Army successfully demonstrates tactical operations smart grid

U.S. Army

ABERDEEN, Md. (Oct. 4, 2012) -- The U.S. Army demonstrated a proof of concept for a smart grid that could support tactical operations, this summer at its integrated capabilities testbed at Fort Dix, N.J.

The U.S. Army Research, Development and Engineering Command's communications-electronics RD& E Center, or CERDEC, powered portions of a Tactical Operations Center and used the event to gather data and lessons learned that would help inform/support Department of Defense efforts to develop a solution that will reduce the number of generators needed, prevent overloads and grid collapse while reducing the number of generators needed, manpower requirements for grid operation and fuel consumption by 25 percent.

"The Army has traditionally addressed power generation through a collection of application-specific, stand-alone solutions. But no matter how good the individual technology, variations in loads lead to inefficiencies during operation. It's nearly impossible to keep generators operating at peak efficiency when they are operating by themselves. That's why the right solution is a mix of all technologies," said Marnie DeJong, an electrical engineer with CERDEC's Command, Power & Integration directorate.

Microgrid systems are currently the only solution that allows the incorporation of multiple technologies, such as renewables and energy storage systems, to supplement traditional power generation techniques, DeJong explained.

"This allows us to create platforms that manage and distribute power efficiently while using smaller generators. It's a sustainable practice that has applicability across all echelons, from the Forward Operating Base down to the Soldier. Furthermore, this is all transparent to the Soldier; the plug-and-play system has an open, user-friendly architecture that allows for greater operational flexibility," DeJong said.

CP&I, which was one of the first DOD organizations to work in intelligent power management, developed their microgrid architecture under the Hybrid Intelligent Power program. HI Power is an OSD-funded initiative which seeks to develop a standard tactical microgrid to help reduce redundancy of power generation and to optimize generator performance while reducing maintenance and the logistical footprint, DeJong noted.

Tactical microgrids need to be fully mobile, easily deployable and field rugged. To date, CERDEC CP&I has developed three tactical architectures, and have demonstrated two, said Michael Zalewski, a mechanical engineer in CERDEC CP&I's

Alternative Energy branch.

"The intelligent power generation, distribution and management technologies of the microgrid support major Army initiatives to reduce both the fuel consumption and logistics associated with bases. We're also developing intelligent power management solutions for Soldier borne applications to reduce the physical burden of the dismounted squad," Zalewski said.

In addition to the tactical microgird architecture, CP&I tested a prototype handheld application that they hope will aid in managing power for forward operating bases, allowing the grid operator to monitor the fuel level of generator sets on a handheld device without having to be present.

"This stemmed from interacting with Soldiers to get their feedback on what's needed and what's important to them. For this demonstration, we just looked at fuel level alerts, but the way ahead is to determine what additional information we need to provide through this application, such as status alerts for the entire grid and the capability to control and adjust loads. If the Android has enough processing power, we see a capability to control the grid," said Christopher Wildmann, Hybrid Intelligent Power Program lead for CERDEC's Command Power & Integration directorate.

"That's one of the reasons we came to PD C4ISR & Network Modernization, to figure out what would and would not work so we can implement the best strategy that will enable us to integrate this into other applications of a larger power distribution network," Wildmann said.

Product Director Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance & Network Modernization is an R&D program within RDECOM CERDEC that focuses on the future network, near term and several years out.

The program provides the Army with a relevant venue to assess next generation technologies and to facilitate technology maturation. The PD is also a key component in CERDEC's support of the agile acquisition process, utilizing its field lab environment to perform risk mitigation and candidate assessment/selection for future Network Integration Rehearsal/Exercise events.

"The ever increasing use of electronics for communication, surveillance, sensing and targeting devices at the Soldier level dictates an intelligent micro-grid, so it makes scientific and economic sense to collaborate, share information and resources where permissible," said Product Director Lt. Col. Quentin L. Smith, PD C4ISR & Network Modernization.

"This is a neutral, non-attribution environment, not a pass/fail test; we're here to work things out collaboratively so we can inform decision makers of what's technically possible and what still needs to be done to get there," Smith said.

CERDEC CP&I is working with programs of record to transition and field pieces of the

microgrid architecture. Project Manager Mobile Electric Power has taken pieces of the architecture to NIE, Wildmann said.

"We're continuing to refine these systems to find the most desirable configuration of simplicity, functionality and cost that could eventually be fielded. The feedback we received this summer will directly impact design considerations for how tactical microgrids should be transported, set up and operated," Wildmann said.

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