"Leading the Way in Delivering Air Force Installation Energy Assurance"

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Electrical infrastructure improvements: 75 years in the making

By Airman 1st Class Tristan Viglianco
9th Reconnaisance Wing

Beale Air Force Base, California, opened during World War II and a lot has changed since then. Aircraft have come and gone and so have entire services, but one thing has remained a constant, the electrical system. With the addition of new mission sets and an increased need for power, the 9th Civil Engineer Squadron has begun to modernize the systems.

"The current electrical system was built in 1942 and was not originally intended to provide power to key national security assets," said Calvin Hendrix, 9th CES deputy base civil engineer. "So, we

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Contractors work on electrical substation renovations at Beale Air Force Base, Calif. Oct. 23, 2017. Beale is upgrading five substations and building a new substation to meet the growing energy demands. (U.S. Air Force photo by Airman 1st Class Tristan D. Viglianco)

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are replacing the old system with a new system, which is much more robust and resilient."

According to Hendrix, they have renovated half of the 12 kilovolt (kV) distribution circuits so far and are going to begin renovating the 12 kilovolt kV transmission infrastructure.

"Up until now we have been working on the 12 kV system. Our next big project is upgrading the 60 kV circuits," he said "We are taking out the old wooden poles, which run 60 kV, and replacing them with new steel poles. We also plan on adding a new 60 kV circuit to create a loop to increase reliability."

In addition to the upgrades to the power lines, Hendrix said they plan on renovating the five existing substations on base and building a new one.

The planned improvements to Beale's electrical infrastructure are ongoing and will continue for the next few years.

"We are going through a phased five year plan to renovate the backbone of our electrical infrastructure," said Hendrix. "In this fiscal year we are going to renovate the circuit from main base to the flightline. After that, we are going to renovate the circuit from the clinic out to Pave Paws and then we are going to renovate the system in housing."

These updates are taking place just as the high-altitude intelligence, surveillance, and reconnaissance mission expands and the necessary power needed to keep them functioning increases.

"Beale's missions rely on power," said Charlie Gritzmacher, 9th Mission Support Group project manager. "We were getting close to our energy capacity. Part of what is driving the upgrades and the increase in capacity are the Common Control Mission Center and Distributed Ground Station buildings coming online."

As technology improves, the need for energy will inevitably increase. The 9th CES has plans to meet the demands of the future.

"On most bases in the Air Force, the mission revolves around the flightline. We have a flightline mission, but our primary mission revolves around electricity going to buildings," said Hendrix. "In order to provide increased mission growth potential in the future, we are attempting to connect to the Department of Energy WAPA (Western Area Power Administration) on the west side of the base."

Gritzmacher said connecting to those lines would dramatically increase the power available to the base and ensure we can meet future energy needs.

"The side of the base we are currently tapped into provides us with 25 megawatts," said Gritzmacher. "The side we would like to tap into could provide us with 512 megawatts."

The improvements which have taken place and will take place are thanks to Beale's Energy Resiliency Program.

"The Secretary of the Air Force selected Beale to be the Resilient Energy Demonstration Initiative in 2016," said Hendrix. "With that comes technology upgrades to our electrical infrastructure, photovoltaic storage, and a microgrid."

Both Hendrix and Gritzmacher believe SECAF made the right decision in selecting Beale for the initiative.

"The reason Beale was selected is because we have a unique need for power," said Gritzmacher. "Improving our electrical infrastructure on Beale is in the best interest to our national security."

Workers load a power pole onto a truck to make room for its replacement at Beale Air Force Base, California, April 24, 2017. The new poles will be able to supply Beale's increased energy demands in addition to weathering storms more reliably. (U.S. Air Force photo by Airman 1st Class Douglas Lorance)

E|e Profile

Sundae Knight

Resource Efficiency Manager
Yokota Air Base, Japan

Sundae Knight is the resource efficiency manager at Yokota Air Base, Japan. She has a Bachelor of Science in Civil Engineering from the University of Central Florida. Knight served on active duty at Hill Air Force Base, Utah, where she worked for and was mentored by Kent Nomura, energy and utility manager for the 75th Civil Engineer Squadron at that time. According to Knight, after working there, she was "hooked" on working in energy. Recently, Knight was awarded 2017 Energy Engineer of the Year for the Asia Pacific Rim Region by the Association of Energy Engineers.

How would you describe your role as a Resource Efficiency Manager?
I analyze utility and energy consuming systems and find a way to apply new technologies to make them more efficient; to consume less resources and save money.

What motivates you about working with Air Force Energy?
Saving the taxpayers money and implementing new technologies to advance the Air Force mission are the two things that motivate me most.

What is the most interesting part of your role?
The sheer diversity of technologies available to improve efficiency of almost every facet of modern life is incredibly interesting. From nano-technologies improving solar panels in space, to LED lighting, to new ceramics to improve the standard coffee pot, there is almost no part of modern life that can't be made more efficient with new technologies. Every day is a learning opportunity.

Please describe the relationship you've had with the Air Force Civil Engineer Center's Energy Directorate.
The people at AFCEC's Energy directorate really care about their mission. It's one of the places in the Air Force where projects are required to pay for themselves with energy savings. That makes our mission unique and self-sustaining.

What is your favorite energy-saving tip for airmen?
Turn stuff off! As simple as it sounds, developing less wasteful habits is the key component to increasing the energy security of our nation. "A penny saved is a penny earned," was true in Benjamin Franklin's time and it's still true today. Interacting with the public is one of the fun parts of the job. I'm always looking for new ways to advocate for saving energy. My latest find is an app called Joulebug, which makes conserving energy and sustainability fun, interactive, and competitive. Now to find a way to deploy it…

Team Offutt chosen for solar power testing

By 55th Wing Public Affairs

OFFUTT AIR FORCE BASE, Neb. -- Thirty-seven sites were chosen worldwide to participate in an experimental evaluation of photovoltaic technology and the potential for its application to the Air Force. Offut Air Force Base, Nebraska, was selected as one such site.

The study began in June 2017 by an Air Force Institute of Technology research team and will continue for a year.

The research aims to establish the potential for monocrystalline and polycrystalline silicone photovoltaic technology, which together represent 70 to 90 percent of the market share, across the enterprise.

Offutt Air Force Base, Nebraska, is one of 37 sites chosen worldwide to participate in an experimental evaluation of photovoltaic technology and the potential for its application to the Air Force. The research aims to establish the potential for monocrystalline and polycrystalline silicone photovoltaic technology. (Courtesy Photo)

This research seeks to tell any Air Force location approximately how efficient a panel at their site will be based on observed, not theoretical, data.

The researchers also want to measure the impact of ambient temperature on this type of technology. There are currently five different published correlation coefficients for monocrystalline silicone technology showing disagreement amongst the industry and higher academics.

Researchers will also be looking for a statistical correlation between ambient humidity and photovoltaic performance. It's known that humidity affects irradiance, but no study has carried that through to actual photovoltaic performance, much less accounted for the additional impacts of humidity besides effects on irradiance.

The study will assess flat panel performance and is driven by a specific application: solar pavement. Since pavement is flat, this is how they must be tested, in Offutt's case, the panels are located on a flat rooftop.

Depending on the strength of the material, ideally a base could replace any pavements (even airfield pavement) with a solar pavement product. More realistic implementation might see these being put on parking lots and sidewalks initially. Conceptually energy resilience can be maximized for any facility on

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base by tying the solar pavements into the grid. Another possibility is using these as part of decentralized micro grids (current research being conducted at AFIT) for each facility.

For this phase, researchers are looking at the two types of silicon-based panels, mono- and poly-crystalline, since they make up the vast majority of market share. Future research might look at other types, but that would be up to the researchers to design a compatible panel node for use with the current test systems or design a new one.

This research may open up some potential projects for the future, but first information is needed to arm decision-makers. The work is aiming to characterize performance of the flat panel orientation in various climate types, temperature and humidity ranges while future efforts can look at material strength, cost analysis, alternate panel types, etc. The end state is the ability to determine whether it might make a suitable project for any given location on the globe.

The amount of power produced varies widely by site. A compilation of Offutt's production shows the potential storage for the month of June was 4.5 KW (mono-crystalline) and 15.6 KW (poly-crystalline), and the potential storage for the month of July and August was 15.3 KW (poly-crystalline).

Depending on the results of the study, a project using the technology being tested could be used here in the future to enhance Offutt's energy resiliency and produce electricity using a renewable resource.

If you would like to nominate someone to be profiled in one of our upcoming issues, please contact us at afcec.pa@us.af.mil

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