single-shielded type bearing shall be installed where a lip type seal is not feasible, with the shield on the inboard side.

6. Contractor shall use sealed bearings only on motors less than three horsepower that have no provision for greasing. They should not be used in any motor with a rated speed above 1800 rpm.

**e. Motor Half Coupling**

1. Motors with half coupling will normally be sent out with their coupling removed. Contractor shall check and reinstall the shaft coupling as part of the normal repair. Contractor shall check a straight bored coupling for proper interference fit. The minimum acceptable interference is 0.0005 inch per inch of shaft diameter; maximum is 0.001 inch per inch of shaft diameter. If the interference is outside of these limits the Austin Energy plant contact must be notified for disposition. Contractor shall replace a loose coupling. Contractor shall inspect the coupling hub and keyway for cracks and other damage that may require replacement.

2. Contractor shall examine taper bored couplings for mounting wear indicating that the coupling is loose or does not match the shaft taper. Contractor shall replace a loose or mis-matched taper bore coupling. The acceptable radial runout shall be less than 0.002 TIR on the coupling and the face runout shall be less than 0.001 in. Excessive runout shall require replacement and be brought to the Austin Energy plant contact's attention.

**f. Bearing Housing**

1. Contractor shall steam clean and inspect all bearing housings for damage. Cracks in the housing, broken mounting flanges, heat distortion or rubbing from the rotor shall be brought to the Austin Energy plant contact's attention for agreement on acceptable repair or replacement. The acceptable loose tolerance for an anti-friction bearing fit in the housing shall be per ABMA Std. 7, Fit H7. The shell of a sleeve bearing shall seat tightly in the bearing housing with no more than 0.002 in. clearance. Bearing pre-load shall be as specified by the manufacturer. Contractor shall notify the Austin Energy Plant contact for approval of corrective action or replacement if excessive clearance is found.

2. Contractor shall ensure all grease connections are free of dirt and old grease. Contractor shall replace all damaged fittings. Compatible solvents may be used to improve cleanliness.

3. Contractor shall inspect non-contact oil seals for distortion and shaft rubbing. Damaged non-contact oil seals shall be replaced unless the Austin Energy plant contact agrees to reuse the seals. All contact type oil seals shall be replaced.

4. Contractor shall review any damage to the bearing housing, oil seals or improper bearing fits with the Austin Energy plant contact for agreement of an acceptable repair or replacement.

5. Contractor shall bore and sleeve worn bearing housings, and finish machine the I.D. of the new bushing to meet the original manufacturer's specification or conform to the housing mounting fits for the A.B.E.C. tolerance of the particular bearing. The new sleeve must be made of steel and must be secured to the bearing housing of the end bell by three setscrews equally spaced around the housing. The O.D. of the bushing must have a 0.002 in. to 0.003 in. interference fit with the housing bore. Metallizing, welding, and belzona build up are not acceptable for repairing worn bearing housings. Loctite products, punching or shimming the housing are not acceptable for repairing worn bearing housings. Motors that require one or both bearing housings to be insulated from the end bell to prevent circulating eddy currents must be returned to their original insulated condition when they are bored and sleeved. This may be accomplished by boring the housing to the required O.D. and applying a coating of insulating material such as Belzona, epoxy, or phenolic. The insulating material must then be finish machined to the same tolerance as stated above and a steel bushing must be installed in the

insulator. The insulator must be a minimum of 0.0625 in. in thickness. A megger reading should be taken between the steel bushing and the end bell and a reading of > 100 MΩ at 500 volts is required.

6. Contractor shall inspect, and replace as necessary, tubing and connections that are designed to furnish pressurized air to the bearing housing inner oil seal. The bearing housing pressure during a running test must be within +1/4 in. of water pressure. If there is evidence of excessive oil leakage into the motor winding chamber, the problem shall be reviewed with the Austin Energy plant contact.

**g. Motor End Bells and Metal Covers**

1. Contractor shall steam clean and inspect motor end bells for cracks, distortion, and damaged mounting surfaces. When the end bell contains the bearing housing or supports the bearing housing, the fit up to the stator shall be checked for squareness and looseness. The end bell face runout tolerance shall be from 0.003 to 0.005 in. maximum and the babbitt fit looseness, 0.002 in. maximum. Motors of horsepower ratings greater than 900 horsepower that have been rewound or have experienced bearing problems shall be inspected for alignment of the bearing housings by the line bore method. This is accomplished by placing the stator in a horizontal milling machine and recording dial indicator readings on each end of the stator where the end bells attach to the motor. The end bells should then be recorded inside each bearing housing from end to end and on each bearing cap surface. This will indicate if the bearing housings are in alignment with each other. If they are not, corrective action must be taken. Corrective action shall be reviewed with the Austin Energy representative and may include: (1) rebuilding and machining the ends of the stator and the stator base, (2) rebuilding the end bell flanges, (3) boring, (4) sleeving, (5) machining the bearing housings, and (6) boring and machining the bearing caps.

2. Contractor shall inspect the metal housing enclosing the motor fans cracks and for adequate safety screening. The safety screening shall be in accordance with NEMA MG-1 requirements.

3. Contractor shall inspect sheet metal enclosures for dust filters or rain protection for corrosion. Corrosion products shall be mechanically removed, and the housing repainted inside and outside with a metal primer and epoxy finish coat. Holes shall be patched internally with fiberglass felt and epoxy. Dust filter supports shall be flat, and not allow air bypass around an installed filter. The supports shall be repaired as necessary. The sheet metal enclosure shall have an adequate separation of cool inlet air from the warm exhaust air. The sheet metal enclosure shall fit tightly to the main motor frame. Replacement sheet metal parts, where required, shall have 1/8 in. minimum thickness and shall be hot dip galvanized after fabrication.

4. Contractor shall repair or replace any damaged or defective parts found during disassembly and inspection of the motor to meet the original factory specifications and all specifications mentioned in this document. The end movement of the rotor should be measured and recorded following assembly. The end movement must meet the original manufacturer's specifications.

**h. Lubrication**

1. Contractor shall grease the grease type motor bearings using grease specified in the purchase order. Mobil Synthetic SHC 100 is recommended by the PdM motor testing department.

2. Contractor shall fill the oil-lubricated motor bearing housings to the oil level mark. If there is no oil level mark, the Contractor shall contact the Austin Energy plant contact for advice to determine the correct level. A stainless-steel tag shall then be added to mark the proper oil level. At the completion of the running test, the oil shall be drained from the bearing housing and then tagged with a cardboard tag in large lettering - OIL HAS BEEN DRAINED.

3. Contractor shall ensure all oil piping is straight, level and braced to the motor frame on end bells. Brass pipe or fittings are not permitted.

4. Contractor shall ensure oil mist lubricated type motor bearings are pre-lubricated.

**i. Motor Rotor Balancing and Running Vibration**

1. Contractor shall balance motors to a tolerance of 4W/N oz-in., per plane, where W = Rotor Weight in lbs., and N = Max Rotor operating speed in RPM.
2. Contractor shall completely assemble and test all motors after repairs are made. All motors up to the limitation of the test stand must be run at full rated nameplate voltage. Motors shall not be run on an elastic mounting. Motor must be bolted down to the test stand. Motors must be vibration tested with the motor running at full speed and rated voltage. Vibration readings must be taken with an instrument that can display a vibration spectrum with at least 800 lines or resolution. Vertical and horizontal readings are to be taken at each bearing, plus one axial reading at the drive-end. Maximum allowable overall (unfiltered) vibration velocity shall not exceed 0.1 in/sec. Additionally, no frequency component, other than running speed, shall exceed 0.05 in/sec.
3. Casing vibration readings shall not exceed 0.10 IPS in any plane. Casing vibration shall be checked with the motor bolted to a robust steel base, operating at its rated speed. Do not use any vibration isolation or dampening material such as rubber between the feet and steel base.
4. Contractor shall provide vibration data giving a complete spectrum of the readings, as well as a spike energy reading on anti-friction bearings. A copy must accompany the motor repair form (Attachment A) that is submitted to the Austin Energy plant contact in accordance with paragraph 6.E.a.1.

**j. Motor Tests**

1. Contractor shall perform a phase resistance test, with a sensitive (one-tenth of one percent accuracy) resistance bridge, on each phase of a rewound motor greater than 100 HP. The maximum allowable variation between phases is 5%.
2. Contractor shall perform a surge comparison test on rewound motors testing each phase with the results and test voltage recorded. Contractor shall NOT perform a surge test on a reconditioned motor.
3. Contractor shall megohm meter test phase-to-ground each winding that is replaced, reconditioned, cleaned, dried, had its lead wire replaced, or coil connections repaired. A 1000-volt megger shall be used for motors rated 480 volts and below with an acceptable reading being 100 megohms or greater after one minute of application. A 2500-volt megger shall be used for motors rated 2300 volts and a 5000-volt megger for 4160 volts, with an acceptable reading being 250 megohms or greater after one minute of application.
4. Contractor shall apply the megohmmeter for 10 minutes continuously with readings taken at the end of each minute. The polarization index or ratio of the 10 minute to the 1 minute reading shall be 2.0 or greater in order to be acceptable. PI plots must be provided! Magnetic center is to be checked and scribed.
5. Contractor shall test all polyphase motors for proper connections.
6. Contractor shall test motor space heaters connecting to rated voltage and recording the line current.
7. Contractor shall measure a no-load reading of phase currents at normal voltage and frequency on each phase for all completely assembled motors with a maximum allowable variation being 2%. The no-load ammeter readings shall be recorded. A no-load ammeter reading that is greater than 40% of the full load amp rating shall be reported to the Austin Energy plant contact.
8. Contractor shall make a no-load, single-phase check for rotor electrical condition for all completely assembled form wound motors. A single-phase voltage of 30 to 50% of rated

voltage at normal frequency shall be applied to one phase. An ammeter reading of the phase current shall be monitored while the rotor is slowly turned by hand through 360°. A current variation of more than 10% indicates a rotor bar problem that must be brought to the Austin Energy plant contact's attention for approval of further rotor repair or replacement. The current variations shall be recorded.

9. Contractor shall complete all data required by this section on an individual data sheet for each motor that is repaired.

**k. Motor Storage and Care in Storage**

1. Ownership: Contractor, if requested, shall store Austin Energy motors and related equipment ("Property") held pursuant to the following agreement for the exclusive use of Austin Energy. This property shall, at all times, remain the exclusive property of Austin Energy. Contractor agrees to obtain written approval from the appropriate Austin Energy representative prior to interchanging motors and equipment received from different Austin Energy plants. Contractor agrees to execute appropriate Uniform Commercial Code forms and such other documents as may be required by Austin Energy to reflect Austin Energy's ownership of the Property.
2. Identification: So long as the Property remains in possession and control of Contractor, Contractor shall ensure that, at all times, said Property has attached markings clearly identifying Austin Energy's ownership. The supplier shall identify each motor with a unique Austin Energy motor tag number. Contractor shall stamp the number onto a stainless-steel nameplate, physically attached to each motor.
3. Contractor shall provide a clean, well-lit, climate controlled (less than 60% humidity) storage facility.
4. Contractor shall rotate motor shafts once a month, megger test every six months, and motors identified by Austin Energy as critical, test at rated voltage annually.

## 7. REPORTS

A. Final Repair Report

Austin Energy template reports can be found in Section 14, Attachments of this document.

Before final payment can be made, Contractor shall submit a detailed Final Report to the Austin Energy project lead within thirty (30) days of completion of the job. The Final Report shall include, but not limited to shop inspections and test results; parts and materials used; and a complete summary of work performed. Reports shall also include color photos of abnormal component conditions or failures found during inspections, and final assembly measurements, clearances, and relevant drawings. Reports shall be submitted as requested by Austin Energy per project as specified in the project SOW.

## 8. SPECIFIC INVOICE REQUIREMENTS

The City's preference is to have invoices emailed to the applicable Email address listed below or mailed to the below address:

| | |
|---|---|
| | City of Austin |
| Department | Austin Energy |
| Attn: | Tim Youts<br>Tim.Youts@austinenergy.com<br>Sand Hill Energy Center |
| Address | 1001 Falwell Lane |

| | |
|---|---|
| City, State, Zip Code | Del Valle, TX 78617 |

| | |
|---|---|
| | City of Austin |
| Department | Austin Energy |
| Attn: | Ricky Kirkland<br>Ricky.Kirkland@austinenergy.com<br>Decker Creek Power Plant |
| Address | 8003 Decker Lane |
| City, State, Zip Code | Austin, TX 78724 |

| | |
|---|---|
| | City of Austin |
| Department | Austin Energy |
| Attn: | Barrett Story<br>Barrett.Story@austinenergy.com<br>Mueller Energy Center |
| Address | 4901 Lancaster Drive |
| City, State, Zip Code | Austin, TX 78723 |

| | |
|---|---|
| | City of Austin |
| Department | Austin Energy |
| Attn: | Barrett Story<br>Barrett.Story@austinenergy.com<br>Domain District Cooling Plant |
| Address | 3120 Kramer Lane |
| City, State, Zip Code | Austin, TX 78758 |

| | |
|---|---|
| | City of Austin |
| Department | Austin Energy |
| Attn: | Armando Armengol<br>Armando.Armengol@austinenergy.com<br>DCP1 |
| Address | 300 San Antonio St. |
| City, State, Zip Code | Austin, TX 78701 |

| | |
|---|---|
| | City of Austin |
| Department | Austin Energy |
| Attn: | Armando Armengol<br>Armando.Armengol@austinenergy.com<br>DCP2 |
| Address | 410 Sabine |
| City, State, Zip Code | Austin, TX 78701 |

| | |
|---|---|
| | City of Austin |
| Department | Austin Energy |
| Attn: | Armando Armengol<br>Armando.Armengol@austinenergy.com<br>DCP3 |
| Address | 812 W. 2nd Street |
| City, State, Zip Code | Austin, TX 78701 |

| | |
|---|---|
| | City of Austin |
| Department | Austin Energy |
| Attn: | Armando Armengol<br>Armando.Armengol@austinenergy.com<br>DCP4 |
| Address | 500 E Cesar Chavez St. |
| City, State, Zip Code | Austin, TX 78701 |

For questions regarding your invoice/payment please contact the City Contract Manager.

9. **PAYMENT AND COMPENSATION**

Austin Energy will compensate the Contractor on a time and materials basis or lump sum (Firm Fixed) basis for authorized work. Contractor shall commence work only after receipt of a properly approved project work scope from Austin Energy. If Contractor elects to initiate work prior to receiving an approved project work scope, such work is performed and invoiced at Contractor's risk. The City is under no obligation to pay for unauthorized work.

A. Time-and-material

Austin Energy will pay labor rates for each craft category participating in the work and authorized expenses as shown in Price Rate Sheet. Austin Energy will pay for equipment rental, materials,

supplies and parts according to the percentage markup in the Price Rate Sheet. Contractor shall not change percent markup of Blue Book rate or fees due to variances between actual equipment and tools used and anticipated equipment and tools unless approved by Austin Energy in writing prior to work completion. Personnel and craft categories utilized by the Contractor but not included in Price Rate Sheet, shall not be billed unless approved by Austin Energy in writing prior to work completion.

B. Progress Payments

Contractor shall submit before beginning the work a payment schedule that lists specific milestones for the job. Work associated with each milestone must be completed and accepted by Austin Energy in writing prior to invoicing for payment on a per-project basis.

C. Lump Sum Work (Firm Fixed)

Austin Energy reserves the right to require the Contractor to perform certain work on a lump sum (Firm Fixed) basis if Austin Energy determines that this method of payment is in the best interest of Austin Energy and its ratepayers. In such cases, Austin Energy and Contractor shall cooperate to develop a mutually agreed upon lump (Firm Fixed) price for the work. Specific procedures for authorizing project work scopes will be developed with the Contractor after award.

## 10. DESIGNATION OF KEY PERSONNEL

The City and the Contractor resolve to keep the same key personnel assigned to this engagement throughout its term. In the event it becomes necessary for the Contractor to replace any key personnel, the replacement will be an individual having equivalent experience and competence in executing projects such as the one described herein. Additionally, the Contractor shall promptly notify the City and obtain approval for the replacement. Such approval shall not be unreasonably withheld. The Contractor's and City's key personnel are identified as follows:

| | Name/Title | Phone Number | Email Address |
|---|---|---|---|
| City Contract Manager | Jeff Randolph | (512) 322-6121 | Jeff.Randolph@austinenergy.com |
| City Project Manager | Tim Youts | (512) 505-3720 | Tim.Youts@austinenergy.com |
| City Contract Administrator, Procurement Specialist | Julia Finn | (512) 322-6060 | Julia.Finn@austintexas.gov |

## 11. WARRANTY

Contractor shall include equipment, product and labor/workmanship warranties with Final Repair Reports.

## 12. DAMAGES

Contractor shall be responsible for all damages to any Austin Energy worksite and/or equipment that is caused through incorrect usage and/or indirect contact while working on nearby systems/equipment, as well as replacing damaged equipment that is unable to be repaired.

## 13. SAFETY AND SECURITY

A. Contractor shall attend a safety orientation provided by Austin Energy.

B. Contractor and subcontractors shall follow Austin Energy safety rules while on the work site.

C. Contractor and subcontractors shall adhere to all City of Austin/Austin Energy guidelines.

14. **ATTACHMENTS**

A. Attachment A - Electric Motor Repair Form

B. Attachment B - Stator Hot Spot Check

C. Attachment C - Vacuum Pressure Impregnation Treatment

D. Attachment D - Electric Motor Sleeve Bearing Clearance

**CITY OF AUSTIN**
**PURCHASING OFFICE**
**SCOPE OF WORK**
**LARGE MOTOR REPAIR FOR AUSTIN ENERGY**
**SOLICITATION NUMBER: RFP 1100 SMB3010**

**ATTACHMENT A** (Page 1 of 2)

**ELECTRIC MOTOR REPAIR FORM**

DATE:_____ MOTOR ELN#:_____ MOTOR TAG#:_____

PLANT CONTACT:_____ PHONE #:_____

WO#:_____ MSO#:_____ MANUFACTURER:_____

H.P:_____ VOLTS:_____ F. L. AMPS:_____RPM:_____ FRAME:_____

ENCLOSURE: _____SF:_____ UL LABEL?: YES ___ NO ____

SERIAL#:_ MODEL #:_____

OIL MIST SETUP?: YES _____NO _____INPRO SEAL YES _____ NO_____

REASON FOR SERVICE:_____

_____

_____

REPAIR SHOP:_____

MOTOR CONDITION WHEN RECEIVED:_____

INITIAL MEG. READING_____ @ _____VOLTS

DRIVE END MECH. CONDITION _____

OPPOSITE DRIVE END MECH. CONDITION:_____

REPAIR WORK DONE:_____

_____

FINAL INSPECTION DATA: POLARIZATION INDEX: @ _____VOLTS

MEGGER READING:_____ @ _____ VOLTS

WINDING RESISTANCE _____ A TO B _____ A TO C _____ B TO C

MOTOR SPACE HEATER AMPS:_____

**ATTACHMENT A** (Page 2 of 2)
**ELECTRIC MOTOR REPAIR FORM**

SURGE COMPARISON TEST: PHASE A TO B _____ OK _____ NOT OK @ _____ VOLTS

PHASE A TO C _____ OK _____ NOT OK @ _____ VOLTS

PHASE B TO C _____ OK _____ NOT OK @ _____ VOLTS

NO LOAD CURRENT: _____ A PHASE _____ B PHASE _____ C PHASE

NO LOAD PHASE CHECK: PHASE CURRENT VARIATION _____ @ _____ VOLTS

MOTOR OPERATIONAL TEST AT FULL SPEED AT _____ VOLTS

VIBRATION READINGS:

DRIVE END: VERTICAL: _____ IPS HORIZONTAL: _____ IPS

OPPOSITE DRIVE END: VERTICAL: _____ IPS HORIZONTAL: _____ IPS

**CITY OF AUSTIN**
**PURCHASING OFFICE**
**SCOPE OF WORK**
**LARGE MOTOR REPAIR FOR AUSTIN ENERGY**
**SOLICITATION NUMBER: RFP 1100 SMB3010**

**ATTACHMENT B** (Page 1 of 2)

## STATOR HOT SPOT CHECK

The stator core iron shall be tested in accordance with the following, (or by using an Austin Energy approved core loss tester) to determine whether there are shorts between laminations. The method is to wind a coil through the bore and around the outside of the frame. When the coil is energized, a magnetic field will be set up in the core. If it is bad, the damaged area should heat much faster than the rest of the core. Cores can be tested with a winding in them as long as the leads are separated, and well insulated and delta connections are opened and insulated. For personal safety the core should be solidly grounded.

As a necessary safety precaution, do not probe the iron or enter the core with the cable energized as voltage is generated between lamination. Metallic objects, i.e., bolts or clamps, should not be allowed to contact the lamination during the test.

Contractor shall use the following as a guide to calculate the number of cable turns and the current required.

1. Measure stator core length, core depth, stator core bore diameter and slot depth (in inches).
2. Effective stator core length (C.L.) is obtained as follows:

   C.L. = measured stator core length x 0.80
3. To determine core depth (C.D.):

   Core depth is measured from the bottom of the coil to the core's outer circumference.
4. To determine effective core cross sectional area:

   Core area = (C.L.) x (C.D.)
5. To calculate estimated voltage per turn:

   Volts per turn = 0.26 x core area
6. To determine the number of cable turns to be placed through the stator core:

   Turns = Supply voltage/volts per turn
7. To determine effective stator core diameter (E.C.D.)

   Stator core inside bore diameter = C.I.D.

   Slot depth = S.C.

   Core depth = C.D.

   E.C.D. = C.I.D. + C.D. + 2 S.C.
8. To determine ampere turns (A.T.) required:

   A.T. = 45 x E.C.D.
9. Current required:

   Amperes: (A.T.)/Turns

**ATTACHMENT B** (Page 2 of 2)

**STATOR HOT SPOT CHECK**

10. Cable size:

Be sure cable size to be used has a nominal current rating of not less than the current required to conduct the test.

During testing a uniform core temperature of approximately 80°F to 100°F rise would indicate sufficient flux to produce hot spots. Changing the number of cable turns may be required if the temperature is less, remove turns (2 at a time) and again observe the temperature. If it is greater, add turns to reduce the current.

The test must be constantly monitored. With sufficient flux circulating hot spots may show up very rapidly resulting in further core damage if the testing is not stopped in time.

**CITY OF AUSTIN**
**PURCHASING OFFICE**
**SCOPE OF WORK**
**LARGE MOTOR REPAIR FOR AUSTIN ENERGY**
**SOLICITATION NUMBER: RFP 1100 SMB3010**

**ATTACHMENT C** (Page 1 of 1)

**VACUUM PRESSURE IMPREGNATION TREATMENT**

VPI - Vacuum Pressure Impregnation treatment for form windings of electrical motors.

1. Preheat for 3 Hours at 250 degrees F.
2. De-aerate Resin in Reservoir: 1mm.
3. Cool Stator: 70-100 degrees F.
4. Place Stator in Chamber and pull Vacuum: 1mm.
5. Impregnate and hold Vacuum: 1 hour.
6. Pressure Chamber: 80-100 psi for 1 hour.
7. Depressurize and drain.
8. Cure: 5 hours at 300 degrees F
9. Repeat Process

Supplied by Contractor

Approved by Austin Energy

**ATTACHMENT D** (Page 1 of 1)
**ELECTRIC MOTOR SLEEVE BEARING CLEARANCE**
**DECKER CREEK POWER STATION**

(All are Diametral Clearances)

| Nominal Diameter Inches | Minimum Clearance Inches | Maximum Clearance Inches |
|---|---|---|
| 1 | 0.004 | 0.005 |
| 1-3/4 | 0.004 | 0.005 |
| 2 | 0.004 | 0.005 |
| 2-1/ | 0.004 | 0.005 |
| 2-1/2 | 0.005 | 0.006 |
| 2-3/4 | 0.006 | 0.008 |
| 3 | 0.006 | 0.008 |
| 3-1/2 | 0.007 | 0.009 |
| 4 | 0.008 | 0.010 |
| 4-1/2 | 0.009 | 0.011 |
| 5 | 0.010 | 0.012 |
| 5-1/2 | 0.011 | 0.013 |
| 6 | 0.012 | 0.014 |
| 7 | 0.014 | 0.016 |
| 8 | 0.016 | 0.019 |
| 9 | 0.018 | 0.022 |
| 10 | 0.020 | 0.02 |