



Mission Assurance through Energy Assurance

# INSTALLATION ENERGY STRATEGIC PLAN 2021

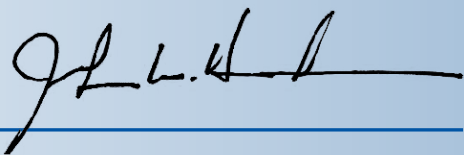
# Forward

January 13, 2021

As the National Defense Strategy makes clear, the homeland is no longer a sanctuary. Warfare has changed, challenging our traditional methods to ensure mission success. Amidst greater reliance on increasingly interconnected capabilities, more prevalent asymmetric threats, and unprecedented changes to the natural operating environment, the Department of the Air Force (DAF) must modify its approach to mission assurance to prioritize areas of new and rising vulnerability. To build a more lethal and ready DAF, the Enterprise requires a strategic plan with resilience at its core that better aligns installation energy efforts with mission needs.

The Installation Energy Strategic Plan meets this need by outlining a path to greater mission assurance through the realization of more resilient energy systems. The Plan will achieve the new installation energy vision of Mission Assurance through Energy Assurance by pursuing three goals: *Identify Enabling System Vulnerabilities*, *Improve Resilience Planning*, and *Ensure Resilience Results*. The Plan sets the DAF on a new course to create an Enterprise that is more aware of how threats to enabling systems like energy may impact mission assurance, more cognizant of how its investments can support resilience, and ultimately more prepared to deliver what is needed to protect the nation, its values, and its interests. The Plan is a key tool to help implement energy resilience and readiness objectives in collaboration with the DAF Infrastructure Investment Strategy.

By executing the Plan, the DAF seeks to enhance its combat capabilities, mitigates risks to its global missions, and improves resource use to meet Executive Orders, federal legislative provisions, Department of Defense (DoD) Directives, and the 2017 National Security Strategy’s call for more resilient critical infrastructure. Ultimately, the plan provides the DAF with a more agile posture to strengthen its operational effectiveness in air, space, and cyberspace.



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A high-angle, front-facing view of a formation of F-35 fighter jets on a runway. The lead jet is in the foreground, with several others following in a staggered line behind it. The runway is dark asphalt with yellow and white markings. The background shows a hazy sky and distant airport infrastructure.

# Executive Summary

The DAF recognizes it can no longer expect traditional mission assurance methods to deliver results in a technology-driven world of interconnected capabilities, unprecedented changes to the natural operating environment, and more prevalent asymmetric threats. Key mission assets require the support of systems like energy to enable mission capabilities. As the DAF's dependence on these enabling systems grows in scale and complexity, system disruptions can expose the Enterprise to unacceptable risk. At the same time, the effects of these disruptions on DAF missions are expected to expand in their geographical scope and duration. Consequently, the DAF has created the Installation Energy Strategic Plan to address these enabling system vulnerabilities through a more dynamic approach to mission assurance.

The Plan supports mission assurance using a mission-centric view to improve the resilience of energy and water systems that enable DAF capabilities. To execute this new approach, the Plan lays out three goals – *Identify Enabling System Vulnerabilities*, *Improve Resilience Planning*, and *Ensure Resilience Results* – which have been selected to support the installation energy vision of Mission Assurance through Energy Assurance. Strategic objectives set the major milestones or actions required to achieve each goal. The Plan includes an overview of the DAF Facility Energy Program governance structure introduced in DAF Instruction 90-1701 as well as a suite of assessment, planning, execution, and verification tools to assist the DAF in realizing these goals. Recognizing the DAF charge to be mission-ready both now and in the future, the content of this Plan will be reviewed every two years and updated as needed to keep pace with the continuously changing operational landscape.

The Plan represents a living roadmap which will evolve as the DAF continues to provide installations with the guidance and tools necessary to progress towards greater mission success. With this innovative path forward to build end-to-end energy resilience into its missions, the DAF becomes well-positioned to fly, fight, and win in air, space, and cyberspace, even as the world around it becomes increasingly connected to and dependent on enabling systems.



# Introduction

The DAF recognizes its approach to mission assurance, with respect to energy and water, must maintain and enhance U.S. warfighting dominance in the name of protecting the nation, its values, and its interests. The Enterprise must enhance mission assurance methods to deliver results in a world of unprecedented changes to the natural operating environment characterized by increasingly interconnected capabilities, and more prevalent asymmetric threats. These changes in the operating landscape have the potential to introduce new, or heighten existing, vulnerabilities within energy and water systems that enable DAF capabilities. Therefore, ensuring these enabling systems deliver resources in the time, quantity, and quality needed to support the DAF mission to fly, fight, and win in air, space, and cyberspace must be a priority.

Acknowledging the need to address enabling system vulnerabilities across the Enterprise, the DAF has created the Installation Energy Strategic Plan. This ambitious Plan sets out to provide a comprehensive, strategic, and innovative path forward to build end-to-end energy resilience into DAF missions. This path is built upon integrating resilience concepts and considerations at each step in the mission, and from the strategic to tactical levels, to ensure enabling systems enhance—not inhibit—mission assurance. The Plan begins by explaining how the changing operating environment poses additional threats to the Enterprise before identifying the main components of the DAF’s new approach to mitigate these threats. To execute this new approach, the Plan lays out three goals—*Identify Enabling System Vulnerabilities, Improve Resilience Planning, and Ensure Resilience Results*—which have been selected to support the installation energy vision of Mission Assurance through Energy Assurance. The Plan then introduces the Air Force Facility Energy Program governance structure as a vehicle to translate goals into actions. In addition, the Plan outlines assessment, planning, execution, and verification tools to enable Airmen and Guardians to build greater resilience into the Enterprise in line with these goals.

Ultimately, the Plan enhances the ability of the DoD to

further build military readiness in support of a more lethal force, and reform DoD business practices as outlined in the 2018 National Defense Strategy. By taking a mission-focused approach to mitigate potential vulnerabilities in enabling systems supporting critical infrastructure and key military capabilities, the Plan ensures DAF readiness is not impaired by unexpected disruptions. It is this enhanced readiness, this capacity to execute the mission despite what systems or services may be denied to the Enterprise, that augments DAF lethality. The Plan enables DoD business practices to gain the full value of each dollar spent on defense while being flexible enough to integrate new technologies and measures to meet evolving needs. To realize the full value of investments, the Plan leverages analysis outputs to more efficiently allocate limited financial resources to targeted areas that have been identified as posing risks to missions. Designed to constantly refine and validate its outputs against mission-based metrics, the Plan is built to grow alongside the DAF’s understanding of cutting-edge resilience solutions. Through its flexibility, the Plan will drive, rather than limit, the full expression of technological innovation within and for the DAF.

By applying the tools and procedures contained in this Plan to address any potential enabling system resilience gaps, the Enterprise can become less vulnerable to disruptions—whether natural or manmade—that can challenge its ability to accomplish its mission. Not only does this greater resilience create a more lethal and ready DAF today, but it puts the Enterprise in a better position to meet the challenges that lie ahead, regardless of their nature or duration.

This prioritization of energy resilience activities will better enable the DAF to achieve energy and subsequently the full spectrum of mission requirements to be able to fly, fight, and win even in an evolving operational environment.

## The Department of the Air Force Installation Energy Vision: Mission Assurance through Energy Assurance

# Understanding the Threat

The changing operational environment is introducing the Air Force Enterprise to greater vulnerabilities that may hamper mission success. The DAF’s dependence on energy and water systems is growing in scale and complexity as its missions become more interconnected and technology-driven. As a result of this increasing dependence, disruptions to these enabling systems can expose the Enterprise to greater risk.

Key mission assets require the support of enabling systems to provide mission capabilities. Therefore, disruptions to these systems—whether from a significant environmental event or an orchestrated physical or cyber-attack on an installation or related infrastructure—stand to threaten mission success by causing critical mission asset failure.

At the same time, the impacts of these disruptions on DAF missions are expected to expand in their geographical scope and duration, further intensifying Enterprise vulnerabilities (Figure 1). These expanding vulnerabilities have widespread implications for DAF mission assurance.

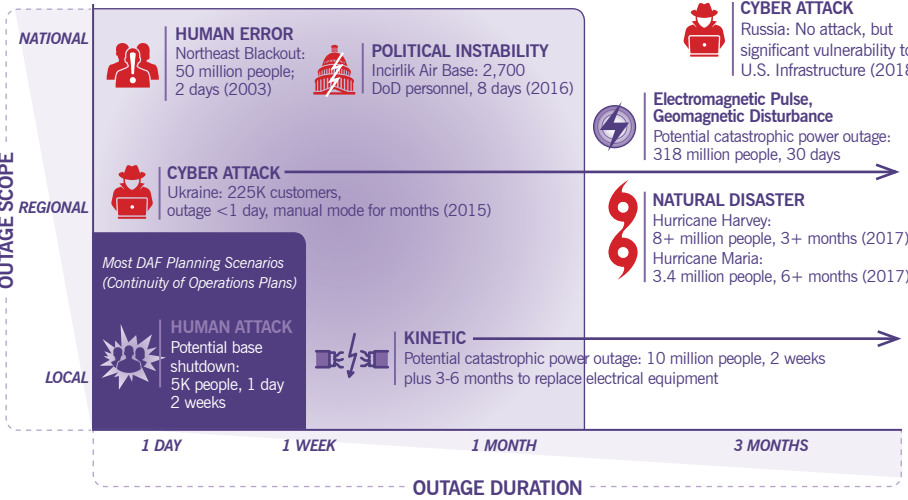


Figure 1: Expanding Risk from Denial of Service



Figure 2: Interdependencies of DAF Missions and Infrastructure

Recognizing that missions are dependent on assets distributed across multiple installations, a disruption in one location can have cascading impacts on other parts of the mission that may be miles away (Figure 2). By crippling crucial enabling systems, these disruptions could compromise the DAF’s ability to effectively conduct its missions, as well as cause significant economic damage and threaten national security more generally. These rapid changes in the operational landscape have prompted the Enterprise to rethink its approach to mission assurance.

# Energy Assurance Approach

Previous strategic approaches to energy took an installation-centric view of mission assurance, and prioritized energy projects by placing equal weight on resilience, cost-competitiveness, and cleaner energy generation. While those approaches reflected Air Force requirements at the time, the DAF determined they are no longer sufficient to lead the Enterprise into a future state focused on mission assurance. This new Plan replaces the Air Force Energy Flight Plan and captures major shifts in DAF thinking toward a greater focus on resilience, mission, and the growing importance of water, with the goal of integrating the results with the overarching DAF mission assurance construct.

## Resilience-Focused

Resilience has become central to DAF efforts. To demonstrate, the Enterprise now places the greatest emphasis on resilience, followed by cost-effectiveness and cleaner energy generation, when evaluating energy projects (Figure 3).

The DAF defines resilience using five attributes, referred to as the 5Rs, described in Table 1. These attributes are woven throughout all efforts to achieve DAF goals and objectives within this Plan. The Enterprise approach to resilience acknowledges it is

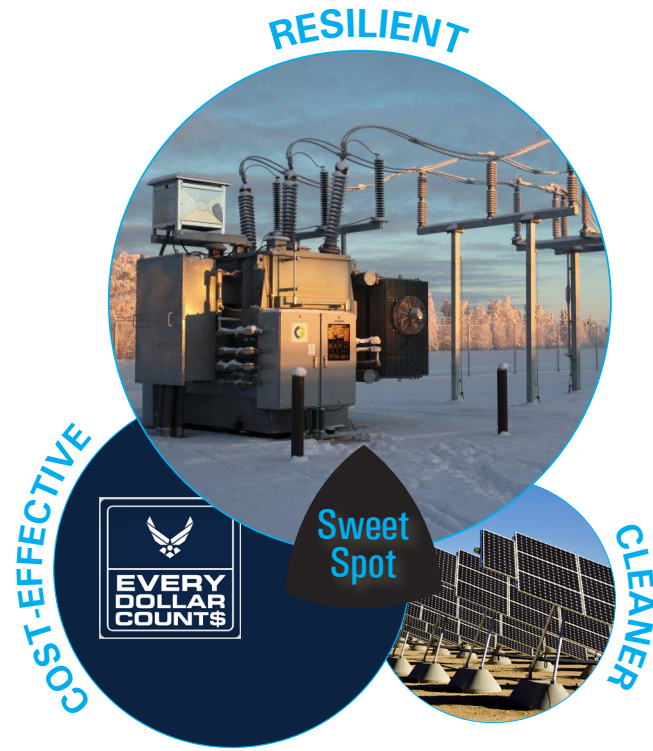


Figure 3. Energy Project Characteristics

Table 1 : Describing the 5Rs	
Robustness (R1)	Incorporates concept of reliability and refers to ability to withstand disturbances
Redundancy (R2)	Involves having excess capacity and back-up systems, which enable the maintenance of core functionality in the event of disturbances
Resourcefulness (R3)	Ability to adapt to crises, respond flexibly, and neutralize negative impacts
Response (R4)	Ability to mobilize quickly in a crisis
Recovery (R5)	Ability to regain a degree of normality after an event, be flexible, and evolve to deal with new circumstances

not a simple, singular metric, but consists of several distinct characteristics. When taken holistically, the 5Rs illustrate the complex and dynamic nature of true resilience. Applying the multi-dimensional resilience approach offered by the 5Rs to DAF goals gives the Enterprise a more robust understanding of where its weaknesses lie, as well as where there are opportunities to enhance the resilience of DAF capabilities and prioritize investment of finite fiscal resources.

## Mission-Centric

The DAF has taken on a mission-centric view of mission assurance through Energy Assurance. While DAF installations are weapon system platforms, they are not the mission themselves, so resilience of the installation should not come at the expense of the resilience of the discrete missions housed at an installation. From a mission perspective, this means the DAF must consider how its weapon systems and capabilities are potentially “tethered” to different installations and a diverse collection of DoD and industry nodes. These nodes are dispersed around the world and are not confined to a single installation. From an installation perspective, the Enterprise must recognize there are various missions and tenants housed at one location, and balancing the requirements of each must be considered when looking at the supporting infrastructure needed at any one installation. By taking a more mission-centric approach, DAF analyses can better identify interdependencies impacting mission success that may have otherwise been overlooked, and recognize that additional vulnerabilities and adaptive capacities come with the geographical dispersion of its missions. In order for this mission-centric view to be realized, mission owners and installation personnel must collaboratively engage in energy assurance planning and execution.

## Water-Inclusive

Though the DAF has historically focused on electrical energy assurance, it is increasingly recognizing the need to consider how water provides critical mission support. This new focus has been driven by a deeper understanding of DAF water rights, recent real-world instances of water impacting mission success, and growing water availability challenges that affect water quantity, quality, and access. The Office of the Assistant Secretary of the Air Force Installations, Environment, and Energy is working to establish requirements for base civil engineer personnel to

periodically validate and report the status of installation water rights to the Air Force Civil Engineer Center (AFCEC).

As Figure 4 demonstrates, any water resources management framework should support a water system that has a sufficient volume of water (water quantity) and adequate water quality to meet requirements. Additionally, such a framework should support appropriate water access whether that comes from the physical water infrastructure; regulatory processes such as water rights, permits, or policies; or financial mechanisms like affordability.

Water is a limited, non-substitutable resource. The DAF is forecasting more frequent water shortages and, as water resources become stressed, water rights disputes stand to become more common. To address these and other water issues, this Plan breaks with previous electric-centric approaches to mission support by more fully incorporating water into resilience efforts through an effective water management framework.

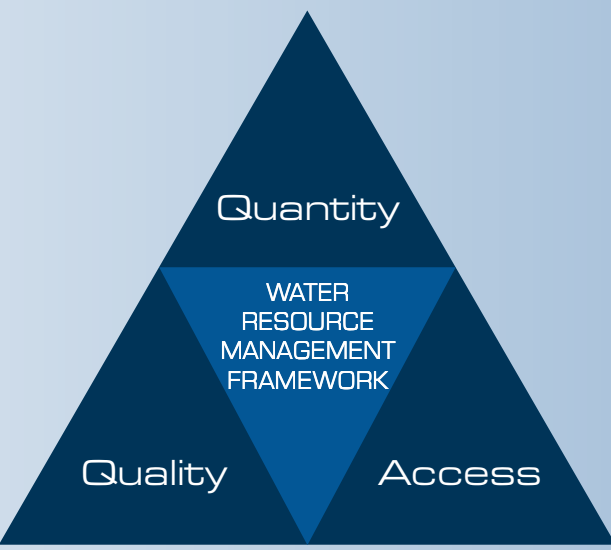


Figure 4. Water Availability Dimensions for a Management Framework

- Quantity  
Sufficient volume and redundancy of water
- Access  
Necessary physical, regulatory, and financial means
- Quality  
Adequate chemical and biological characteristics



# Executing the Energy Assurance Approach

To realize a resilience-focused, mission-centric, and water-inclusive mission assurance approach that enhances key mission capabilities, the DAF has built a holistic four-step process to Assess, Plan, Execute, and Verify investments aimed at increasing energy assurance (Figure 5). This is not a process in a vacuum, but one that will integrate with the processes, goals, and objectives identified in the overarching DAF mission assurance construct and the Installation Investment Strategy. A variety of tools and processes support each of these steps, and are described in greater detail in the Tools section of this Plan. This process is cyclical; as such, it indicates DAF energy assurance actions will be continuously refined over time to optimize resilience improvements. Given this cyclical nature, there are many points of entry into the process that may cause some installations to begin at a different step than others. Coordinated process step entry will ensure action visibility and support to resilience and energy assurance improvements across project lifecycles. For the purposes of this Plan, the described order of steps is Assess, Plan, Execute, Verify.

First, assessments provide the foundation upon which effective planning can be built. Mission, policy, or statute dictate requirements that drive planning. Through a deliberate planning process, the DAF can ensure it meets certain objectives to sustain its key mission capabilities. Whether planning

involves updating existing plans, such as Installation Development Plans (IDPs), or developing new plans like Installation Energy Plans (IEPs), assessments should be conducted to identify potential gaps and vulnerabilities that are then accounted for throughout the planning process. The Assess and Plan steps are iterative and should continually inform one another until a final plan is completed.

Next, a plan is executed through projects or other actions. In the eyes of the DAF, all installation projects are energy projects, requiring planning and execution to be very closely and intentionally linked. Funding initiatives that demonstrate improvements to mission assurance through energy assurance will be prioritized over others. Financing for such projects can come in any of the three primary forms: public-private partnerships, public-public partnerships, and direct investment from the DoD.

Finally, verification measures determine whether projects or other actions that were executed to enhance resilience did, in fact, deliver intended mission assurance improvements. Executed actions that do yield desired results can be considered for replication or enhancement. If verification measures show actions fell short of achieving their projected outcomes, modifications are made at the Plan step to correct the inconsistency.

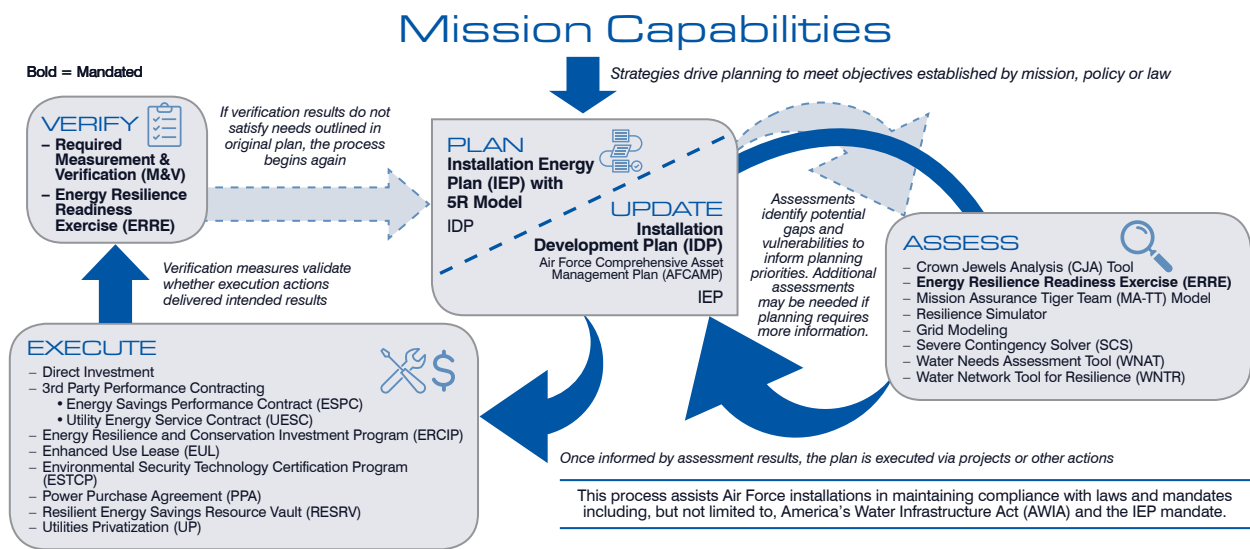


Figure 5. Outlining the New Energy Assurance Approach

# Goals

The DAF has identified three goals to support its new vision of Mission Assurance through Energy Assurance: *Identify Enabling System Vulnerabilities*, *Improve Resilience Planning*, and *Ensure Resilience Results*. These goals define and prioritize the broad, long-term direction of the DAF's desired future state. Strategic objectives set the major milestones or actions required to achieve each goal, and are categorized into three timescales—near (0-5 years), mid (6-10 years), and far (beyond 10 years). Targets associated with each objective provide measurable metrics to determine progress toward achieving that objective. The 5Rs are integrated into the execution of these strategic objectives to ensure resilience is a core component of the goals. Acknowledging the DAF's charge to be mission-ready, both now and in the future, the content of this Plan will be reviewed every two years and updated as needed to keep pace with the continuously evolving operational landscape.

providing them guidance and tools to conduct their own analyses. The objectives supporting Goal 1 take a comprehensive look at missions to offer installations the resources to identify points of vulnerability in both water and energy systems that could jeopardize mission success. It is critically important that mission owners and installation personnel work collaboratively towards this goal to address vulnerabilities at both the installation and Enterprise mission levels.

## Goal 1: Identify Enabling System Vulnerabilities

A vital step toward building greater resilience into DAF mission supporting infrastructure is to *Identify Enabling System Vulnerabilities*. The DAF has traditionally focused its attention on detecting vulnerabilities at the mission asset level. However, this approach neglects the many vulnerabilities that may be introduced through the enabling energy and water systems directly supporting key mission assets.

As the DAF's reliance on more complex enabling system networks increases, so does the potential for unforeseen vulnerabilities to jeopardize asset performance and, by extension, overall mission success. Taking a holistic approach to determine both where these infrastructure vulnerabilities exist and the scope of their impact on a mission is essential for any future resilience actions. Moreover, it is important to empower Airmen and Guardians to evaluate potential risks facing their missions by



Goal 1

Objective	Target
1.1. The DAF has a refined approach to evaluate energy resilience risks to readiness through the complete separation of an installation from the commercial electric grid (near)	By the end of FY21, complete Energy Resilience Readiness Exercises at five DAF installations
1.2. The DAF has the capability to identify mission vulnerabilities from supporting energy and water systems (near/mid)	Provide DAF installations and mission owners the tools and guidance necessary to identify mission vulnerabilities from supporting energy and water systems by FY25 and FY27, respectively

In an effort to assess installation energy resilience through real-world testing, the Office of the Assistant Secretary of Defense (OASD) has led power outage exercises known as Energy Resilience Readiness Exercises (ERRE) across the Services. To expand upon these OASD exercises, the DAF will complete a total of five ERREs by the end of Fiscal Year (FY) 2021, documenting lessons learned and best practices resulting from the process to refine its execution of ERREs. Conducting these five ERREs also stands to enhance the effectiveness of other DAF activities. ERREs can help identify potential vulnerable electrical assets, which can then be the focus of subsequent assessment and planning efforts. ERREs can also validate or disprove findings from other assessment tools and, in doing so, highlight opportunities to refine these tools and their associated processes to yield increasingly accurate results over time. For example, ERREs can be leveraged to improve the success of the tools used in the DAF's larger Mission Thread Analysis (MTA) process.

The MTA process as a whole indicates where targeted investments in enabling systems such as energy and water may most effectively advance mission readiness. The first step of an MTA is to assess mission needs using a probability-agnostic approach, and test enabling system capacity to meet mission requirements during a denial-of-service. It is the execution of this first MTA step that will allow installations and mission owners to identify mission vulnerabilities from both electrical and water systems. The DAF will encourage installations to prioritize missions identified on the Mission Assurance List for an MTA before moving on to high-consequence missions.

By FY25, DAF installations and mission owners will have the ability to pinpoint key areas of vulnerability within the electrical system that could compromise a

mission through the first step of the MTA process. To begin, the DAF will focus on developing and testing tools and assessment processes, such as mission decomposition-based analysis methods and electrical system modeling, to identify mission-essential electrical assets. This focus will include tools developed within the DAF and those developed by industry. Next, the resilience of the electrical network and its ability to support mission nodes during a denial-of-service will be evaluated. Results will inform the development of guidance to share with installations and mission owners to enable their execution of this electrical system analysis.

Given that DAF water efforts lag behind those for energy, installations and mission owners will be able to identify water vulnerabilities within their water systems by FY27. Similar to the MTA energy process described above, the DAF will develop and test assessment methods and water system modeling tools to identify water system assets that, if unable to operate as needed, have the potential to impact the mission. After evaluating the resilience of the water network and its capacity to support mission nodes during a disruption, results will be translated into guidance for installations and mission owners, improving the DAF's knowledge of installations' susceptibility to a water denial-of-service.

Meeting these objectives allows the DAF to harness robust analysis tools and real-world testing to identify mission vulnerabilities and create the foundation for more informed, effective, and comprehensive mitigation efforts.

Goal 2: Improve Resilience Planning

Once mission vulnerabilities have been identified at the enabling system level, it is important to *Improve*

Goal 2

*Resilience Planning* to address those vulnerabilities. Though plans and assessments exist that consider aspects of enabling systems such as Air Force and Joint Mission Assurance Assessments, as well as Continuity of Operations Plans, plans must be developed that both account for enabling system vulnerabilities and connect those vulnerabilities directly to potential mission impacts. Additionally, there is a fundamental need for the DAF to provide greater guidance on water's role in mission assurance. The objectives supporting Goal 2 put the Enterprise on a path to better account for water in its planning process.

It is important to note that all future energy and water-related DAF project funding will depend on an installation's ability to demonstrate that the project enhances readiness and resilience. Collaboration with mission owners is therefore essential for procuring future funding for resilience projects. Moreover, the DAF's requested allocation of resources detailed within the Program Objective Memorandum delivered to the Office of the Secretary of Defense each year will prioritize those projects that can demonstrate resilience enhancements.

IEPs are at the center of DAF efforts to enhance mission resilience throughout the Enterprise. IEPs provide an important decision-making structure to define mission energy requirements, incorporate long-term plans for energy resilience capabilities, and ensure reliable and available utilities for key missions. Developing initial IEPs for priority and top 75% DAF energy consumer installations begins to establish a common planning baseline to not only mitigate installation enabling system vulnerabilities, but also recognize how those vulnerabilities can cascade throughout the mission. The initial objective focuses

on priority and top 75% DAF energy consumer installations with a long-term goal of completing IEPs at all DAF installations.

To supplement the IEPs, the DAF is engaging in additional efforts to advance water planning. First, the Enterprise will develop and execute a process to establish water requirements for missions. Defining mission water requirements provides the foundation upon which all future water resilience activities must be built. The process will augment the DAF's ability to understand how water supports mission capabilities across the Enterprise. By defining these requirements, the DAF can ensure water resources are readily available and water supply architectures are sufficiently resilient to enable the mission.

Using mission water requirements as a baseline, the DAF will then develop action plans to increase the resilience of installations most vulnerable to long-term water availability issues.

These plans will mitigate intensifying water supply challenges that can lead to operational disruptions.

As assessments and tools provide additional water data and the demand for such data increases, it is important that this information be made available to installations in an easy-to-understand and accessible format. For this reason, each installation will have completed a water dashboard by FY25 that will serve as a central repository of essential information on an installation's water system. Such information will not only give an installation a more holistic understanding of their water risk picture, but also inform a variety of water planning efforts focused on resilience improvements.

Objective	Target
2.1. DAF installations have initial Installation Energy Plans (near)	By FY22, develop Installation Energy Plans for priority and top 75% DAF energy consumer installations
2.2. The DAF can define mission water requirements (near)	By FY23, develop and test process guidance to define mission water requirements
2.3. Installations most vulnerable to long-term water availability issues are more resilient (near)	By FY25, create resilience action plans for all installations identified to be most vulnerable to long-term water availability issues
2.4. DAF installations have improved access to water system data to support a greater understanding of their water resilience posture (near)	By FY25, establish water dashboards at each DAF installation



### Goal 3: Ensure Resilience Results

Improving resilience planning is not sufficient on its own, but must translate into actions that achieve results through the execution of energy resilience solutions, whether materiel or non-materiel. Implementing these solutions should result in enabling systems that are better designed, engineered, tested, and maintained to meet mission requirements. To ensure the most effective use of DAF financing, there is an additional need to evaluate how well materiel projects deliver intended resilience benefits. The objectives supporting Goal 3 make the important link between resilience planning, project implementation, and monitoring and verification, completing the end-to-end process of considering mission resilience from vulnerability identification through to solution execution.

The DAF recognizes incorporating energy technology innovations into resilience projects has the potential to augment and accelerate mission resilience improvements. For this reason, it is important that the Enterprise identify new or strengthen existing relationships with external stakeholders who are active in the energy innovation spaces. Stakeholders may be from industry, government, or other sectors. Establishing a mechanism to most effectively engage with these stakeholders during the project planning and financing phases can allow the DAF to most appropriately leverage technological innovation to meet its resilience project goals.

The DAF's limited infrastructure budget incentivizes the Enterprise to invest its dollars into resilience projects

that provide the best return on investment. However, project funding justification often does not clearly demonstrate how the funding directly addresses a potential resilience gap in DAF missions. Therefore, the DAF will encourage installations to first identify any mission resilience gaps based on quantitative analysis outputs, and then demonstrate how project funding requests fill those gaps. These analyses can come from the processes resulting from Goals 1 and 2, as well as the various tools described later in this document. By making these processes and tools available for the DAF community to turn assessment results into project justification, the Enterprise can garner potentially greater resilience improvements from energy projects.

Once analysis-supported energy resilience projects are funded, the DAF must evaluate the extent to which these enabling system resilience investments have actually improved the resilience posture of a mission. To this end, the DAF will develop and implement an assessment process that determines how well funded projects addressed any identified mission resilience gaps. Should an assessment show a project did not deliver anticipated mission resilience gains, lessons learned will be used to improve the resilience planning and funding processes, and an action plan will be developed to achieve unrealized resilience gains for a given project. By pursuing this goal, the DAF can be more confident that its dollars spent on energy projects do, in fact, result in greater Enterprise resilience.

Goal 3

Objective	Target
3.1. The DAF is better able to strategically invest in technological innovations within the energy and water domains (near)	By FY23, the DAF has established a mechanism to improve information sharing among external stakeholders active in the areas of energy and water technology innovation
3.2. Quantitative analyses that demonstrate mission resilience improvements are used to justify DAF energy and water resilience projects (mid)	In FY27, ensure that at least 40 percent of DAF energy and water resilience projects awarded in FY26 used quantitative analyses which demonstrated funding mission resilience requirement
3.3. The DAF validates resilience improvements from funded energy resilience projects (mid)	In FY29, evaluate 20 percent of DAF energy resilience projects funded in FY24 to determine how well they addressed identified mission resilience gaps and develop action plans to compensate for any shortfalls

## Governance and Management

The DAF's vision and goals will best be accomplished if they are executed within a governance and management structure that enables their success. Thus the Enterprise has established a multi-tiered hierarchical governance and management structure composed of the Facility Energy Board (FEB), Facility Energy Group (FEG), and the Facility Energy Panel (FEP) (Figure 6). The Authority to establish this structure is derived from Air Force Policy Directive (AFPD) 90-17, Energy and Water Management, section 3.2.7: "Establish and manage the Air Force energy governance structure, which will provide strategic direction and oversight, as well as resolve energy issues impacting more than one organization or functional area". The AFPD designates the Assistant Secretary of the Air Force for Installations, Environment, and Energy (SAF/IE) as the DAF's Senior Energy Official. SAF/IE has delegated the day-to-day management of the DAF Installation Energy Program to the Deputy Assistant Secretary for Environment, Safety, and Infrastructure (SAF/IEE). The structure provides strategic guidance and coordination for development, review, validation, and approval for near-and long-term facility energy and water project planning.

### Facility Energy Board (FEB)

The FEB is the strategic forum used to provide Secretariat and Air Staff vision, priorities, and vectors to the DAF Facility Energy Program's decisions and processes focused on energy resiliency. This body will ensure Headquarters Air Force (HAF), DAF Facility Energy Program, and Major Command strategic goals and priorities are considered when balancing risk to mission and risk to Airmen and Guardians within available resources or whether the DAF Corporate Structure should increase energy resiliency efforts. Where practical, the FEB will serve as a forum to discuss industry initiatives or best practices in achieving DAF energy goals.

### Facility Energy Group (FEG)

Within the context of the DAF Facility Energy Program governance structure, the FEG serves as the mid-level decision forum to ensure appropriate oversight of facility energy projects. This governance board is focused on ranking projects based on HAF priorities, identifying risks and mitigation plans to be briefed at the FEB, and discussing opportunities for collaboration across organizations to increase efficiencies for project transition and execution.

### Facility Energy Panel (FEP)

The FEP serves as an action officer-level advisory committee for all DAF energy resilience projects. Members of the FEP determine whether or not an energy, utility, or water resilience requirement will be transitioned to its appropriate execution partner. The FEP is responsible for validating the prioritization of the resilient energy project portfolio.

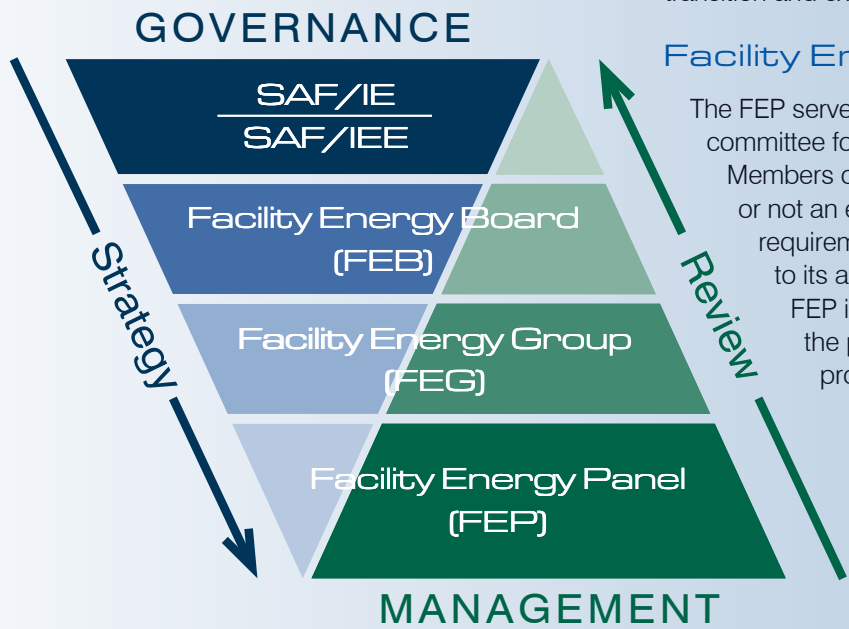


Figure 6. DAF Facility Energy Program Governance and Management Structure



# Tools

A variety of assessment, planning, execution, and verification tools support DAF efforts to reach the goals outlined in this Plan and, in doing so, enable Airmen and Guardians to build greater energy resilience into the Enterprise. The DAF plans to make these tools available via an online resource hub that is accessible to all installations, and will indicate where installations can access the tools once this hub is fully operational.

Each of the assessment, planning, execution, and verification tools are designed to be used in tandem by installation and Enterprise-level mission owners. Recognizing the unique perspective and understanding of mission capabilities and requirements that mission owners can provide, the DAF expects that mission owners will meaningfully engage in the use of these tools as a way to meet their mission assurance responsibilities with respect to energy assurance. By partnering with mission owners in the energy assurance planning process, installations can further mitigate the risks and uncertainties posed by enabling systems to installation operations and mission capabilities. Identifying and managing risks is crucial to the DAF's vision of Mission Assurance through Energy Assurance, and is the responsibility of both installation personnel and mission owners. For example, installation experts may provide important insight into hazards and risk levels for the installation, but they cannot determine if the risk level is acceptable to the Enterprise. Ultimately, a decision regarding acceptable risk to missions are determined by the HAF, Major Commands, and mission owners and operators, in coordination with the Combatant Commands.

## Assessment Tools

Effective assessment tools like the ones shown below improve the DAF's ability to identify and prioritize enabling system assets that are most in need of resilience investments to support mission success. All assessment tools listed here are still under development. Though these tools are not yet available, efforts are currently being made to draft guidance that will allow installations to access and use these tools.

### Crown Jewels Analysis Tool

The Crown Jewels Analysis (CJA) Tool performs criticality and dependency analyses to identify and

prioritize assets that may cause mission impact if an enabling system service was denied to a given asset. A mission is decomposed into tiered levels that increase in specificity from Mission Objectives to Functions, Tasks, and Assets to make up a mission hierarchy. Data collection and a mission owner-focused workshop help establish a common understanding among key stakeholders of the known and unknown dependencies, deficiencies, and potential workarounds necessary to accomplish a mission. Using this baseline, stakeholders provide a quantitative measure of mission dependencies between layers of a mission hierarchy for both on- and off-base nodes.

### Energy Resilience Readiness Exercise

An ERRE is a DoD-led effort to test the resilience posture of installation energy, water, and communications networks, and the capacity of an installation to recover from a long-term power outage. Such an exercise further determines how a widespread power loss is managed at an installation, and if installation systems, such as energy, water, and communications, can still support key mission operations during such a loss. Also known as a "pull-the-plug" exercise, an ERRE involves an assessment of backup power asset performance during black start and multi-hour operations, which is used to identify capability and performance gaps. ERRE results inform planning and investment priorities to maintain installation readiness.

### Installation Water Dashboard

The Installation Water Dashboard is a collection of essential information on an installation's water system and rights, designed to track water rights, ascertain and report on the condition of the system, areas of vulnerability, and adequacy of contingency response and maintenance plans, as well as consumption patterns, cost of operations, and planned improvements. The Installation Water Dashboard is resilience-oriented, focusing on risks, water availability, and planning. Ultimately, developing an Installation Water Dashboard for each DAF installation improves the usability of available water data by creating a one-





stop-shop to gain a comprehensive understanding of an installation's water risk picture.

### Mission Assurance Tiger Team Tool

The Mission Assurance Tiger Team Tool is a system-of-systems analysis tool to map, visualize, and dynamically test a mission architecture. The Tool uses a denial-of-service analysis to identify key assets within a mission architecture. Time-based scenarios test the resilience of a mission in adverse conditions to define capability degradation. From there, the Tool suggests courses of action and a measurement of their effectiveness to deliver resilience within these conditions.

### Severe Contingency Solver Tool

The Severe Contingency Solver (SCS) Tool is a power flow optimization model that can assess electrical system performance under N-1 and certain N-k scenarios. With these scenarios, SCS can evaluate the system's ability to maintain power to a building or facility housing a key mission asset given the removal of one or more electrical assets from a desired electrical system. In this way, the SCS Tool helps to identify how a denial-of-service at the energy enabling system level can lead to mission impact.

### Water Needs Assessment Tool

The Water Needs Assessment Tool (WNAT) is an Excel-based tool that uses installation real property data and water use intensity factors to provide annual water needs estimates for each of the nine major real property categories and more than 150 functional facility sub-categories. The outputs from the WNAT allow users to estimate water needs by function without the need for sub-metering data, which are not currently available to most DAF installations. This more granular understanding of water needs beyond the master meter provides valuable information as installations look to ensure long-term access to an adequate water supply, plan for projected increases in population or change in mission, assert or defend their water rights, identify opportunities for conservation, and create water prioritization plans.

### Planning Tools

Planning tools can use assessment outputs to determine actions to enhance the resilience of any

identified key assets in the short- and long-term. IEPs are actively being developed in coordination with DAF installations, whereas the Air Force Comprehensive Asset Management Plan (AFCAMP) is currently an established process.

### Air Force Comprehensive Asset Management Plan

The AFCAMP process supports mission planning, programming, project validation, and execution to develop investment strategies. AFCAMP is managed by AFCEC, and incorporates the 5Rs into its assessment of system asset performance.

### Installation Energy Plans

An IEP represents the integration of strategic guidance, plans, and policies into a holistic roadmap that enables the installation to work constructively to enhance mission assurance through energy assurance. An Installation Commander works collaboratively with all tenant organizations and mission owners to develop an IEP that considers the mission, future plans, and critical requirements. Using its 5R model tool, an IEP delivers a data-driven approach that incorporates opportunities and constraints to mitigate energy risks and vulnerabilities. In the end, IEPs provide DAF installations with a living assessment that prioritizes known projects and programs, but also offers the agility necessary to respond to unforeseen changes in mission, requirements, or supplies.

### Execution Tools

Investment tools like those listed below help maximize resilience benefits by optimizing funding sources that turn plans into projects. Investment tools are broken down into three sub-categories: public-private partnerships, public-public partnerships, and direct investment. Strengthening existing or pursuing new community partnerships have the potential to introduce additional capacity for the DAF to support its key mission capabilities. Community partnerships tend to come in two forms—public-private or public-public partnerships. A public-private partnership involves at least one public or semi-public agency and at least one private organization sharing resources from a mix of public and private revenue streams to realize a desired objective. Public-public partnerships work in much the same way but involve two or more public agencies that pool resources from two or more public revenue streams. In addition to identifying key community partnership opportunities, this section

describes direct investment opportunities to support DAF projects in the form of DoD-internal funding mechanisms.

### Public-Private Partnerships

#### 3rd Party Performance Contracts

Performance contracts can be leveraged to address mission assurance gaps by providing needed funding for identified resilience projects. These contracts allow the DAF to partner with private energy service companies and utilities to implement energy efficiency and resilience improvements at federal facilities by paying for the investment over time through guaranteed savings. Third-party performance contracts, such as Energy Savings Performance Contracts (ESPCs) and Utility Energy Service Contracts, provide the federal government with a partnership opportunity to procure energy savings and facility improvements with no up-front capital costs. The DAF is pursuing ESPCs across its facilities, targeting depots and data centers, and exploring new ways of bundling ESPCs to take advantage of economies of scale. These projects not only provide an avenue for the DAF to optimize its energy demand, but also to help modernize its aging infrastructure.

#### Enhanced Use Leases and Power Purchase Agreements

The DAF is looking at the full spectrum of cleaner energy project types to improve its energy posture and monetize underutilized land or buildings with the potential for cleaner energy development which, for the time involved, are not needed for public purpose.

An Enhanced Use Lease is a cooperative arrangement where the DAF provides a long-term lease of an underutilized property to a private developer for its use. In return, the Enterprise receives a financial benefit, such as reduced energy rates or in-kind consideration of a value not less than the Fair Market Value of the property. The latter might include construction of resilient utility systems, energy conservation or demand reduction features in facilities, or first right to the electricity in the event of an electrical disruption.

A Power Purchase Agreement (PPA) is a long-term purchase commitment for all or most of the energy generated by a renewable power source on a parcel of non-excess and underutilized land contributed to the developer for use by the DAF. Under an on-site PPA, a developer installs a distributed energy system on or near DAF property under an agreement where the Enterprise will purchase the power generated by

the system. The DAF pays for the system through these power payments over the life of the contract. After installation, the developer owns, operates, and maintains the system for the life of the contract. PPAs allow the DAF to implement on-site energy projects with no upfront capital costs. PPAs must demonstrate mission assurance gains to receive funding from Office of the Secretary of Defense (OSD).

#### Utilities Privatization

Utilities Privatization (UP) is a method to obtain modern, responsive, resilient, secure and environmentally sound utility systems at a relatively lower cost by shifting the government's role from that of a utility system owner-operator, to that of a utility service customer. UP establishes a fiscal and operational partnership and direct investment for both the DAF and utility system providers. Privatization of utility systems involves a "bill of sale" conveyance of the real property to a third party, such as a municipal, private, regional, district, or cooperative utility company. Under this approach, the DAF conveys the entire system and no longer owns, operates, maintains, or repairs these systems. The agreement also includes a utility service contract for operations, maintenance, and recapitalization for a specified period of time, not to exceed 50 years. UP benefits the DAF since a system at industry standard improves reliability, reduces commodity consumption, and ensures consistent maintenance, repair, and upgrades to the utility systems. Paradoxically, the most significant benefit is also the biggest challenge—maximizing reliability and resilience requires significant near-term investment to eliminate system deficiencies. By divesting the DAF of these utilities, Active, Guard, and Reserve installation commanders can focus on operations and core defense missions and functions, rather than repairs and upgrades to utility systems.

### Public-Public Partnerships

Public-public partnerships involve leveraging expertise and resources at government agencies; national labs; community groups; non-profit organizations; various levels of government including local, regional, and state; and other public institutions to enhance the desired impact of DAF funding. When considering how best to execute an energy or water resilience project, the Enterprise should determine how such partnerships can extend the resilience return on investment for DAF-invested dollars.



Direct Investment

*Energy Resilience and Conservation Investment Program*

The Energy Resilience and Conservation Investment Program (ERCIP) is a subset of the defense-wide Military Construction program, and an important element of the DoD’s strategy to improve the energy resilience, energy security, and energy efficiency of its fixed installations. Authority for the ERCIP is established by 10 United States Code (USC) Section (§) 2914. The ERCIP allows the DAF to promote and sponsor projects that achieve its strategic requirements. The Enterprise evaluates each ERCIP project on how it will improve mission assurance, and assesses how the system increases capacity, quality, and condition using attributes defined by the 5Rs.

*Environmental Security Technology Certification Program*

The Environmental Security Technology Certification Program identifies and demonstrates the most promising innovative and cost-effective technologies and methods that address the DoD’s high-priority environmental requirements.

*Facilities Sustainment, Restoration and Modernization*

Facilities Sustainment, Restoration and Modernization provides funding to keep the DoD’s inventory of facilities in good working order, repair damaged or aging facilities, or modify existing facilities to meet new needs.

*Resilient Energy Savings Resource Vault*

The Resilient Energy Savings Resource Vault is an extended availability account that applies existing federal policy in the DoD Financial Management Regulation and 10 USC § 2912 to capture energy savings.

Verification Tools

Verification tools help the DAF understand how effectively executed resilience projects delivered the anticipated mission assurance improvements. If such tools identify discrepancies between desired and actual resilience gains, the DAF can correct the cause of the gap through a reform of its assessment, planning, and/or execution tools and processes. In this way, verification tools offer the Enterprise a way to continually improve to meet evolving needs.

Energy Resilience Readiness Exercise

An ERRE can not only serve as an assessment tool, as described in the Assess section of this document, but can also function as a verification tool. As a real-world test, an ERRE can be used to validate or disprove the accuracy of other assessment results, such as electrical models. Any discrepancies between ERRE and other assessment results must be identified and corrected by beginning the mission assurance process anew, starting with the Assess step.

Required Measurement and Verification

Required measurement and verification includes the defined evaluation procedure(s) for determining performance as mandated by OSD.

By continuously assessing, planning, executing, and verifying, the DAF will continue to adapt to the changing operational environment.





# Conclusion

This Plan demonstrates the DAF's commitment to mitigating potential enabling system vulnerabilities that may jeopardize mission success. By adopting a resilience-focused, mission-centric, and water-inclusive approach to mission assurance, the DAF is better able to meet the challenges posed at the enabling system level by the rapidly changing operating environment. This approach, supported by the new Facility Energy Program governance structure and a suite of tools, will allow the Enterprise to achieve the Plan's three goals – Identify Enabling System Vulnerabilities, Improve Resilience Planning, and Ensure Resilience Results. Through the pursuit of these goals, the DAF can realize its vision of Mission Assurance through Energy Assurance.

The Plan represents a living roadmap that will evolve as the DAF continues to provide installations with the guidance and tools necessary to progress along a pathway toward greater resilience. For example, as the Enterprise gains a better understanding of its resilience posture, one of its first steps will be to refine requirements. These and other refinements, whether they be related to weapons systems, ground support equipment, vehicles, contingency operations, or other aspects of mission, will be captured in future iterations of this Plan and expressed throughout DAF efforts. With this innovative path forward to build end-to-end energy resilience into its missions, the DAF will be well-positioned to fly, fight, and win in air, space, and cyberspace, even as the world around it becomes increasingly connected to and dependent on enabling systems.

By identifying enabling system vulnerabilities, improving resilience planning, and ensuring resilience results, the DAF will continue to fly, fight, and win against evolving threats in air, space, and cyberspace.

# Appendix 1 : References

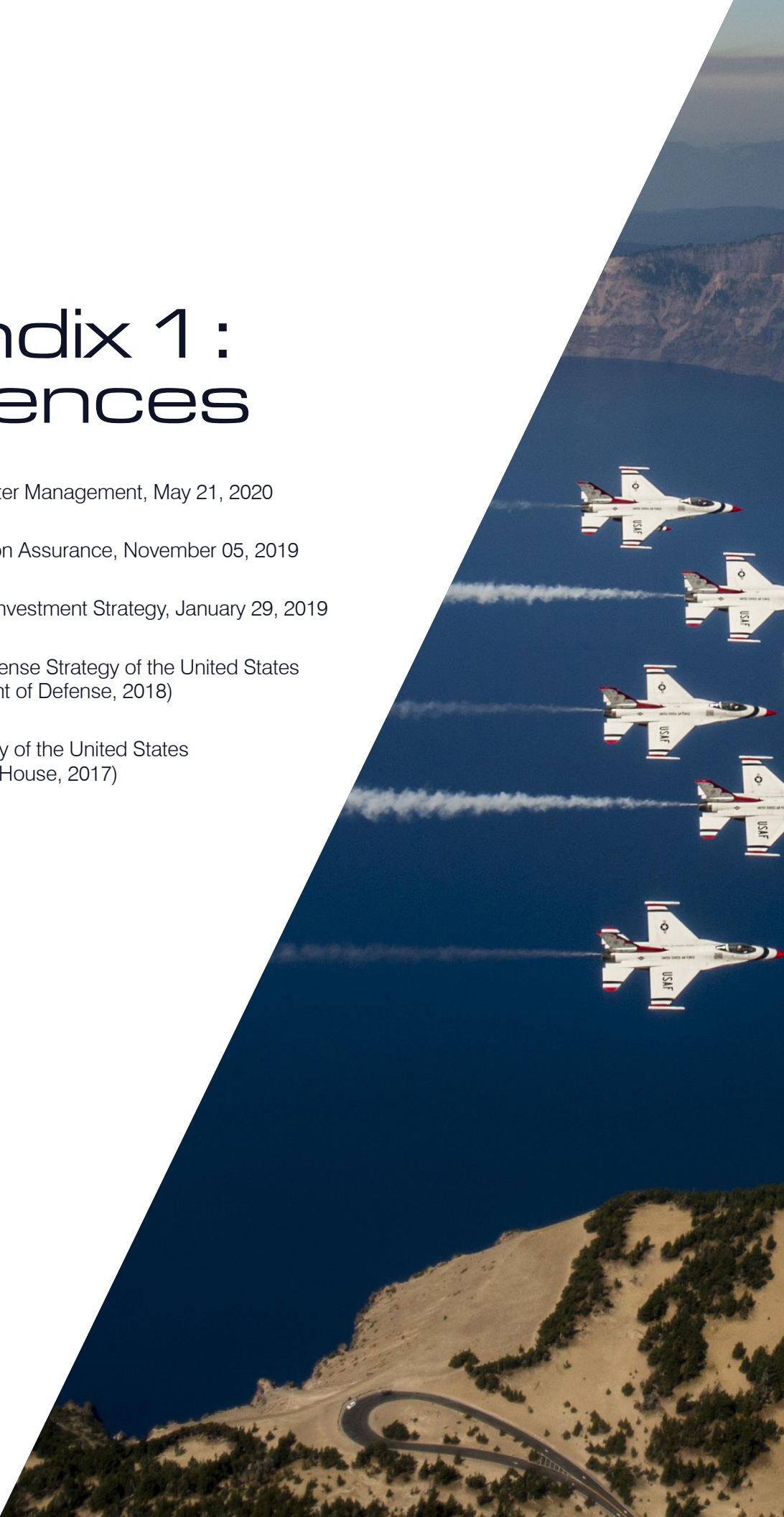
AFPD 90-17, Energy and Water Management, May 21, 2020

AFPD 10-24, Air Force Mission Assurance, November 05, 2019

U.S. Air Force Infrastructure Investment Strategy, January 29, 2019

Summary of the National Defense Strategy of the United States (Washington, DC: Department of Defense, 2018)

The National Security Strategy of the United States (Washington, DC: The White House, 2017)





# Appendix 2: Definitions

## Critical Infrastructure

Cyber and physical systems and assets so vital that the incapacity or destruction of such systems and assets would have a debilitating impact on DAF’s ability to execute its missions. (42 USC § 5195(c)(e))

## Energy

Any usable power, including, but not limited to, electricity and power produced from coal, petroleum products, steam, natural gas, propane, military operational fuels and propellants, alternative fuels, and alternative and renewable energy sources, such as solar, wind, geothermal, and nuclear. (AFPD 90-17)

## Energy Resilience

The ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from energy disruption. (10 USC § 101(e)(6))

## Facility

A real property entity consisting of one or more of the following: a building, a structure, a utility system, pavement, and underlying land. (AFPD 32-10)

## Facility Energy

Energy consumed in any building, structure, or other property (including any applicable fixtures) owned or operated by, or constructed or manufactured and leased to, the federal government where the majority of energy use is devoted to the heating, cooling, lighting, ventilation, or to service the water heating energy load requirements of the facility. (AFPD 90-17)

## Installation Energy

The energy used to power all facilities located on military installations and enduring locations, as well as fuel for the non-tactical fleet vehicles used at those locations and the energy consumed in manufacturing, maintenance, and other processes. (AFPD 90-17)

## Military Installations

A base, camp, post, station, yard, center, or other activity under the jurisdiction of the Secretary of a military department or, in the case of an activity in a foreign country, under the operational control of the Secretary of a military department or the Secretary of Defense, without regard to the duration of operational control. (10 USC § 2801(c)(4))

## 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 in any operating environment or condition. (AFPD 10-24)

## Project

A planned undertaking having a finite beginning and ending, generally involving definition, development, and production, to create, improve, or refurbish a facility, weapon platform, or other combat support tools or systems. A project may be the whole or a part of a program. (Defense Acquisition University Glossary)

## Water Resilience

The reliable ability to access an adequate quantity and quality of water to meet mission requirements, while also mitigating water-related risks to mission success. (AFPD 90-17)

## Water Resources Management

The process of developing, executing, and overseeing plans, programs, and initiatives to achieve water resources goals and objectives across all functional areas. (AFPD 90-17)

# Appendix 3: Acronyms

AFCAMP	Air Force Comprehensive Asset Management Plan
AFCEC	Air Force Civil Engineer Center
AFPD	Air Force Policy Directive
CJA	Crown Jewels Analysis
DAF	Department of the Air Force
DoD	Department of Defense
ERCIP	Energy Resilience and Conservation Investment Program
ERRE	Energy Resilience Readiness Exercise
ESPC	Energy Savings Performance Contract
FEB	Facility Energy Board
FEG	Facility Energy Group
FEP	Facility Energy Panel
FY	Fiscal Year
IDPs	Installation Development Plans
IEPs	Installation Energy Plans
MTA	Mission Threat Analysis
OASD	Office of the Assistant Secretary of Defense
OSD	Office of the Secretary of Defense
PPA	Power Purchase Agreement
SAF/IE	Assistant Secretary of the Air Force for Installations, Environment, and Energy
SAF/IEE	Deputy Assistant Secretary for Environment, Safety, and Infrastructure
SCS	Severe Contingency Solver
UP	Utilities Privatization
USC	United States Code
WNAT	Water Needs Assessment Tool



