Hannum Substation
Protection Replacement

REVISED PER ADDENDUM #1

JULY 2010

City of Anaheim
Public Utilities Department – Substation/Automation Division
201 S. Anaheim Blvd., Suite 701
Anaheim, CA 92805

HANNUM SUBSTATION
PROTECTION REPLACEMENT

The City of Anaheim Public Utilities Department, Substation/Automation Division (City) requests a bid proposal for services of a switchgear fabricating vendor (Vendor) to replace the old protection system and provide, deliver, install, configure, test, and place into service the new protection system for Hannum Substation located at 435 N. Gilbert St., Anaheim, California.

A. Scope of Work

1. This Specification establishes the requirements
    - Remove existing old relays, relay racks, cable tray, AC and DC panels, SCADA RTU cabinets, current and power factor transducer panel, and all equipments inside,
    - Remove all old existing wires in the substation, including but not limited to AC, DC, control, communication, current, 69 kV potential, and indication wires,
    - Provide and install new cable trays to replace the old cable trays and place the communication cables from the old cable trays to the new cable trays
    - Provide and install one AC panel, two DC panels, and raceways for AC and DC panels in the control room to replace the old AC and DC panels; and cut square holes on the ground to run the AC and DC wires to the underground vault to reach relay racks and the switchyard,
    - Provide and run all new cables inside the substation to replace the old/existing cables, including but not limited to AC, DC, control, communication, current, 69kV potential, and indication wires,
    - Provide and run 1.25” PVC conduits for the 69kV potential wires from the 69kV bus PT to the nearby cable trench,
    - Provide and install the two rows of total sixteen 19” relay racks with 3.65” channel separation to replace the old/existing relay racks and panels,
    - Provide and install new microprocessor type relays, test switch and required equipment to replace the old/existing relays on the two rows of old/existing 19” relay racks and panels,
    - Remove the existing SEL1102 Computer Platform, Ethernet switch, GPS Clock, LCD monitor, fiber patch panel, and JungleMux from the old existing relay racks and re-install on the new/replacement relay racks,
    - Relocate, as necessary, existing equipment in the control room for construction convenience, such as Test Power, inverter, etc.,
    - Remove the temporary two PTs and connected safety switch, power cables, grounding wires, control wires, and conduits at the 12kV switchgear bus tie position,

- Repair and restore the control room after the construction, including but not limited to broken floors, ceiling, wall, etc. Clean up and remove all debris. Return the facility to its normal and clean working condition.

All work shall be in accordance with the attached elevation drawings, elementary diagrams, wiring diagrams and other drawings, and Bill of Material. The relays, transducers, test switches, and all required equipment shall be mounted on pre-fabricated 19" relay racks according to the attached drawings. (See attached drawings)

2. Drawing H5381 and relay rack elevation drawings, H5732, H5733, H5734, H5735, H5736, H5737, and H5738 can be used for a general description to the relay replacement project. (See attached)

3. The new Chatsworth Product Inc. racks replacing the old relay racks and panels shall be a 19" rack, 8'-0" high, self-standing, 3" channel, Aluminum, and complete with two base angles, two top angles, bolts and nuts, four anchor bolts for bolting to the floor, and top support bracket(s). All racks are separated by a 3.65" plate covered spacer. Any and all new/replacement rack installation designs shall include mounting (bracing) sufficient to withstand a Zone 4 earthquake.

   The work also includes but is not limited to the removal of the old relay racks and panels, AC and DC panel, SCADA RTU Cabinet, and all equipments within it; and the replacement of all the related control cables, in accordance with the drawings and instructions of the Project Engineer. All material removed shall be transported by the Vendor to the City's Utility Service Center (USC) located at 901 E. Vermont Street, Anaheim at least once a week.

4. The scope of work includes but is not limited to pulling and termination of cables among relay racks, battery, battery charger, AC and DC panels, and 12kV and 69kV switchyard facilities, as shown on the attached drawings.

5. The old/existing wiring of all relay racks shall be replaced for the proper operation of the system according to the elementary diagrams and the wiring diagrams.

6. Any relay panel and racks that are removed shall be transported by the Vendor to the City's Utility Service Center (USC) located at 901 E. Vermont Street, Anaheim. In this regard, the Vendor should note that the Control House or any other area in the substation cannot be used as the storage for these relay panels/racks; therefore, the shipment of each removed panel/rack to the USC should be done at least once a week.

7. The new/replacement relay racks shall be strongly braced to prevent wobbling, twisting or resonance. See item A.3.

The new/replacement racks shall be the same as the existing racks in quality, thickness, look, and color. It is the responsibility of the Vendor to make all necessary measurements for the fabrication of racks.

8. The Vendor shall be responsible for replacing all control and data cables, as shown on the drawings.

9. If the City requires canceling a scheduled outage, the Project Engineer or the Field Checker will make every effort to inform the Vendor about such cancellation, during the normal working hours of the day prior to the scheduled outage. The Vendor, in this case, will be informed via e-mail or telephone. Additional time will be given for rescheduling the outage, but no extra charges to the City will be allowed.

10. The setting/programming of the relays and SCADA equipment is **not** included in the Scope of Work and is performed by the City's Test Technicians.

11. The work includes the furnishing of all material and equipment (except City-furnished materials), machinery, tools, and other means required to complete the Project in strict accordance with the Specifications and Drawings. All the material and equipment provided by the Vendor shall get approval by the Project Engineer and Field Checker before purchasing and installing.

12. Whenever there is a discrepancy between the elementary and the wiring diagrams, the elementary diagrams shall be the leading guide.

    The Vendor shall perform complete work regardless of possible errors and omissions in the Drawings, manufacturer (equipment) drawings, Bill of Material, Cable Schedule, and this Specification. Miscellaneous small material items that are missing shall be furnished by the Vendor at no additional cost to the City to produce a complete working system in conformity with the intent of the work. The Project Engineer shall have final authority in determining the Vendor's responsibility to complete all work in conformance with the Drawings and Specifications. The Project Engineer shall have the final authority to direct the contractor to correct any and all work that has been improperly performed, at no additional cost to the City.

13. The following shall be considered in modification and manufacture of the racks:

    a. Insulated ring-tongue terminals shall be used for secondary wiring. Spade, slotted spade, flagged spade, and hooked terminals are not acceptable. Ring-tongue terminals shall be sufficiently strong to prevent their

breakage under conditions of vibration inherent in the equipment in which they are installed.

b. The following insulated ring-tongue terminals distributed by American Pamcor Incorporated (API), or City approved equal, are acceptable for stranded wire; AMP PIDG or AMP Plasti-Grip are typical.

c. Terminals must have insulated ferrules. To assure positive electrical connections, and to avoid damage to the ferrule, it is mandatory that the proper terminals and crimping tools be used for each wire size in accordance with the installation instruction.

d. The wiring shall be no smaller than No. 12 AWG, stranded copper for control and No. 10 AWG for current leads except where otherwise specified. All wires shall meet the requirements of the "Control and Secondary Wiring" subsection of the latest revision of ANSI Standard C337.20. In addition to the types of wires given in this standard publication, wire insulated with cross linked thermosetting polyethylene insulation suitable for 600 volt operation (ICEA Pub. No. S-66-524) is approved by the City. All wires used in the racks, panels, and enclosures shall be clearly and properly tagged with wire destination included in the tagging. The material and procedure are subject to the City's approval.

e. Miscellaneous accessory equipment not shown on the drawings and Bill of Material but required for proper operation of the relays, SCADA, or by the intent of the specifications such as small resistors, terminal blocks, etc. shall be furnished by the Vendor and mounted on the rear of the rack together with necessary brackets, wiring, mounting, etc.

f. Terminal blocks shall be provided for all connections leaving the relay racks and shall have marking strips approved by the City, to accommodate the City's internal number - identification system as well as that of the manufacturer. Terminal blocks shall have screw terminals, barriers between terminals, high flame-retarding properties, mechanical toughness and high electrical strength. Each conductor shall be identified at each end with "Brady Quick Labels".

g. CT leads shall be directly run to relays with no splices. Each CT secondary shall be grounded at one location (per

the drawings) and independently of all others to the ground bus.

h. The City will provide separate SEL-587 and SEL-551 relays for the project. It's the Vendor's responsibility to provide the necessary parts, which are made by Schweitzer Engineering Laboratories, to mount the relay pair of SEL-587 and SEL-551 on racks. The mounted relay pair of SEL-587 and SEL-551 shall be stable enough to withstand a Zone 4 earthquake.

14. Nameplates:

Nameplates are not listed in the Bill of Material, but they are furnished by the Vendor.

Nameplates for all new/replacement devices shall be provided with laminated plastic or Formica type not less than 1/16" thick. The City will furnish a display and tabulation of required nameplates. Designation shall be machine engraved in upper case letters and shall be centered on the nameplates. The minimum requirements for nameplates shall be per ANSI C20.2 Section 6.1.4.1.

B. Installation

1. Hannum Substation is an energized and operating distribution substation with primary voltage of 67kV and secondary voltage of 12.47kV. The substation will remain in operation during the process of this project. The Vendor shall provide one or two temporary relay racks to maintain the substation protection system full operation and transfer smoothly to the new/replacement protection system. The Public Utilities Department will furnish a qualified substation test technician to monitor the City's energized electrical facilities at the site during the installation. No field work shall be performed by the Vendor's crews without the presence of the City's Test Technician.

Substation test technicians work schedule is from 7:00 a.m. to 3:30 p.m., Monday through Friday. The City Test Technician will report to the site at 7:00 a.m. Any after hour works, overtime, for the test technician required by the Vendor shall be paid by the Vendor. City Test Technician overtime work required by the City is the responsibility of the City. The City's intention is to maintain the overtime hours as minimal as possible.

2. The City cannot de-energize all lines at the same time for the installation of the new/replacement racks. The work shall be done in phases and in close coordination with the Project Engineer, Systems Operations and Field groups. A minimum of ten working days is required for scheduling any outages before the actual work shall be started.

In addition, in the case of prolonged amount of time in between planned outages, or between different phases of work, which could be due to system requirements, City field crew availability, or any other reason, the Vendor shall store all material at the Vendor's location at no expense to the City until work resumes.

3. The Vendor will be responsible for working around the existing energized electrical equipment and maintaining safe working and operating conditions. Any damage to the existing facilities will be restored by the Vendor to its original condition without any cost to the City.

C. Drawings and Installation Data

1. Drawings and Installation Data Furnished by the City:

a. Drawings of major City-furnished devices shall be provided to the Vendor, when available. The Vendor shall obtain the cutout details and mounting instructions of the devices from the manufacturers of those devices if they are not furnished by the City.

b. Erroneous information, missing details, and omissions on the Drawings, Bill of Material, and Cable Schedule furnished to the Vendor shall not reduce the Vendor's responsibility to install said equipment in complete working order. The Project Engineer's interpretation of the Vendor's responsibility for a complete installation of said equipment shall be final. The City and Project Engineer shall not be responsible for equipment drawings that are not available due to acts beyond their control (e.g., shipping delays, etc.).

c. It's the Vendor's responsibility to compare and verify the drawings to the real structures and circuits in the field. If the drawing doesn't match the real substation, the Vendor shall mark up and correct the drawing and report to the Project Engineer immediately at no additional cost to the City.

D. Interpretation of Documents after Contract Award

1. Report any errors or ambiguities in the Specifications and/or Drawings to the Project Engineer as soon as detected. The Project Engineer shall interpret the intended meaning of the Specifications and his/her interpretation(s) shall be final.

2. If any problem(s) arises during the installation that is not covered by these Specifications, the Project Engineer shall be consulted immediately and shall render a decision on the problem(s).

E. Manufacturer's Specifications and Instructions

1. All manufactured material, products, equipments, or the like shall be installed or applied in accordance with the manufacturer's instructions, directions, or specifications.

2. Any deviation from the manufacturer's printed recommendations shall be explained and acknowledged in writing by the manufacturer involved as correct for the circumstances. The Vendor shall be held responsible for all installations contrary to the manufacturer's recommendations. If any item of material is found to be installed out of accordance with the manufacturer's standard, the Vendor shall make all changes necessary to achieve such compliance. If the drawings, specifications and/or the Engineer decisions are contrary to the manufacturer's recommendations, the City's Project Engineer shall be contacted immediately and a decision will be made.

F. **Work Quality** - **REVISED PER ADDENDUM #1**

1. Work shall be performed by workers, skilled and experienced in the work involved. All work on this Project shall be performed in accordance with the best practices of the various trades involved and in accordance with the Drawings and these Specifications.

2. The Project Engineer reserves the right to reject any material and work quality which is not considered to be up to the highest standards of the various trades involved. The Project Engineer shall be responsible for the determination of those standards. Such inferior material or work quality shall be repaired or replaced as directed, at no additional cost to the City.

3. The Vendor shall warranty the full operation of the new/replacement protection and SCADA system hardware for a period of one year after the completion of this project.

4. All elements of substation protection and SCADA Work require specific skills and training to safely complete the installation of the protection and SCADA equipment, cables, connections, testing, etc. Supervisors of the Work and the craft person(s) performing the Work shall be certified journey level, thoroughly trained in the skills and knowledge of the tasks and operations necessary to complete the Work either energized or de-energized.

ADDED

5. The Vendor shall submit proof that all craft persons have satisfactorily completed skills and safety training in all areas related to his/her job classification, which may include, but not be limited to: confined space safety, lockout/clearance procedures, grounding safety, fall protection, etc. Craft person(s) shall also have experience working on electric utility systems, specifically on the utility side of any metering equipment, subject to California Public Utilities Commission (CPUC) safety standards, including General Orders 95 and 128.

ADDED

6. Failure to have qualified supervision and/or craft persons performing the Work will result in suspension of the Work until qualified personnel are certified and the City authorizes the Work to resume. No additional costs to the City shall be imposed due to the delays for lost time associated with unqualified personnel attempting to perform the Work

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G. Material

1. City-Furnished Material (If any)

a. Material furnished by the City shall be transferred to the Vendor at the City's Utilities Service Center (USC) located at 901 E. Vermont Street, Anaheim, California or at Anaheim West Tower located at 201 S. Anaheim Blvd., Anaheim, California, based on the City's convenience.

b. The Vendor shall 1) accept all the material at the delivery point specified; 2) check all material to satisfy itself that the material delivered is in good condition and the quantities are correct; and 3) execute a receipt for all material accepted from the City.

c. All material furnished by the City shall meet minimum industry specifications. All material which does not meet specifications or is broken or damaged shall be culled by the Vendor and a report made to the Project Engineer as to the number culled and reason for culling.

d. After the material is accepted as specified on the attached bid price sheets, the Vendor shall become solely responsible for their care, storage, and protection. In the event material are damaged, lost, stolen, or destroyed by any cause whatsoever after the Vendor has received for them, repair or replacement shall be entirely at the Vendor's expense.

e. The Vendor shall load, unload, haul, and store all material furnished by the City. The Vendor shall be responsible for any damage.

f. If the City fails to deliver the material set forth on the "Bill of Material" ordered by the City on the date specified on the "List", the Vendor's sole remedy and compensation shall be an extension of time not greater than the actual delay. Any such time extension must be requested in writing by the Vendor immediately.

g. All material furnished by the City in excess of those actually used in the installation of racks shall be returned to the City's designated location together with a complete list of all material returned, unless otherwise specified by the Project Engineer. The return of excess material to the City shall be at the Vendor's expense.

2. Vendor-Furnished Material

a. The Vendor shall purchase all material (other than City-furnished material) outright and not subject to any conditional sales agreement, bailment, lease, or other agreement reserving unto the seller any right, title, or interest therein. All such material shall become the property of the City when erected in place.

b. The identification, purchasing, and delivery of all material (except City-furnished material) are the responsibility of the Vendor. Contract extension days will not be considered for Project delays caused by late delivery of Vendor-furnished material.

3. Material Storage

All material shall be stored so as to be protected from detrimental effects of the elements, theft, and damage.

H. Substitutions

Should any materials specified on the price sheets not be available, the Vendor shall submit proposed alternates to the City's Project Engineer for written approval **PRIOR** to the purchase of such alternates.

I. Testing

1. After the completion of the installation on each rack the Vendor shall be required to perform all tests as listed in Appendix "A".

2. Testing of the equipment shall be provided as indicated under the description of the various material, the supplier's instruction manual, and as further outlined in these Specifications. If the material is damaged, either in shipment or during installation, additional tests shall be made as recommended by the manufacturer and as specified by the Project

Engineer. All the material shall be given complete mechanical operation tests to ensure proper operation.

3. The Vendor shall be responsible for coordinating all tests, including the final checkouts and energization. If the Vendor schedules a test requiring the City and/or Project Engineer, the Vendor shall notify the City and/or Engineer at least forty-eight (48) hours prior to the original test time.

J. Coordination, Installation Schedule, and Reports

1. Coordination

a. The Vendor shall be required to attend a pre-installation conference with the Project Engineer, and any other parties involved with the Project. The Vendor's superintendent (field man-in-charge) shall attend the conference. At the conference the Vendor shall present an installation plan including but not limited to the following:

i. Installation sequence, methods, and equipment to be used in all phases.

ii. Installation schedule showing all activities for the entire Project.

b. The Vendor shall be required to attend weekly coordination meetings with the City of Anaheim representatives to schedule work for the next week to coordinate his work with system requirements.

K. Hygiene, First Aid, and Safety

1. The Vendor agrees to comply with all safety provisions for the Project, including the applicable requirements and regulations of MSHA, OSHA, and the state concerning health and safety on construction projects.

2. In the event of the occurrence of a situation wherein life and/or valuable property are in apparent imminent danger, the Vendor is hereby authorized without further special instructions from the City to act at its own discretion to prevent injury to persons and/or damage to property.

3. The Vendor shall furnish to the City detailed written reports of all injuries occurring on the job.

4. The Vendor bears sole responsibility under the law for the safety of its own personnel and for persons entering the job site as agents or visitors of the Vendor.

L. Submittal of Drawings

1. A master set will be kept at the substation control room and changes will be made to the master set throughout the duration of the project. This will be kept separate from the working set of prints.

2. Upon completion of the work, the Vendor shall provide the City with one set of as-built mark-ups within seven (7) working days of project completion. Vendor's final payment will not be released until the City has received the as built mark-ups. Upon receipt of the Record Drawings the City will review it. If the drawings are found to be incomplete or inaccurate, they will be returned to the Vendor. The Vendor shall correct and return them to the City within five (5) working days after receipt of the Record Drawings.

M. Progress Payments:

Progress payments to the vendor for materials and services will be as follows:

Phase I, 25%: When Vendor completes the fabrication and pre-wiring of all required relay racks and upon the City's full acceptance and approval of all fabricated relay racks.

Phase II, 30%: When 69KV Protection System has been installed, brought into error-free operation and after City Project Engineer's final acceptance.

Phase III, 30%: When 12KV Protection System has been installed, brought into error-free operation and after City Project Engineer's final acceptance.

Final, 15%: Final payment upon 100% completion and final acceptance of all required work by the City's Project Engineer and upon receipt of as built mark-ups.

NOTE: Vendor is to include itemized material and labor costs with invoices.

APPENDIX "A"

The following tests and checks are required by the Vendor:

19" Rack Mounting

- Check mounting of relays and other devices on the racks.
- Refer to all installed Relay Instruction Manuals for the proper installation of the relays.
- Check that the ground terminals are connected to the frame ground.
- Check that the relay frame is connected to the ground bus in the relay room.

Wiring

- Check DC circuits at 67 volts plus or minus to ground on the SEL relay terminals (positive and negative).
- Verify any cutout switches power on and power off.
- Check that all connections are tight and all crimps tight.
- Check that all wiring are coded with appropriate identification wire markers.
- Check neatness and accessibility, free of sharp intrusions, i.e., wire strung too tightly across sharp corners, etc.
- Check that all terminals are insulated and proper size for wire and terminal blocks.
- Check wiring SIS #12 AWG, 64 strand switchboard wire gray.

Alarms

All alarm circuits shall be tested and proven by the Vendor.

Current Circuits

Test push secondary current and prove A-phase, B-phase, and C-phase at all devices in scheme with correct magnitude and polarity, including metering devices. Verify correct magnitude and polarity at relays and meters.

Voltage Circuits

Prove station voltage B1, B2, and B3 at all devices in the scheme with correct rotation and magnitude. Verify correct magnitude and polarity at relays and meters.

Test Reports

The Vendor shall provide a test report for each relay to document all test processes and results for the City's review and approval. The Vendor shall make any corrections as necessary at no additional charges or costs to the City.

Additional Tests Required or Recommended by the Manufacturer

Refer to the Testing and Troubleshooting section of the SEL Relays and all other equipment instruction manuals.

Trip test

Push secondary current and voltage and prove circuit breaker trips at all in-service or enabled elements of the relay, i.e., each phase and neutral overcurrent, negative sequence, and reclosing circuit.

Note: The observing Test Technician has the final responsibility for testing procedures and may direct further testing, if relay scheme fails to perform as required.

The final trip test is to be performed by the City at the circuit breaker current transformer before releasing the new/replacement relay schemes for service.