

# Addendum #1



## Project Information

**Project Name:** WTRF Power Generation

**Bid Number:** F23-7-066

**Date:** August 23, 2023

**Project Manager:** Cadee Oakleaf

## Addendum Questions

**Question #1** Is it preferred the procurement be between the City and vendors directly or is it preferred to go through an electrical contractor?

**Answer** There are three alternatives that may be proposed on. Vendor may elect to propose on any of the alternatives as described in Section II.A. Scope of Services in the RFP document. No alternative has been identified as the preferred alternative. Either procurement between the City and vendors directly or through an electrical contractor may be included under the different alternatives, based on how they are included in the proposals.

**Question #2** Are there any size restrictions for the enclosure?

**Answer** Generator enclosure shall be no more than 42'x11'.

**Question #3** Are there any size resurrections for switchgear Nema 3R walk in enclosure?

**Answer** Switchgear dimensions shall be approximate 21'x14'

**Question #4** What is the fuel tank capacity requirement? 6500g or 48 hours at full load?

**Answer** 48hrs at full load minimum

**Question #5** Is the generator required to be rated at 2000 kw at 5,000 ft or nominal 2000kw?

**Answer** 2000KW nominal, generator derating has already been taken into account

**Question #6** Will Square D be considered for the switchgear frame manufacturer? Are only Eaton components acceptable for the MV switchgear ?

**Answer** Eaton is required for the new switch on the existing lineup and for the ATS modifications in the existing switchgear in the blower building since they are both Eaton lineups. New switchgear PSWG-ATS is open to any manufacturer that meets the specifications.

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## Addendum Questions

**Question #7** Specification for the MV Switchgear 226-13-13 was not included in the RFP. Would it be possible to provide the specification in the addendum?

**Answer** See attached Specification Section 26 13 13 - MEDIUM VOLTAGE METAL-CLAD SWITCHGEAR (Attachment 1).

**Question #8** The Generator Cabinet shown and Specified in Section 26-24-13 calls for a Switchgear "Quick" Connect style for a mobile generator. Trystar and Asco are the only two specified, after contacting both manufacturers, it has been confirmed that neither Manufacturer makes what is Specified as they typically only make low voltage versions. Provide a Part Number for a Connection Cabinet to use or allow a Cooper Sec-TER in which information has been attached.

**Answer** Specification section 26 24 13 - MEDIUM VOLTAGE GENERATOR QUICK CONNECTION SWITCHGEAR, Section 2.3 shall be updated to list only ATP, or equal. (Attachment 2)

A standard manufacturer cut sheet from APT is provided for reference only (Attachment 3).

## SECTION 26 13 13 - MEDIUM VOLTAGE METAL-CLAD SWITCHGEAR

### (PRE-PROCUREMENT PACKAGE)

#### PART 1 -- GENERAL

##### 1.1 THE SUMMARY

- A. The MANUFACTURER shall provide medium voltage metal clad switchgear, complete and operable, in accordance with the Contract Documents.
- B. The switchgear shall be provided by the SUPPLIER of the Standby Generation system to ensure proper coordination between generator and switchgear.
- C. The requirements of Section 26 00 00 - Electrical Work, General, apply to the WORK of this Section. Coordinate this equipment with the Generator supplied in Section 26 32 13 - Standby Power Generation.
- D. The requirements of Section 01 11 00 – Summary of Work (Standby Power Generation) apply to this Section.

##### 1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

###### A. Commercial Standards

- 1. IEEE C37.6, Standard for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis – Preferred Ratings and Related Capabilities for Voltages Above 1000 V
- 2. IEEE C37.04, Standard Rating Structure for AC High-Voltage Circuit Breakers (includes supplements C37.04A, C37.04BI)
- 3. IEEE C37.20.2, Standard for Metal-Clad Switchgear
- 4. IEEE C57.13, Standard Requirements for Instrument Transformers
- 5. IEEE C37.90, Standard for Relays and Relay Systems Associated with Electric Power Apparatus

###### B. Codes

- 1. ANSI/NFPA 70 National Electrical Code
- 2. NFPA 110 Standard for Emergency and Standby Power Systems

###### C. Reference Specifications

- 1. Section 01 11 00 – Summary of Work (Standby Power Generation)
- 2. Section 01 33 00 – Submittal Procedures
- 3. Section 01 33 17 - Structural Design, Support and Anchorage
- 4. Section 01 60 00 – Products, Materials, Equipment, and Substitutions

- 5. Section 26 00 00 – Electrical Work, General
- 6. Section 46 01 00 – Equipment General Provisions

### 1.3 SYSTEM DESCRIPTION

- A. Outdoor, protected aisle, metal clad switchgear intended for use on 12.47 KV, 3-phase 3 wire grounded, 60-Hz system. Switchgear shall be rated as indicated on drawings and have removable-element vacuum circuit breakers. Enclosures and circuit breaker(s), as a unit, shall have a basic impulse rating of 95 KV. Switchgear, including circuit breakers, meters, and relays, shall be factory tested.
- B. Equipment shall be completely factory-built, assembled, wired, and tested. All equipment and components shall be of new construction.

### 1.4 MANUFACTURER SUBMITTALS

- A. MANUFACTURER submittals shall conform to the requirements of Section 26 00 00 Electrical Work, General, Section 01 33 00 – Submittal Procedures.
  - 1. Engineering data to include voltage, current, and short-circuit ratings.
  - 2. Outline dimensions to include available space for conduits, stress cone type cable terminations, and cable supports.
  - 3. Certified copies of all Type (Design) and Verification Test Reports on a specified product.
  - 4. Copies of installation, operation and maintenance procedures.
  - 5. Operation and maintenance data based on factory and field testing, operation and maintenance of specified product.
  - 6. Certified factory test reports
  - 7. Final factory drawings shall be provided in an electronic format as well as hardcopy format. Provide electronic files in DXF CAD format.
  - 8. Automatic Transfer Controller and description of operation.

### 1.5 QUALITY ASSURANCE

- A. General: All materials shall be tested and inspected in accordance with Section 26 00 00 and the following requirements.
- B. Manufacturer shall have specialized in the manufacture and assembly of medium voltage metal clad switchgear for a minimum of 25 years.
- C. Manufacturer's Certificate of ISO 9002 Compliance.
- D. Switchgear shall be qualified for use in seismic areas as defined in Section 01 33 17 - Structural Design, Support and Anchorage

## 1.6 PROJECT CONDITIONS (SITE ENVIRONMENTAL CONDITIONS)

- A. The switchgear shall be designed for continuous duty service in the environmental conditions in Section 26 00 00.

## 1.7 MAINTENANCE AND GUARANTEE

- A. The MANUFACTURER shall submit recommended spare part lists.
- B. Special tools and equipment for system and equipment maintenance shall be furnished.
- C. The equipment provided under the pre-procurement effort shall be warrantied by the MANUFACTURER for two (2) years in accordance with Section 46 01 00 – Equipment, General Provisions.
- D. The MANUFACTURER shall guarantee that the furnished equipment shall meet the requirements specified herein and specified elsewhere in the Contract Documents.

## PART 2 -- PRODUCTS

### 2.1 GENERAL

- A. Switchgear shall consist of breakers, transfer controls, generator controls and auxiliary units, as indicated on drawings, assembled to form a rigid, self-supporting, metal-enclosed structure. The switchgear shall be provided in compliance with this Specification and with all applicable NEMA and ANSI standards. All major components shall be manufactured by **Eaton, Schneider, ABB**, or equal, establishing one source of responsibility for the equipment performance and assuring high standards in quality, coordination, reliability, and service.
- B. Switchgear shall be **Eaton's VCP-W Metal- Clad Switchgear, Schneider's HVL Switchgear, ABB's Advance Medium Voltage Metal- Clad Switchgear**, or equal.
- C. Switchgear assembly shall be UL listed and be labeled where possible.
- D. The bus bar(s) shall be tin-plated copper and fully insulated; copper shall be silver plated at joints. A full-length tin-plated copper ground bus bar shall be provided at the bottom of the switchgear enclosure.
- E. For rigidity during fault conditions all connections to roll-out potential transformer trays and control power transformer trays shall be rigid bus bars insulated to full voltage rating of switchgear assembly.
- F. Circuit breaker compartments shall be designed to house 15KV removable-element circuit breakers. Stationary primary disconnect contacts shall be silver-plated copper. Grounded metal safety shutters shall isolate all primary connections in compartment when breaker is withdrawn from connected position.

### 2.2 SERVICE

- A. The switchgear shall be suitable for operation at 12.47 kV, 3 phase, 60 Hz directly grounded system. The switchgear shall have an interrupting rating as indicated in drawings.

## 2.3 ENCLOSURE

- A. The switchgear enclosure shall be an outdoor, weatherproof, NEMA 3R, walk-in, protected aisle type.
- B. The switchgear shall be rodent-and bird-proof. Each section shall be equipped with a switched overhead lighting fixture and one convenience receptacle.
- C. The floor-standing switchgear shall be shipped fully assembled and tested; if shipping breaks are imperative, the units shall be assembled and tested then broken down for shipping.
- D. Energized bare parts mounted on doors shall be guarded where the door must be opened for maintenance of equipment or removal of drawout equipment.
- E. Furnish full height hinged covers which can be bolted closed for each cable compartment.
- F. Provide a mimic bus on front of the enclosure. Mimic bus shall be plastic and held in place with screws.
- G. Protected Aisle Outdoor Enclosures
  - 1. Outdoor protected aisle metal clad switchgear shall be enclosed in a weatherproof enclosure. An aisle space measuring a minimum of 75 inches from the exterior front to the breaker covers shall be provided.
  - 2. Include suitable weatherproof aisle access doors with provision for padlocking. Interior of access doors shall be provided with panic style hardware.
  - 3. Provide protected ventilation openings as required; interior lighting, utility outlets with protective devices; and equipment heaters with protective devices. Heaters are to remain energized with no switch or thermostat provided. In each unit, major primary circuit parts (breaker, buses, transformers) shall be completely enclosed by grounded metal barriers, including a front barrier as part of the circuit breaker.

## 2.4 DESIGN AND CONSTRUCTION FEATURES

- A. The switchgear configuration shall be as indicated on drawings.
- B. Incoming and outgoing sections shall have ample space for stress-cone terminations, lightning arresters (where indicated). All terminals and lugs shall be of the solderless type suitable for copper cables of size indicated.
- C. Main Bus
  - 1. The main bus shall be tin plated copper and rated as indicated on drawings. Bus bars shall have a continuous current rating based on temperature rise and documented by design tests. All joints will be silver plated with at least 2 bolts per joint. Bus bars will be braced to withstand magnetic stresses developed by currents equal to main power circuit breaker close, carry, and interrupt ratings. Access to bus bars shall be through removable front panels. The entire bus, except for terminations, shall be completely isolated with metal barriers and insulated as required by ANSI Standards. The bus supports shall be polyester glass (standard)

#### D. Ground Bus

1. A ground bus (1/4 by 2 inch tin-plated copper) shall extend throughout assembly with connections to each breaker grounding contact and cable compartment ground terminal. Joints shall be made up as indicated in drawings. Station ground connection points shall be located in each end section.

#### E. Circuit Breakers

1. Circuit breakers shall be rated as indicated on drawings. Circuit breakers of equal rating shall be interchangeable. Circuit breakers shall be operated by an electrically charged, mechanically and electrically trip-free, stored-energy spring. A handle shall be used to manually charge the spring for slow closing of contacts for inspection or adjustment.
2. Circuit breakers shall be equipped with secondary disconnecting contacts which shall automatically engage in the connected position.
3. The circuit breakers shall be horizontal drawout type, capable of being withdrawn on rails. The breakers shall be operated by a motor-charged stored energy spring mechanism, charged normally by a universal electric motor and in an emergency by a manual handle. The primary disconnecting contacts shall be silver-plated copper.
4. Each circuit breaker shall contain three vacuum interrupters separately mounted in a self-contained, self-aligning pole unit, which can be removed easily. A contact wear gap indicator for each vacuum interrupter, which requires no tools to indicate available contact life, shall be easily visible when the breaker is removed from its compartment.
5. Each breaker compartment shall have a breaker rackout device. Using rackout device, a breaker will be self-aligning and will be held rigidly in the operating position. In the disconnect position, breaker shall be easily removable from compartment. Breaker racking shall be accomplished with door closed and latched. Insert handle through a hole in front door to operate rackout device.
6. An indicating tape shall show breaker position when racking breakers in or out of their connected positions
7. Interlocks shall prevent moving breaker to or from operating position unless main contacts are open. Operating springs shall be discharged automatically when breaker is rolled fully into connected or disconnected position. Rackout device shall have provisions to padlock in connected or disconnected position. When locked in disconnected position, breaker shall be removable from compartment using portable lifting device. Padlock shall not interfere with breaker operation.
8. Automatic shutters shall cover primary disconnect stabs when breaker is withdrawn to test/disconnect position. Shutters shall be positively driven by linkages connected to racking mechanism. A stationary barrier shall be located in front of the shutters for additional safety.
9. Breaker control voltage shall be 125VDC.

10. Circuit breakers installed in the lower compartments shall be capable of being removed from their compartment without the use of a breaker dolly once they are moved to the disconnect position.
11. Each circuit breaker shall be provided with an auxiliary switch. Main breakers shall have 6-stage switch containing six "a" (normally open) and six "b" (normally closed) contacts. Feeder breakers shall have a 6-stage switch containing six "a" (normally open) and six "b" (normally closed) contacts. All spare contacts shall be wired to terminal boards.
12. Each circuit breaker shall be provided with a position switch indicating whether the circuit breaker is in the "Connect" or Disconnect" position. Main breakers shall have a 3-stage switch containing three "a" and three "b" contacts. Feeder breakers shall have a 3-stage switch containing three "a" and three "b" contacts. All spare contacts shall be wired to terminal boards.
13. Main breaker closing circuits shall be wired to prevent parallel connection of the utility source except during the short duration upon retransfer. Provide removeable cover plates over the mechanical "close" buttons on the front of the breaker to prevent inadvertent operation.

## 2.5 AUTOMATIC TRANSFER CONTROL

- A. An automatic transfer control system shall be incorporated in the switchgear allowing it to operate as follows:
  1. The switchgear shall consist of one (1) utility circuit breaker, two (2) generator circuit breakers and two (2) feeder circuit breakers.
  2. In normal operation the utility and feeder circuit breakers shall be closed and the generator circuit breakers shall be open.
  3. Primary Feeder Failure
    - a. Failure of the utility source shall be detected by a 3-phase voltage sensor.
    - b. Activation of this relay shall cause the utility circuit breaker to open, initiate the generator to start, and the generator breakers to close after an adjustable time delay.
    - c. The transfer controls shall also provide a start signal for the generators.
  4. After power has been restored on the utility source and monitored by the sensing relay for a predetermined time period, the paralleling controls shall adjust the generator frequency and voltage to match the utilities, the utility circuit breaker shall close and then the generator circuit breaker shall open.
  5. If any breaker tripping has occurred, the lockout relay shall prevent closure of the circuit breaker until the fault has been cleared and the lockout has been reset.



## 2.6 AUTOMATIC PARALLELING CONTROLS

1. The automatic paralleling controls shall provide for complete, automatic synchronizing and paralleling of 2 generators rated 2000 KW, 12,470 VAC as described in Section 26 32 13 - Standby Power Generation. Controls shall also provide for momentary paralleling of the generators to the utility allowing for a closed retransfer to utility power.
2. Equipment shall control all related equipment installed under this contract and contain provisions for addition of future equipment as indicated.
  - a. Although system shall be designed and constructed to parallel 2 generators, only one generator will be installed at this time.
  - b. Breaker for future generator is to be provided but is not to be connected to paralleling system at this time. Breaker will be used for connection of a portable generator and if used will be manually controlled.
  - c. Paralleling controls shall ensure that loss of utility power opens the feeder breakers and they are not closed until the generators are paralleled and the breakers are closed.
  - d. Manufacturer shall include as much wiring and programming in the system at this time as possible to make future addition of second generator and parallel operation as easy as possible.
3. Materials and components utilized in the manufacture of the equipment shall be new, of latest available version, and shall be delivered with no prior service except as required for factory tests.

## 2.7 PROTECTIVE RELAYS

- A. Each circuit breaker cubicle shall include a protective microprocessor-based relay. Protective relays shall be a **Schweitzer (SEL) 751, GE/MULTILIN 850, EATON EDR-5000**, or equal.
- B. The protective relay shall provide the minimum functions listed below and their locations in the switchgear shall be as indicated on the drawings.
  1. Phase overcurrent (Device 50/51)
  2. Neutral Overcurrent (Device 50/51N)
  3. Residual Time Overcurrent (Device 51G)
  4. Synchronism Check (Device 25) - where indicated
- C. All protective-type relays shall be suitable for operation at a frequency of 60 Hz with current transformers having 5 ampere secondary circuits and with potential transformers having 120 V secondary circuits.

## 2.8 METERING AND INSTRUMENTATION

A. Instrument Transformers:

1. Current transformer ratios are listed in each switchgear units specification paragraphs shall be as indicated on drawings. Current transformer accuracy shall be ANSI standard. Transformer mechanical ratings shall equal the momentary rating of the circuit breakers. Transformers, when mounted in switchgear assemblies, shall be rated for the full voltage of the switchgear.
2. Voltage transformers shall be drawout type, with current-limiting fuses and with BIL rating equal to the switchgear. Transformer ratios are listed on drawings.

B. Solid State Meters

1. Digital meters/monitors shall be **GE EPM 9700, EATON Power Xpert Meter 2000** or other approved equivalent devices.

2.9 CONTROL POWER AND WIRING

- A. Provide control power transformers where indicated on drawings. Transformers shall be rated as indicated. Transformers rated 15kVA single phase and less shall be mounted on roll-out trays.
- B. Secondary control wiring shall be No. 14, extra flexible, stranded, tinned-copper control wire, Type SIS cross-linked polyethylene, rated 600 volts, except for specific circuits requiring larger wire.
- C. Crimp-type, uninsulated spade terminals shall be furnished on all wire ends, except where non-insulated ring terminals are used to connect to fuse blocks, instrument studs, or terminal block points with two or more wire connections
- D. Secondary control wires shall be armored where they pass through primary compartments.
- E. Short circuit style terminal blocks shall be installed in current transformer secondary wiring between the current transformer and all connected devices.
- F. Provide marking sleeves on all switchgear control wiring, heat stamped with wire origin and / or destination information.

2.10 SURFACE PREPARATION, PAINTING AND CLEANLINESS

- A. Cleanliness of the equipment furnished shall be such that it is smooth and free of all foreign matter such as scales, sand, blisters, weld splatters, metal chips and shavings, oil, grease, organic matter, and rust.
- B. All metal enclosures shall be chemically cleaned and treated in a process which provides a phosphate coating, then be primed and finished with a corrosion resistant enamel paint.
  1. The switchgear shall be painted with an electrostatically applied polyester powder with final baked on average thickness between 1.5 and 2.0 mils and meet ANSI requirements for outdoor equipment.

2. All exterior surfaces of the switchgear assembly shall be given final finish coats of ANSI 61 gray as standard.
3. Finish shall have a minimum pencil hardness of 2H as tested per ASTM D3363 and shall pass the SATM B117 Salt spray test for a minimum of 1000 hours.

## 2.11 ACCESSORIES

- A. Provide two indicating lights (red and green) for each breaker and one indicating light (white) for each lockout relay, when provided. The indicating lights shall be **GE type ET-16** or equal.
  1. Indicating lights shall be LED push-to-test type.
- B. Provide a hand-resettable lockout relay (device 86) where indicated on the drawings or where required. The lockout relay shall disable closing of the corresponding circuit breaker until the relay has been reset. The lockout relay shall be a **GE type HEA** or equal.
- C. Provide intermediate class arresters where indicated on drawings. Arresters shall be gapless metal-oxide type with a nominal rating of 9kV and an MCOV of 7.65kV. The arrester shall be enclosed in a polymer housing. Arresters shall be designed and manufactured in accordance with the latest revision of ANSI/IEEE C62.11. Arresters shall be **GE type Tranquell, similar by Eaton**, or approved equal.
- D. Non-drawout style protective relays shall be furnished with test switches to permit trip blocking, relay isolation and testing. Test switch shall be **GE Multilin type 515** or approved equal.
- E. The switchgear manufacturer shall furnish one set of accessories for each line-up for test, inspection, maintenance and operation, including:
  1. One maintenance tool for manually charging the breaker closing spring.
  2. One levering crank for manually moving the breaker between the test and connected positions
  3. One mobile lift for lifting the breaker on or off the rails

## 2.12 NAMEPLATES

- A. Furnish nameplates for each device as indicated in drawings. Nameplates shall be black and white 1/8-inch thick lamicaid, with lettering engraved through the black surface exposing the white lamination beneath. Letter height shall be 1/8-inch minimum unless otherwise indicated. Nameplate shall be fastened using 2 matching screws; adhesive tape is not acceptable.
- B. The switchgear shall carry a manufacturer's label stating switchgear ratings and catalog or shipping number as well as the name of the manufacturer.

## 2.13 BATTERY SYSTEM

- A. The switchgear shall include a 125VDC battery system including batteries, battery charger and distribution panel for operation of the circuit breakers and powering other devices. The battery system shall be sized to open and close each breaker a minimum of 3 times.
  - 1. Batteries shall be VLRA type

## 2.14 SYSTEM OPERATION

- A. General: It is the intention of these Specifications to describe a system of switchgear and associated equipment to provide an automatic and unattended back-up power system for the facility loads. Provisions shall be included for the addition of the indicated future equipment. These provisions shall be an integral part of the installed system.
- B. Normal Mode: With utility power available, ac power will be distributed from the utility feed to the loads by means of the various switchgears and panels as indicated.
- C. Standby Mode
  - 1. Upon loss or unacceptable values of normal source voltage, the generator shall start and close into the main bus in the switchgear, and assume facility load. The generator shall remain on line unless normal source returns or the operator initiates manual operation.
  - 2. Upon restoration of normal utility service and after a time delay to ensure it has stabilized, the transfer switch shall transfer to normal. When all load has been transferred, the engine generator shall be disconnected from the main bus and enter a cool-down period. The unit will then be shut down and the system will reset in preparation for the next operation. Should the normal utility source fail during the shutdown sequence, the system shall reverse the sequence at whatever point the system is at and assume the facility loads again.
    - a. If a portable generator is connected in lieu of the permanently installed generators, the retransfer to utility power shall be an open transition and there shall be no paralleling.
- D. Manual Operation: It is the intent of this specification to provide automatic system operation. However, all major system functions shall be provided with a means of manual operation. These functions, shall include at least:
  - 1. Circuit breaker open/close
  - 2. Engine generator start/stop
  - 3. Utility/auxiliary power transfer

## 2.15 FACTORY TESTS

- A. General: The paralleling switchgear shall be completely assembled and adjusted at the factory and given the manufacturer's standard shop tests and other tests, including those indicated below. All tests herein shall be witnessed by the ENGINEER or the OWNER's representative unless waived in writing. The MANUFACTURER shall notify the

ENGINEER sufficiently in advance of test dates so arrangements can be made for witnessing tests. The MANUFACTURER shall cover the costs for three (3) OWNER selected representatives for travel, lodging, and food for this testing. If the testing should not be successful, for any reason, the MANUFACTURER shall cover the costs for any additional witnessed factory testing.

- B. The switchgear equipment and circuit breakers shall receive factory production test as listed below:
1. Equipment
    - a. Low frequency dielectric test
    - b. Grounding of instrument cases
    - c. Control wiring and device functional test
    - d. Polarity verification
    - e. Sequence test
    - f. Low frequency withstand voltage test on major insulation components
    - g. Low frequency withstand test on secondary control wiring
  2. Breakers
    - a. Coil check test
    - b. Clearance and mechanical adjustment
    - c. 300 Electrical and mechanical operation test
    - d. Timing test
    - e. Conductivity of current path test
    - f. Hi-potential testing of breaker
    - g. Vacuum bottle integrity test
- C. Relays: auxiliary and protective relays shall be checked for proper operating sequence per the drawings. Calibration of the protective relays shall be done by the switchgear manufacturer, utilizing the services of an independent testing agency.
- D. Instruments: indicating and recording meters shall be checked for proper operation by injecting 3 phase current and voltage into the appropriate circuits.
- E. Manufacturer shall provide to the Engineer documents verifying completion of factory production tests.

## **PART 3 -- EXECUTION**

### **3.1 INSTALLATION**

- A. The CONTRACTOR shall install the switchgear in accordance with the manufacturer's installation instructions and as indicated. The CONTRACTOR shall provide the floor channels and shall secure the switchgear to the channels by bolting or tack welding at the front and the rear. Prior to energizing, all equipment shall be cleaned, inspected for loose connections, checked out for electrical and mechanical operations and phase-sequence, and all circuits made free of any shorts or ground connections following field testing.

### **3.2 FIELD TEST**

- A. The paralleling switchgear in conjunction with the engine generator units shall be functionally tested after installation to verify compliance with the contract documents.
- B. Various loading conditions shall be accomplished with load banks or site load, in accordance with section 26 32 13 - Standby Generator System to verify operation of the automatic sequencing function. Fault conditions shall also be simulated to verify proper operation of the automatic prefault, fault, and recording networks.
- C. Testing of the manual start, stop, and synchronizing controls shall be accomplished.

### **3.3 START-UP ASSISTANCE AND TRAINING**

- A. The manufacturer's representative shall furnish on-Site start-up assistance and shall inspect the installation prior to start-up to verify that equipment is installed in accordance with the manufacturer's requirements.
- B. In addition, the manufacturer's representative shall provide on-Site training for operation and maintenance of all equipment included in this Section.
- C. The following times shall be included, as a minimum, for the above tasks. A Day is defined as 8 hours on-Site, exclusive of meals and travel. Each task shall be considered a separate trip to the site. Dates and times for the trips shall be coordinated with the OWNER.
  - 1. Inspection of the installation: 2 Days
  - 2. Startup assistance: 3 Days
  - 3. Operation and Maintenance Training: One Day
- D. The manufacturer shall be responsible for activation and acceptance of switchgear

END OF SECTION

# SECTION 26 24 13 – MEDIUM VOLTAGE GENERATOR QUICK CONNECTION SWITCHGEAR

## (PRE-PROCUREMENT PACKAGE)

### PART 1 -- GENERAL

#### 1.1 THE SUMMARY

- A. Provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish medium voltage generator quick connection switchgear.
- B. The requirements of Section 01 11 00 – Summary of Work (Standby Power Generation) and Section 26 00 00 – Electrical Work, General, apply to the WORK of this Section.

#### 1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

##### A. Reference Standards:

- 1. C37.55, Medium-Voltage Metal-Clad Assemblies
- 2. NFPA 70, National Electric Code

##### B. Reference Specifications

- 1. Section 01 11 00 – Summary of Work (Standby Power Generation)
- 2. Section 01 33 00 – Submittal Procedures
- 3. Section 01 60 00 – Products, Materials, Equipment, and Substitutions
- 4. Section 01 33 17 – Structural Design, Support and Anchorage
- 5. Section 26 00 00 – Electrical Work, General
- 6. Section 46 01 00 – Equipment General Provisions

#### 1.3 MANUFACTURER SUBMITTALS

- A. Furnish submittals in accordance with Section 26 00 00 – Electrical Work, General and Section 01 33 00 – Submittal Procedures.
- B. Shop Drawings:
  - 1. Electrical and mechanical drawings for each type of unit, showing electrical ratings, dimensions, mounting provisions, connection details, and layout diagrams.
- C. Product Data:
  - 1. Manufacturer's technical information, including catalog information.
  - 2. Manufacturer's technical specifications with assembly and component ratings.

- D. Certifications: Certification that station devices comply with standards referenced in this section.
- E. Test results: All test results shall be submitted to OWNER/ENGINEER.

#### 1.4 QUALITY ASSURANCE

- A. The equipment furnished under this section shall be the product of a manufacturer who has produced switchgear up to 15kV for a period of at least 15 consecutive years.
- B. Switching gear shall be qualified for use in seismic areas as defined in Section 01 33 17 - Structural Design, Support and Anchorage.

#### 1.5 FACTORY TESTS

- A. Switchgear shall be subjected to the manufacturer's standard tests which shall include as a minimum:
  - 1. Visual and Mechanical Inspection:
    - a. Inspect bolted electrical connections using calibrated torque-wrench method.
    - b. Confirm correct operation and sequencing of mechanical interlock systems.
    - c. Inspect insulators for evidence of physical damage or contaminated surfaces.
    - d. Verify correct barrier installation and operation.
    - e. Exercise active components.
  - 2. Electrical Tests:
    - a. Power frequency dielectric withstand voltage test
    - b. Current-injection tests on the entire current circuit in each section of switchgear.
  - 3. System Function Tests:
    - a. Simulate the Power System conditions as required.
    - b. Verify operation sequence.

#### 1.6 WARRANTY

- A. The equipment provided under the pre-procurement effort shall be warrantied by the MANUFACTURER for two (2) years in accordance with Section 46 01 00 – Equipment, General Provisions.



## PART 2 -- PRODUCTS

### 2.1 GENERAL

- A. System Rating:
  - 1. 15kV, 3 phase, 60 Hz, 1200A, 95KV BIL and housed in a NEMA 3R enclosure.
- B. Phase and Ground Busbar
  - 1. Material: Silver-plated Copper
  - 2. Equipment Ground Bus: bonded to box.
  - 3. Isolated Ground Bus: insulated from box.
- C. Temporary generator connectors shall be Camlok style and shall be provided loose with the switchgear (1 per phase and 1 ground connector)
- D. Permanent Connection shall be factory installed broad range set-screw mechanical type, located behind a physical barrier
- E. Phase Rotation Monitoring Device:
  - 1. Phase monitoring relay to be **Siemens 3U4512-1AR20** or equal and shall be factory installed

### 2.2 ENCLOSURE

- A. Enclosure shall be NEMA 3R Rain-Tight Enclosure. NEMA 3R integrity shall be maintained while temporary cabling is connected during use
- B. Front door shall be pad-lockable and shall include a hinged access plate at the bottom for entry of temporary cabling that prevents unauthorized tampering while in use.
- C. Front and Side shall be accessible for maintenance. Top, Side, and Bottom shall be accessible for permanent cabling
- D. Enclosure shall be painted ANSI 61 grey.

### 2.3 Manufacturer, or equal:

- A. ~~Trystar~~ APT
- B. ~~ASCO~~

## PART 3 -- EXECUTION

### 3.1 GENERAL

- A. CONTRACTOR SHALL install quick connection switchgear in accordance with equipment manufacturer's written recommendations and instructions and the Contract Documents.

### 3.2 FIELD TESTING

1. CONTRACTOR shall provide a portable generator for 1 day minimum to test operation of Quick Connection Switchgear and upstream switchgear connections.
2. Portable generator rating shall be 1000kw minimum.

END OF SECTION



ADVANCED POWER  
TECHNOLOGIES

# 2.4kV-38kV GLQC Switchgear



## MF2-Series Generator, Load Bank Quick Connection Solutions Brochure

www.appt-power.com  
433 N. 36<sup>th</sup> Street  
Lafayette, IN 47905  
(765) 446-2343

**SAFE SMART SIMPLE SWITCHGEAR &  
ENGINEERED POWER SYSTEM SOLUTIONS**



ALN: 515 Rev. 01

# Standard Construction



Figure 1: MF2-Series with Fused Visible Disconnect Switch Stainless Steel NEMA 3R with Optional Polished Finish



Figure 2: 200A GLQC Switchgear Loadbreak NEMA 3R



Figure 3: Power Quality Metering & Phase Rotation Indication



Figure 4: Isolated Customer Low Voltage Control Power Wiring Panel

## 2.4kV-38kV Generator Quick Connection Switchgear

- ⊙ System Ratings:
  - Voltage: 2.4kV-38kV (3Ø)
  - Current: 200A-1200A (3Ø)
  - BIL: 60, 75, 90, 150 kV
- ⊙ Dual purpose termination cabinet allows for safe and clean connection of a portable temporary generator or load bank
- ⊙ Isolated customer low voltage control power wiring panel
- ⊙ Silver-plated copper phase bus bar for permanent connection to the facility.
- ⊙ Rear phase barriers physically isolate each phase to minimize the possibility of phase to phase contact
- ⊙ Standard air-insulated bushing wells allow the versatility to connect either a portable temporary generator or load bank to the same receptacle
  - ANSI/IEEE Std. 386 connectors compatible
  - 200A Air insulated load break bushing wells, inserts, and caps
    - Up to six (6) connections per phase
  - 600A Air insulated dead break bushing wells, caps
    - Up to two (2) connections per phase
- ⊙ Hanger for insulated caps when cables are connected to the bushings
- ⊙ Insulated caps installed on bushing inserts when cables are not connected using elbows
- ⊙ Grounding wires for insulating caps
- ⊙ 200A, 600A, 1200A Manually operated load break switch with visible disconnect
  - Unfused
  - Fused: 50 – 1200A
- ⊙ Standard Enclosure:
  - Filtered ventilation louvers
  - Pad-lockable hinged main access door
  - Pad-lockable integral lower flip door (allows the main door to be closed with the mobile generator/load bank cables connected)
  - Powder coated ANSI 61 Gray
  - NEMA 1/3R for indoor/outdoor applications
  - Bottom Entry/Exit
  - Typical Dimensions:
    - 80"H x 44"W x 62"D

# Switchgear Features



Figure 5: 3 x 200A GLQC Switchgear Loadbreak NEMA 3R



Figure 6: 600A GLQC Switchgear Deadbreak NEMA 1

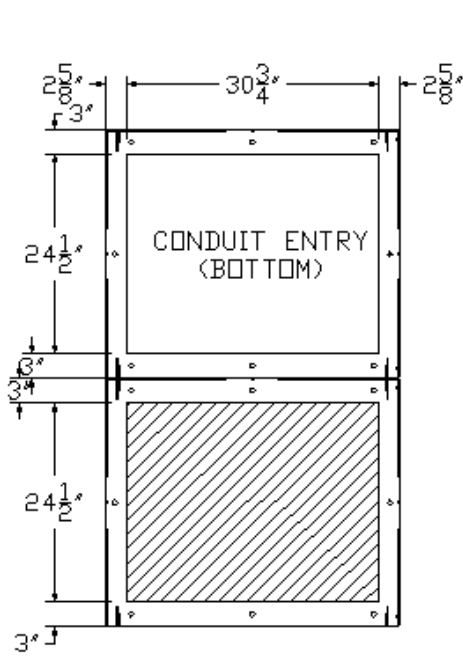


Figure 7: Rear View - PTs & CTs for GLQC Switchgear NEMA 3R

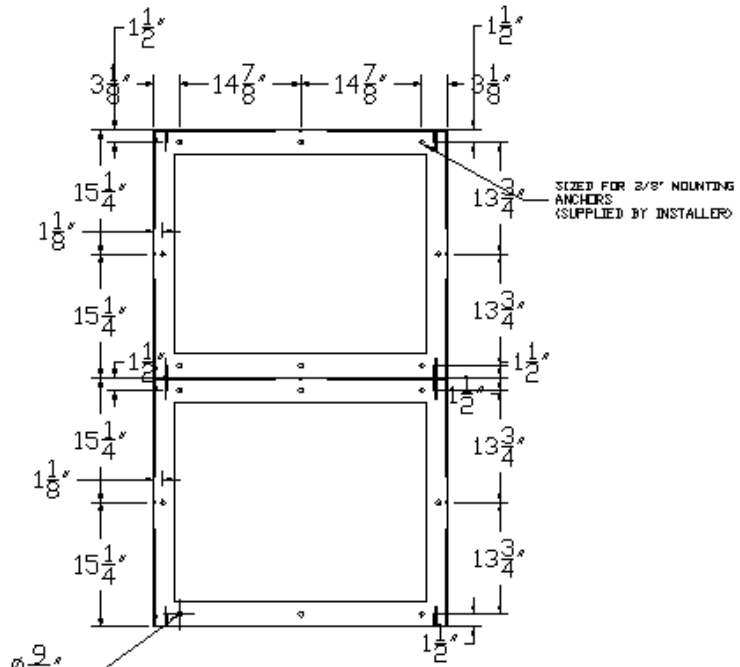
## Interlocking, Monitoring, and Metering

- ⦿ Interlocking:
  - NEC 700.3 compliant key interlocking to prevent inadvertent paralleling of the temporary generator source with normal source(s) available upon request
- ⦿ Internal Climate Control to include (2) Space Heaters with a Thermostat
  - Requires customer supplied 120VAC, 10A circuit
- ⦿ Surge Protection:
  - One set of three distribution, intermediate, or station class surge arresters for incoming permanently connected cables from switchgear
- ⦿ Monitoring:
  - Phase Rotation Monitoring
    - Insures portable genset phase rotation matches facility phase rotation
    - "Rotation Correct" light provides visual assurance of correct phasing
- ⦿ NEC 700.3 compliant temporary generator source connected indication
- ⦿ Current Transformers (CTs):
  - One set of three current transformers and mounting assembly insulated for the full voltage rating of the switchgear
- ⦿ Potential Transformers (PTs):
  - Fused, fixed mounted, potential transformers connected in open delta configuration to the load side of the loadbreak switches for temporary source sensing
- ⦿ True RMS, 3 Element Power Quality Metering:
  - Metering accuracy shall be in accordance with ANSI C12.20-1998 and rated as follows:
    - Class 10 0.5% for energy.
    - 0.2% of reading and 0.02% of full scale for voltages and currents.
    - 0.3% of reading and 0.02% of full scale for active and apparent power
  - Dedicated high-brightness digital LED displays are visible in the bright sun light or in the dark

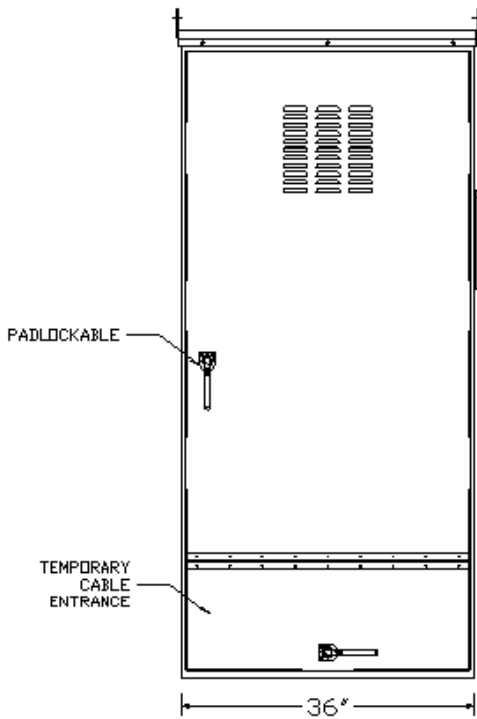
# Switchgear Layout Drawing



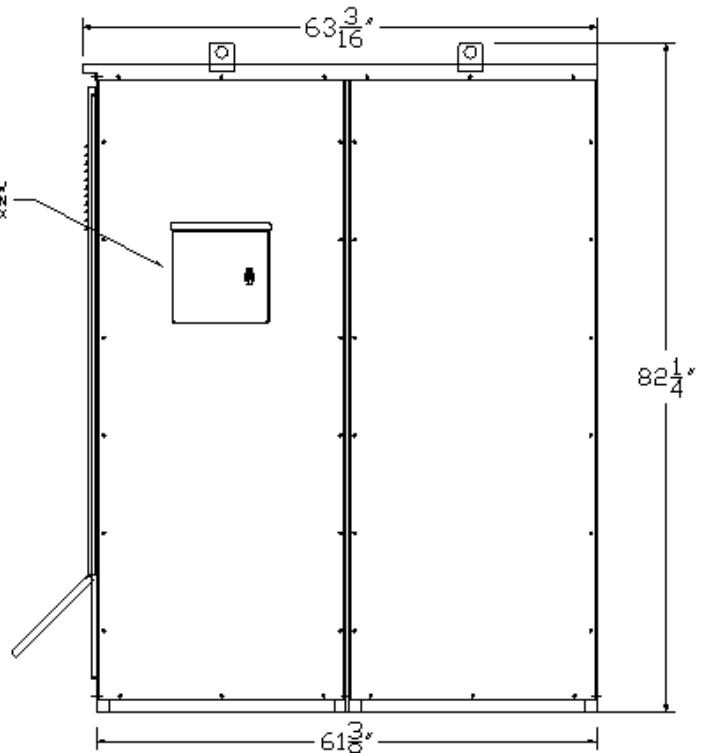
CONDUIT ENTRY  
(BOTTOM)



ANCHORING



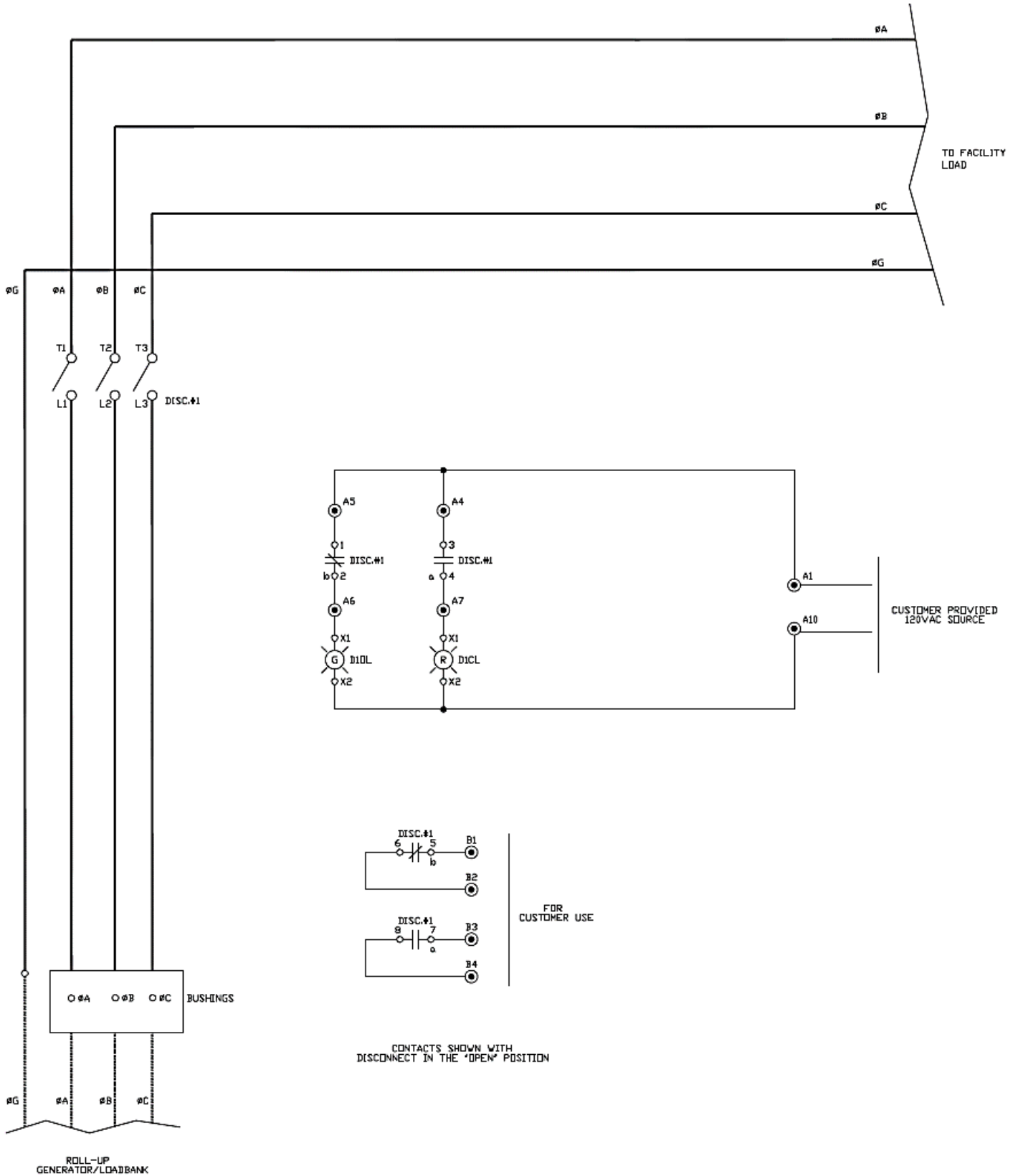
FRONT



SIDE

EXTERNAL

# Switchgear Wiring Diagram



# APT Product Part Number Builder – Coming Soon



# About Advanced Power Technologies



Advanced Power Technologies (APT) is on the cutting edge of the latest engineered power system smart technologies, as it relates to microgrid & storage management, renewable & conventional energy source deployment, demand peak shaving, and facility back-up and co-generation power systems. Located in the central United States and headquartered in Lafayette, Indiana with solutions development engineers around the country, APT provides domestic and international products and services to industry leading companies from around the world. APT engineers have decades of power system experience from working with some of the largest companies in industry. Over the last two decades, we have produced successful solutions for hundreds of large-scale electric power projects involving utility/generator paralleling, transfer, peak shaving, and distribution. We pride ourselves in providing electrical power systems that are engineered and custom built, utilizing state-of-the-art technologies to fit our customer's exact needs. The core of our business is low & medium voltage engineered power systems for a wide range of indoor & outdoor applications, such as:

- ⦿ Utility(ies) and Generator(s) Paralleling/Transfer/Peak Shaving/Distribution Switchgear
- ⦿ Microgrids, Microgrid Master Control Panels, SCADA systems
- ⦿ Containerized Battery Energy Storage Systems (BESS)
- ⦿ Photovoltaic (PV) Solar Power Collection/Distribution & Renewable Energy Storage Systems
- ⦿ Low & High Resistance Grounding Systems, Grounding Systems for Photovoltaic Effective Grounding
- ⦿ High Efficiency Combined Heat and Power Switchgear & Control Systems (CHP, Co-generation)
- ⦿ Outdoor Walk-In electrical houses (e-houses) & Skid-Mounted Switchgear
- ⦿ Motor Control Centers & Motor Control Switchgear
- ⦿ Automatic & Manual Load Transfer Switchgear
- ⦿ Bypass/Isolation & Power Distribution Circuit Breaker Switchboards
- ⦿ Generator/Loadbank Quick Connection Switchgear, Switchboards, & Tap boxes
- ⦿ Industrial Control Panels

Please see our product webpages on [www.appt-power.com](http://www.appt-power.com) for product brochures and relevant information. Actual products may look different from images shown on the website and in brochures, based on actual specifications.

APT cares and understands that each power system is different. We will evaluate various solutions in order to develop the best solution for a site. APT focuses on our ability to a combine several traditional pieces of equipment/functionality into as little of a footprint possible. This saves on space, the cost of equipment, cost of installation, and accomplishes the most optimal/state-of-the-art design your facilities. APT's desires to foster and grow a culture of continued open communication with each customer. Let APT be your source to provide fully engineered power system equipment solutions for the full customer facility on time, on or under budget, and in the smallest footprint possible. We are always available to assist customers and engineers representing customers in the development of complex power solutions for all facility types.