CALL Lesson of the Day

SUBJECT: Contingency Power Generation Management in Afghanistan

Theater: Afghanistan

Date: 15 September 2012

(U/FOUO) Observation: There is a high demand for power generation throughout Afghanistan. A typical brigade combat team's battle space may have between 10–60 outlying bases or tactical infrastructures that require power through the means of generators of various types and sizes. During a recent staff assisted visit, we have discovered that the power generation management within Afghanistan has grown more complex and worsened over the last 10 years. Several leading causes exacerbate power management within the theater.

a). (U/FOUO) There are many different types and variants of generators in theater that require the same maintenance attention. If not properly used, serviced, or maintained, the generator's life expectancy will be short. Generators usually fall into two categories (with different manufacturers) – *continuous* or *prime power* and *stand-by. Continuous* or *prime power* generation serves as the main source of power and is designed to operate continuously or for extended periods of time (24hrs/day for 10 days). *Stand-By* generators (500 hours a year) are mainly back-up sources of power when the prime power is out.

b). (U/FOUO) We have found generators of all types and sizes in yards throughout our area. These generators were delivered from other locations or requisitioned through contracting by civilians or military without understanding the correct requirements of what is being powered. When generators aren't matched by requirements (i.e., size of the base and power requirements), these engines frequently break down and/or circuit boards are blown. Consequently, these broken generators are left in yards around bases and contribute to the excess broken equipment found throughout theater.

c). (U/FOUO) There are several generator storage yards, commonly known as the generator bone yards. These yards contain generators of both military and civilian specifications. When an organization has power requirements that are well beyond the capabilities of what military-issued equipment can provide (i.e., civilian refrigerator units, environmental control units (ECUs), building /structures), these yards become cannibalization points for harvesting generator parts and components. Nonetheless, these yards add unnecessary stress on the unit because they become junk yards for unwanted equipment and, eventually, units are responsible for clearing out and turning in these pools of equipment.

d). (U/FOUO) The number of qualified maintainers (91D, 91C) to work on generators cannot meet the demand of the battle space. Military units do not have enough trained personnel to meet the maintenance needs of several hundred power generation systems. Soldiers in these critical MOSes are subject to additional duties (guard shift, convoy operations, etc.), and are not always available to meet the demands of generator repair. Furthermore, units at many of the outlying locations without qualified mechanics are relegated to troubleshooting their generator systems on their own. This has caused injury to personnel and damage to equipment. In very rare cases, having unqualified personnel working on generators has resulted in fatalities.

Figure 1: Generator storage yard (also known as the bone yard)

Figure 2: Generator Maintenance Bay

(U/FOUO) Discussion: Units and contractors have ordered several million dollars worth of power generation equipment. Due to the lack of understanding on power generation requirements, units and/or contractors are ordering generator equipment that does not necessarily match the requirements of the FOB. In most cases, a particular generator may be too big in regard to power output, whereas another generator may be too small and not provide enough power. Either way, this causes the generator to wet stack (leak fluids), overload, and short circuit the power grid, thus becoming unserviceable. Having properly trained technicians with the proper certification and knowledge base to repair, maintain, or service generators is key. Military trained generator mechanics are certified on military generators only and need to be trained further in the principals and maintenance of civilian generators. These generators likely make up 2/3 of the power generators in theater. Furthermore, there are several variants of these generators with different configuration, control boxes, and wiring that, if repaired incorrectly, can ruin the entire system. In this time frame over 100 different variants of civilian generators, ECUs, and refrigerators have been purchased that need maintenance support. Poor maintenance leads to broken equipment, subsequently adding to the bone yard of generators.

a). (U/FOUO) Civilian generators are rarely maintained to the same standard as military equipment. The inability to requisition parts through the same methods as for military equipment causes an urgency to repair equipment that is inoperable by performing

cannibalization to repair. The main issue here is that maintenance of civilian equipment is not the first thought.

b). (U/FOUO) Military and civilian generators (mostly civilian generators) have long lead times on replacement parts. Requisitioning parts for the civilian models is difficult because most parts have to be locally purchased. Consequently, we are forced to

cannibalize; push the requisitions through S4 channels; or to submit a DD Form 1348-6, DOD Single Line Item Requisition System Document, to contract a locally purchased item for Military Standard Requisitioning and Issue Procedures (MILSTRIP). This is a tedious and long process. When larger parts are needed (i.e., engines, radiators, A/C main alternators, and cylinder heads), units are forced to cannibalize from other generators to render mission critical equipment fully mission ready.

Figure 3: Generator storage yard with cannibalization

Figure 4: Generator Cannibalized

c). (U/FOUO) There is no standard to the civilian equipment when several hundred variants are present. Much of the civilian equipment has unique tool requirements and troubleshooting procedures. This includes computers and diagnostic sets that are not compatible with military diagnostic equipment. Maintainers don't have the knowledge base to troubleshoot civilian equipment because they are untrained on the processes of non-standard equipment.

d). (U/FOUO) If a generator is not running at its recommended load, it will create maintenance issues, always! Generators are meant to run for long periods of time if properly maintained and the load is balanced. Weather and environmental conditions (e.g., heat and dust) affect the performance of the generators. Operators need to properly shade these systems and routinely spray them down to either cool or prevent dust from clogging vents and filters. Furthermore, the proper changing of oils and lubricants will prolong the life of the system. Over the period of our operations in theater, military and civilian generators have often been left behind by the previous unit and not turned in for RESET or reutilization. Civilian generators have never been inducted into a certified RESET program; there needs to be a RESET standard for civilian generators.

Figure 5: Unserviceable military generators

e). (U/FOUO) When the bases are running their generators at less than the capacity they start to wet stack (appearance of oil, fuel, and coolant leaks), which causes problems. These are the common issues throughout outlying bases. Maintainers try to balance the loads in order to optimize performance of the generators. Larger bases have more resources to support the civilian generators (i.e., contractors, and abundant military maintainers), thus fewer issues are found on larger bases. The smaller bases unfortunately lack the same resources and thus lack operator maintenance; no permanent service schedule is established for the military and civilian generators.

f). (U/FOUO) Power generation issues would be reduced if there was one standard for power grids and subject matter experts (SMEs) were consulted. When decreasing or increasing the size of bases, little planning is done with respect to power generation needs and how they will affect the power grid and supply. Base owners need to ensure the size of the installation and the power generation requirements are matched by the available power generation output. Proper planning for the required power output—the increase or decrease of the power supply—would allow the maintainers to be proactive in supporting both the military and civilian equipment on the base power grids.

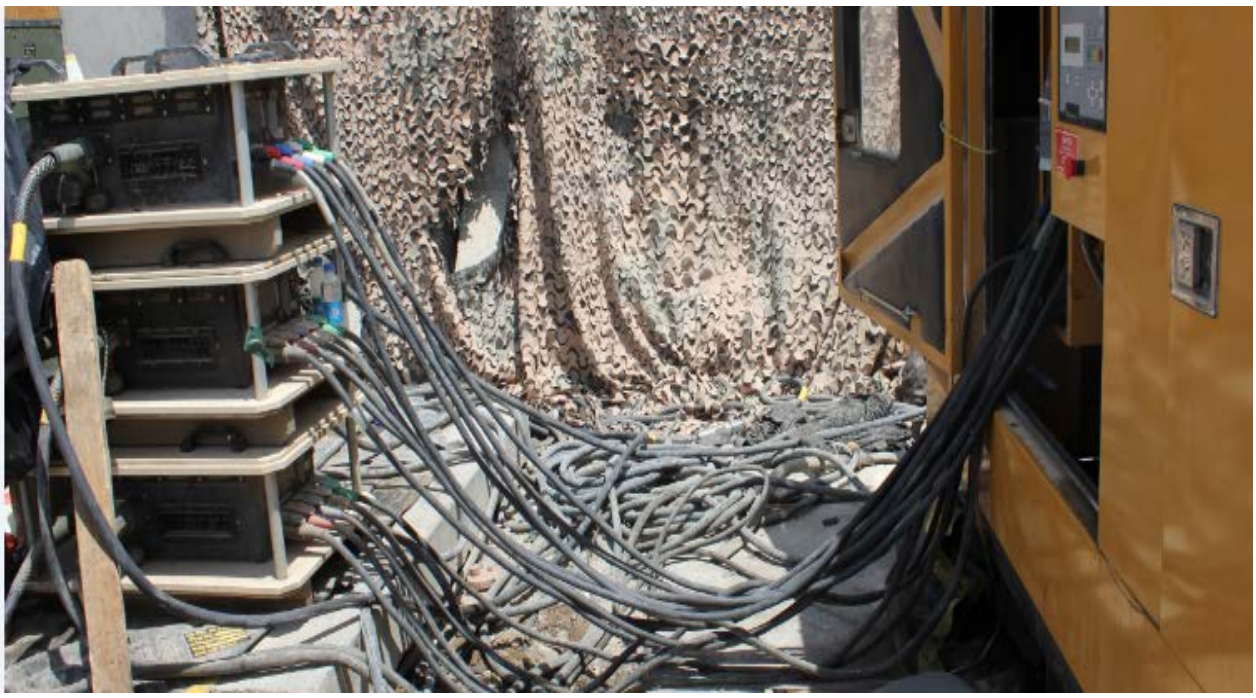

Figure 6: A power outage in the making

g). (U/FOUO) Generator output and performance are severely degraded during extreme weather conditions and temperatures, dry air, and sandy and dusty environments. According to CECOM, every one year of operation in theater reduces the life expectancy of generators, ECUs, and refrigeration units by five years. With incorrect usage and rapid failure, the pool of generators in the bone yard increases. Basic generator maintenance and certified personnel collectively improved the life expectancy of power generation.

(U/FOUO) Lessons Learned:

a). (U/FOUO) Develop a means to obtain a bench/shop stock of civilian generator parts. Although this is difficult, one method is to cannibalize/harvest parts from the bone yard or through contracting means.

b). (U/FOUO) Ensure military mechanics have the proper training and certification. The 2d BSB succeeded in this by creating a generator and air condition float program that allowed the GSE section to maintain the power generation support across the battle space. Also, we sent a significant amount of personnel at home station to be trained on civilian generators. The unit paid for civilians to cross-train our military generator mechanics.

c). (U/FOUO) Ensure your GSE sections have a load bank large enough to test the load on larger generators (rated for 70kw and higher).

(U/FOUO) Recommendations:

a). (U/FOUO) Be prepared to send teams of two with the proper tools and equipment to circulate the battle field and take pictures of generators and their load carrying (i.e., data

plate, wiring, engine size, etc.). This allows the mechanics to conduct site surveys and gain an understanding of what is actually needed to power a location.

b). (U/FOUO) Create a float pool of equipment (usually FMC generators from the bone yard) for emergency replacement.

c). (U/FOUO) Keep generators cool by building concrete containment walls around them with shade over the top. Spray down generators occasionally during extreme high temperatures.

d). (U/FOUO) After 250 hours of use, shut down; check hoses, belts, and wiring harnesses; change oil and replace all filters. This is just like taking care of your vehicle. Maintain between 45–75 percent of the generator's power output. There are gauges that tell you what percentage or KW you're running. If you are below 45 percent or above 80 percent, you're going to cause damage to the equipment. Consult a certified electrician or generator technician to validate or ensure the generator is operating at its proper level.

e). (U/FOUO) Establish a RESET program for the civilian generators and commercial off-the-shelf equipment.

(U/FOUO) Related CALL publications:

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