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

ENERGY express

A product of the Air Force Civil Engineer Center

September 2017

Thousands exchange ideas, information at annual event

By Brian Garmon
AFCEC Public Affairs

TYNDALL AIR FORCE BASE, Fla. – More than 2,600 professionals from the energy industry, including approximately 200 Air Force attendees, gathered in Tampa, Florida, Aug. 14-18 for the U.S. Department of Energy Federal Energy Management Program's 2017 Energy Exchange.

This year's topics included energy resilience, cybersecurity, emerging energy technologies, policy direction, third-party financing options for projects and best practices from industry and the Department of Defense.

This three-day industry event, supplemented by an additional day-and-a-half of Air Force specific content, featured senior leaders from Air Force Energy, the Office of Energy Assurance and the Air Force Civil Engineer Center's Energy Directorate. Attendees heard from Acting Assistant Secretary of the Air Force for Installations, Environment and Energy Richard Hartley, Deputy Assistant Secretary of the Air Force for Environment, Safety and Infrastructure Mark Correll, Deputy Director of Civil Engineers, Deputy Chief of Staff for

continued on pg. 2

U.S. Air Force photo by J. Brian Garmon

In this issue:

Energy Exchange *continued from pg. 1*

Logistics, Engineering and Force Protection Ed Oshiba, AFCEC Director Randy Brown and the OEA Executive Director Bob Hughes.

Each leader gave his or her unique perspective on the state of Air Force energy and answered questions from attendees.

During a Department of Defense session, Hartley emphasized the importance of reliable energy to critical Air Force missions.

"Our critical missions, for the most part, rely on electricity from the U.S. grid," said Hartley. "Because we're so dependent on this energy to support our critical missions and face a growing cyber thread, physical threat, and even national disaster threat to the grid, we've really put a heavy emphasis on what we call 'protect the power' at our bases and installations. This is what really drives our strategic vision for Air Force energy, 'enhancing mission assurance through energy assurance.'"

Air Force attendees were given the opportunity to provide feedback via survey, and results for this year's event have been positive.

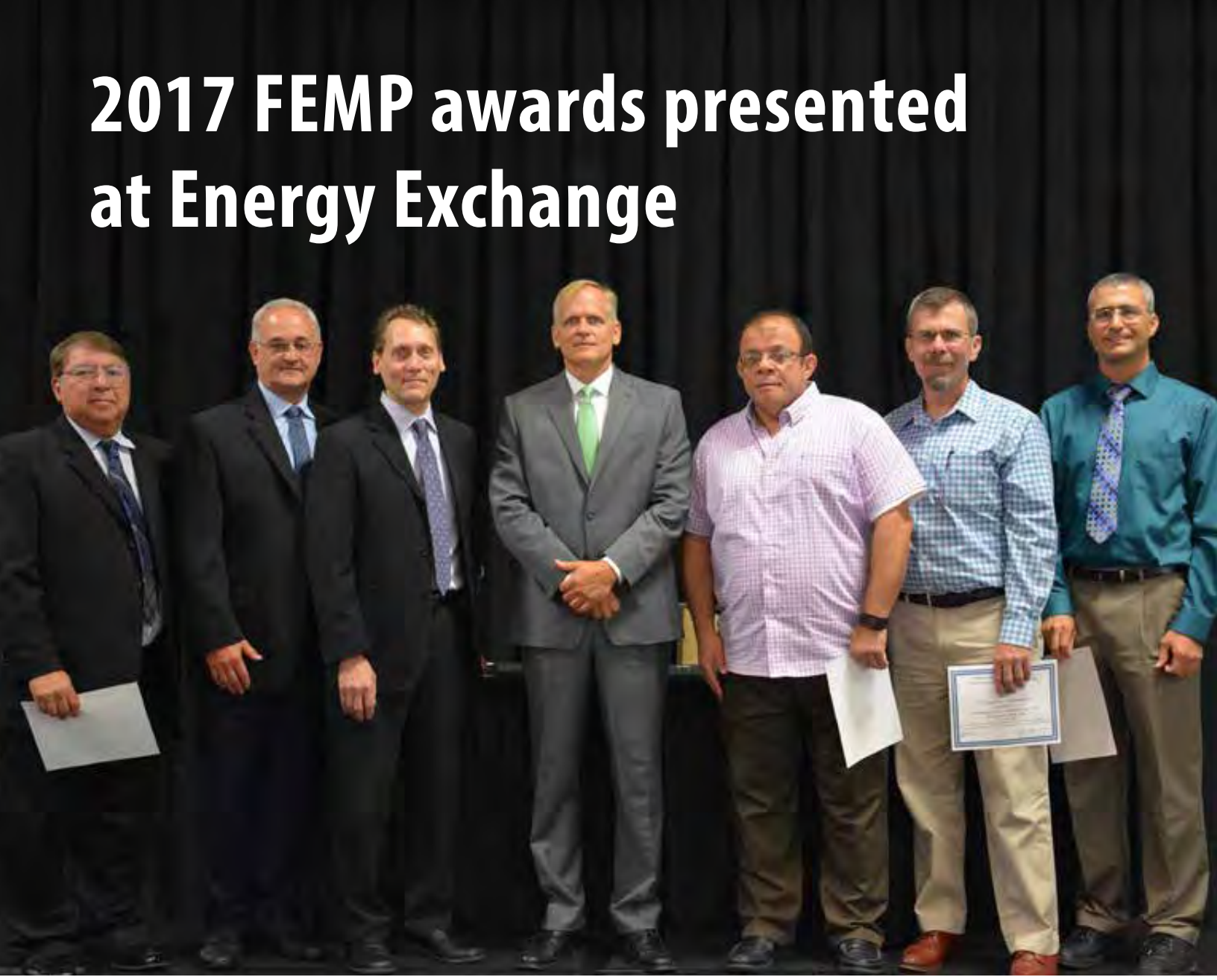
"The event was a rousing success," said Robert Gill, director of AFCEC's Energy Directorate. "We had the right people and the right topics. It truly was a banner event."

The 2018 Energy Exchange is planned in Cleveland, Ohio.

Energy Exchange 2017

U.S. Air Force photos by J. Brian Garmon

2017 FEMP awards presented at Energy Exchange



At center, Acting Assistant Secretary of the Air Force for Installations, Environment and Energy, Richard Hartley, center, stands with 2017 FEMP award recipients. Recipients were recognized Aug. 18, 2017 at the 2017 Energy Exchange held in Tampa, Fla. (U.S. Air Force photo by J. Brian Garmon)

By Brian Garmon
AFCEC Public Affairs

TAMPA, Fla. – The Air Force recognized six Federal Energy Management Program, or FEMP, award winners Aug. 18 at the 2017 Energy Exchange in Tampa, Florida.

Acting Assistant Secretary of the Air Force for Installations, Environment and Energy, Richard Hartley, presented representatives from each installation along with individual winners with certificates of achievement and coins from SAF/IE.

"Congratulations to our Air Force award winners for the outstanding work they are doing to improve Air Force energy resilience, and helping enhance mission assurance through energy assurance," said Hartley. "Each winner represents the best of what the Air Force has to offer and demonstrates a strong commitment to ensuring we are well positioned for the future."

In the project category, Jeff Blazi accepted the award on behalf of Nellis Air Force Base, Nevada, which led a multidisciplinary team to construct an 18.8 MW solar array at no cost to the government. All project costs totaled $54 million, and include a 102-acre, 31-year land lease. The array generates enough energy to reduce energy usage by 61 billion British Thermal Units, or BTUs. This array, when coupled with an array completed in 2007, will allow 100 percent of the base to be powered by solar energy.

Brian O'Leary accepted an award in the project category on behalf of Peterson Air Force Base, Colorado. The base achieved long-term cost savings at Clear Air Force Station, Alaska, through new energy sources eliminating $16 million in pending repairs at the old coal plant, which also reduced labor costs by $3.2 million annually. In addition, this project will significantly reduce greenhouse gas emissions from 42,000 tons to 6,700 tons per year, an 84-percent reduction.

Abe Irshid accepted a program category award for his leadership at Schriever

Air Force Base, Colorado, where the base reduced energy consumption by more than 447 billion BTUs, resulting in a cost savings of over $11 million. He developed a $3.3 million fiscal year 2016 energy management and control systems replacement project to save $733,000 per year. He also developed a $4.4 million energy resilience and conservation investment program, or ERCIP, project to upgrade and sequence chillers at the central plant, saving $631,000 in the first year alone. Irshid led a team of subject matter experts to develop a $15.3 million fiscal year 2018 ERCIP project supporting resiliency through 20 MW of back-up power based on a co-gen duel-fuel turbine and microgrid.

The Oklahoma City Air Logistics Complex was honored for its work in reducing energy usage by over 147 billion BTUs, resulting in a cost savings of more than $4.4 million. The complex's accomplishments include: the awarding of a $262 million energy savings performance contract; the largest in the history of the Department of Energy, achieving leadership program endorsement through ISO 50001 accreditation and developing a $19 million utility energy service contract project to replace boilers, upgrade lighting and upgrade compressors. Joe Cecrle, energy manager for the complex, received the award on behalf of the organization.

Tom Behany, from Stewart Air National Guard Base, New York, and Andres Hinojosa, from Joint Base San Antonio-Fort Sam Houston, Texas, were presented career exceptional service awards.

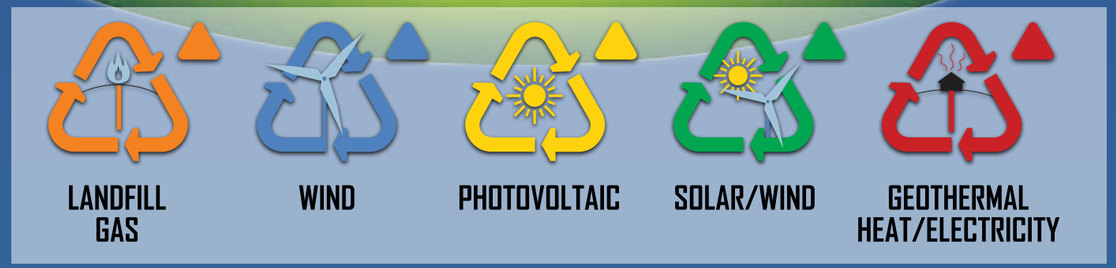
Behany's leadership on multiple projects and initiatives spans 31 years of civil service, where he began as a postmaster and currently is a real property manager in the 105th Air Wing Civil Engineer Squadron. Behany began assisting AFRL in 2010 for a microgrid research project commissioned in 2015 and he initiated many solar projects at facilities throughout the installation. In 2014, he facilitated the award of a $4.25 million project with multiple energy conservation measures, to include HVAC, lighting and hangar upgrades. Finally, he is partnering with stakeholders on a possible Catskill Aqueduct hydropower project.

Hinojosa began his 32-year career as a mechanical engineer supporting the C-130 Hercules, B-52 Stratofortress and C-5 Galaxy weapon systems. During fiscal year 2016, he served as the lead energy manager for Joint Base San Antonio. Hinojosa is currently leading a team finalizing the audit for an energy savings performance contract that will provide $240 million in conservation measures at all three installations at JBSA. The planned improvements are projected to cut JBSA's energy bill by 25 percent or $17 million. Other initiatives include a community partnership program to install a 20 kW solar array sponsored by the National Renewable Energy Laboratory, an on-site load curtailment program garnering rebates worth $2 million and a stand-alone $2 million project to upgrade energy management and control systems throughout JBSA with use of direct digital controls.

"These winners and nominees represent the great strides our bases are making towards the Air Force's goal of mission assurance through energy assurance," said Dan Soto, AFCEC Energy Directorate's measurements and analysis division chief.

> "Each winner represents the best of what the Air Force has to offer and demonstrates a strong commitment to ensuring we are well positioned for the future."

U.S. Air Force Renewable Energy Projects



Operational and In-Development Projects

	Installation	MW	Operational
1.	F.E. Warren AFB, WY	1.3	2004
2.	Hill AFB, UT	2.3	2005
3.	JBMDL (McGuire/Dix), NJ	1.0	2009
4.	Toledo ANGB, OH	1.5	2009
5.	Buckley AFB, CO	1.0	2010
6.	U.S. Air Force Academy, CO	6.0	2011
7.	Nellis AFB, NV (I)	14.2	2011
8.	Burlington ANGB, VT	1.5	2012
9.	JB Cape Cod (AFCEC), MA	4.5	2012
10.	Edwards AFB, CA	3.0	2012
11.	JBER (Richardson), AK	7.0	2013
12.	Cape Cod AS, MA	3.3	2014
13.	Davis Monthan AFB, AZ	16.4	2014
14.	Offutt AFB, NE	6.4	Multiple yrs.
15.	Minot AFB, ND	6.1	Multiple yrs.
16.	Grand Forks AFB, ND	56.2	Multiple yrs.
17.	Consolidated minor ANG locations	9.7	Multiple yrs.
18.	Nellis AFB, NV (II)	18.8	2016
19.	Luke AFB, AZ	10.0	2016
20.	Air Force Plant 42 (AFLCMC), CA	20.0	2016
21.	JBPHH (Hickam ANGB), HI	1.0	2017
22.	Holloman AFB, NM	6.8	2017
23.	Los Angeles AFB, CA	1.3	2017
24.	Eglin AFB, FL	30.0	2017
25.	JBER (Richardson phase II), AK	1.4	2018
26.	Hanscom AFB, MA	10.0	2018
27.	JBMDL (Lakehurst/McGuire), NJ	16.0	2018
28.	Otis ANG, MA	10.0	2018
29.	Vandenberg AFB, CA	28.2	2018
30.	JBMDL (McGuire/Dix), NJ	17.0	2018

Information courtesy of AFCEC/CNR. Current as of August 2017

Energy Resilience: Prepare for and recover from energy disruptions that impact mission assurance

E | e *Profile*

Abe Irshid

Energy Manager, 50th Wing Schriever AFB, Colorado

Abe Irshid has spent nearly five years as an Energy Manager for the 50th Wing at Schriever Air Force Base, Colorado. He has a bachelor's degree in civil engineering with a focus in structural and a minor in mechanical and electrical engineering from New Mexico State University in Las Cruces, New Mexico. Irshid then completed post-graduate courses in information technology and information systems from Bowie State University in Bowie, Maryland. He served on active duty in the Air Force for 24 years.

How would you describe your role as an energy manager?

I ensure the Air Force meets its energy goals in order to fly, fight and win in air, space and cyberspace. While my effort may seem small, when combined with others, it can have a big impact across the Air Force and the Department of Defense. We each make a difference and it is our responsibility to do so.

What motivates you about working with Air Force Energy?

I enjoy working with a great energy team and sharing ideas and solutions with the installation, command and the Air Force Civil Engineer Center. Everything we do requires some energy to make or use. The paper we print or write on is derived using energy. The computer we use in our day-to-day business uses energy. Any increased efficiencies we see can save our Air Force money. In the current fiscal climate, any energy savings the Air Force can realize is crucial for our nation and its security. These savings only happen when Air Force members are aware of how we consume energy and engaged in taking action to use it wisely.

What is the most interesting part of your role?

I am eager to generate ideas and devise feasible solutions to broadly relevant issues. Everyone should look past the paradigm of how things have operated in the past and create new opportunities to save resources. "Insanity is doing the same thing over and over again and expecting different results," as Albert Einstein said.

Describe the relationship you've had with the AFCEC's Energy Directorate?

I've had a great relationship with AFCEC's Energy Directorate since 2009. We work as a team to share energy ideas and provide solutions to implement at the base.

What is your favorite energy-saving tip for Airmen?

Using energy more efficiently can be accomplished simply by turning off lights when you leave a room and turning off equipment no longer in use. Developing an energy-aware culture is achieved with consistent training and communication of expectations.

Is there anything else you'd like to add?

Energy is a critical component of the Air Force's operation. Considering the magnitude of energy consumed by the Air Force, any actions taken to reduce energy consumption are significant in their potential impact for reducing costs and enhancing energy security and independence.

Exercise to Enhance Resilience

By Mike Rits
Subject Matter Expert on Renewables and Resilience

"Fit to Fight" was a phrase commonly used to promote fitness, diet and exercise for the military. Energy resilience, with respect to supporting mission assurance, applies the same principles.

We promote resiliency "fitness" by training all personnel associated with our critical missions, craft our resiliency "diet" through proper maintenance and repair of our existing infrastructure, and "exercise" by running the gamut of scenarios.

When our scenario plans include electrical infrastructure outages, it enhances our readiness. Energy managers should work closely with the emergency manager and base leadership to develop exercise scenarios to initiate during actual generator load tests and black start tests that include regional grid outages extending beyond 10 days. These should also include specific components that drive expanded thinking and simulated contingency response to mitigate mission impact.

In preparation, energy managers, emergency managers and leaders should take the FEMA and DHS courses on National Incident Management System (NIMS courses IS-100, 200, 700 and 800) and Critical Infrastructure Security and Resilience (CISAR courses IS-860, 913 and 921) at https://training.fema.gov/is/cisr.aspx.

Additionally, the Department of Energy is conducting GridEx IV, a biennial exercise designed to simulate a cyber or physical attack on electrical and other critical infrastructure, on Nov. 15-16. Registration is open for energy managers to observe. Participating in this exercise can help you shape scenarios at your particular installation and identify potential impacts.

If you are an energy manager preparing for an exercise at your installation, here are some key resiliency questions you should ask:

1. **When was your last emergency management exercise that included a grid outage?**

   - If there hasn't been one recently, work with leadership to organize one.

   - If there have been previous exercises, look at the after action report and lessons learned.

2. **What critical missions are on the base?**

   - If they are not relocatable or do not have redundancy elsewhere, you will need to plan for indefinite mission assurance, not just seven days (see AFPD 90-17).

   - If they are relocatable (see the base continuity of operations plan), find out what events trigger the relocation and when. The missions still need back-up power and water until they relocate or transfer mission ops to another location.

continued on pg. 11

U.S. Air Force Airman 1st Class Jared Aversano, 20th Communications Squadron client systems technician, works on a laptop following a simulated power outage during operational readiness exercise Weasel Victory 17-07 at Poinsett Electronic Combat Range, near Wedgefield South Carolina, May 16, 2017. Exercises such as these are critical in assessing base resilience. (U.S. Air Force photo by Airman 1st Class Christopher)

AFRL tests high-efficiency engine for unmanned aircraft

By Holly Jordan
Air Force Research Laboratory Materials and Manufacturing Directorate

WRIGHT-PATTERSON AIR FORCE BASE, Ohio (AFNS) --

The Air Force Research Laboratory Advanced Power Technology Office, along with Engineered Propulsion Systems and the Arnold Engineering and Development Center, recently concluded ground-based testing of an advanced diesel engine that promises to increase the utility and ease the logistics burden of military aircraft missions.

The high efficiency, innovative aviation diesel engine is a potential replacement for current manned and unmanned aircraft internal combustion engines. Designed by Engineered Propulsion Systems as part of an AFRL effort, the Graflight V-8, 4.3 liter engine is a "clean sheet" design specifically intended for aircraft use. It is liquid-cooled and capable of using either a composite or aluminum propeller.

The compact engine is built to use up to 40-percent less fuel than typical aircraft engines, with less vibration. This increased efficiency extends operational range and loiter time by up to 50 percent.

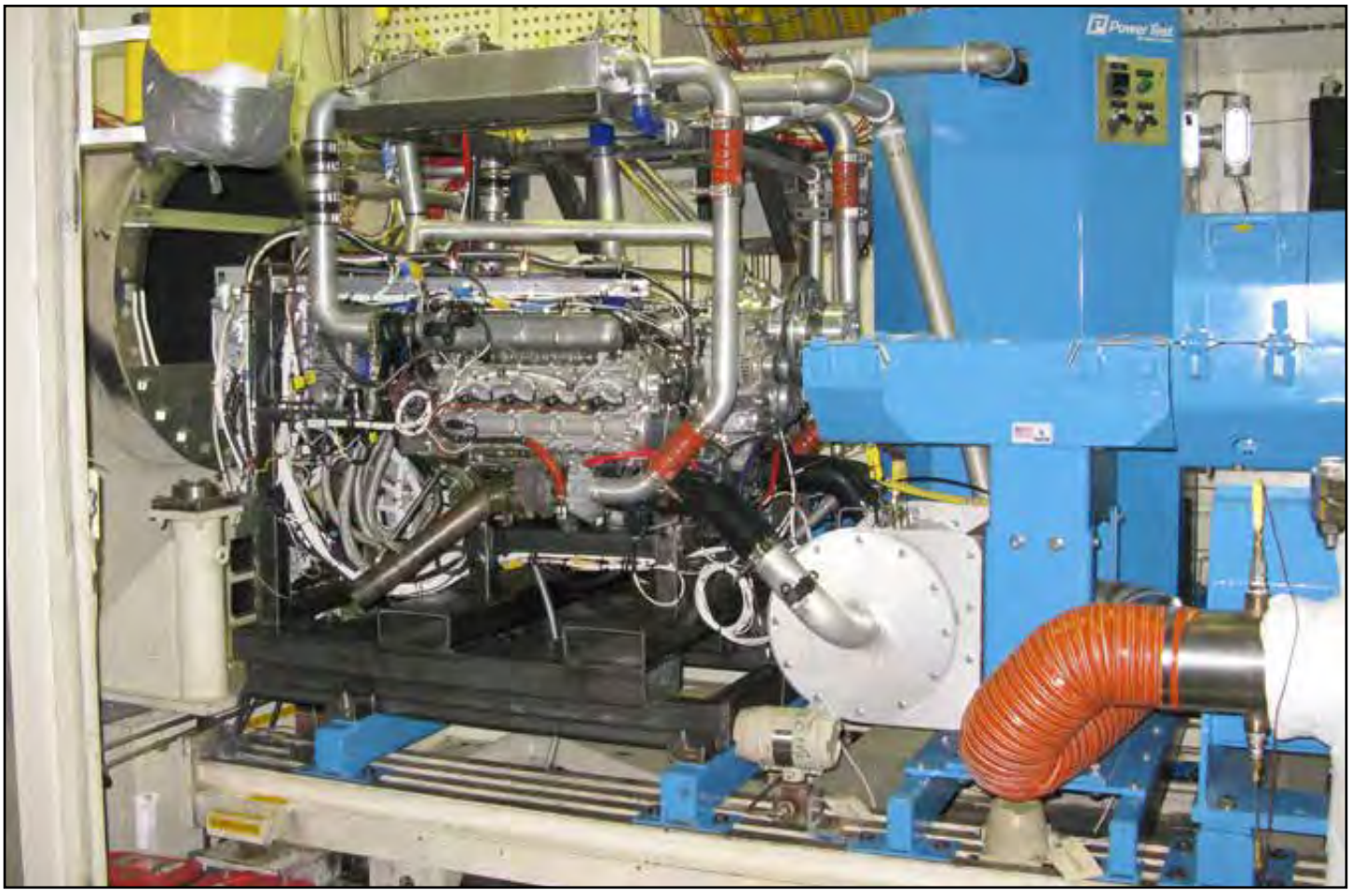
"Since this engine requires less fuel to fly the same distance, an aircraft or unmanned air vehicle could either carry more payload or fly a longer mission. Overall, if implemented, this technology has the potential to provide the Air Force a significant improvement in mission flexibility," said Capt. Randall Hodkin, the APTO Aviation Working Group lead.

The benefits go beyond simple fuel efficiency.

Using an innovative new control unit, the engine can operate using diesel, Jet-A, or JP-8 fuels that are readily available in-theatre, thereby reducing or eliminating the need to transport specialized fuels. This flexibility opens up the possibility of unmanned aircraft use in regions that were previously impractical.

"Often one of the greatest military logistics burdens is fuel transport," said Hodkin. "If we can reduce or eliminate

continued on pg. 11



The Air Force Research Laboratory Advanced Power Technology Office's high efficiency innovative aviation diesel engine is shown here in the Arnold Engineering Development Center T-11 Test Cell. The Graflight engine, developed by Engineered Propulsion Systems, could offer extended range and greater fuel options for unmanned aircraft missions. (Courtesy photo by AEDC)

Exercise to enhance resilience *continued from pg. 9*

3. What are the critical mission electrical and water requirements? What are the base and line capacities at those facilities?

- Limitations may be the peak power and may vary over time. A graph of wattage (or gallons for water) over time would be helpful to have.

- Power quality is an important consideration as well. An electrical "bump" or surge may only cause a flicker in the lights for most users but it could be enough to take critical mission off-line or damage equipment.

- Water quality is an equally important consideration. Water may be needed only for fire flow, throughout in cooling towers or it may need to be potable for hygienic purposes.

4. Where does your water and electricity come from? What is the reliability provided to the base and what is the reliability needed for the critical mission?

-The base may have back-up and sustainable power and water, but the off-base community may not. That is where the preponderance of people come from who conduct and support the mission.

- Community partnerships can and should be established to help mitigate the impact on people.

5. Do all emergency response and critical communications facilities have back-up power?

- If you can't communicate with emergency responders (police, fire and medical), the mission focus will quickly devolve to mitigating problems to provide for these basic services.

- All levels of communication should be assessed to include Land Mobile Radios, cell phone networks, Giant Voice, inter/intranet and industrial controls/fire alarms.

If you have any questions about resiliency and how to incorporate it further into your exercise scenarios, please contact the AFCEC Reachback Center through CE DASH or at 888-232-3721.

AFRL *continued from pg. 10*

the need to ship specialized fuels, we've then reduced the associated cost and risk."

The first step in turning this innovative design into reality was proof-of-concept testing, beginning with the recent ground tests conducted at the Arnold Engineering Development Complex. Here, the development team performed simulated flights at altitude in the facility's Propulsion Development T-11 Test Cell, which was reopened for this test effort after not being used for a decade. The T-11 test cell simulates airflow at a variety of altitudes.

During the ground testing, the EPS Graflight engine was taken through a range of operational flight conditions, from sea-level to 30,000 feet and back, successfully meeting performance expectations and generating valuable data on performance factors such as fuel consumption, calibration, vibration and power output.

AFRL researchers will use this data to prepare for future flight testing, confirm the engine's efficiency and validate the engine's performance characteristics for future Air Force users.

Once the proof-of-concept is fully demonstrated, it will be considered for use in several Air Force manned platforms. Designers will also work to scale the engine down to a smaller variant, better sized for current Air Force unmanned aircraft.

Reach-Back Center
(888) 232-3721
DSN 523-6995
AFCEC.RBC@us.af.mil

Energy Express is a publication of the Air Force Civil Engineer Center, Detachment 1, Tyndall AFB, Florida.

Please send your comments, story ideas and photos to afcec.pa@us.af.mil.

AFCEC Director Mr. Randy Brown

AFCEC Deputy Director Col. Charles Kelm

Director of Energy Mr. Robert Gill

Public Affairs Mr. Mark Kinkade

Editor Mr. J. Brian Garmon