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

ENERGY | express

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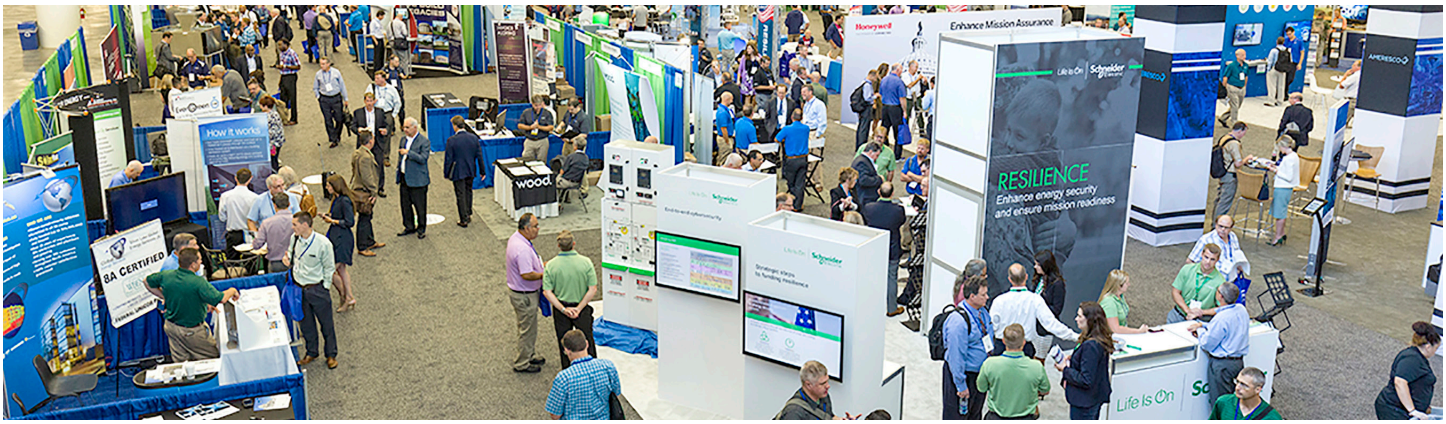

Air Force photo

Agency Goals

Energy Exchange 2019 serves as a platform for agency leadership engagement to outline priorities to staff and stakeholders.

Attend agency-specific meetings and policy update sessions, including White House priorities and leadership roundtables.

Mission Readiness

Agencies coordinate across federal government on integrated portfolio planning, cost-effective operations, cost and waste reduction and advanced technologies and resilient projects.

Hands on peer-to-peer learning and collaboration and solution providers.

Workforce Development

Energy Exchange 2019 provides accredited training for continuing education, professional certification retention and future-focused skills training.

Cross-training sessions tackle the evolving and dynamic nature of energy and water management.

This year's Energy Exchange encourages all to "Be Efficient and Resilient"

By Sarah McNair
AFIMSC Public Affairs

The U.S. Department of Energy (DOE) is hosting the 2019 Energy Exchange in Denver, Colorado on 20 Aug - 22 Aug. The event officially kicks off in the afternoon on Monday, 19 Aug with an Energy Exchange Welcome and wraps up Friday, 23 Aug with an Air Force Day. "Be Efficient and Resilient" is the theme for this year's event, a common goal infused throughout DOE, federal government, and the private sector.

This trade show event offers networking opportunities within the federal energy and water management community and provides accredited training for continuing education, professional certification retention and future focused skills training. It will feature roughly 120 training sessions, 13 technical tracks covering topics such as Implementing Federal Policy, Integrating Resilience and Design for Agency Mission and Leveraging Affordable Financing. Senior leaders from DOE, Secretary of the Air Force for Installations, Environment and Energy (SAF/IE) and the National Renewable Energy Laboratory will present agency goals and priorities.

Last year's event hosted nearly 3,000 attendees and had over 120 exhibitors. The focus, as with the theme for the industry event, will be on efficiency and resiliency for federal energy and water management with an emphasis on cost-effective operations, cost and waste reduction and advanced technology and resiliency projects. Other areas of interest covered will be on how to implement projects, policies and technologies to strengthen and secure federal infrastructure. This strategic approach to energy reinforces the Air Force's focus on delivering mission assurance through energy assurance.

For more information or to register for the event visit https://www.energy-exchange.com/. Advanced registration is available until the event begins.

In this issue:

E|e Profile Maj. Scott Kirk

Maj. Kirk is the chief of the Air Force Utility Law Field Support Center (ULFSC), for the Air Force Legal Operations Agency under the Environmental Law and Litigation Division. ULFSC's branch office is co-located at Tyndall Air Force Base, Florida. Kirk has been an active duty Air Force Judge Advocate attorney for the past eight years, practicing law in a broad variety of topic areas. Recently, he received a Master of Laws in Energy and Environmental Law at The George Washington University School of Law in Washington, D.C.

His new role as chief of ULFSC is to lead the Air Force's only utility litigation team, determining when intervention is needed on behalf of the Federal Executive Agencies impacted by proposed regulated utility rate cases around the country. Being co-located with AFCEC's Energy Directorate at Tyndall also enables him to provide timely and specialized legal support and advice on proposed energy and installation resilience projects such as Energy Savings Performance Contracts and Power Purchase Agreements. The ULFSC also provides Air Force base legal offices with field support subject matter expertise in all utility law matters such as utility contracting questions, state utility regulatory issues, or even assistance settling utility billing disputes. In the past three years, the ULFSC has appeared across the country in 52 cases before state utility commissions, where they successfully prevented over $5.3 billion in unnecessary charges from being applied to Air Force installations.

What motivates you about working with Air Force Energy?

I am excited to use my legal training in energy and environmental law to work with some brilliant subject matter experts at AFCEC, on projects that incorporate some of the ground-breaking new energy technologies, such as microgrids and energy storage projects that will increase our installations' resilience and renewable energy compliance while reducing our overall energy use.

What is your favorite energy-saving tip for Airmen?

Most people know when they are wasting energy, but unless you have a reason to change your behavior you won't make the effort. Try this: Remind yourself that, as a taxpayer, you pay a part of the base's utility bill. Also, next time your unit doesn't have the budget for new equipment or training that you need, remember that the utility bill is a "must pay" from the base's operations and maintenance budget, so wasting money on unnecessary electricity means less money for that new gear or TDY you do need.

What do you see as the biggest energy challenge?

As the requirements for military installation resilience are being defined, a major challenge for the Air Force will be financing the upgrades to aging infrastructure and integrating our renewable energy projects while ensuring that taxpayer dollars are used efficiently and effectively.

Energy Resilience and the "5 R's"

By Mike Rits
AFCEC subject matter expert on renewable energy and energy resilience

Today's military is inexplicably dependent upon reliable and high quality power to sustain defense mission capability. This is why the five R's of energy resiliency (**Robustness**, **Redundancy**, **Resourcefulness**, **Response** and **Recovery**) are important attributes of withstanding, responding to and recovering from disruptions. In recent years, the Air Force has recognized this dependence and started to increase its focus on energy resiliency for sustainability and ensuring the ability of installations to perform mission-critical functions, under adverse conditions, disruptions and an array of potential threats. According to the Office of the Secretary of Defense, **energy resilience** is the *"ability to prepare for and recover from energy disruptions that impact mission assurance on military installations."* The National Defense Authorization Act of 2019 further expanded that definition (Section 2864 of title 10, United States Code), to include *"…anticipation, preparation for, and adaptation to utility disruptions and changing environmental conditions and the ability to withstand, respond to, and recover rapidly from utility disruptions while ensuring the sustainment of mission-critical operations."* Additionally, the definition of "energy" in context of resilience also includes heating, cooling, water, gas, steam and wastewater.

In order for installations to develop resilience solutions, an energy resilience evaluation or assessment is essential. There are three interdependent aspects to evaluating energy resilience (Figure 1) on an installation: the criticality (or national defense impact) of the mission(s), the existing infrastructure that delivers the critical mission capabilities and the threats or hazards that could negatively impact the infrastructure and mission. By analyzing all three components together, the right levels of risk mitigation can be developed instead of building a "one-size fits all" solution.

The types and quantities of solutions needed depend on the threats and existing infrastructure in place. An understanding of the mix of mission types that require resilience will help determine the solutions, as well as decision-making on priority and planning. Aspects to consider include what the mission sets are, how much power is needed and when, as defined in the Hierarchy of Scope of Requirements (Figure 2). The Critical Infrastructure Program (CIP) within the Critical Asset Risk Management (CARM) framework and infrastructure supporting Operations Plans (OPLANS) are the highest resilience priorities, especially when it is not easy to relocate critical assets. Solutions for resiliency may include the need for high levels of reliability, uninterruptibility and government control for both short-term and long-term outages. For business case requirements, such as contractor-operated depot maintenance for aircraft engines, the financial tolerance for downtime due to short-term unscheduled electrical outages is low but the solutions can include more innovative, cost-beneficial technologies with smart controls and

Figure 1: Aspects of ER Evaluation

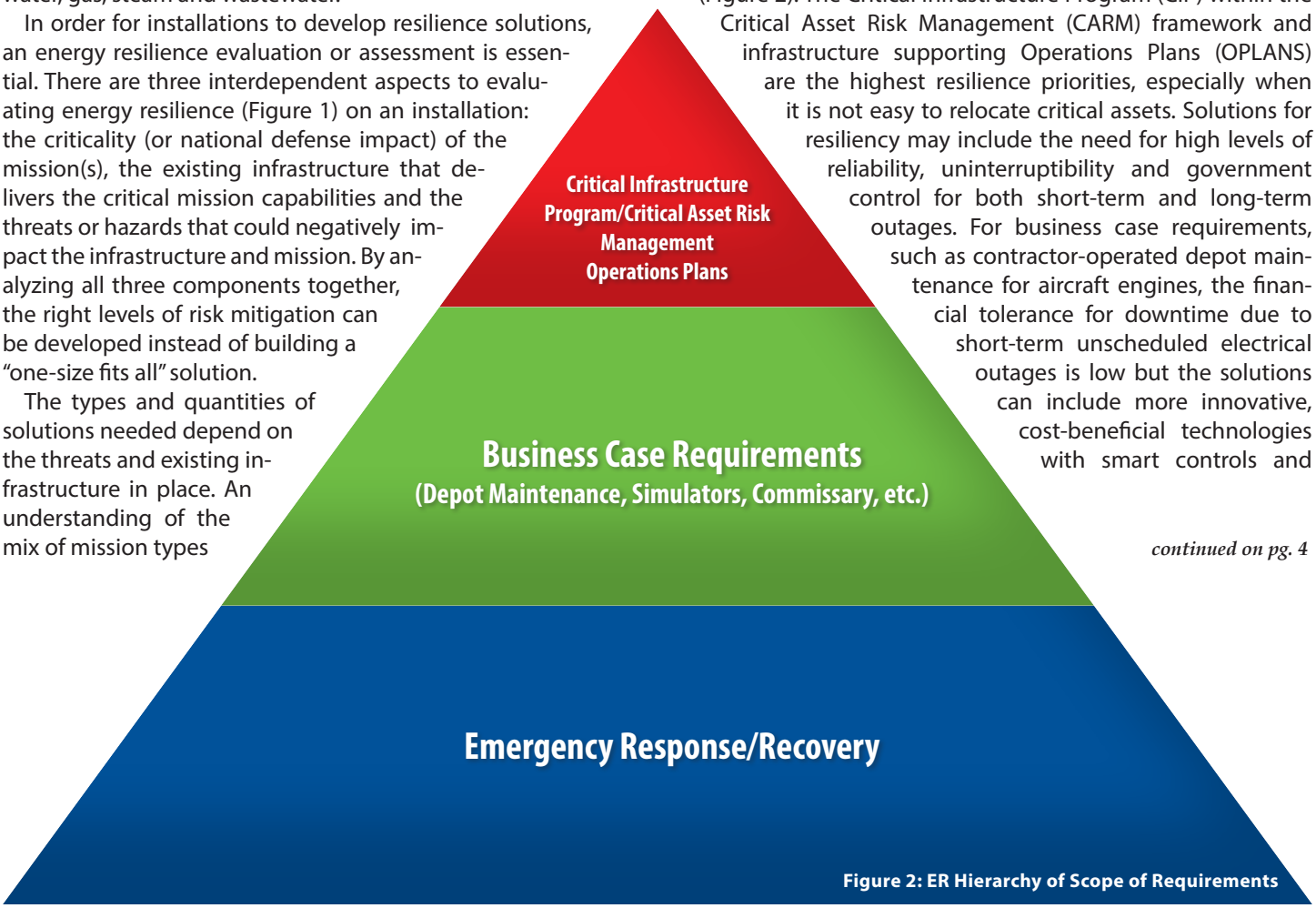

Figure 2: ER Hierarchy of Scope of Requirements

continued on pg. 4

ENERGY RESILIENCE

continued from pg. 3

load shifting without having to plan as much for resilience to the long-term threat. Finally, every base has about the same requirement for back-up power for emergency response and recovery operations, which again needs to be resilient for both long-term and short-term outages across a wide spectrum of threats and hazards. Understanding the mix of requirements and their criticality helps highlight vulnerabilities and gaps in resilience. For example, a single satellite antenna on an installation may have great importance to national defense but may be well protected from threats and hazards and only need a small amount of resilient power compared to peak load requirements at the entire installation. This small amount of power may be met with existing commercial power backed up by traditional facility emergency generators. Contrast this with another installation that may have a large percentage of its installation peak load that is critical, which may then necessitate additional infrastructure resilience layered over the resilience from facility generators, to provide an appropriate level of risk mitigation for mission assurance.

Having an understanding of the **threats** to the mission and infrastructure leads to properly evaluating the vulnerabilities of the existing infrastructure. Threat analyses (Figure 3), including the potential, likelihood, and impact, will come from the installation threat-working group as well as the Defense Threat Reduction Agency's most recent Mission Assurance Assessment. The potential and likelihood of flooding versus an electro-magnetic pulse, for example, impacts some systems more than others.

Evaluating the **infrastructure vulnerability** (Figure 4) includes an understanding of the existing condition, capacity, quality, reliability, and configuration of the community/installation/campus/facility utility distribution and back-up systems, the level of system maintenance, testing, and availability of parts and replacement components. This is where the five R's of energy resiliency (Figure 5) come into play: three preventative attributes — **Robustness**, **Redundancy** and **Resourcefulness** — and two attributes for performance — **Response** and **Recovery**. These five R's describe what the infrastructure needs to achieve to help the mission continue. They provide a systematic layered approach to assess and evaluate energy assurance by identifying existing gaps or vulnerabilities between all of the systems' performance capabilities and requirements in the event of an outage due to threats and hazards. Specific qualities of the infrastructure, such as hardening or energy storage, describe how the infrastructure can make the mission more resilient, while the elements of resilience describe how the resilience qualities are delivered or achieved. If gaps or vulnerabilities exist, these attributes, qualities and elements (Table 1) provide installations a robust methodology for identifying and developing the proper level of risk mitigation and assist with facilitating discussions for viable investment solutions to increase overall energy resilience.

The Air Force must be prepared for and have the ability to recover from energy disruptions that impact mission assurance at its installations. Installations rely on commercial power to conduct missions, which can be threatened by natural and man-made hazards. The Air Force has recognized that such events could result in power outages that directly and indirectly affect

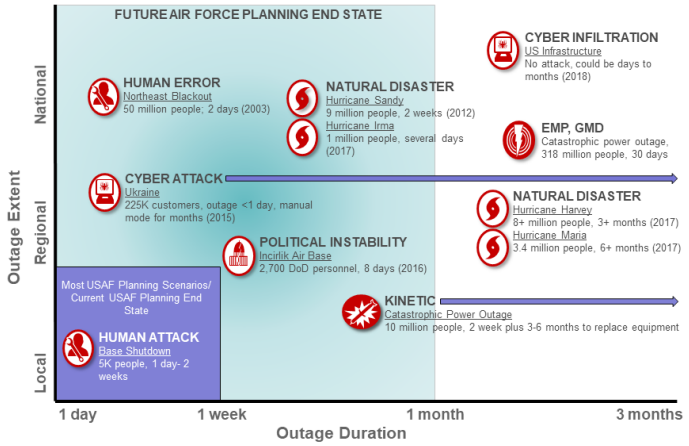

Figure 3: Threat Analysis Example

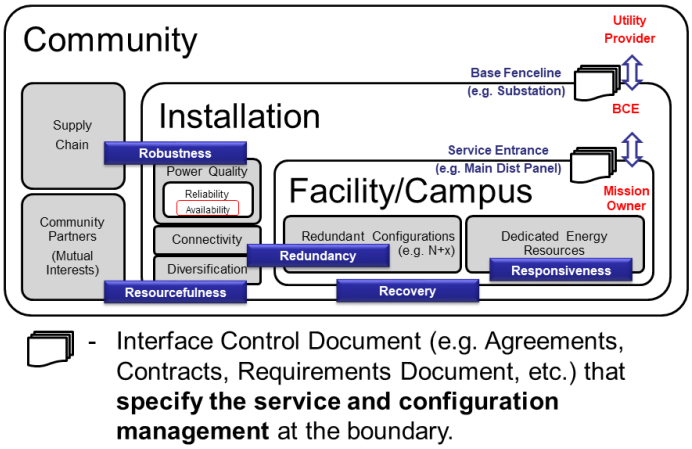

Figure 4: Infrastructure Vulnerability Evaluation

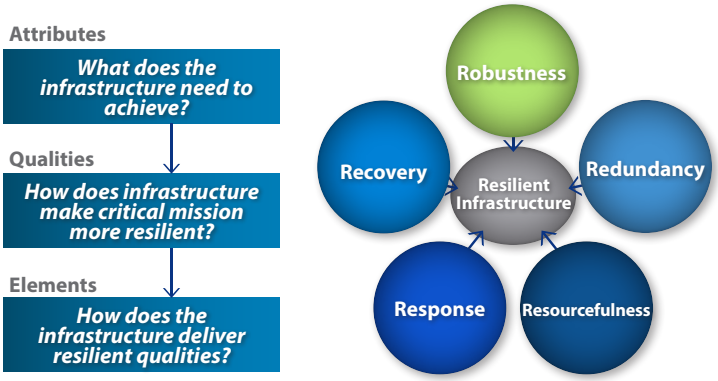

Figure 5: The 5R's of Energy Resiliency

critical assets and missions involving power projection, defense and support operations.

The Air Force's energy resilience is driven by an enterprise approach focused on mission. Therefore, it is critical for installations to understand and identify the vulnerabilities and threats that can impact mission assurance in order to develop and implement viable solutions for risk mitigation. Energy resilience can be achieved in a variety of ways: redundant power supplies (e.g. energy storage and generators); introduction of renewable energy technologies (e.g. solar, wind and microgrid); upgrading,

continued on pg. 5

	Attributes What does it need to be?	Qualities How does it make it resilient?	Elements What about that quality makes it resilient?
Preventative	**Robustness**	• **Performance monitoring** • **Hardened infrastructure** • **Physically secure**	• Risk management framework-compliant control systems • Active vs. passive performance monitoring • Maintenance schedule and checklist • Power quality voltage/frequency/phase match • Site access protocols (physical security)
Preventative	**Redundancy**	• **Eliminate single points of failure** • **Distributed generation topology**	• Mess and ring with bi-directional flow • Modular assets to account for system component maintenance and down-time (i.e., shared, mobile backup generation)
Preventative	**Resourcefulness**	• **Community coordination** • **Available power generation** • **Energy storage** • **Recurring and relevant training exercises**	• Community planning and resource integration • Uninterruptible power supply (UPS) • Nearby generation • Disrupted generation • Renewable energy • Load-shedding • Reduced operations and maintenance planning window
Performance	**Response**	• **Automated** • **Self-healing** • **Forecasting/threat assessment performance indicators**	• Maintenance staff training and exercises • Energy consumption data collection and predictive analysis • Fault tolerance (controlled cool-down for safe recovery) • Inclement weather response plans • "Smart" control systems with built-in response protocol • Documented procedures • Condition-based maintenance
Performance	**Recover**	• **Standardized components** • **Spare inventory** • **Damage assessment** • **Prioritization of re-powering**	• Centralized management of spares • Open architecture software • Commercial Off-The-Shelf parts • Portfolio and equipment consolidation • Utility coordination and agreements • Distributed generation systems
Additional factors for evaluating resiliency: Capacity - Quality - Condition			

Table 1: 5Rs Qualities and Elements

ENERGY RESILIENCE

continued from pg. 4

standardizing, or replacing current installation energy generation systems, infrastructure and equipment; and eliminating single points of failure to critical assets or mission-critical operations (e.g. dual feed).

Energy resilience continues to be a focal point for the Air Force. As part of its energy resilience strategy, the Air Force utilizes the five R's as an effective first-look approach to further prioritize energy projects and ensure effective enabling system investments in supporting mission requirements. By making the best use of its investments, the Air Force achieves its objective to continually provide reliable and high quality power to sustain defense mission capability under adverse conditions, disruptions and an array of potential threats.

If you would like to nominate someone to be profiled in an upcoming issue, please contact us at AFIMSC.PA.Workflow@us.af.mil.

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