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

ENERGY express

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The ANG finds new partner for improving energy efficiency… AFCEC

By J. Brian Garmon
AFCEC Public Affairs

TYNDALL AIR FORCE BASE, Fla. – For the first time, the Air Force Civil Engineer Center is supporting an Air National Guard, or ANG, base in the development of a Utility Energy Service Contract, or UESC.

A UESC is a contract between a utility and a federal agency that provides energy and water efficiency improvements and demand-reduction services to the agency at little or no up-front cost. In these projects, utilities can provide services such as performing a preliminary assessment of the project, designing appropriate solutions for the installation, installation of energy and water conservation measures, assuring a minimum level of performance and financing the project.

The Memphis Air National Guard Base, Tenn., the Tennessee United States Property and Fiscal Officer, the National Guard Bureau Logistics and Installations Operations Division and AFCEC are teaming with the Tennessee Valley Authority, or TVA, on this project to conceptualize some of the energy savings opportunities this base may see. Initial findings have shown energy saving opportunities may exist in lighting, renewable energy sources, energy management control systems, water savings and heating, ventilation and air conditioning.

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Members of the Tennessee Air National Guard hold a salute during the presentation of the colors by the 164th Air Wing Color Guard on Memphis Air National Guard Base, Tennessee. This is the first ANG base to partner with AFCEC on a UESC project. (U.S. Air National Guard Photo/Staff Sgt. Allan Eason)

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"AFCEC has provided a wealth of knowledge to the Memphis ANG by starting up the UESC process with TVA. This information includes lessons learned from previous contracts, knowledge in the various steps in the contracting process, the differences between a preliminary and detailed study and pitfalls to avoid while working the process," said Lt. Col. Ron Hawkins, 164th base civil engineer, Memphis ANG Base.

As a partner in this process, AFCEC brings the experience of having helped develop a number of UESCs with other Air Force installations throughout the United States.

"UESCs are another avenue for installations to improve infrastructure and reduce energy consumption with new technology or upgraded equipment," said John Broughton, AFCEC ESPC/UESC project manager. "Our program development division is committed to helping installations navigate the UESC process."

There are approximately 93 ANG units in the United States, Puerto Rico, Guam and the U.S. Virgin Islands. These and other ANG controlled installations comprise approximately 50 million square feet of facilities. ANG units, while generally considered low energy use sites in comparison to their larger Air Force base counterparts and operate under the same constrained budget environment. This creates incentive for the bases to seek ways to improve efficiency while maintaining their mission. The UESC is one route bases may pursue to accomplish this goal.

"For the ANG, the UESC can be another tool in our energy tool box to reach energy goals as we approach energy resiliency and assurance as a whole for the Air National Guard and the Air Force," said Bill Kelly, ANG resource efficiency manager for Region six. "The UESC method will not meet the requirement for all ANG bases, but it will for some."

For more information on opportunities UESCs may hold for your installation, contact Mike Ringenberg, ESPC/UESC program manager on AFCEC's Energy Program Development Division team at: afcec.cn.workflow@us.af.mil.

AEMR is now AEMRR

2017 Annual Energy Management Resilience Report

By J. Brian Garmon
AFCEC Public Affairs

The Air Force Civil Engineer Center's Energy Measurement and Analysis Division, or AFCEC/CNA, is ramping up for the 2017 Annual Energy Management and Resilience Report, otherwise known as the AEMRR.

In last year's report, the Air Force reported reducing energy intensity by 4.1 percent, which exceeded their 2.5 percent goal. Energy consumption was reduced to 55,130 billion British Thermal Units, or BBTU, from 57,407 BBTU in fiscal year 2015. In addition to weather and mission operations tempo contributions, many bases reported direct funding, third party funding and aggressive energy awareness programs as significant factors.

Deven Volk, an analyst in AFCEC's Energy Directorate at Tyndall Air Force Base, Florida, prepares guidance for the 2017 AEMRR. (U.S. Air Force Photo/ J. Brian Garmon)

The AEMRR compiles various components of the Air Force energy program into one report, which is submitted to the Office of the Secretary of Defense, or OSD, who submits the report to the Department of Energy, along with all federal agencies. DOE then submits a final report to Congress.

To produce the AEMRR, AFCEC collects, collates and summarizes a variety of information to include annual consumption and costs for various utility types, renewable energy, energy/water conservation projects, utility outages and facility sustainable design. Additionally, they calculate various metrics identified in Executive Order 13693, "Planning for Federal Sustainability in the next Decade." Key measures include facility energy/water intensity, renewable energy usage and building energy efficiency standards.

"The AEMRR is a coordinated effort between installation energy managers, Air Force Reserve and Air National Guard major command staff and AFCEC to bring the entire year's energy information together," said Deven Volk, AFCEC Energy Directorate analyst and Air Force lead on this project. "It takes a lot of teamwork to pull it all together within a limited timeframe."

For this year's report, annual OSD instructions have been received, and AFCEC is preparing an Air Force guidance document along with appropriate workbooks, which installation energy managers will complete and return to AFCEC for compilation. The instructions and workbooks are expected to delivered to installations early this month with a completion due date of Sept. 18. Training sessions are being scheduled Aug 7 - 11. Additional details will be identified in the Air Force AEMRR Guidance.

"AFCEC is here as a resource to support your installation through this process," said Volk. "The instructions we send out will list points of contact that can answer any questions during the reporting process. Please do not hesitate to reach out to us for support."

E|e Profile

John Kitson

Resource Efficiency Manager
Eglin Air Force Base, Florida

John Kitson is the resource efficiency manager, or REM, at Eglin Air Force Base, Florida. Kitson received his Bachelor of Science in Management Information Systems from Wesleyan College and his Master of Science in Engineering and Thermodynamics with a focus in Energy Management from North Carolina State University. His professional accreditations include certified energy manager, certified demand-side manager, certified lighting efficiency professional, lighting consultant, and he has a 1600-ton United States Merchant Marine master's license.

In total, he has over 25 years of experience as an energy professional working with the Department of Defense in installations around the world. He has been a REM for over 10 years, working with Air Force, Marine Corps, Navy and Army installations. Prior to becoming a REM, he spent seven years writing a syndicated weekly newspaper column called "Energy Economics."

How would you describe your role as a REM?

Whether stationed in the frigid expanse of Alaska, the temperate shores of San Diego or the endless horizon on some unnamed sandbox far away, the REM soon realizes he or she must often fill multiple roles in pursuit of the mission. One moment, a REM is an engineer and auditor harvesting and analyzing reams of raw data to ensure technologies, designs and system strategies are appropriately matched with viable opportunities. The next moment they may find themselves educating leadership or individual customers about how their meter is read or standing in front of a room full of highly skilled, seasoned shop professionals, bringing them up to speed on the nuances of some new technology they may be skeptical of. Essentially, the REM brings a toolbox, full with years of real-world DOD experience, coupled with a solid academic foundation, inherent curiosity and a core belief that more is possible through homework, patience and persistence.

What motivates you about working with Air Force Energy?

Over the years I have had the rare honor and opportunity to serve as a REM for each of the DOD agencies at installations worldwide. I believe the Air Force offers unique challenges in both the project development and execution process. This is especially true at Eglin AFB. With more than 720 square-miles inside the fence and nearly 500,000 total acres, Eglin is the largest U.S. military installation in the world (including offshore ranges). Its weapons design, testing and training mission is both historic and critical to our national defense.

What is the most interesting part of your role?

The project developmental process – identification of opportunities (audits, surveys, etc.), validation of technologies and potential energy conservation measures (technical research, data harvesting and analytics), proposal writing and submission.

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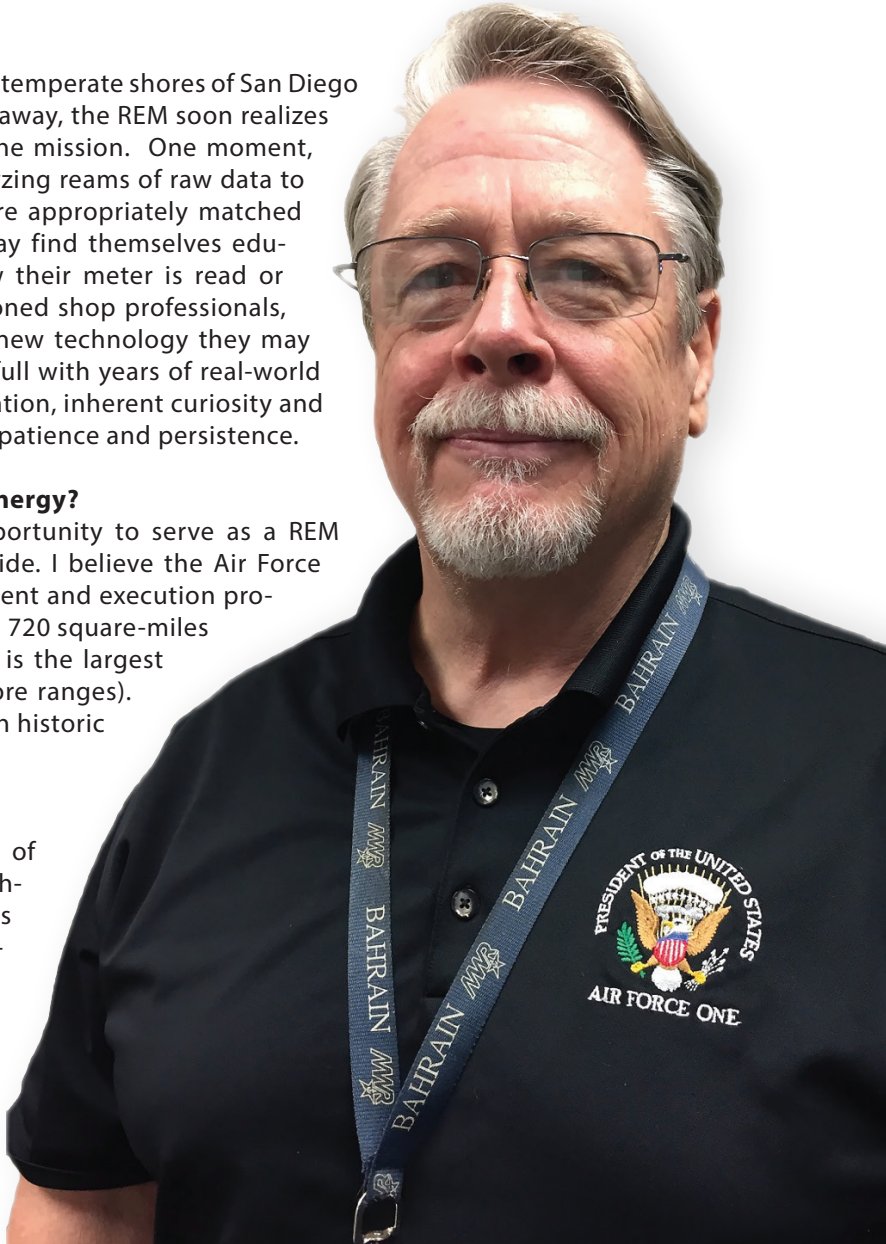

AFRL researchers explore automation, additive technologies for cost efficient solar power

By Marisa Alia-Novobilski
Air Force Research Laboratory

WRIGHT-PATTERSON AIR FORCE BASE, Ohio -- Inspired by newspaper printing, and taking cues from additive manufacturing technology, researchers at the Air Force Research Laboratory are exploring new ways to make solar cells more cost efficient — increasing application potential in the process.

"Sun is abundant and it's free," said Dr. Santanu Bag, a project scientist at AFRL's Materials and Manufacturing Directorate. "Solar cells can generate electricity in an environmentally friendly way, but current, complex fabrication costs make the technology expensive. We're looking at new ways to use materials and manufacturing technologies to make these less expensively."

Though research into solar cells began in the 1950s, the technology for making them is complex and labor intensive. At a basic level, to fabricate solar cells, engineers rely on extremely pure, single-crystalline silicon. The pure silicon is extracted from an original material such as quartz or sand and is transformed into thin wafers. The silicon wafers are chemically treated to form an electric field, with a positive and negative polarity. These silicon semiconductors, or solar cells, are encapsulated in a support to form a photovoltaic module, where they are then able to collect and transform sunlight into an electric current.

This multistep, labor-intensive process is time consuming and uses highly sophisticated equipment, requiring a number of technicians and engineers to create the end product. Quality control is key, as a discrepancy during any stage of the manufacturing process could have an effect on the performance of the cells.

This high cost of manufacturing has prohibited widespread use of solar power, despite its cost saving potential.

"If you want to make solar competitive, you need to make solar cells more efficient and cost effective," said Bag.

Inspired by the concept of newsprint, where rolls of paper are printed with ink to create newspapers, Bag and his team looked for alternatives to inorganic, hard silicon in search of a material able to transform solar into energy — and be printed in the process.

"Silicon cells use purely inorganic materials, which by nature are very hard," said Bag. "We needed a material that was easy to print and at the same time able to capture sunlight. We determined an inorganic-organic hybrid material would be easy to print and could still harvest solar energy."

Bag's material of choice, thin-film perovskites, have an excellent light absorbing capability and power conversion efficiencies that have improved

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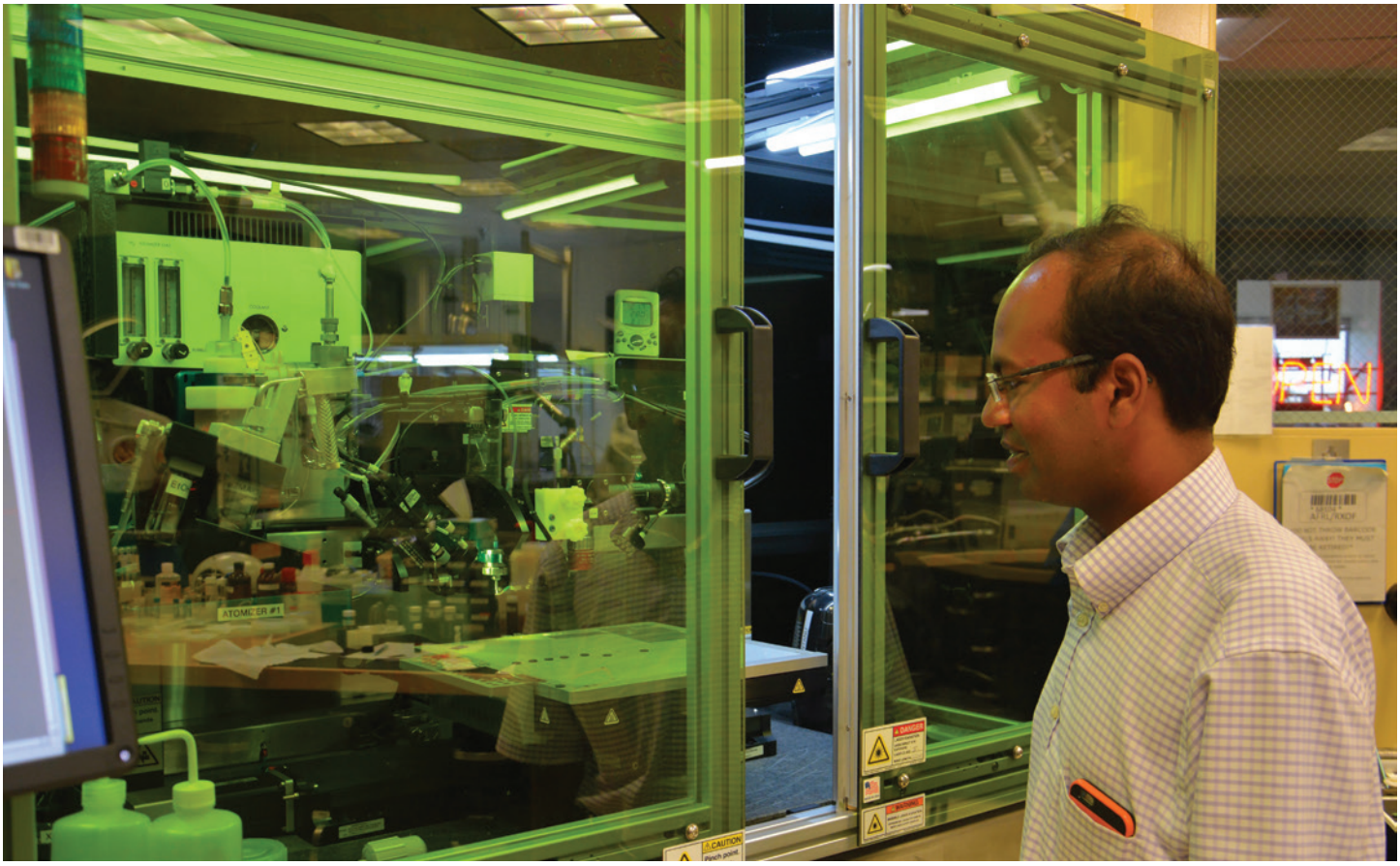

Dr. Santanu Bag, a project scientist at the Air Force Research Lab's Materials and Manufacturing Directorate, is exploring cost-efficient manufacturing of solar cells using additive technology. (U.S. Air Force photo/David Dixon)

John Kitson

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Please tell us a little about the relationship you've had with AFCEC's Energy Directorate.

They have been quite supportive of our work here and have never hesitated to assist us in our mission. Les Martin and his team have always assisted us in both large initiatives (energy savings performance contracts, utility energy services contracts) and smaller projects, never hesitating to offer alternative strategies, resources and direct technical support.

What is your favorite energy-saving tip for Airmen?

Just like ammo, energy is an essential, incredibly powerful and finite resource – SAVE IT!

Is there anything you'd like to add?

Skeptics of your cause can often make the greatest champions of that same cause. Thank your advocates but communicate with and educate the un- or ill-informed.

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

ANG finds a new partner

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tremendously compared to the more than 30 years it took for silicon solar cells to improve to today's levels. Only recently has this material been explored for its solar power ability, with Bag among the researchers expanding the field.

"The material has been around since the 1990s and was used to make test-level, light-emitting diodes. Researchers knew it had solar ability, but this was not the focus at the time," said Bag.

In Bag's study, perovskite precursor material (a hybrid organic-inorganic material used for light harvesting) was atomized using ultrasonic waves to form extremely fine, aerosol droplets able to be transferred into the print nozzle of an aerosol-jet spray printer. Using computer-aided design tool paths, a surface was then coated with the material using a direct-write printer, forming a solar cell with a 15.4 percent efficiency on a flat surface.

Bag and his team also demonstrated the ability to print these solar cells on a 3-D surface with a 5.4 percent efficiency — marking the first time this has been shown in the field of printed photovoltaics.

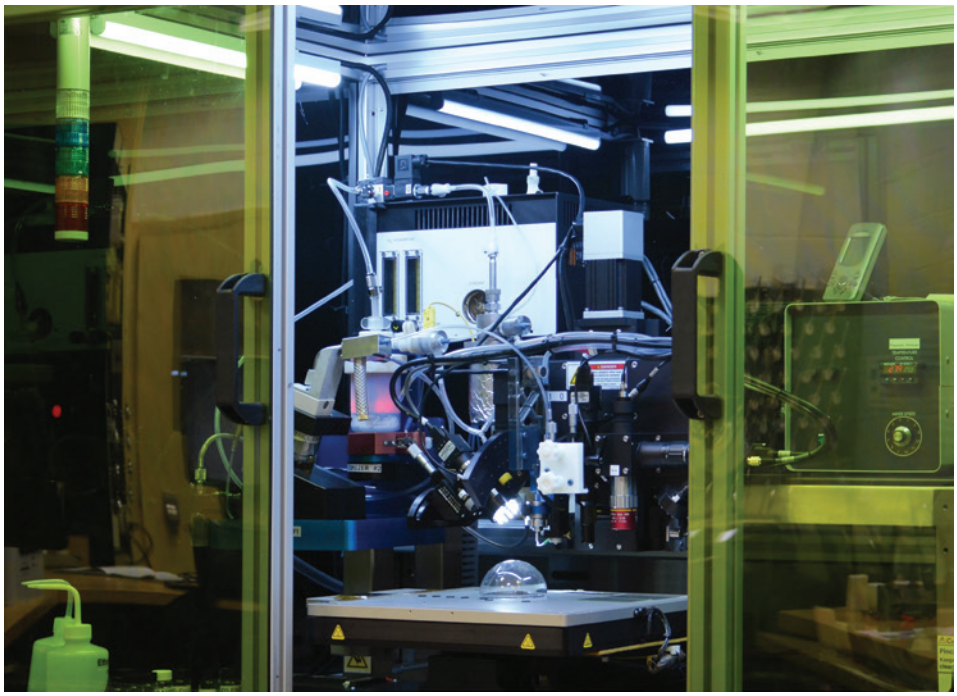
"We have not optimized conditions for 3-D printing of these yet, but we know it can be done. Once you know how to print it, it has huge potential for other applications," said Bag.

For the Air Force, the applications for this material and the new printing process are enormous. The method can be used to print flexible solar cells on clothing, to create self-powered robotics and light-emitting devices and even to make flexible, self-powered sensors, to name a few.

Bag, along with fellow researchers Dr. Michael Durstock, soft matter materials branch chief at the AFRL Materials and Manufacturing Directorate, and James Deneault, a research engineer at Universal Technology Corporation, have filed a patent application for the technology. Though this research is still in its early stages, the impact of the new manufacturing processes has great potential for the future.

"Understanding ways to make and print this material more efficiently at the most basic level can lead to future cost savings," Bag concluded.

Dr. Santanu Bag, together with Dr. Michael Durstock and James Deneault, published their work in Advanced Energy Materials, July 14. The article can be viewed here: http://onlinelibrary.wiley.com/doi/10.1002/aenm.201701151/full.



Researchers at the Air Force Research Laboratory's Materials and Manufacturing Directorate, Air Force Research Laboratory, have demonstrated the ability to print solar cells on three-dimensional surfaces using a modified aerosol spray printer. The ability to print three dimensionally opens the aperture for future application of solar cells on diverse surfaces for sensors, robotics and more. (U.S. Air Force photo /David Dixon)

New ESPC playbook now live

TYNDALL AIR FORCE BASE, Fla. - The Air Force Civil Engineer Center's Energy Directorate recently went live with a new playbook for Energy Savings Performance Contracts, or ESPCs, replacing Engineering Technical Letter 13-13.

This interactive web-based tool, located on the CE Portal, is a hub for ESPC best practices and direction, helping installations better navigate through the complex process to a successful contract award.

"The new playbook contains a basic history of the ESPC program, primary roles and responsibilities, step-by-step instructions, job aids and reference documents," said Mike Giniger, the Air Force subject matter expert on ESPCs. "Its objective is to provide parameters and guidance used by the Air Force to implement an ESPC."

Requirements in the playbook are mandatory, and any deviations require written approval from the ESPC program manager, the Air Force Civil Engineer Center and the Energy Program Development Division.

The ESPC program allows the Air Force to implement infrastructure improvements with no up-front capital expenditures. In an ESPC, an Energy Services Company, or ESCO, designs, constructs, implements, operates, maintains and arranges the necessary funding of improvements that reduce energy and water consumption and promote the use of renewable energy technologies. ESPCs improve energy performance while addressing aging infrastructure concerns and reducing consumption through a budget-neutral approach for the Air Force.

During the past three years, AFCEC has been committed to meeting its $450 million share of the presidential performance contracting challenge.

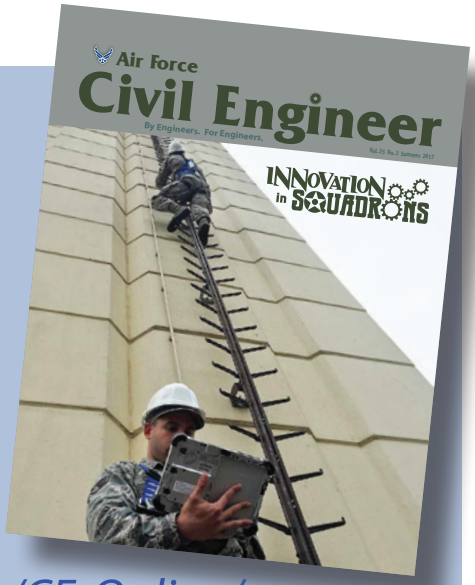
"Some of the solicitations were successful and others were not, but we captured the lessons learned and put them into this new playbook," said Mike Ringenberg, ESPC program manager.

This playbook is written for all Air Force personnel involved with ESPCs, ESCOs and contracting offices.

"Although we have created this playbook to include all ESPC nuances, you can still contact anyone on our team to get live support," said Les Martin, AFCEC's Program Development Division chief."

If you find any errors or would like to suggest an edit to the playbook, users may submit a CE Portal request to ask questions on content or provide suggestions for improvement. All CE Portal requests for a playbook are checked with the playbook content owners for approval or incorporation.

Follow the link below to read other energy-related stories in the Summer 2017 edition of Air Force Civil Engineer magazine.



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