ENERGY ASSURANCE CAMPAIGN PLAN

WHERE MISSION ASSURANCE MEETS ENERGY ASSURANCE

AIR FORCE MATERIEL COMMAND VISION

"One AFMC-- integrated, collaborative, innovative, trusted, and empowered...indispensable to our nation, disruptive to our adversaries."

OUR MISSION

"Powering the world's greatest Air Force... We develop, deliver, support, and sustain war winning capabilities."

CONTACT: AFIMSC DET 6

937.257.3732 / DSN 787.3732

AFIMSCDet6.CCA.CommandSection@us.af.mil

https://usaf.dps.mil/teams/22211/energy/

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COMMANDER'S MESSAGE

Energy and water are essential mission resources we depend on every day. Events of recent years demonstrate an upward trend in environmental, physical, and cyber threats to our nation's supply systems. In the past, we relied on emergency measures to sustain missions through short-term disruptions. However, with the risk for a more widespread and prolonged disruption growing, we need to ensure installation energy systems can provide a mission appropriate level of energy assurance.

This update to our 2021 EACP continues to drive us to a more robust, secure, and mission-ready energy assurance posture. It adopts and complements the DAF vision and approach - in defining mission requirements for energy and improving our systems to support. Together, we will continue to operationalize the five EACP Lines of Effort (LOEs) and meet the milestones defined in Appendix A. As we work to improve, we must remain forward thinking. Our messaging must be clear and far-reaching, inspiring the innovative spirit of all civilian and uniformed Airmen and capitalizing on our vast problem-solving capabilities.

I look forward to a seamless and collaborative partnership between the mission and installation support communities – unified in purpose and laser focused on ensuring our energy and water systems are mission ready.

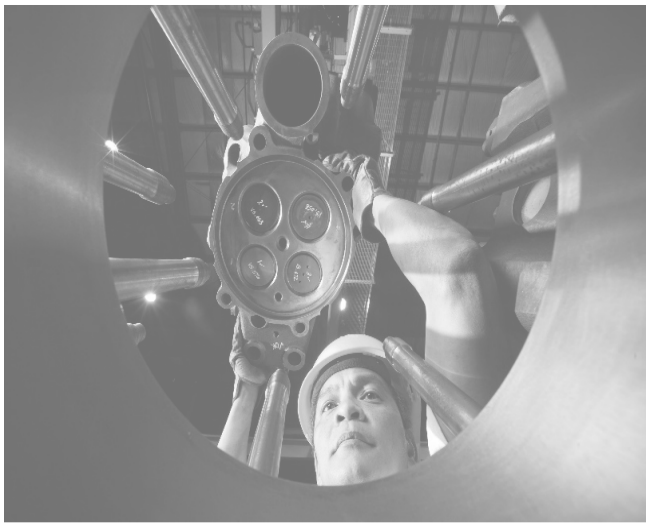
DUKE Z. RICHARDSON
General, USAF
Commander

INTRODUCTION

Having energy and water readily available (energy resilience) is foundational to mission. Energy commodities like Electricity, Natural Gas, Water, and Fuel as well as energy generated mission resources such as Steam, Chilled Water, and Compressed Air are critical enablers; yet we depend upon increasingly vulnerable supply chains. Commercial and installation infrastructure continues to age quicker than it can be replaced and is threatened by climate change, acts of terrorism, and cyber intrusion. The risk for a disruption in the availability of the energy is real and growing. We must work to better understand these risks and to assure we are able to sustain mission.

Energy availability and resilience are often under-valued, yet vital aspects of being mission effective. In the 2021 DAF Installation Energy Strategic Plan (IESP), leaders challenged us to rethink the critical role energy plays and to better manage the impact a prolonged supply disruption can have on mission accomplishment. This focus culminated in the DAF vision to "*Enhance Mission Assurance through Energy Assurance*" which underpins the 2023 AFMC EACP.

While the DAF IESP provided the foundation, the 2023 EACP establishes an actionable framework to assure mission has dependable access to energy when and where needed. It bridges communities to drive us to a more secure and resilient energy assurance posture. It adopts DAF standards and metrics, sets unity in approach, organizes our response, and heightens awareness that without a sustained investment in vital energy resources and infrastructure, missions are increasingly at risk.



COMMANDER'S INTENT

By 2030, AFMC installations will have mission-enabling energy systems and infrastructure that are: 1) sustainable enough to supply known demands, 2) flexible enough to match changing priorities and missions, 3) scalable enough to meet increasing mission demand, and 4) secure and resilient enough to withstand climate driven events and cyber or operational degradation.

AFMC STRATEGIC PLAN ALIGNMENT

The "One AFMC" vision communicates our unified approach to deliver integrated materiel capabilities to the warfighter. It challenges and drives all Airmen to embrace and amplify our war-fighting culture to accelerate change, enhance delivery of our capabilities, and connect themselves directly to mission. This EACP implements *AFMC Strategic Plan* Line of Effort #1 to Deliver Integrated Capabilities, in the context of assuring our energy systems and infrastructure is made capable to support mission. Specifically, we will make these systems responsive and fit for the critical role they must serve - today and tomorrow. The EACP also aligns with the DAF Strategic Plan for Control Systems LOE #3 to Implement Lifecycle Resilience of Control Systems and Air Force Installation and Mission Support Center (AFIMSC) Strategic LOEs to Optimize Infrastructure, Increase Installation Resiliency, and Revolutionize Base Lethality. AFMC will be purposeful and systematic in improving these systems to assure ready, resilient, and lethal installations.

GOVERNANCE

Unity in vision and approach is assured through the AFMC Energy Assurance Steering Group (EASG), which is chaired by the AFMC Commander, Deputy Commander, or Executive Director.

The EASG is comprised of senior leaders representing Directorates, Centers, Complexes, and Wings and provides strategic direction in managing energy as a mission resource. The AFMC Energy Assurance Working Group (EAWG) supports the EASG and is chaired by AFIMSC Det 6. AF Installation Support Teams (ISTs) are comprised of energy experts and other key stakeholders to guide installations in operationalizing the EACP.

RESPONSIBILITIES

AFIMSC DET 6

- Champion AFMC's energy program, inform and advocate Higher Headquarters for policy, and develop enterprise strategies and plans to improve energy systems
- Implements and sustains the AFMC EASG (Secretariat), EAWG (Lead), and ISTs (Co-Lead)
- AFMC lead interface with the DAF installation energy program and governance structure
- Liaison between Centers, Complexes, and Wings and support organizations

CENTERS

- Assure mission requirements for energy assurance are met
- Guide Installation hosted Center missions in their determination of requirements for energy assurance
- Implement demonstration of energy assurance capabilities in Continuity of Operations (COOP) plans and exercises
- Plan, program, budget, and execute energy resilience projects and initiatives, as appropriate
- Execute plans and programs to improve the cyber resiliency of energy control systems and operational efficiency, as appropriate
- Guide Center missions in planning, development, and execution of DAF Energy Resilience Readiness Exercises (ERRE)

MISSION OWNERS

- Working through the IST, determine mission requirements for energy assurance
- Support OEA in the development and/or update of the IEP, RSR, and IEAP, as appropriate
- Participate in the Installation EASG chaired by an installation senior leader or the BCE to operationalize this EACP
- Plan, program, budget, and execute energy resilience projects and initiatives, as appropriate
- Develop plans and programs to improve operational efficiency, as appropriate
- Participate in planning, development, and execution of Energy Resilience Readiness Exercises (ERRE)

INSTALLATIONS

- Through the IST, supports development and/or update of the IEP, RSR, and IEAP
- Establishes an EASG chaired by an installation senior leader or the BCE and attended by mission leadership to operationalize this EACP
- Plans, programs, budgets, and executes energy resilience projects and initiatives
- Identifies shortfalls in energy posture using mission commander readiness reporting, inspections, and new mission bed down and mission basing analysis tools.
- Ensures new energy technology concepts are integrated with future installation planning

AFCEC/CN (AF Office of Energy Assurance)	▪ Co-Leads ISTs in defining energy resilience requirements and oversees and supports development of Installation Energy Plans (IEPs) and Resilience Solutions Reports (RSR) for installations ▪ Conducts technical studies and alternatives analyses and integrates expertise to determine the most economic and mission effective solution(s) to close energy system capability gaps ▪ Recommends energy resilience projects to the AF Facility Energy Panel for approval and transition to execution
AFCEC/CF/CI/ CO/CP	▪ In partnership with OEA, provides subject matter expertise, AF policy implementing guidance and business processes for the improvement, operation, and control of CE owned energy systems ▪ Develops, implements, and executes AF programs to enable installations to address energy system requirements and vulnerabilities such as improving the cyber-resiliency of CE control systems and managing aging infrastructure, as required in this EACP
AFRL/RXT	▪ Provides subject matter expertise on sciences and technologies that promote energy resilience and energy systems modernization ▪ Executes research and development projects to advance innovative energy systems technologies for the operational environment

POSITIONING INSTALLATION ENERGY SYSTEMS

As a system of systems platform, installations share commonality with other war fighting machines. Energy and water systems, including subsystems that supply energy generated resources, are critical mission enablers. To ensure freedom to operate, these system(s) must be mission-aligned and sustained in a constant state of readiness – robust enough to respond to dynamic mission needs, agile enough to assure continuity in times of system stress, and resilient enough to rapidly recover from adverse events.

The *AF Future Operating Concept - A View of the AF in 2035*, highlights the central idea of leveraging operational agility as a way to adapt swiftly to any situation. Operational agility is the ability to rapidly generate - and shift among - multiple solutions for any given scenario. In the context of energy systems, agility refers to the ability to deliver energy and water resources when and where they are needed. This can be done by diversifying sources of energy, improving infrastructure to provide alternative paths of distribution, and modernizing control systems to better secure and control the flow of energy across the installation.

While these attributes frame what we need energy systems to do, the technologies we exploit must be visionary, yet grounded in principles of economy and sustainability. Strong winds, sunny skies, and heat from the earth can provide sustainable, resilient, and affordable energy while contributing to a more secure (modular and diversified) supply. Over recent years, we have capitalized on resilient and efficient energy technologies like combined heat and power plants and solar farms. We must continue to build on these successes.

Securing access to energy is one aspect of a mission-assured posture. We must remain committed to eliminating waste - as part of being mission effective. We will strive to right size energy demand and to use savings to subsidize the cost of making improvements in system resiliency. We must also assure our energy control systems are robust and cyber-resilient such that we can shift between alternative sources of energy and paths of delivery. Last, we must continue to work to actively manage the risk to mission of faults and failures arising within our systems. These and other mission enabling aspects are foundational.

Mission success is rooted in collaboration and teamwork between communities. Working in partnership, mission owners identify energy requirements while installation support is charged with finding solutions. Mission owners will work to optimize mission needs for energy, improve cyber resiliency of mission systems, and manage the risk for equipment failure. In some instances, mission owners own and sustain prime sources of energy, energy derived mission resources, and back-up power systems. These systems are mission equipment and are not real property assets. Communities will work together to assure these systems are mission appropriate, sustained to perform as designed, and meet energy assurance requirements.

Energy systems support mission as well as installation operational requirements. This distinction is important because not all installation functions are operationally critical. For missions determined to be critical, our energy systems must be independently capable of providing an uninterruptable supply at the quality and quantity required for the period of time needed to relocate the mission or at least seven days, whichever is longer. In deciding how best to support missions, we must not underestimate dependencies on other direct and ancillary installation support functions.

The amount of energy needed to sustain mission(s) will increase as the duration of a disruption increases and additional capabilities are needed. This planning value is influenced by the amount of energy that can be readily supplied by the energy system(s) and, the expected recovery rate of the commodity supplier. As much as practical, installations will evolve systems to enable energy and energy generated resources to be shared across missions and to generate or store independent of commercial sources the minimum amount of energy needed to sustain critical loads. Commercial energy sources may only be used as the primary resilient source of energy if OEA determines it to be sufficiently resilient for the mission and the commercial entity grants the installation the first right to the minimum amount of energy needed during a disruption or declared emergency.

INSTALLATION ENERGY PLANS

Defining and planning energy system improvements will be accomplished through development of an Installation Energy Plan (IEP). OEA, in partnership with AFIMSC Det 6 and Installations, will develop Installation Support Teams (ISTs) to assist Commanders in better understanding the mission readiness of their energy systems. The IST is a cross-functional forum to operationalize the EACP. The IST will identify gaps and opportunities in energy systems, analyze and recommend alternatives to act on them, and execute needed improvements. The IST will include representatives from installation hosted missions, installation support, and related support organizations (AFIMSC Det 6, AFCEC/CN/CO, and AFRL/RXT). The IST will use the IEP to develop an installation appropriate roadmap - the Installation Energy Action Plan (IEAP).

The DAF IEP framework captures mission requirements and evaluates current capabilities against standard readiness strategies across five AF components of resilience – Robustness, Redundancy, Resourcefulness, Response, and Recovery. These components, or 5Rs, and their associated sub-categories describe what energy systems need to do, as noted in Table 1. Differences between DAF standards and current conditions identify capability gaps and/or opportunities for improvement of energy systems. These gaps are further decomposed in a follow-on Resilience Solutions Report (RSR).

TABLE 1 – COMPONENTS OF RESILIENCE

COMPONENT OF RESILIENCE	R	RESILIENCE SUB CATEGORY	DESCRIPTION
R1 ROBUSTNESS	R1A	Cybersecurity of Energy Systems	Level of compliance with cybersecurity protocols
	R1B	Physical Hardening	Protection of physical infrastructure
R2 REDUNDANCY	R2A	Supply Path Alternatives in Energy & Water Systems	Alternative resource supply routes
	R2B	Energy and Water Source Diversity	Alternative resource supply sources
R3 RESOURCEFULNESS	R3A	Energy and Water Demand Reduction	Reduction of resource use
	R3B	Loads Sustainment Capacity	Ability to store, maintain, and manage resource supply on-site
R4 RESPONSE	R4A	Emergency Management Protocols	Level of emergency response plan and trained personnel
	R4B	Analytics, Smart Controls, and Islanding Capabilities	Access to information and infrastructure to enable Island (off-grid) operations
R5 RECOVERY	R5A	Availability of Personnel for Assessment and Repair	Ability to access staff of appropriate expertise for recovery and repair
	R5B	Equipment, Parts, and Procurement	Ease of access to replacement equipment

RESILIENT ENERGY ASSESSMENT FRAMEWORK

The IEP Energy Resilience Profile, commonly referred to as the Resilient Energy Assessment Framework (REAF), provides a visual representation of an installation's existing energy resilience posture. The REAF provides an installation resilience score, as noted in Table 2. Results of the baseline assessment are colored as Red, Yellow, or Green, which indicates how well the energy system compared against DAF defined resilience strategies underpinning each of the 5Rs.

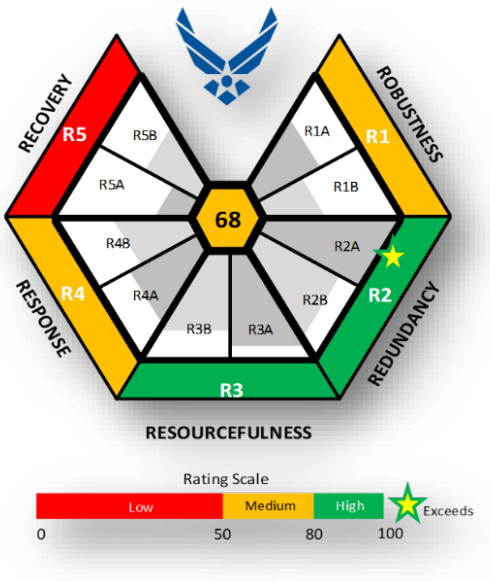
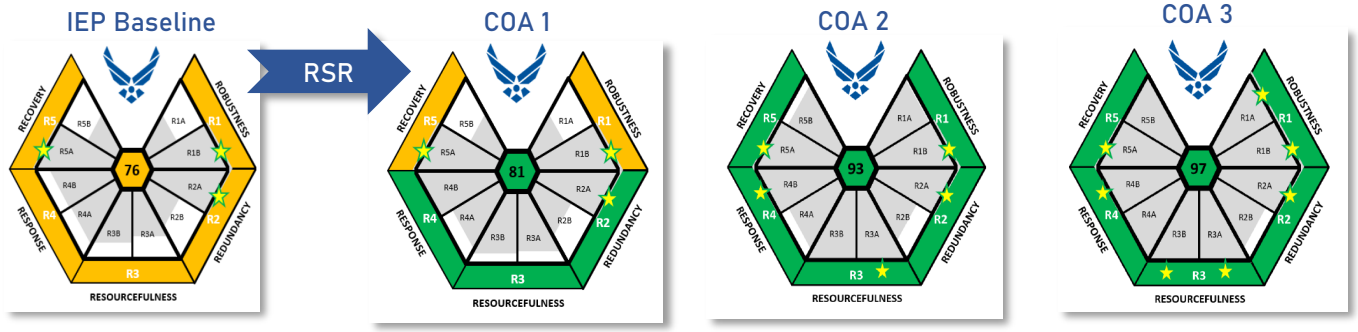


TABLE 2 – RESILIENT ENERGY ASSESSMENT FRAMEWORK

Upon completion of the IEP, energy system capability gaps and alternatives to solve them are assessed in an RSR developed by OEA in partnership with the IST. As capability gaps within each of the sub-categories are addressed, the shaded area moves outward and the color of the affected component advances toward Green, as illustrated in Table 3. Installations will use and update this illustrative framework to identify baseline conditions and report progress in addressing capability gaps.

TABLE 3 – INSTALLATION RESILIENCE CURRENT VS FUTURE STATE EXAMPLE



OPERATIONALIZING IEPs

While energy systems' functions are defined in the IEP, closing gaps and assuring mission readiness requires an integrated approach that unifies and bridges communities. To assure connectedness, we will execute improvements in the REAF through five LOEs, as illustrated in Table 4. These LOEs align with the 5Rs of resilience, as illustrated in Table 5.

TABLE 4 – AFMC LINES OF EFFORT

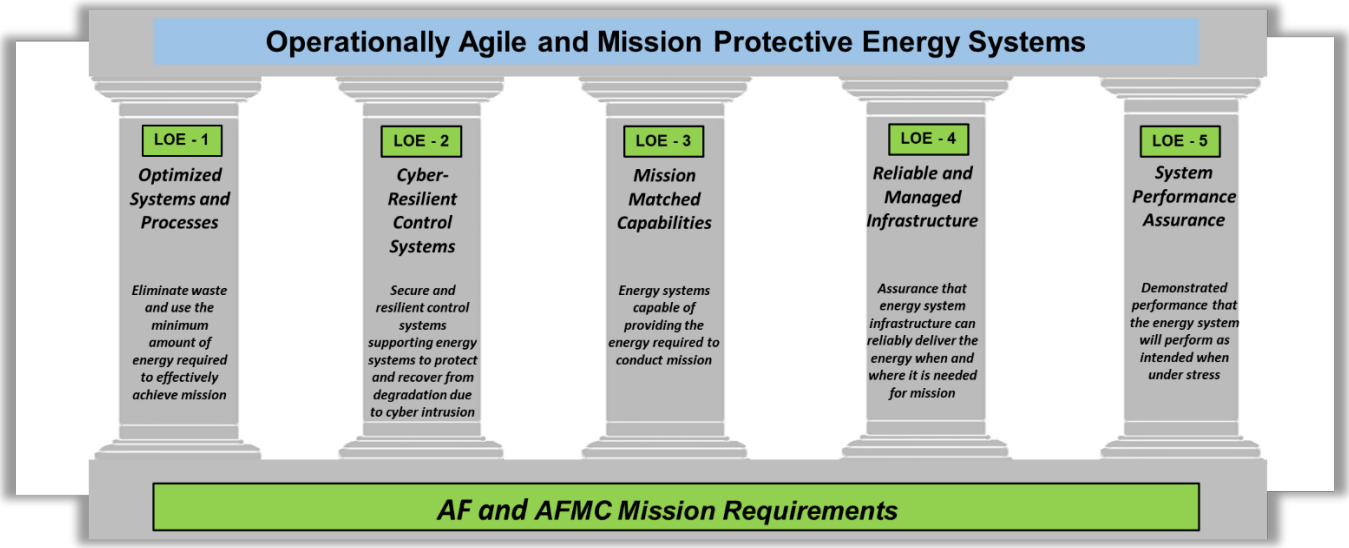


TABLE 5 – LOE ALIGNMENT WITH THE ENERGY RESILIENCE DASHBOARD

Lines Of Effort (LOE)	5Rs of Resilient Energy Systems									
	Robustness		Redundancy		Resourcefulness		Response		Recovery	
	R1A	R1B	R2A	R2B	R3A	R3B	R4A	R4B	R5A	R5B
1: Optimized Systems and Processes					✖					
2: Cyber-Resilient Control Systems	✖	✖	✖				✖	✖	✖	✖
3: Mission Matched Capabilities			✖	✖		✖		✖		
4: Reliable and Managed Infrastructure							✖			✖
5: System Performance Assurance	✖	✖					✖		✖	✖

Performance objectives to assure progress in each of the interdependent LOE's are defined in Appendix A. AFIMSC Det 6 will review and update performance objectives in partnership with installation enabling organizations on a biannual or as-needed basis.

LOE – 1. OPTIMIZED SYSTEMS AND PROCESSES

Optimizing mission demand for energy reduces the amount of energy needed to sustain mission in times of stress. We will pursue improvements in efficiency and conservation, as part of being mission effective, and use realized budget savings to subsidize the cost of improving the resiliency of installation energy systems.

Improving energy efficiency in the design of buildings, support systems, and infrastructure is a key component to reducing energy demand. As assets age, they can become unreliable. By upgrading to new, more efficient equipment, these reliability concerns can be mitigated. Enabling optimization requires an understanding of energy usage and the processes and missions it serves. To do this, DAF requires the use of the Advanced Meter Reading System (AMRS).

Operational efficiency occurs when the production of an output is maximized while the amount of waste is minimized. We will improve energy efficiency and conservation energy through actions such as:

- Identify and assess energy intensive uses for opportunities to optimize. (Action 1.1a)
- Implement AMRS to provide visibility of energy use. (Action 1.1b)
- Upgrade to more efficient real property and equipment during replacement cycles.
- Continuously strengthen an energy aware culture across the enterprise.
- Expand and/or modernize control systems to optimize consumption.
- Capitalize on technologies to improve energy efficiency and increase capability.

LOE – 2. CYBER-RESILIENT CONTROL SYSTEMS

DAF uses control systems (a subset of operational technology) to monitor, operate, and/or control equipment, infrastructure, and their associated devices. The applications include power generation and distribution, air conditioning, water and wastewater plants, natural gas distribution, and other related systems. A control system is a collection of technological components that monitor, manage, and/or control the behavior of people, devices, and systems. Control systems can take various forms according to size, complexity, function, or configuration.

Some types of control systems may exist as building automation systems, fire suppression systems, industrial control systems, or airfield lighting systems. Typically, they consist of components that can be categorized as inputs, controllers, actuators, sensors, and outputs. Although control systems across the enterprise reside under multiple functional communities (such as Civil Engineer, Security Forces, Logistics, Medical, etc.), the control systems supporting energy systems primarily fall within the Civil Engineer Authorizing Official's (AO) boundary. While this EACP is focused on Civil Engineer control systems, AOs for other functional boundaries will pursue risk management actions, as appropriate.

A specific example of a CE control system is a Supervisory Control and Data Acquisition (SCADA) system that overlays infrastructure, regulates the flow of energy, and responds to changes within the system. As part of a microgrid, a SCADA system provides real time agility in responding to stresses and faults within the energy system. On the demand side, control systems include building automation systems, life safety systems, utility monitoring and control systems, airfield control systems, traffic control systems, and energy management control systems (EMCS).

These and other uses of control systems are foundational to the effective and efficient supply and use of energy. As control systems have become increasingly automated and interconnected for greater efficiency and cost savings, there is a risk to mission due to the increased cyber vulnerabilities. Control systems support nearly all aspects of DAF core mission areas. By extension, if the control systems can be compromised, so can the mission(s) they support. Adversaries can exploit unmitigated vulnerabilities, potentially leading to mission failure, extended operational impacts, and physical damage to infrastructure.

To place Civil Engineer networked control systems in a better cybersecurity posture, AFCEC developed the Community of Interest Network (COIN) as a logically-separated network to segment control system traffic from the AFNET. Before control systems (as part of projects or initiatives to improve energy system resilience) are installed, we will ensure AFCEC assesses CE control systems for cyber risks. Bases will migrate networked control systems into the COIN environment at the installation.

Mitigating the risk to control systems posed by cyberspace requires purposeful investment to enhance their cyber resiliency by following the guidance outlined in DAFGM2022-32-01 or current DAF guidance and UFC 4-010-06 to "bake-in" cybersecurity standards into these systems' life cycle. We will also incorporate cybersecurity standards into applicable energy assurance and resilience efforts including IEP, Utilities Privatization (UP), microgrids, energy storage, etc.

- The Department of the Air Force published the DAF Strategic Plan for Control Systems and the corresponding Implementation Plan in March 2021 to commit to and instill an enterprise approach for successfully identifying, protecting from, defending against, and mitigating risks to control systems. (Completed action)
- Implement COIN as a logically-separated network to strengthen the security of CE networked control systems. (Action 2.1b)
- Establish cybersecurity guidance for the selection of CE control systems when acquiring or upgrading control systems. (Action 2.1b)
- Modernize legacy control systems based on mission requirements to improve mission readiness and strengthen mission capability. (Action 2.1c)

- Actively monitor systems and networks to manage the risk of cyber incidents. (Action 2.1c)
- Ensure that energy control systems and their components have operational redundancy, backup/restoration protocols, and manual control procedures that are properly and routinely configured, maintained, and exercised.

LOE – 3. MISSION MATCHED CAPABILITIES

What it takes to make energy systems mission ready will vary across installations. System requirements depend on the mission(s), capabilities of the existing energy system(s), expected recovery rate of the commodities provider(s), and suitability of the system(s). The IEP provides a baseline determination of mission requirements, an assessment of current system capabilities, and a decision framework from which to decide what additional actions should be taken. The IEP is followed by one or more RSRs, which provides an in-depth assessment of shortfalls or gaps in existing energy system capabilities, conducts an analysis of alternative solutions, and recommends projects to improve resilience.

The IEP also captures mission tolerance for a disruption in energy supply. There are two determinations documented in the IEP. The first is capturing the quantity and quality of the energy and water needed to sustain mission for a minimum of 7 days or until it can be relocated or, in the instance of unrelocatable missions, until commercial service can be restored. This amount can be referred to as critical energy demand, which is the energy required to operate real property assets that support missions across the installation. The second is identifying the ability of existing systems and infrastructure to meet critical energy demand. The IST will use IEP process to identify practical strategies to ensure mission requirements can be met. The critical energy demand shall be the minimum amount of assured supply that must be available.

To achieve energy security, we need to improve both the readiness and resilience of our energy systems. Generally speaking, energy systems were designed to meet legacy reliability and efficiency standards and are becoming increasingly dated lacking physical and cyber resilience attributes required to achieve diversity in supply and redundancy in distribution (Refer to LOE-2). Energy diversity means the energy we need is assured and available through a variety of reliable commercial and/or installation sources like solar arrays, wind turbines, or energy storage systems such that if one source is compromised, we can readily

shift to another. Energy redundancy infers that the energy system can supply mission through a variety of distribution paths.

Although temporary back-up systems, e.g. 7-day emergency generators, will remain an important capability, the risk of their failure increases over time. As such, OEA will guide installations in determining what improvements need to be made to assure energy (assured supply) is available across the installation's critical energy load.

Required improvements will be captured in an IST developed IEAP, which summarizes the projects and initiatives planned and underway to remedy capability gaps. We will diversify supply and improve agility through modernization of energy systems by taking the following actions:

- Capitalize on ISTs to validate IEP defined capability gaps and update the IEAP. (Action 3.1a)
- Complete RSRs to decompose capability gaps, evaluate alternative solutions, and determine the most practical and economic solution. (Action 3.1b)
- ISTs update the IEAP to organize and sequence improvement projects both planned and underway to resolve energy system gaps, as defined in the IEP. (Action 3.1a)
- Update IEPs annually to capture new, evolving mission requirements, determine the limitations of energy systems, and define capability gaps. (Action 3.1c)

LOE – 4. RELIABLE AND MANAGED INFRASTRUCTURE

Aging and obsolete infrastructure presents a mission risk as significant as a disruption in the commercial supply chain. In an energy system, reliability is a measure of how well the system provides availability of energy. Resilience refers to the ability of the system to adapt to changing conditions and withstand, respond to, and recover from energy system failures both internal and external to the system. Both are key attributes of an operationally agile and secure system, but assuring reliability and resilience isn't only about having diversity in supply and redundancy in distribution. Managing the risk for failures arising from within the energy system is as important as owning an assured supply of energy.

Visibility of the age and condition of infrastructure components and understanding how the system deteriorates over time is critical to managing the risk for internal system failure. Energy systems are comprised of thousands of components such as feeders, switches, transformers, and substations, which all play an interdependent role. All of these components are susceptible

to failure and many take days, weeks, or even months to acquire, if they can be found at all. Maintenance of spares and other temporary solutions can help mitigate mission impact, but these approaches are not always practical or even viable.

The AF Asset Management Program (AMP) provides a structured process to capture aging infrastructure related system risks, lend visibility to the potential mission impact of a specific asset failure, and enable proactive investments to mitigate. As part of the AF AMP process, utility systems are segmented, components captured, and conditions assessed in preparation for the DoD Enterprise Sustainment Management System - Utility Domain (ESMS Utilities), which is currently under development. We will mitigate the aging infrastructure risk by capitalizing on ESMS Utilities, implementing asset management principles in managing infrastructure risks, and by working with privatized utility system owners to assure these types of risks are managed. Unplanned disruptions will be captured, tracked, and analyzed through the AF Utility System Operational Report Tracker (USORT). This data will help in assessing system performance, predicting system deterioration, and mitigating emerging risks attributed to internal system faults and failures. We will continue to capitalize on the principles of asset management through actions such as:

- Utilize and sustain condition data obtained through linear segmentation of AF-owned energy systems to determine which assets are at risk of failure, determine the impact to mission, and develop effective strategies to mitigate the risk. (Action 4.1a)
- Develop a framework to improve the use and usefulness of utilities system engineering studies and related condition data. (Action 4.1b)
- Operationalize ESMS Utilities to actively manage aging energy infrastructure risk (record, analyze, and respond to problematic infrastructure). (Action 4.1c)
- Establish energy system performance standards and monitor performance (Action 4.1d)
- Develop strategies and standards for analyzing and interpreting condition data.
- Build plans and requirements that manage infrastructure related risk to mission.

LOE – 5. SYSTEM PERFORMANCE ASSURANCE

How well an energy system performs speaks to its reliability, which provides insight into the system's health based on past performance. In the context of assuring system reliability, redundancy signifies that the system has been designed to continue to function in spite of the failure of some of the system components. This resistance to failure is gained by providing alternative paths for energy supply and/or distribution by arranging selected elements of the energy system in parallel.

From an energy system perspective, resilience can be thought of as the systems' ability to continue to function to the level required by mission under a variety of stresses. A system's resilience is an outcome of a purposeful design that mitigates the assessed likelihood and consequences of a failure. As such, how resilient a system is can only be validated by its performance under stress. The DAF Energy Resilience Readiness Exercise (ERRE) program enables Commanders to conduct a real-world assessment of the energy systems capabilities. These pull-the-plug or black start exercises can help validate system gaps and provide a comprehensive framework to demonstrate system resilience through a planned disruption in supply. As part of the exercise planning process, subject matter experts assess the risk to installation infrastructure and mission systems and recommend mitigation measures. Based on the assessment, mission owners and mission support commanders will determine how best to demonstrate energy system resilience. Mission owners and installation support shall work together to implement the DAF ERRE.

To assure energy systems (includes systems providing energy generated resources) are properly designed to mitigate or eliminate mission disruption risks, we will demonstrate the systems designed resilience through actions such as:

- Thread demonstration of energy resilience in Continuity of Operations (COOP) exercises. (Action 5.1a)
- Conduct "Pull-the-Plug" exercises under the AF ERRE program. (Action 5.1b)
- Actively monitor energy system performance.
- Implement energy availability table top and/or simulated exercises.
- Include failure in the system(s) or disruption in availability in readiness exercises.
- Participate in large scale, regional table top exercises such as GridEx.
- Include disruption in installation energy availability as part of war-gaming exercises.

APPENDIX A – PERFORMANCE OBJECTIVES & MEASURES

LOE-1: OPTIMIZED SYSTEMS AND PROCESSES

Objective 1.1: Optimize energy demand by identifying and acting on opportunities to mission effectively reduce the amount of energy required to meet mission

a) Action 1.1a: Base Civil Engineers (BCEs) identify the organizations and processes that consume the top 75% of the energy consumed on the installation and determine what can be done to optimize demand
   i. EASG Reporting: Consumption trend FY15-25 with highlighted projects planned and underway reported by installations during their annual briefing
   ii. Performance Measure: BCEs identify and program at least two Facility Sustainment Restoration and Modernization (FSRM) eligible improvement projects for each year

   - OPR: BCEs
   - OCR: Mission Owners

b) Action 1.1b: AFCEC in partnership with ISTs develop and implement a plan to assist installations in reaching Full Operating Capability (FOC) build-out of a fully-functional AMRS
   i. EASG Reporting: Status Update – During annual review
   ii. Performance Measure: Number of utility meters required by law vs the number of AMRS compliant meters installed, connected, and automatically read

   - OPR: AFCEC
   - OCR: BCE

LOE-2: CYBER-RESILIENT CONTROL SYSTEMS

Objective 2.1: Manage the risk for mission impact attributed to cyber intrusion into energy control systems by developing policy, guidance, processes, and standards to enable installations to better manage the risk for cyber intrusion

a) Action 2.1a: HAF publish the DAF Strategic Plan for Control Systems and enabling policy directives. COMPLETED ACTION
   i. EASG Reporting: N/A
   ii. Performance Measure: N/A

   - OPR: AF/A4CS
   - OCR: AFCEC

b) Action 2.1b: AFCEC/COO develop cybersecurity guidance aligned with DAFGM2022-32-01 that enables installations to better select, field and/or secure control systems, and to assess control systems for cyberspace vulnerabilities. AFCEC/COO install COIN at AFMC installations and ensure functionality at full operational capability (FOC). AFMC installations connect and operate networked CE control systems on COIN.
   i. EASG Reporting: Status Update – During annual review

ii. Performance Measure: AFCEC/COO publish a supplemental DAFGM2022-32-01 "how to" guidance playbook. Number of installations with COIN functioning at FOC. Number of networked CE control systems operating on COIN.

- OPR: AFCEC/COO
- OCR: BCEs

c) Action 2.1c: BCEs obtain Authorization to Operate (ATO) for control systems, BCEs mitigate control system modernization risks, and BCEs mitigate risks identified in plan of action and milestones (POA&M) for ATOs.
   i. EASG Reporting: Status Update – During annual review
   ii. Performance Measure: Number of and progress toward obtaining ATOs. Number of CE control systems modernized (operating on Microsoft Windows 10 or latest DoD-approved Windows operating system.) Progress toward completing the POA&M(s) for each ATO to mitigate risks.

- OPR: BCEs
- OCR: AFCEC/COO

LOE-3: MISSION MATCHED CAPABILITIES

Objective 3.1: Assure missions have unimpeded access to energy when and where needed in the right amount and of the right quality

a) Action 3.1a: ISTs validate IEP defined gaps and update the IEAP to address them
   i. EASG Reporting: Chart showing number of gaps identified in IEP defined categories and the plan to address them – Installation Briefs
   ii. Performance Measure: Annual reduction in number of IEP gaps in each IEP defined category

- OPR: Installation IST
- OCRs: AFCEC, AFRL, BCEs

b) Action 3.1b: ISTs complete RSRs to decompose capability gaps identified in the IEP, develop solutions, and transition projects to AFCEC/CN to solve them
   i. EASG Reporting: RSR development update – FY23/4th QTR
   ii. Performance Measure: Number of IEP gaps addressed in an RSR and the number transitioned to AFCEC/CN, number in progress or pending, and number remaining

- OPR: AFCEC/CN
- OCR: BCEs

c) Action 3.1c: ISTs complete updates annually for baseline IEPs to capture mission changes
   i. EASG Reporting: Plan/Update - FY23/4th QTR
   ii. Performance Measure: None

- OPR: AFCEC/CN
- OCR: BCEs

d) Action 3.1d: AFCEC/CN develop a methodology to prioritize IEP defined gaps such that vulnerable missions are identified and addressed first
   iii. EASG Reporting: Plan/Update - FY23/4th QTR
   iv. Performance Measure: None

- OPR: AFCEC/CN
- OCR: BCEs

e) Action 3.1e: Installation progress in addressing mission requirements for energy assurance
   v. EASG Reporting: Percent complete chart showing by commodity, the total amount of required energy assurance (Generation/Distribution), the amount available and the plan to meet the requirement by 2030 - FY23/4th QTR
   vi. Performance Measure: By 2030, AFMC installations will have mission-enabling energy systems and infrastructure that are: 1) sustainable enough to supply known demands, 2) flexible enough to match changing priorities and missions, 3) scalable enough to meet increasing mission demand, and 4) secure and resilient enough to withstand cyber or operational degradation.

- OPR: AFCEC/CN
- OCR: BCEs

LOE-4: RELIABLE AND MANAGED INFRASTRUCTURE

Objective 4.1: Manage the risk for faults and failures arising within energy systems and attributed to aging infrastructure by improving visibility of the condition of assets and the usefulness of infrastructure data.

a) Action 4.1a: Utilize and sustain condition data obtained through linear segmentation of AF-owned energy systems to determine which assets are at risk of failure, determine the impact to mission, and develop effective strategies to mitigate the risk. Data sources include the base Utility Asset Management Plan (AMP) Manager and the Installation State of the Asset Management Plan (I-STAMP).
   i. EASG Reporting: Status Update – During annual review
   ii. Performance Measure: Utility Condition Index

- OPR: BCEs
- OCR: AFCEC

b) Action 4.1b: AFCEC develop a framework for Installation Utility Management Plans to operationalize installation studies and guide future utility system planning and investments
   i. EASG Reporting: AFCEC Plan/Update – FY23/4th QTR
   ii. Performance Measure: Management development timeline

- OPR: AFCEC
- OCR: BCEs

c) Action 4.1c: AFCEC develop a plan to assist installations in the stand-up of the DoD ESMS Utilities to provide enduring visibility of utility system assets and associated vulnerabilities.
   i. EASG Reporting: AFCEC Plan/Update – FY23/4th QTR
   ii. Performance Measure: Number of installations that have implemented ESMS Utilities vs number in progress or pending

- OPR: AFCEC
- OCR: BCEs

d) Action 4.1d: Installations continually analyze energy system outage data (frequency, duration, and scope) as reported in USORT to identify and mitigate risks that may lead to future outages.
   i. EASG Reporting: Service interruption trends (FY18-most recent fiscal year) as reported in USORT to include outage data analysis results, System Average Interruption Duration Index (SAIDI) data, and actions or plans to mitigate utility assurance risks – Installation Briefs

ii. Performance Measure: Locally established SAIDI Target for energy systems

- OPR: BCEs
- OCR: Mission Owners

LOE-5: SYSTEM PERFORMANCE ASSURANCE

Objective 5.1: Assure installation energy systems enable non-relocatable missions to continue to function during a prolonged disruption in commercial energy supplies

a) Action 5.1a: AFMC incorporate demonstration of the mission resilience provided by the installation energy system(s) as part of assessments and exercises conducted to meet mission Continuity of Operations (COOP) requirements
   i. EASG Reporting: AFMC A3/6 Plan/Update - FY23/4th QTR
   ii. Performance Measure: Annual number of IEP identified missions and supporting energy systems at installations exercised, as part of COOP, vs number of IEP identified missions.

- OPR: AFMC A3/6
- OCRs: Mission Owners

b) Action 5.1b: Demonstrate the resiliency of energy systems through the conduct of an average of one ERRE in AFMC per fiscal year
   i. EASG Reporting: SAF/IEE and AF/A4CF – FY23/4th QTR
   ii. Performance Measures: Number of ERRE complete vs number required. Number of ERRE findings outstanding vs number of findings fixed.

- OPR: SAF/IEE through FY23, AF/A4CF in FY24 and beyond
- OCR: AFIMSC Det 6

DEFINITIONS

CONTROL SYSTEM: A system in which deliberate guidance or manipulation is used to achieve a prescribed value for a variable. Control systems include SCADA, DDC, PLC, and other types of industrial measurement and control systems (ref. NIST SP 800-82r2).

CRITICAL ENERGY REQUIREMENT: The minimum amount of energy that must be always available to support missions, as determined through the IEP development process.

ENERGY: Any usable power, including purchased energy commodities such as electricity, natural gas, propane, and fuels; energy produced onsite including sustainable sources such as solar, wind, geothermal, and nuclear; and, energy generated resources such as back-up power, steam, chilled water, hot water, and compressed air.

ENERGY AVAILABILITY: The minimum amount of energy and energy generated resources such as steam, chilled water, hot water purchased or produced that is required for a mission to perform its required function at a stated instant of time or over a stated timeframe.

ENERGY COMMODITY: A commercially available energy product purchased from a commercial supplier, such as electricity, natural gas, propane, coal, water, propellants, chemicals, fuel, pure gases, and cryogenic fluids.

ENERGY GENERATED RESOURCE: An energy product typically installation produced and derived from the conversion of an energy commodity or commodities into a useful product such as steam, chilled water, hot water, and compressed air.

ENERGY DIVERSITY: The capability in an energy system to assure the supply of the energy required by a mission component or system to perform required functions under stated conditions for a stated timeframe.

ENERGY RELIABILITY: The ability of an energy system to supply energy to a mission component or system to perform required functions under stated conditions for a stated timeframe.

ENERGY RESILIENCE: The ability of the installation and the energy system(s) to readily adapt to changing conditions and withstand, respond to, and recover from internal system failures and/or externally imposed disruptions in the availability of energy.

ENERGY SECURITY: Having assured access to reliable supplies of energy and the ability to protect and deliver sufficient energy to meet mission essential requirements.

ENERGY SYSTEM: The interconnected infrastructure and control system that produces and/or supplies energy to a mission component or system to perform required functions under stated conditions for a stated timeframe.

INSTALLATION ENERGY: The energy used to power all facilities, systems, and processes on military installations.

INSTALLATION SUPPORT INFRASTRUCTURE: The physical systems and assets of an energy system that are not immediately vital to the performance of installation's mission(s).

MISSION ASSURANCE: A process to protect or ensure the continued function and resilience of capabilities and assets – including personnel, equipment, facilities, networks, information and information systems, infrastructure, and supply chains – critical to the performance of DoD Mission Essential Functions (MEF) in any operating environment or condition.

MISSION INFRASTRUCTURE: The physical systems and assets of an energy system so vital that the incapacity or destruction of such systems and assets would have a debilitating impact on the installation's ability to execute missions.

PULL-THE-PLUG EXERCISE: Exercise to simulate the impact of an event that cuts power to an installation, such as a natural disaster, to better prepare for and recover from an energy disruption.

ACRONYMS

AF - Air Force
AFCEC - Air Force Civil Engineer Center
AFIMSC - Air Force Installation and Mission Support Center
AFMC - Air Force Materiel Command
AFNET - Air Force Network
AMP - Asset Management Plan
AMRS - Advanced Meter Reading System
ATSO - Ability to Survive and Operate
BCE - Base Civil Engineer
CAT - Crisis Action Team
COA - Course of Action
COIN - Community of Interest Network
COOP - Continuity of Operations
DAF - Department of the Air Force
DDC - Direct Digital Control
EACP - Energy Assurance Campaign Plan
EASG - Energy Assurance Steering Group
EAWG - Energy Assurance Working Group
EMCS - Energy Management Control Systems
ERRE - Energy Resilience Readiness Exercise
ESMS - Enterprise Sustainment Management System
FEP - Facility Energy Panel
FOC - Full Operating Capability
FSRM - Facility Sustainment Restoration and Modernization
GIS - Geographic Information System
HAF - Headquarters Air Force
IEAP - Installation Energy Action Plan
IEP - Installation Energy Plan
IESP - Installation Energy Strategic Plan
ISO - International Standards Organization
IST - Installation Support Team
LOE- Line of Effort
MEF - Mission Essential Function
OEA - Office of Energy Assurance
PLCs - Programmable Logic Controllers
QTR - Quarter
RMF - Risk Management Framework
SAIDI - System Average Interruption Duration Index
SCADA - Supervisory Control and Data Acquisition
UP - Utilities Privatization
USORT - Utility System Operational Report Tracker

REFERENCES

10 U.S.C. § 2911 to 2920 (Chapter 173 Energy Security)
Executive Order 14052 Infrastructure Investment and Jobs Act
Executive Order 14057 Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability
DoDI 4170.11 Installation Energy Management
DoDI 8500.01 Cybersecurity
DoDI 8510.01 Risk Management Framework for DoD Systems
DoDD 3020.40 Mission Assurance (MA)
OSD Policy dated 20 May 21: Metrics and Standards for Energy Resilience at Military Installations, Supporting Policy and Guidance and Associated Reporting Requirements
UFC 3-540-01 Engine-Driven Generator Systems for Prime and Standby Power Applications
UFC 3-540-07 Operation and Maintenance (O&M): Generators
UFC 3-540-08 Utility-Scale Renewable Energy Systems
UFC 3-550-01 Exterior Electrical Power Distribution
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UFC 4-010-06 Cybersecurity of Facility-Related Control Systems
DAF Installation Energy Strategic Plan 2021
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AFPD 10-24 Mission Assurance
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AFI 10-208 Continuity of Operations (COOP) Program
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Air Force Mission Directives
Department of the Air Force Strategic Plan for Control Systems, March 2021
Department of the Air Force Implementation Plan for Control Systems, March 2021
NIST SP 800-37r2 Risk Management Framework for Information Systems and Organizations
U.S. Air Force Infrastructure Investment Strategy, January 29, 2019