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March 1st, 2022

Don Schuette
573-579-5886

RE: Caterpillar Generator Controls Upgrade Project

Dear Mr. Schuette,

Please accept this submittal quote for the following:

Blakely & Associates responsibilities and deliveries:

- Provide Engineering Design and Updated Drawings for Caterpillar Generators 10, 11 & 12 Controls Upgrade.
- Remove Existing Generator Control Components and Replace with New Generator Controls
- Remove Existing Generator Protective Relays and Replace with New Protective Relays
- Wire New Generator Controls, Including Additional Breakers, Relays and Terminal Blocks
- Develop Relay Settings Files and Program New Relays and Generator Control Components
- Update PLC Programming and Scada Controls
- Upgrade CAT controls to EMCP 4.3 Control Panel (Fabick)
- Install Communication Gateway (Fabick)
- Upgrade CDVR Regulator (Fabick)
- All Required Parts and Labor are Included to Complete this Work

Blakely & Associates agrees to complete the above responsibilities and deliveries for a total cost of: $212,413

Please see the attachments for existing system details and life expectancy of existing control components. The following pages detail the benefits of upgrading the current system, with summary sheets for the quoted components.

Sincerely,

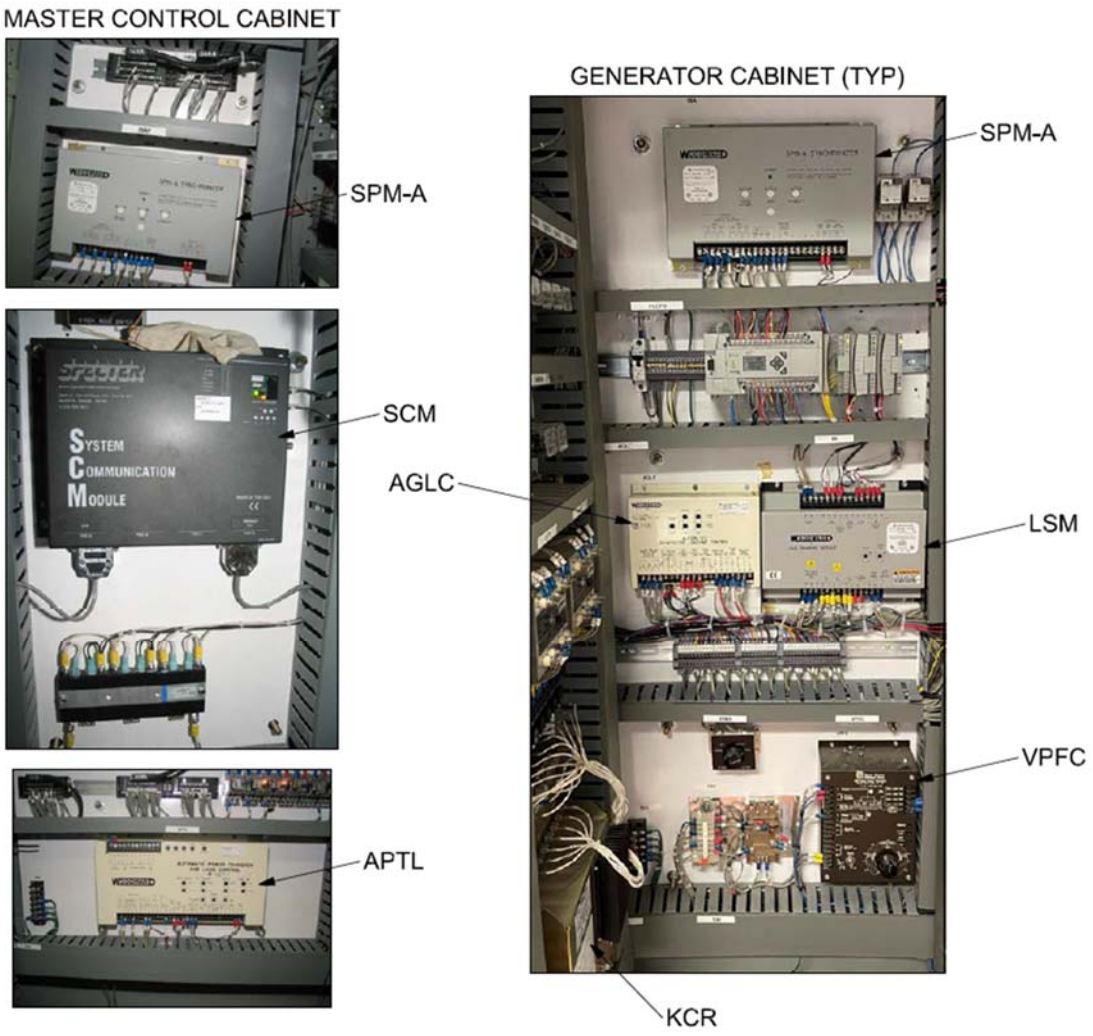
Blakely & Associates Consulting Engineers, Inc.

Jason Eckles

Jason Eckles, P.E.
Project Engineer

Details of Existing Generator Control Cabinet Components

The current controls system for the (3) Caterpillar Generators has been installed since 2006 and was obtained from an AT&T.com failed facility that was originally installed in 2000. This means that the current controls system has components over 22 years old, with no warranty coverage remaining. Most of the critical components are obsolete, which means they are no longer supported, cannot be repaired, or replaced if a failure occurs. In the event of a component failure, the generator will be offline, and a replacement device will have to be found on the used market, or the controls would need to be updated at that time. The diagram below shows the existing components in the control cabinets and their obsolete date:



SYMBOL	MANUFACTURER	DESCRIPTION	OBSOLETE DATE
AGLC	WOODWARD	AUTOMATIC GENERATOR LOADING CONTROL	2021
APTL	WOODWARD	AUTOMATIC POWER TRANSFER AND LOAD CONTROL	2015
KCR	KATO	VOLTAGE REGULATOR	2008
LSM	WOODWARD	LOAD SHARING MODULE	2023
SCM	SPECTER	SYSTEM COMMUNICATION MODULE	2012
SPM-A	WOODWARD	SYNCHRONIZER	2023
VPFC	BASLER	VAR POWER FACTOR CONTROLLER	2010

The proposed upgrade hardware for the generator is a DSLC-2 device, which is a digital synchronizer and load control designed for use on three-phase AC generators. The DSLC-2 combines synchronizer, load sensor, load control, dead bus closing system, VAR, power factor

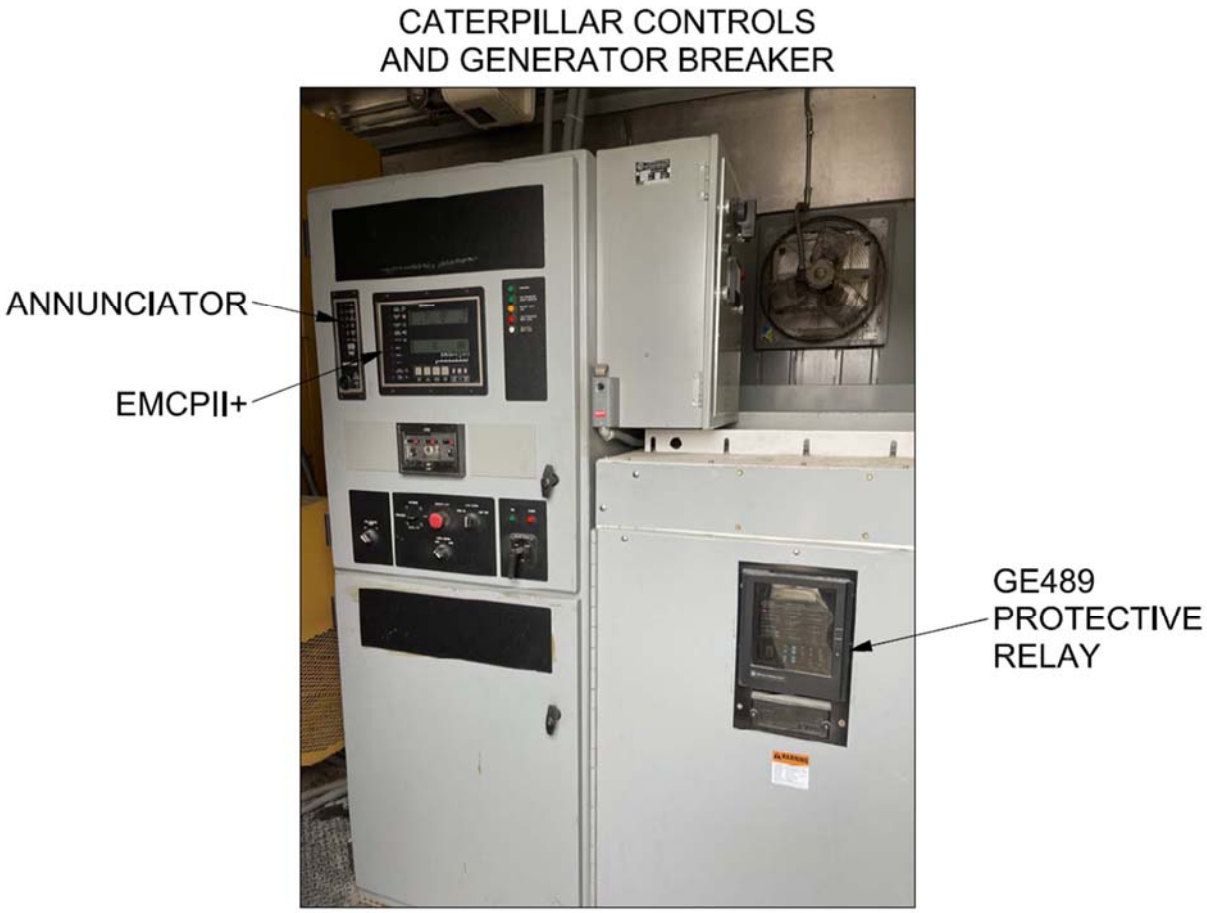
and process control, all in one powerful package. The current control system for a generator uses a SPM-A for synchronizing, AGLC for load control, LSM for load sharing and VPFC for var and power factor control. With the upgrade to a DSLC-2, all these components will be replaced with a single device. The DSLC-2 is also equipped with Modbus communications via ethernet, and all control functions can be programmed and accessed with the Scada system. There are no control dials or pot adjustments on the DSLC-2, which results in a stable engine controller. The DSLC-2 devices also communicate with one another through the ethernet network, making for a completely balanced load sharing system.

The proposed upgrade hardware for the 34.5kV main breaker is a MSLC-2 device, which functions with the DSLC-2 control to provide synchronization and load control across a utility breaker. The MSLC-2/DSLC-2 combination operates over an Ethernet communication network to control the generators and allow for paralleling across the 34.5kV main breaker without taking a utility outage. The MSLC-2 device will replace the existing APTL and SPM-A that is in the main cabinet and allow a more stable control system.

The installation of the MSLC-2 for the 34.5kV main breaker, and the DSLC-2 for each generator will replace the obsolete components in the existing control system, resulting in a complete control system upgrade. The new components will come with a one-year warranty and can be quickly replaced utilizing the removable terminal blocks. The controls will streamline the interface with the existing Scada system, and the operator will be able to easily control the generator and adjust with ease.

Each of the generator synchronizing breakers has a GE489 protective relay that has been out of warranty for over 10 years. General Electric recommends replacing the relay after the 10-year warranty expires. The proposed replacement relay is a Schweitzer SEL-700G relay, which will have many upgraded features, and comes standard with a 10-year warranty. This relay manufacturer will match most of the relays in the electrical system. These relays will be equipped with ethernet communications, which will allow for much faster response time and monitoring capabilities. The Square D Switchgear that contains the 52UA and 52UB breakers also contains GE750 protective relays, which have also been out of warranty for over 10 years. The proposed replacement relay is a Schweitzer SEL-751A relay, which will have ethernet communications and is a substantial upgrade to the GE750 relay. All these relays are integral in the control scheme to run these generators and are all overdue to be replaced. The proposed Schweitzer models will offer more functionality, flexibility, and communication options, improving the integrity of the control system.

Details of Existing Caterpillar Generator Control Components



EMCPII+

Controls the start/stop function of the genset, monitors and displays engine and generator protection fault codes coded numerically. Displays AC Voltage, Current, Power, Frequency, Power Factor. Displays engine hours plus basic engine conditions such as Oil Pressure, Coolant/Exhaust/Oil temperature, Battery Voltage, engine RPM. Provides three spare custom inputs for warning or shutdown and are displayed as SP1 through SP3 faults. Also includes three form-A dry outputs with limited programming for each.

8 Led Local Annunciator

Displays four amber warnings and four red shutdowns. Displays pre-programmed warnings/shutdowns. There are an additional five separate indicators for coolant level, cooldown, rupture basin leak and fuel heater mounted away from the annunciator.

CIM-Customer Interface Module

Comprised of an 8-circuit Relay Board and a Relay Driver Module, unit is located in the switchgear. Provides eight dry contacts for pre-programmed warning/shutdowns.

CCM-Customer Communications Module

Located in the switchgear, provides remote PC communication over RS232 in conjunction with Specter SCM Module.

Warranty Status
The EMCPII+ is has not been available on production genset packages since the 2000s. The previous EMCPII is no longer available, and it is expected the EMCPII+ will be obsolete in the near future. All the other devices are still available as replacement parts, but these are not compatible with the EMCP4 (EMCP4.2/4.2B/4.3/4.4) family of controllers or the previous EMCP3 (EMCP3.1/3.2/3.3) controller family so they will become obsolete as well.

Details of Proposed Caterpillar Generator Control Components

EMCP4.3

Controls the start/stop of the genset, monitors, and displays engine and generator fault codes with full text description of each event. Provides hundreds of different available codes. Displays AC Voltage, current, power, frequency, reverse power, reactive power, power factor with breakdowns of all for each phase, and more. Displays engine hours plus basic engine information plus advanced engine information such as air/oil/fuel filter restriction, fuel pressure, fuel consumption, total fuel burned, and more. Provides twelve fully programmable digital inputs, sixteen fully programmable C-form dry output contacts. Custom text can be applied to display non-common custom faults to be viewed on the EMCP4.3. Provides over current, over/under voltage-frequency, reverse KW/KVAR, over KW protection, and more. Provides remote communication over ModBus+ and ModBus TCP/IP (Ethernet).

RS485 Local Annunciator

Provides eight pairs of fully programmable LEDs (8 amber warning and eight red shutdown) for instant fault recognition of notable events. Planning to re-use the five individual indicators mentioned above.

Discrete Input/Output Module (D-I/O)

Provides an additional twelve selectable digital inputs and eight selectable form-C outputs. Custom I/O selections are available, but custom text changes to be viewed on the EMCP4.3 are not available.

CDVR-Voltage Regulator

Programmable via an onboard serial port or through the CAN network described below. Provides its own set of control and protective parameters.

All devices (including the engine ECM) can communicate on one proprietary network (CAN) and are all programmable from one of two service ports (CAN1 and CAN2) that will be located at the generator control cabinet. All new devices will be located within the generator control cabinet. Event/fault information for all devices (including the engine ECM) will be viewable on the EMCP4.3 display.

The upgrade will result in removal of previously listed current components (except the five indicators) as well as a portion of the ancillary components inside the cabinet. External E-Stops, manual breaker control, multifunction relay, and manual louver controls will be retained. Additional upgrade schematics will be provided to work in conjunction with the existing CAT schematics.

All the proposed components are currently used in new machine production and readily available. The EMCP4 series is 10 years old and a has been a standard on all production gensets, regardless of size, since its introduction. The CDVR has been out since early 2000s, and the Digital I/O Module came out in the late 2000s with the EMCP3 series. The likelihood of any of the components becoming obsolete is not a factor to consider currently.

Attached Documents

Detail Fabick Quote No: 180133-1 (Included in Bid Price)

DSLC-2 Digital Synchronizer and Load Control - Specification

MSLC-2 Master Synchronizer and Load Control – Specification

SEL-700G Generator Protection Relay - Specification

SEL-751A Feeder Protection Relay - Specification