POWER/VAC® Application Update

June 20, 2003 *Issue No. 4*

INTRODUCTION –

This is the forth installment in the "POWER/VAC Application Update" series. Our intent is to inform you of the current design enhancements, providing application tips and other information necessary to assist you in selling, applying and engineering POWER/VAC Switchgear.

SUBJECT # 10 – Power/Vac Features – *"Better Than The Best"*

In today's extremely competitive market, with Customers who seem to have the "switchgear is a commodity" mindset, keep these differentiators in front of them to illuminate the "overlooked" benefits of Power/Vac.

✓ Power/Vac uses 11 gauge steel for the frame, the main compartment barriers and even the front doors. This is one reason why our gear is heavier than the competition, who use 14 gauge material extensively, where not mandated 11 gauge by ANSI. Our 11 gauge doors provide greater safety in the event of a fault inside the gear, and do not warp, sag or flex like our competitor's 14 gauge offering. Vibration and flex in such doors have been know to cause relay mis-operation.

✓ All of our secondary control wiring where it passes through a primary compartment, is protected in a grounded metal braiding, or armoring, as required by ANSI C37.20.2. Have your customer examine the competitor's gear or ask them about this requirement. They will likey find unprotected wiring, and a much "relaxed" interpretation of the ANSI requirement when compared to GE Power/Vac.

✓ We use fully rated, epoxy-coated, copper bus as the primary connection to Power/Vac roll-out trays. All of our competitors but one, use insulated cable for these connections. Cable connections cannot match the superior BIL and Momentary duty capability of our bus connections. If solid bus bars can flex several inches during a severe fault, imagine what happens to the flexible cables used to connect competitors trays?

✓ Power/Vac utilizes heavy-duty, formed steel frame channels, with gusseted corners. The gear is assembled with grade 5 plated nuts, bolts and washers. Our competitors are now using "pop-rivets" to assemble their product.

✓ Power/Vac provides an additional insulated safety barrier in front of the primary shutters, to minimize the possibility of accidental contact with live parts and to enhance personnel safety.

✓ And don't forget, that GE has more Vacuum Metalclad Switchgear experience than any other manufacturer (27 years). GE introduced 2-high vacuum, horizontal-drawout, Metalclad Switchgear to the marketplace with Power/Vac.

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SUBJECT # 11 – Vacuum Integrity Testing - AC vs DC

GE Switchgear Business has always strongly recommended the use of an AC high potential machine for vacuum interrupter integrity tests. This test is used to determine whether an interrupter is maintaining a proper level of vacuum, by measuring the small amount of leakage current across the open interrupter contacts, when applying a maximum of 36KVAC or 50KVDC for 5 to 10 seconds. The use of DC for testing is recommended only if an AC tester is not available, and should be used for quick field checks only. Our experience with DC testers over many years indicates they can frequently yield false negative test results, due to the capacitive component of the vacuum interrupter during DC testing, and that most lightweight DC testers have a very low trip setting for leakage current.

If using a DC tester, and the test indicates a bad interrupter, retest with the polarity of the DC test voltage reversed. If this results again in a failure, we would recommend a final AC test prior to discarding or replacing the interrupter.

Regardless of whether using an AC or DC tester, the following should be followed:
Prior to performing any vacuum interrupter integrity tests, the outside (external surface) of the interrupter should be wiped clean of any contaminates with a non-linting cloth. This is critical that the entire external surface is to be completely free of all dirt, dust, oil, etc.

We have been recommending the Hipotronics 860PL or 880PL DC tester, if the customer chooses to use DC for this test. Programma, now a part of GE, offers a small, lightweight DC vacuum integrity tester labeled the VIDAR. The GE Switchgear Business has tested this unit in our Factory, and found it to be a reliable device. For those who which to use a DC tester for vacuum integrity testing, we now include the GE/Programma VIDAR Tester on our recommended tester list.
For more information on the VIDAR Tester, or where to purchase, contact
Don Spieth – GEPS/Energy Services - 1-847-506-1126.

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SUBJECT # 12 C400, 1200:5 MRCTs on Distribution Breakers

On occasion our DB Customers specify a quantity of two (2), 1200:5A Multiratio CTs, on each bushing, with a relay accuracy class of C400. Previously we could only supply two of our standard 1200:5 MRCTs with accuracy class of C200, because two of the C400 units would not fit on the bushings. GE/ITI, in conjunction with the Burlington Engineering Team, have developed a solution to this problem. We have combined two 1200:5 Multiratio CTs with C400 accuracy, into a single molded case. This reduced the overall thickness of the unit when compared to two individual MRCTs, allowing it to fit properly over our roof entrance bushings.

SUBJECT # 13 Revised Power/Vac Breaker Cap Switching Duty

We have recently completed testing of our ML-18 mechanism, for Back-to-Back* Capacitor Bank switching capability. Breakers used to switch capacitor banks for power factor correction, or motor starting, must be rated for such duty. The Power/Vac breakers in the following table are enhanced to achieve these ratings. Previously, only our ML-17 mechanism was rated for this severe duty. Back-to-back Capacitor Switching is a requirement per ANSI C37.06, table 1A, of indoor circuit breakers labeled as “Definite Purpose”. However,Power/Vac breakers will continue to be labeled as “General Purpose” breakers only. The ratings shown in the following table 3-4, apply to either Isolated Capacitor Bank switching current, or Back-to-Back Capacitor Bank switching current.

The existing Table 3-4B in GET- 6600F, Cap Switching capability for the ML-17, lists switching currents exceeding the ratings shown in the new table. While Burlington will continue to support and warrantee existing breakers which were applied per the ratings shown in Table 3-4B in GET- 6600F, all new Power/Vac breakers should now be applied per the Capacitor Switching Duty table 3-4 as shown on the next page. For our customers, this means they can now use the lower cost ML-18 mechanism in Back-to-Back applications. This new table 3-4 will replace the existing tables 3-4A & 3-4B, in the upcoming revision of GET- 6600(G).

* Back-to-Back is where one or more shunt capacitor banks are connected to the system in parallel with the one being switched.

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SUBJECT # 13 Revised Power/Vac Breaker Cap Switching Duty, cont'd

TABLE 3 - 4 GET-6600 rev G

SPECIAL Capacitor Switching Duty POWER/VAC® Circuit Breakers

Capacitor Bank Switching Capability (all mechanisms)

Rated Maximum Voltage (kV RMS)	Rated Short Circuit Current (kA RMS)	**Isolated-Capacitor** Bank or **Back-to-Back** Switching	
		Breaker Continuous Current Rating	
		1200	2000 - 4000
4.76	29 - 50	1200	1250
4.76	63	1200	1800
8.25	33 - 40	1200	1250
8.25	50 - 63	1200	1800
15	18 & 20	1200	1700
15	25 - 40	1200	1250
15	50 - 63	1200	1800

Footnote - The capacitor bank rating is subject to the following conditions:

1. The transient voltage from line-to-ground, shall not exceed 3 times the maximum design line-to-ground crest voltage measured at the breaker terminals.
2. The number of restrikes or reignitions shall not be limited as long as the transient voltage to ground does not exceed the value given in footnote 1.
3. Interrupting time shall be in accordance with the rated interrupting time of the circuit breaker.
4. Maximum Capacitor Bank KVAR rating is calculated as follows:

$$\frac{\text{System Voltage (kV)} \times \text{Cap. Switching Current (A)} \times \sqrt{3}}{\text{1.25 (for ungrounded banks) or 1.35 (for grounded banks)}}$$

5. For Back-to-Back switching, the bank inrush currents are limited to 15KA at 2000hz.
6. For capacitor switching requirements other than shown above, consult GE Switchgear Factory.

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