

Continuous Commissioning leads to \$6 Million in Energy Reduction

Interview with Jim Rufo, Virginia Department of Military Affairs

Since 2011 the Department of Military Affairs has executed Energy Savings Performance Contracts throughout the Commonwealth of Virginia. The overall project was implemented at 46 National Guard Readiness Centers, 12 Field Maintenance Shops, Ft. Pickett, VAARNG Aviation Facility, and the Virginia State Military Reservation in Virginia Beach. The largest project was the 42,000 acre Fort Pickett site. The contract team leaders, Cliff White and James (Jim) Rufo built a solid foundation and structure to the program punctuated by continuous commissioning. With resilience at the forefront, they have implemented a process to monitor and track the performance of their projects. Here is an interview with Jim Rufo that gives an inside look into the value of continuous commissioning.

What led you to create a process for implementing continuous commissioning measures?

Over the past eight years, we have implemented over \$44-million in energy performance contract work, with a payback between 15-25 years. Over that payback span, we have a total cost avoidance projected at \$52,442,408. When you look at the amount of work we've done, it represents a lot in taxpayer investment. With this in mind, it leads us to the fact that we have a cost avoidance of over \$52 million at stake. Continuous commissioning is the method we utilize that enables us to sustain curtailments of that magnitude.

How did you identify past projects that needed continuous commissioning? Do you look at the whole portfolio, or did you target a selected number?

We look at our whole portfolio. We have a mandated obligation to go back and perform an energy analysis and revisit all of our sites every four years to look for additional opportunities. We also have a performance assurance agreement in place with one of our prime contractors, which is called a "Pass Agreement." This contractor works under this agreement with our internal O&M Controls team and identifies potential cost issues on our HVAC and controls systems. We are required to perform assessments of at least 25% of our sites each year; however, we realize our fully vested interest is quite significant and conduct ASHRAE Level 1 audits annually at all sites. From those we normally develop at least three

investment grade ASHRAE Level III audits for submission and to implement.

We constantly monitor our largest consumers of energy remotely and look for deviations and exceptions past our acceptable thresholds. When we see a variance exception in our utility usage, we know that there is something wrong. When we see an issue at a site, we physically go to that site and verify whether the problem is mission-related, a controls issue or a mechanical issue. We avoid dispatching any contractors if the issue hasn't been vetted by our staff first. This results in maintenance savings.

For example, let's take a look at Fort Pickett. Our regional training site campus is critical to the operations at Fort Pickett. Due to its complexity and size, it is a large user of power, and if not monitored daily can easily become a challenge. On-site, there is half a megawatt of solar PV and in the facilities over 120 heat pumps along with boilers, ERVs, and primary/secondary hydronic loops with frequency drives. We are looking at opportunities there with punching in wells for ground source heat pumps as well as a battery backup system for the PV array.

A good example for that particular site is when we discovered some anomalies on the incoming power or "line side" where fluctuations in power were resulting in control board failures and compressor motor winding issues. We had to investigate those anomalies and identify whether the issue was actually on the line side, or was it a load issue past our internal main distribution panel. That resulted in transformers being rewound. We find these types of issues and anomalies only through daily monitoring and tracking of utility usage and cost.

Has Continuous Commissioning been ongoing since 2011, or did that start once projects were complete?

Once the projects had been completed and closed-out, continuous commissioning measures were implemented, starting in 2016. Before 2016 we completed retro-commissioning, which involved bringing equipment back to factory specifications every year.

Through the Continuous Commissioning process, have you found other opportunities or things that came up that maybe you were surprised by?

Yes. I believe that when you have any type of significant contracting performed, it takes a period of maybe one to two years to get your systems optimized. In that period, you're going to find things that you did not expect. We did not expect to find variances in voltages that caused a 10% failure in our heat pumps at RTI. We were very concerned about this variance of voltage since it would fault our power inverters and literally burn the control board's input terminal blocks on numerous heat pumps. Control boards usually operate in the 5V – 24V range and are more susceptible to power fluctuations than higher voltage components. When you look at communications voltages of 5V and see a variance of over 10%, it has a tendency to eventually cause continuity issues.

Can you speak about your partnership with your prime controls contractor Schneider Electric and how they are involved in the continuous commissioning process?

Schneider Electric developed and manages the specific version of software that we use for building automation and energy management. We have requirements that are called “risk management framework requirements” or RMF. These RMF requirements address issues directly



(Above) Brig. Gen. Timothy P. Williams, the Adjutant General of Virginia, prepares to symbolically turn the switch to send power from the newly-constructed solar array to the administrative and classroom facilities at the 183rd Regiment, Regional Training Institute at Fort Pickett (Photo by Capt. Andrew J. Czaplicki, Virginia Guard Public Affairs) & Solar Array at Fort Pickett



(Left) Brigadier General Paul Griffin, Assistant Adjutant General of Virginia Command Sargent Major Cliff White, CEM, VA ARNG Federal Deputy Facilities Management Officer Mr. Jim Rufo, CEM, CEA, Sustainability Officer, VA ARNG Department of Military Affairs Mr. Aubrey Craven, Utilities Manager, VA ARNG Department of Military Affairs Mr. David Hite, Controls Supervisor, VA ARNG Department of Military Affairs (Recipients of the 2016 Secretary of the Army Renewable Energy Award, Large Installations)

related to cybersecurity. When talking about controls, one must understand that it's not just controls because those controls are ultimately tied into servers and switches with are integrated into a network. With the risk management framework in place, we maintain a secure status and adhere to all the requirements limiting our vulnerability. We would immediately be pulled from the network and lose visibility if we didn't mitigate risks on a constant basis. It's absolutely critical that we have a partnership in place that understands this protocol.

During the continuous commissioning process, is there ever a need for additional funding or capital to correct errors or parts of the project that did not meet expectations?

Yes, it is important to understand that no project is perfect. There are going to be areas that are missed. There are going to be scopes of work that perhaps should have been included that were not. There are going to be times when it's more cost-effective to use maintenance contractors as opposed to nationally recognized firms when the situation might just involve lack of maintenance. In many cases, we use maintenance contractors to change filters, to purge systems, to drain down cooling towers, and provide quarterly PMs.

What is the value of continuous commissioning?

We realized the value of continuous commissioning by achieving a 15% reduction in excessive use that would have occurred had we not continuously been retro-commissioning or commissioning. That comes out too, roughly, \$312,000 a year. Add an inflation rate of 2-3%, and in 20 years, that is \$6 million in reductions. So that makes it worthwhile.