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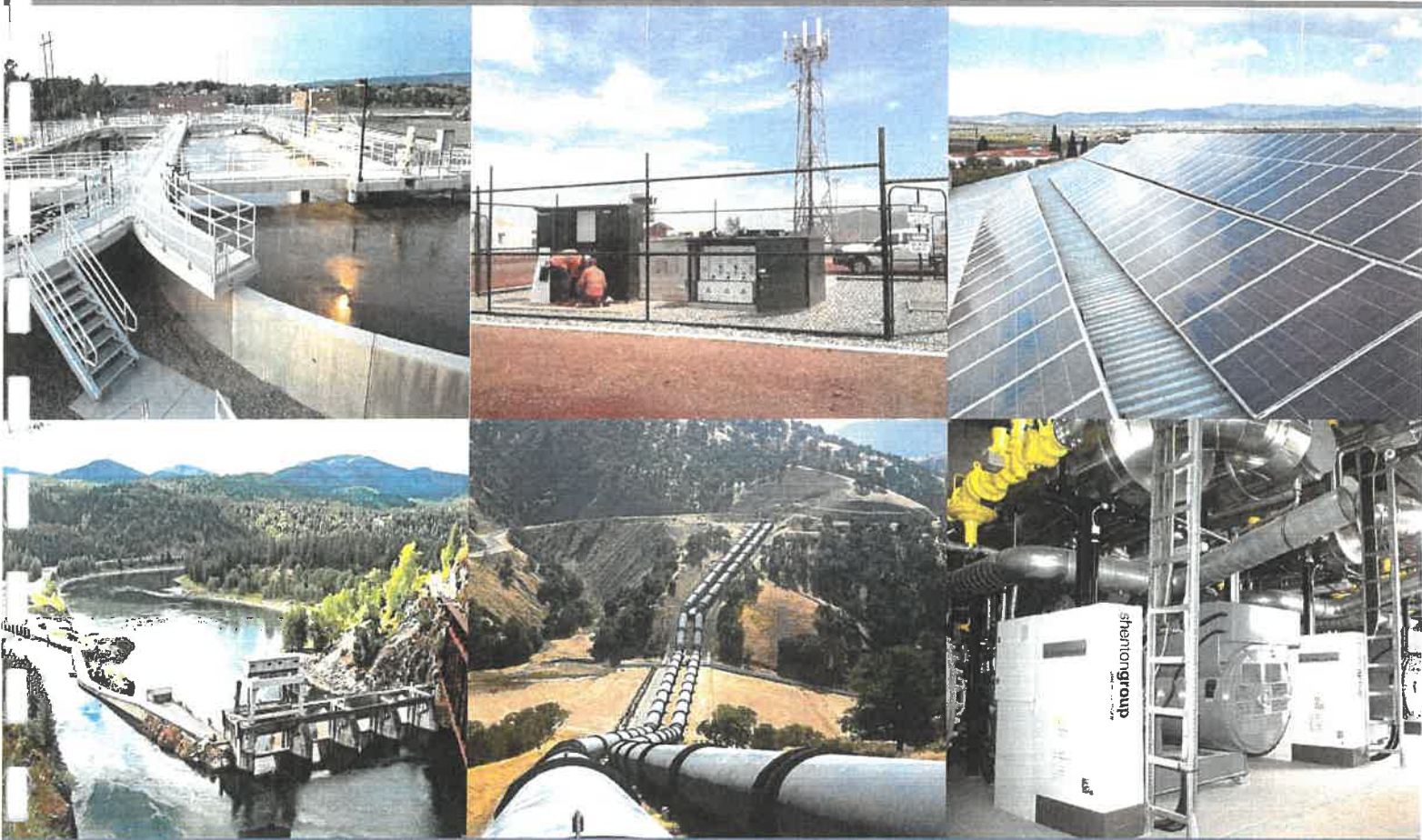
State of West Virginia  
Purchasing Division on behalf of  
West Virginia Army National Guard,  
Construction and Facilities Management Offi

WV PURCHASING  
DIVISION



## Statement of Qualifications

### Installation Energy and Water Plan West Virginia Army National Guard (WVARNG)



CEOI: ADJ210000004  
August 20, 2020



## TETRA TECH

**Submitted by:**

**Tetra Tech, Inc.**  
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**Submitted to:**

Purchasing Division, Department of Administration  
State of West Virginia  
2019 Washington St E  
Charleston, WV 25305

Tara Lyle, Buyer

**tetrattech.com**

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**EXPRESSION OF INTEREST**

August 20, 2020

Tara Lyle, Buyer  
Purchasing Division  
State of West Virginia  
2019 Washington St E  
Charleston, WV 25305

**Subject: Statement of Qualifications for CEOI: ADJ2100000004 Installation Energy and Water Plans for West Virginia Army National Guard**

Dear Ms. Lyle:

Tetra Tech Inc. is pleased to submit this expression of interest and statement of qualifications in response to your request CEOI: ADJ2100000004. Tetra Tech is excited about the opportunity to provide high-quality Installation Energy and Water Plan (IEWP) architect-engineering (A/E) services for the West Virginia Army National Guard (WVARNG) installations.

Tetra Tech's innovative, sustainable solutions help our clients address their water, environment, infrastructure, resource management, energy, and international development challenges. We are proud to be home to leading technical experts in every sector and to use that expertise throughout the project life cycle. Our commitment to safety is ingrained in our culture and at the forefront of every project. We combine the resources of a global, multibillion-dollar company with local, client-focused delivery.

Our team has an unparalleled track record of providing top-level technical services and site-specific solutions to consistently deliver improved facility performance and energy and water resilience for our military clients. We focus on and excel in developing technically sound, economically attractive, and actionable results for our clients.

The WVARNG's vital roles in both the state and federal missions require uninterrupted, or near uninterrupted, mission capabilities. To maintain positive control over the mission capabilities the WVARNG needs to ensure they have the required utility services and capacities at all times to prevent negative mission impacts. An IEWP goes far beyond typical A/E, master planning, or energy audit work – it evaluates the critical state and federal missions, including direct, command and control, communications, and logistics support – and requires the selected contractor to have knowledge of the both the military mission and how to conduct an IEWP. Our project team has National Guard command experience in order to ask the right questions and guide the discussions to ensure an accurate resilience assessment is achieved and an effective plan is created. We have completed or have in process nine IEWPs for the ARNG and Army.

Our team of engineers is led by a project management team with **senior ARNG and ANG leadership experience and mission knowledge**. Our team will ask the right questions to get important information in order to create a plan that most effectively and expeditiously meets the WVARNG's mission requirements and guides energy and water use and resources.

Accomplishing an IEWP is different than either energy auditing or master planning. The IEWP requires the contractor to have a team skilled in conducting energy audits, evaluating audits accomplished by others, master planning, AND evaluating commercial infrastructure mission critical energy requirements and potential risks to the missions. Resilience has become the major driver in energy considerations for

the military, which goes outside the box of an energy audit and efficiency to look at energy and the mission from an effectiveness standpoint. For a contractor to be truly qualified to accomplish this contract, they must have experience and capabilities in all of the above areas. Tetra Tech has this experience through the numerous IEWPs we have accomplished at Army and ARNG installations and microgrid designs for military missions, building on our 20 years of energy efficiency, conservation, and management experience for federal facilities. This IEWP is a complex task and one that requires a team with Tetra Tech's unique capabilities and experience.

Tetra Tech is a licensed professional engineering firm in West Virginia, COA Number: C01322.

I hope that after review of our qualifications, you will agree that Tetra Tech offers the best overall expertise to WVARNG in meeting your energy resiliency planning and auditing needs at Camp Dawson and the other armories and Readiness Centers throughout West Virginia that support your critical state and federal missions. If you have any questions regarding our capabilities or similar work on other contracts, please contact me. We look forward to expanding on our capabilities as part of a shortlist interview.

Sincerely,



Jim Perkins  
Program Manager, Energy Services  
1230 Columbia Street, Ste. 1000  
San Diego, CA 92101  
P: 619.321.6752, Email: [Jim.Perkins@tetrattech.com](mailto:Jim.Perkins@tetrattech.com)



Purchasing Division  
 2019 Washington Street East  
 Post Office Box 50130  
 Charleston, WV 25305-0130

State of West Virginia  
 Centralized Expression of Interest  
 02 — Architect/Engr

Proc Folder: 762738

Doc Description: Installation Energy and Water Plans

Proc Type: Central Purchase Order

Date Issued	Solicitation Closes	Solicitation No	Version
2020-07-31	2020-08-20 13:30:00	CEOI 0603 ADJ2100000004	1

**BID RECEIVING LOCATION**

BID CLERK  
 DEPARTMENT OF ADMINISTRATION  
 PURCHASING DIVISION  
 2019 WASHINGTON ST E  
 CHARLESTON WV 25305  
 US

**VENDOR**

Vendor Name, Address and Telephone Number:  
 Tetra Tech, Inc.  
 Energy Services Program Management Office  
 1230 Columbia Street, Suite 1000  
 San Diego, CA 92101  
 Contact: Jim Perkins, Program Manager, Energy Services  
 619-321-6752

**FOR INFORMATION CONTACT THE BUYER**

Tara Lyle  
 (304) 558-2544  
 tara.l.lyle@wv.gov

Signature X

FEIN # 95-4148514

DATE 8/19/2020

All offers subject to all terms and conditions contained in this solicitation

**ADDITIONAL INFORMATION:**

The West Virginia Purchasing Division, for the agency, the West Virginia Army National Guard, Construction and Facilities Management Office, is soliciting Expressions of Interest from qualified firms to provide professional consulting services to develop two (2) Installation Energy and Water Plans, for the West Virginia Army National Guard, per the attached documentation.

INVOICE TO		SHIP TO	
DIVISION ENGINEERING & FACILITIES ADJUTANT GENERALS OFFICE 1707 COONSKIN DR		DIVISION ENGINEERING & FACILITIES ADJUTANT GENERALS OFFICE 1707 COONSKIN DR	
CHARLESTON	WV25311	CHARLESTON	WV 25311
US		US	

Line	Comm Ln Desc	Qty	Unit Issue
1	Installation Energy and Water Plans		

Comm Code	Manufacturer	Specification	Model #
81101508			

**Extended Description :**

Provide professional engineering consulting services per the attached documentation.

ADJ2100000004	<b>Document Phase</b> Final	<b>Document Description</b> Installation Energy and Water Plans	<b>Page 3</b> <b>of 3</b>
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**ADDITIONAL TERMS AND CONDITIONS**

See attached document(s) for additional Terms and Conditions



## STATEMENT OF QUALIFICATIONS

### 1. QUALIFICATIONS AND EXPERIENCE

Tetra Tech's direct experience with ARNG IEWPs will allow us to effectively and efficiently apply lessons learned to execute and adapt the process for WVARNG. Tetra Tech has recently completed multiple IEWPs for the Michigan ARNG. We have also completed IEWPs for active duty Army at Presidio of Monterey, with additional IEWPs in progress for those clients and another two IEWPs for the Idaho ARNG. Additionally, we conducted ASHRAE Level II energy and water audits for 2.5 million square feet of Michigan ARNG facilities and EISA audits for 1.5 million square feet of Mississippi ARNG facilities.

Founded in 1966, Tetra Tech has grown into a global leader in providing engineering and technical services. Tetra Tech has become an industry leader in energy management through our energy resilience, energy and water auditing, retro-commissioning (RCx), sustainability, and climate change services over the past 20 years. We have built and trained specialized teams to address the military's need to assess and improve energy and water resilience for mission assurance. Our energy resilience, energy auditing, and energy management clients have most recently included:

- ✓ Michigan Dept of Military and Veterans Affairs/Michigan Army National Guard (MIARNG)
- ✓ Idaho Military Department/Idaho Army National Guard (IDARNG)
- ✓ Mississippi Army National Guard (MSARNG)
- ✓ U.S Army Garrison Presidio of Monterey
- ✓ U.S. Army Installation Management Command (IMCOM) and its installations
- ✓ U.S. Coast Guard
- ✓ Air National Guard
- ✓ Naval Facilities Engineering Command (NAVFAC) Southwest
- ✓ Marine Corps Installations West and its installations
- ✓ Osan Air Base and other Pacific Air Forces (PACAF) bases in Korea and Japan
- ✓ March Air Reserve Base


Our preparations to execute IEWPs and our background in energy and water resilience design services, combined with our team's energy auditing and master planning background, enables Tetra Tech to accomplish all tasks from a holistic perspective and to identify actionable projects that address specific resilience shortfalls at your installations. Our team knows that the outcome of these IEWPs and energy audits needs to be an actionable list of fundable projects that are properly scoped and prioritized, in addition to identifying funding mechanisms for the WVARNG. *LTC Kuhns of the Michigan ARNG CFMO office recently relayed to us that they found our IEWPs very helpful and they are already working to implement some of the findings.*


Tetra Tech's unique qualifications make us best prepared to complete the IEWPs and energy audits, as needed, and exceed expectations with the final products. Tetra Tech offers the following benefits to the WVARNG:





#### **Direct experience completing IEWPs for ARNG facilities and assessing ARNG facilities.**

Our team has **already been contracted to accomplish nine IEWPs for the Army and Army National Guard (ARNG)**. The past IEWP experience has enabled our team to optimize our plan for accomplishing the DoD Guidance for IEWPs dated 26 July 2018 and Army Regulation 420-1 regarding the requirement for each installation to have an IEWP, and to adjust our processes to be **more efficient and effective** in meeting the clients' needs. We have also assessed more than 18 million SF of ARNG facilities for multiple states, implementing the BUILDER sustainment management system, where we assess building systems and facility condition.

 **Proven background** accomplishing **energy and water audits** with meaningful results. We provide realistically priced capital improvement projects, in addition to non-capital operational changes and training that can drive energy efficiency. Our established flexible audit process establishes baselines for the installation and associated facilities to generate solutions to save energy, water, and dollars.

 **Thermal resilience evaluation.** As part of the IEWP development, Tetra Tech evaluates the thermal resilience of an installation's mission critical loads and offers solutions to provide for heat should an installation lose its natural gas supply. Losing natural gas supply is not as common as losing electrical power, but it does happen. And when it happens, it happens during the heating season when it's needed the most. These situations leave installations with power to operate, but buildings unable to be heated to an inhabitable temperature, which will impact the mission.

 **Experience applying Army IEWP mission and risk evaluation criteria for IEWPs.** The Army has very specific criteria for contractors to use to evaluate mission risks and evaluating courses of action to derive a relatively objective list of priority projects during IEWPs. Tetra Tech has experience using these criteria and applying the appropriate factors to develop a prioritized list of projects to achieve mission assurance.

 **Unbiased evaluation of renewable energy and battery storage.** Tetra Tech evaluates the time-of-use energy consumption and the current rate structure to **determine the proper amount of photovoltaic (PV) energy and battery storage** for your installations. Tetra Tech has no vested interest in selling any product, so our evaluation is technology agnostic and unbiased – the only intent is to determine if, and how much, renewable energy and energy storage makes sense on an installation. **Alternative fuel sources to provide energy resilience** also include using natural gas to provide power on the installation using **combined heat and power (CHP)** units such as microturbines. Our team evaluates the mission critical loads to determine if CHP is a possible source for electrical and thermal resilience.

## We Bring Solutions

Tetra Tech has provided direct IEWP support, energy audits, and related energy resilience evaluation, planning, and design support for multiple clients.

Tetra Tech is uniquely qualified because we have **completed or initiated nine IEWPs** and multiple **energy resilience studies or microgrid analyses** for ARNG, Army, and Air National Guard (ANG) installations; **extensive experience conducting energy audits** for over 60 million square feet of military facilities; and experience planning and prioritizing mission requirements.

Tetra Tech knows that not all projects fit into a one size fits all box. Combined heat and power systems are one type of project that won't work everywhere, but in states like West Virginia where the temperature is cooler for portions of the year, combined heat and power (CHP) systems can make sense if the application is done with an eye to electric usage and costs and thermal heat loads. Tetra Tech has shown that these systems can have promise in military applications, such as March Air Reserve Base in California, where we're working with the base to provide a project that not only lowers energy costs, but also increases resilience. CHP systems can also be integrated as part of a microgrid project that provides even more resilience opportunities.

The following table outlines our solutions to the unique challenges of each recent IEWPs or energy resilience studies.

Agency	Site	Location	Unique Site Challenge(s)	Unique Site Solution(s)
<b>IEWPs</b>				
<b>Army</b>	SATCOM	San Miguel, CA	Site included a variety of obstacles including its remote location, high security level, lack of gas supply, restrictive utility regulations, wildfire threats, and lack of ground space for local PV.	Developed proprietary methods for quantifying resilience to help clients prioritize resilience actions. Proposed moving power lines underground to reduce exposure to potential wildfire. Army fought and won zero export conditions imposed by the utility on the military.
<b>MIARNG</b>	Camp Grayling	Grayling, MI	Massive training center with a variety of auxiliary sites, including airfield, training sites, and ranges, and a multitude of existing generation assets that required careful consideration to integrate. No backup for natural gas supply.	Developed water-use-optimization procedures to maximize resilience of existing water storage assets while minimizing the need for additional storage assets. Proposed propane-air solution to mitigate natural gas supply interruption.
<b>MIARNG</b>	Fort Custer	Augusta, MI	Project required evaluation of- and integration with- existing PV, battery storage, generators, and microgrid controls that lacked black start capabilities.	Helped initiate coordination between two adjacent water utilities to connect their systems and improve the water resilience of ARNG facilities and the surrounding community.
<b>MIARNG</b>	Joint Forces Reserve Center	Lansing, MI	Site has no existing on-site gas or water storage capacity and no ability to utilize ground-mount or carport-mount PV.	Identified gaps in existing asset security and operations procedures to improve resilience at no cost.
<b>MIARNG</b>	Michigan Minus	MI	Statewide assessment that requires producing regional solutions.	Identified options for regional water supply networks.
<b>Army</b>	Presidio of Monterey	Monterey, CA	Site has multiple sections of campus with separate electric grids and water distribution networks.	Dedicated microgrids for each network with additional shared portable generation and fueling assets.
<b>Army</b>	Ord Military Community	Seaside, CA	Site mission is mostly residential community support.	Worked with client to determine which facilities are critical to prolonged residential community support during extended utility outages.
<b>IDARNG</b>	Gowen Field	Boise, ID	Site layout necessitates coordination with other DoD, government, and civilian entities present on site.	In progress
<b>IDARNG</b>	Orchard Training Reserve Center	Boise, ID	Geographical location of site presents unique threats, such as dam break floods, to energy and water infrastructure and assets.	In progress
<b>Energy Resilience Studies / Microgrid Analysis Projects</b>				
<b>VTANG</b>	Burlington ANG Fire Station Building	Burlington, VT	Project required integration of resilient PV and battery microgrid into base system with existing, non-resilient array that exports all power due to favorable export tariff in this region.	Battery sized to maximize resilience, covering entire winter-time evening load.
<b>CAANG</b>	Fresno ANG Base	Fresno, CA	Base had power quality issues, frequent outages, and many inoperable existing generators.	Identified power quality issues and identified solutions to help repair existing infrastructure while using new microgrid infrastructure to improve power reliability.

Agency	Site	Location	Unique Site Challenge(s)	Unique Site Solution(s)
<b>CAANG</b>	Channel Islands Air National Guard Station	Port Hueneme, CA	Major electrical infrastructure upgrades were required in order to form a functioning microgrid. Base suffered from frequent power outages, disrupting operations.	Worked with client and utility to determine most cost-effective path to upgrade electrical infrastructure to be microgrid-ready.
<b>ORANG</b>	Kingsley Field	Klamath Falls, OR	No interval data was available for the analysis. Backup heating solution is required.	Create daily load profiles for an entire year by adjusting data obtained from DDC for one 24-hour period. A small CHP system was designed into the microgrid.
<b>Army</b>	Presidio of Monterey Bldgs 422, 618, 648, and 848	Monterey, CA	Project required planning for shifting peak period and major tariff changes. Site shifted to CCA for electricity commodity. The area electric provider has a complex rate structure that is in the process of changing, making the project more difficult to analyze.	Calculate PV savings based on best available future rate information and not on current rates that will not be in effect much longer.
<b>USCG</b>	CG Miami Bldg C-3I	Miami, FL	Unique PV optimization requirements due to Florida's cloudy summer weather.	Tetra Tech had to optimize energy storage sizing for both seasonal PV overproduction levels and peak load shifting.
<b>USCG</b>	Charleston Building 681	Charleston, SC	Site requested analysis to be done both with and without energy storage.	Worked with Coast Guard to show that solutions with energy storage reduced the simple payback time by up to 2 years. The Coast Guard is now moving toward a goal that all new PV systems should be resilient and should include energy storage.
<b>USCG</b>	Aviation Training Center Mobile	Mobile, AL	Required careful coordination with Coast Guard and local utility provider to access utility interval data.	In progress
<b>AFRC</b>	March ARB	Riverside, CA	Project required coordination of shared generation assets between host base and tenants. Utility has strict regulations and limits on customer generation.	Consider adding multiple billing meters on base instead of one master meter. This will allow several behind-the-meter projects to be developed so that the base is not restricted to 1 MW of self-generation due to only having one meter.

## Recent and Relevant Experience

We have provided highlights of our most recent and relevant experience, demonstrating our previous success with this scope of work. For these projects, Tetra Tech exceeded client expectations, providing added value on a consistent basis. Highlights of the following projects are provided:

- ✓ Four IEWPs and ASHRAE Level II Energy Audits for Michigan Army National Guard, Michigan
- ✓ Three IEWPs for Presidio of Monterey, California
- ✓ Two IEWPs for Idaho Army National Guard, Idaho
- ✓ EISA Energy Audits for Mississippi Army National Guard, Mississippi
- ✓ Energy Resilience Assessment at Fresno Air National Guard Base, California
- ✓ Energy Resilience Study, Channel Islands Air National Guard Base, California
- ✓ Energy Resilience Design, Kingsley Field Air National Guard Base, Oregon

## Installation Energy and Water Plans and Energy Audits for the MIARNG

### IEWPs

Tetra Tech accomplished three IEWPs for the MIARNG – one at each Camp Grayling, Fort Custer, and the Joint Forces Reserve Center – and is currently working on Michigan minus. These IEWPs have met or exceeded the requirements of the DoD Guidance and Army Regulation 420-1. Tetra Tech met with the CFMO office and the mission owners to determine the mission critical functions and talk about the risks, threats, and opportunities with the stakeholders. Tetra Tech led a thorough discussion of the mission critical loads as well as the essential supporting facilities and loads that would be required to keep the critical missions fully operational.

Site visits were conducted, data were collected, and the **energy, thermal, water, and wastewater resilience baselines were established** after these site visits. The energy consumption history was consolidated and put into an excel spreadsheet for this client – a Microsoft Access database is another way of transmitting the data. During the site visits, Tetra Tech met with and discussed issues with the commercial power and natural gas distribution systems as well as the water and wastewater companies, as appropriate for each installation. The resilience of many military installations is only partially controlled within the confines of the post, so the agencies outside the post that play a role must be interviewed and their resilience evaluated to assess the vulnerabilities to the military installation. The resilience of the energy and water supplies and the commercial infrastructure were assessed from the source to the fence line of the installations. Additionally, the infrastructure on the installation was assessed for age, condition, and risks of physical damage. Tetra Tech reviewed the recent energy audits to account for demand and consumption reductions that could reduce the size and quantity of assets required to meet the 14-day planning factor. We **evaluated 3 years' worth of energy data** and discussed facility usage during that time to determine the most appropriate benchmark to use as steady state requirements. We then discussed the mission requirements with the mission owners to assess an **appropriate planning factor for the facilities under emergency operating conditions** – the 14-day demand and consumption that would support the mission in all reasonable situations. This is an important distinction in that **steady state requirements don't equate to emergency demand requirements**. Tetra Tech also **incorporated the Real Property Development Plans** for each of the installations, making rough estimates of the future facility loads where data were not available. Fort Custer had many assets already in place that could be used to create an operational microgrid and we identified the requirements to create an operational microgrid for the cantonment that includes N+1 redundancy and black start capabilities. Camp Grayling's water and wastewater systems are all owned, operated, and contained within the confines of the installation and at the adjoining Grayling Army Airfield; the ARNG operates the entire airfield so the tower operations and airfield lighting needed to be assessed for resilience. Additionally, there is a rail head and refueling depot near the airfield that required backup power. A basic assessment was conducted of the control systems by our engineers. After the site assessment, we added a cyber security specialist to the team to further assess the cybersecurity of the systems and make recommendations. While cybersecurity is only a small portion of the IEWP, it is an important factor in today's world. It can be accomplished as part of the IEWP or as a separate assessment, but it should be done, and tying it directly to the IEWP is an important connection.

### Client/Owner:

Department of Military Veterans Affairs (DMVA)  
 State of Michigan  
 3423 N. Martin Luther King Jr., Blvd  
 Lansing, MI 48906

### Project Duration:

Sep 2017 – Present

### Status:

Ongoing

The most important aspect to the installation was the **prioritized list of projects** the Tetra Tech team created that could individually be accomplished to improve resilience of the sites over time. Each of these projects had an **associated increase in energy and water resilience** that would be achieved by implementing the projects. Since resilience is a risk-based effort, this risk and associated increase in resilience is an important factor in an IEWP. The team accomplished a **cost estimate and life cycle cost analysis (LCCA)** for each of the projects and a **possible funding stream** was identified. All of the information gathered and solutions identified were written into a report for each installation and submitted to the client for review and comment with comments incorporated into the final report.

#### IEWP Success

*LTC Kuhns, Branch Chief for Planning and Programming, MIARNG, stated that these IEWPs have been very valuable and have allowed the MIARNG to start planning and implementing resilience upgrades for their installations.*

#### ASHRAE Level II Energy Audits

Tetra Tech conducted Level II ASHRAE comprehensive energy and water audits on 2.5 million square feet of facilities for the Michigan Department of Military and Veterans Affairs (DMVA). Tetra Tech audited 60 facilities across the state of Michigan, including a wide variety of administrative and training facilities, vehicle and aircraft maintenance, aircraft hangars, water and wastewater systems, fire stations, and security police facilities. At each facility and group of facilities, our team assessed renewable energy alternatives and the feasibility of incorporating CHP systems.

Tetra Tech established a valid energy and water baseline for each facility, and calculated energy and water use intensities for all facilities to track future progress as energy and water conservation measures are implemented. Tetra Tech's auditing efforts identified \$6.1 million of viable energy and water saving projects with a savings-to-investment ratio greater than 1.0, indicating the life-cycle savings are greater than the investment cost to implement the measures. The total estimated cost savings associated with these energy conservation measures (ECMs) and water conservation measures (WCMS) was \$858,000 annually, which equates to roughly 16 percent of the DMVA's electric consumption, 12 percent of the natural gas consumption, and 3 million gallons of water consumed across the state each year. Additionally, \$300,000 worth of utility rebates were identified to help offset the capital costs of implementing the ECMs and WCMS. Projects included lighting and lighting controls; direct digital control (DDC) system upgrades; plumbing; heating, ventilation and air conditioning (HVAC); building envelope; and renewable projects. Tetra Tech also evaluated each facility to determine if CHP was a technically and economically viable option.

#### Process

To accomplish this contract, our auditors collected utility information and performed detailed analyses in advance of the site visits to establish baselines, as well as review the utility rates, rate structures, renewable opportunities, and the various incentive programs to improve the economic feasibility of potential renewable energy projects. This pre-site visit review helped our experienced auditing teams better understand where the larger opportunities might be found. Then our team called the building managers for each of these facilities and scheduled a date and time to accomplish the audits working within their availability and finding the most efficient scheduling pattern.

Each building audit began with a quick meeting with the building manager and a maintenance worker assigned to that building. This allowed us to gather information on the performance of the existing systems and incorporate maintenance costs and replacement cycles of the systems into the economics of possible projects. Our auditors were escorted at locations when required by the military but accomplished the audits independent of the client most of the time. When we were in advanced mechanical rooms, we coordinated to have a knowledgeable technician at the site to talk about the

operating procedures of those systems to discuss any operational or maintenance issues they might be experiencing. The team looked at the potential for installing photovoltaic (PV) systems on roofs, parking structures, and the surrounding land. For the half dozen locations in Michigan where PV was an economically viable alternative, Tetra Tech talked to the utility companies about third-party financing to install PV at those sites. We identified several alternative financing mechanisms and accomplished estimates of the cost and financing terms.

To meet the clients tight contractual timing, audits were accomplished through three two-person teams through multiple 2-week trips to Michigan. Having an effective plan that was well coordinated with the client and each of the facilities was critical to the successful accomplishment of these audits. One of our teams had to reschedule one audit because of a personal issue of the client's point of contact at one site. The onsite team quickly made alternative plans and completed the audits without any impact to the overall schedule or cost.

### Reporting

We then wrote the ASHRAE Level II audit reports for each of the facilities and installations. Our team tabulated the hundreds of energy and water conservation measures identified into a spreadsheet that allowed us to look at each individual facility, group the facilities by region (city in the case of this contract), type of facility, system, or by individual component. This allowed us to compare different funding mechanisms with different project scopes. We provided the client with a list of funding mechanisms to accomplish these projects. For this contract, these mechanisms included in-house funding streams, both state and federal funding sources, third-party funding from state and federal programs, as well as some utility company-funded alternatives to keep an eye on the future should the utility company situations change. The renewable projects were all provided with a sensitivity analysis of the major variables to allow the Michigan DMVA to determine, without further assessment by a consultant, when renewable projects would be economically viable with changing future rate structures.

These economically viable projects were scoped and presented to the client in the audit report and appreciated by the client. This contract was modified to have Tetra Tech accomplish an additional resilience assessment for each of the facilities and in our continued working relationship with this client, they have indicated that they are already proceeding with implementing some of the projects that we identified.

### *Installation Energy and Water Plans for the Presidio of Monterey, California.*

Tetra Tech accomplished three IEWPs for the active duty Army at the Presidio of Monterey, California – one at a geographically separated unit, a classified site, and one of the Army's most important CONUS-based installations, and two for the Presidio of Monterey/Ord Military Community (POM/OMC). These three IEWPs were accomplished consecutively with the first site being accomplished concurrently with the MIARNG IEWPs. The data were collected and the energy, thermal, water and wastewater resilience baselines were established after these site visits. The missions of these installations are vastly different and required a different approach.

#### Client/Owner:

Presidio of Monterey  
 289 Ft Mervine Place, Bldg 235  
 Presidio of Monterey, CA 93944

#### Project Duration:

Sep 2017 – Present

#### Status:

Ongoing

The first installation is a **self-contained site** in California where Tetra Tech evaluated the existing power demand as well as the future mission demand and compared that against the existing on-site generation capacity. Much of the site has uninterruptible power supplies (UPS) so **black starting is not a factor** that needed to be considered. Tetra Tech determined from the classification of the mission that **2N redundancy** was required and proposed that to the client. Tetra Tech **proposed several resilience alternatives** to reduce the risks of a commercial power outage or disruption and proposed two additional

alternatives, including additional diesel generators, potential natural gas generators with a natural gas line to the site, and generator controls upgrades, to increase the on-site power production and install on-site renewable energy production to improve the resilience of the site. This site also has **full control of the water and wastewater systems consumed and generate onsite**, and Tetra Tech addressed the current and future mission requirements. Tetra Tech evaluated the water and wastewater systems and supplies to determine the risk to the mission and provided several alternatives to improve the water and wastewater resilience. Several water and wastewater infrastructure projects were identified as well as a **no-cost procedural change that would improve the water resilience**. An emergency water connection outside the perimeter of the secure area was also proposed to increase water resilience. This installation's mission is classified so Tetra Tech was briefed on what loads were critical and we estimated loads where necessary to accomplish the IEWP without knowing the mission details. The report was written not talking about the mission itself but at a level of detail that will allow those who know the mission to be able to make decisions based on the report. The draft report was submitted, comments received and incorporated, and the final report has been delivered to the client.

The POM/OMC IEWPs are currently 50 percent complete. Each site has its own distinct challenges to obtaining resilience. The **POM has mission critical facilities dispersed throughout the installation** and the mission itself is unique. Here, however, Tetra Tech was able to draw from the installation's **facility priority listing and load shedding plans** to gain insight into the loads. Tetra Tech did note that some of the load shedding may be too aggressive and questioned the reality of those assumptions with the client based on our team's experience. Those discussions are being assessed by installation leadership prior to setting a direction forward. OMC is more challenging in that the **facilities are amongst the community** so providing resilience to those facilities distributed on the commercial infrastructure takes on a different look and creates non-technical issues that will be addressed in the report as well.

#### ***Installation Energy and Water Plans for Idaho Army National Guard.***

Tetra Tech is currently developing two IEWPs for the IDARNG at Gowen Field and Orchard Combat Training Center. Tetra Tech has collected data through the Initial Data Request, helping the client to overcome obstacles the delayed delivery of the data to Tetra Tech. We are set to conduct site visits and stakeholder meetings once COVID-19 restrictions allow. Tetra Tech is following the four steps of an IEWP to identify and review requirements, assess risk and conservation opportunities, generate solutions, and develop an implementation plan. The site layout necessitates coordination with other Department of Defense, government, and civilian entities present on site. And the geographical location of site presents unique threats, such as dam break floods, to energy and water infrastructure and assets.

##### **Client/Owner:**

Idaho Military Department  
4040 West Guard Street  
Boise, ID 83705

##### **Project Duration:**

Oct 2019 – present

##### **Status:**

Ongoing

#### ***Energy Audits for Mississippi Army National Guard.***

Tetra Tech was hired by the MSARNG to conduct energy and water audits of their facilities to meet requirements of the Energy Independence and Security Act of 2007 (EISA). Tetra Tech recently completed field assessments at 44 sites comprised of 160 buildings and over 1.5 million square feet over the span of 3 weeks. Tetra Tech seized the opportunity to support the MSARNG through combining BUILDER efforts and energy auditing requirements in one contract. Tetra Tech deployed integrated teams to accomplish site visits for both the energy audits and facility inventory and condition assessments needed to support implementation of the BUILDER Sustainment Management System (SMS). The energy auditors conducted the field audits and collected energy data to allow them to establish baseline and build a

##### **Client/Owner:**

Mississippi Military Department  
431 Military Building 303  
Jackson, MS 39208

##### **Project Duration:**

March 2020 – present

##### **Status:**

Ongoing



picture of potential opportunities. The auditors' will use the component and system data they collected, along with that of the BUILDER data collection team, to assess component and system upgrade opportunities and life cycle cost analysis. This will provide for a more cost-effective analysis of energy and water conservation measures. Tetra Tech will produce a written report of findings similar to past audits which are focused on listing projects that the client can actually implement and realize savings from. Preliminary energy conservation measures identified for further analysis include LED lighting retrofits in areas with high hours of occupancy, adding occupancy sensors to replace manual light switches in corridors and spaces with variable occupancy, adding simple direct digital control enhancements to the many HVAC systems that are currently not under centralized control, retrocommissioning buildings constructed within the last 15 years that have DDC systems, and replacing existing constant speed natural gas fired furnaces equipped with direct expansion cooling coils with variable speed furnaces to conserve fan energy in the cooling dominated climate

### ***Energy Resilience Study, Fresno ANGB, CA.***

Tetra Tech was contracted by the Air National Guard Civil Engineer Technical Services Center to investigate the energy resilience needs of the Fresno Air National Guard Base (ANGB) and to augment the Installation Development Plan (IDP) to ensure future potential energy resilience requirements of the base are properly accounted for and that space is identified for these assets in the IDP that is currently in development. Tetra Tech accomplished an assessment of the energy resilience, including the on-base and off-base electrical and natural gas supplies and infrastructure. Tetra Tech evaluated **the risks to the**

**Client/Owner:**

Fresno ANGB, 144 Fighter Wing  
5323 E. McKinley Ave.  
Fresno, CA 93727

**Project Duration:**

April 2017 – Sept 2017

**Status:**

Completed

**base's commercial electrical and natural gas feeds and evaluated the existing on-site generation and storage assets** to provide power to the mission critical loads of the installation. These assets included numerous building-by-building generators and 670 kilowatts of photovoltaic power. Tetra Tech **interviewed the senior leadership and mission owners** on the installation to determine the mission requirements, mission critical facilities and loads, and **established the baseline energy resilience** for the installation. The team then proposed several alternatives for improving the infrastructure to reduce vulnerabilities, which increase resilience, and conceptualized an on-site generation project consisting of interconnected diesel generators, a CHP source, and a control system to create a microgrid that incorporates the existing photovoltaic arrays with new battery-ready inverters. This microgrid will have sufficient power and power distribution for the **mission critical loads to keep the federal and state missions operational.**

### ***Energy Resilience Study, Channel Islands ANGB, CA.***

Tetra Tech conducted a study to assess the opportunities and costs to achieve energy resilience at Channel Islands ANGB and evaluate how the installation should move forward in implementing energy resilience at the base and to what level. This project looked at the **state and federal missions** and then **identified the mission critical loads for these different missions** from day 1 to day 30 requirements. It was important to note that the mission critical functions on day 1 were not the same as on day 14 or day 30. This evolution of the mission over time led Tetra Tech to identify that about 75 percent of the installation could be deemed mission critical at one point or another depending on the mission. We then developed a microgrid project that could be funded in phases to achieve mission resilience. Tetra Tech developed a DD1391 that was **submitted for Energy Resilience and Conservation Investment Program (ERCIP) funding.** The project has been **funded in the fiscal year (FY) 20 ERCIP program.**

**Client/Owner:**

Channel Islands ANGB, 146 Air Wing  
113 Mulcahey Drive  
Port Hueneme, CA 93041

**Project Duration:**

May 2017 – Nov 2017

**Status:**

Completed

### **Energy Resilience Design, Kingsley Field ANGB, Oregon.**

Tetra Tech is **lead design agent** on an energy resilience project that will provide the **command and control node for the state in the event of a major catastrophe**. Tetra Tech helped Kingsley Field ANGB develop the scope of the project through conceptual design (A) services. This **microgrid will provide backup power, heat, water, and wastewater to one section of the base for the emergency responders**. The assets in the microgrid include diesel generators, a CHP unit, propane-air for backup heating, photovoltaic arrays, and battery energy storage system all controlled by a microgrid controller. The client is currently assessing direction of the projects.

**Client/Owner:**

173 Fighter Wing  
 221 Wagner Street, Suite 16  
 Klamath Falls, OR 97603

**Project Duration:**

Sep 2017 – Present

**Status:**

Ongoing

### **Army and National Guard Experience**

Tetra Tech has supported Army, ARNG, and ANG energy programs since 2008. Specifically, we have supported energy programs for Oregon Army National Guard (ORARNG) statewide, and Army Garrisons Fort (Ft.) Bragg, Ft. Knox, Ft. Carson, Ft. Benning, Ft. Hunter Liggett, Camp Parks Reserve Forces Training Area (RFTA), and 63<sup>rd</sup> Regional Support Command (RSC) Army Reserves. We have extensive experience with Army energy storage and microgrid projects going back to 2013 with involvement in DoD pilot programs. For the ANG, we have supported energy programs for

*“The Air National Guard has worked with Tetra Tech, Inc. for many years (7+) and for a variety of services (REMs, retrocommissioning, energy audits, energy studies, etc.) We have always received great support from them. They continue to provide great people with the right expertise to perform whatever services we have requested from them. We will continue to use their services in the future.”*  
 Bob Bossert, PE, Chief, Technical Service Center, Air National Guard, NGB/AO4C

70 ANG installations, plus additional geographically separated units, in 36 states for more than 10 years. Support has included facility energy and water analysis, energy and water master planning, analyzing utility and water rate structures, and driving improvements in energy and water resilience. Our understanding and expertise with ANG, ARNG, Army, and other DoD energy programs is unparalleled.

### **Customer Satisfaction**

At Tetra Tech, we believe the best work comes from long-term relationships with both our clients and our team. It’s part of our company culture. The results of this commitment are evident in our 96% renewal rate on option years and re-competed projects. In the few cases where the working relationship was not renewed for additional terms, it was the result of contract limitations such as the contract switching to small business, the program no longer being funded so there was no re-compete to be won, or option years were not able to be exercised because of lack of funding. The following table shows examples of current or recent contracts where we have won multiple re-compete contracts to continue work, multiple option years have been exercised, or the client has chosen to expand our work because they were pleased with our exceptional service. In an industry to where employees tend to bounce from company to company, we also have had committed employees who have stayed with Tetra Tech long-term.

### Clients Choose to Remain with Tetra Tech

Client	Type	Options Years Exercised	Won Contract	Years	Comments
ANG	Annual renewal through BPA or direct award	9 (annual renewals)	1	2010 – present	Two dedicated energy specialists originally hired in 2010 are still with Tetra Tech
U.S. Coast Guard	Base plus option years	6	3	2011 – present	
Navy and Marine Corps	Base plus option years	12	4	1999 – 2015	Included 21 dedicated energy specialists covering 9,500 facilities. Program funding ended in 2015.
MIARNG	Base plus option years	2	1	2017 – present	Client added work through four change notices to include IEWPs and more

## Our Team and Key Personnel

Tetra Tech has become an industry leader in energy management over the past 20 years. We have built and trained specialized teams to address energy and water resilience for mission assurance, based on our strong foundation of energy management, efficiency, and conservation. Our team leaders draw on military experience to ensure mission critical requirements are addressed and gaps are bridged between the Construction and Facilities Maintenance Office (CFMO), mission stakeholders, and our engineers. Tetra Tech's Project Manager is a former Air National Guard Mission Support Group Commander and Vice Wing Commander who started his military career with the Army and ARNG. He is supported by our Deputy Project Manager, who is a civilian who worked as the Energy Manager for the Washington ARNG and at the National Guard Bureau, directly for Chief Swihart.

Our IEWP and energy auditing efforts across the country are led by a core team of professional mechanical and electrical engineers, Certified Energy Managers, Certified Energy Auditors, and other energy professionals with direct experience developing IEWPs for ARNG and other military installations.

Our proposed specialized team will lead this effort, drawing on other engineers who have been trained to accomplish IEWPs as needed. Our team is ready and available to develop IEWPs, energy audits, or other energy support services for the WVARNG.

With Tetra Tech you get:



A project management team with **senior ARNG and ANG leadership experience and mission knowledge** to ensure IEWPs are developed with Army mission requirements



A **specialized IEWP team** that has already developed or is developing **nine IEWPs for ARNG and Army** installations across the country. They understand the Army IEWP template format and know how to help clients meet DoD and Army resilience planning requirements.



A team that has most recently conducted ASHRAE Level II and EISA **energy audits for 4 million square feet of ARNG facilities.**



**Cybersecurity expert on the team.** Tetra Tech stands head and shoulders above the competition because we have a cybersecurity expert on the resilience team. As we all know, control systems are significant assets but can also be significant vulnerabilities to cyber threats. Having an expert on the team with significant background in military and civilian network security and risk assessment allows Tetra Tech to **assess the vulnerabilities of the facilities related control systems** and suggest improvements to make it more difficult for a bad actor to penetrate the systems on base and possibly make unwanted changes that could negatively impact facility operations.

Our energy resilience and auditing teams are trained to focus on the mission assurance requirements driving the needs for energy resilience, as identified by the client. Additionally, our team leaders have significant military experience that allow us to ensure all of the mission critical requirements are addressed and bridge the gap among the CFMO, mission stakeholders, and our engineers.

Tetra Tech's IEWP team consists of core IEWP, resiliency, and energy auditing team members. Tetra Tech's proposed team has the requisite background, security clearance, and certifications. The following table shows the qualifications of the core Tetra Tech IEWP/Auditing Team.

Key Personnel	Role	Secret Clearance	CEM	PE	Special Requirements								Value-Added				
					Facility energy and water analysis	Energy Audits	Energy and water master planning	Utility scale energy and water infrastructure	Energy and water utility rate structures	Energy and water resiliency	Report writing	Military master planning	ARNG IEWPs	Continuity of operations management	Risk and threat analysis	Cybersecurity	
Robert Aunan	Project Manager	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
John Havens	Deputy PM	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Jim Perkins	Program Manager	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Duan Phan	Energy Resilience				X		X	X		X	X	X	X				
Bruce Boerner	Thermal Resilience	X		X	X	X	X	X	X	X	X	X	X		X		
Geoff Wilkins	Water/ Wastewater Resilience	X	X	X	X	X	X	X	X	X	X	X		X			
Kristin Webster	Renewables	X	X		X	X	X	X	X	X	X	X		X			
Kevin Davis	Cybersecurity	X									X		X			X	
Jennifer Brainerd	Quality										X		X				

Tetra Tech has identified the following key personnel that will support this effort. Tetra Tech's committed team, with long-term, experienced employees, is a clear exception in this industry where it is common to bounce among consulting companies.

Key Personnel	Role	Certifications	Security Clearance	Years' Experience	Years with Tetra Tech
Robert Aunan	Project Manager	PE (CE)	Secret	33	10
John Havens	Deputy Project Manager	CEM	Secret	36	2
Jim Perkins	Program Manager, Energy Services	CEM, CBCP, CORS in EM, LEED AP	Secret	18	9
Duan Phan	Energy Resilience Lead	BSEE	-	12	5
Bruce Boerner	Thermal Resilience Lead	PE (ME)	Secret	30	3
Geoff Wilkins	Water/ Wastewater Resilience Lead	PE (ME), CEM	Secret	6	3
Kristin Webster	Renewables Lead	CEM	Secret	20	4
Kevin Davis	Cybersecurity	N/A	-	24	2
Jennifer Brainerd	Quality Control/ Document Manager	N/A	-	27	25



### **Project Manager**

**Role:** Direct and guide all aspects of the project, working closely with team personnel and appropriate WVARNG personnel to carry out all phases of work on time and on budget while exceeding client expectations. Lead and advise the team on resilience planning and ARNG IEWP requirements based on years of experience with the ARNG/ANG.

**Robert (Bob) Aunan, PE (Col ANG-Ret) [Secret Clearance]** – Mr. Aunan serves as the Senior Project Manager responsible for overseeing the **energy and water resilience team**, the energy auditing team, specialty reachback support for the Resource Efficiency Managers (REM), and the retro-commissioning team. Over the past 3 years, Mr. Aunan has initiated **energy resilience strategies**, **led six energy and water master plans for the Department of the Army**, represented the Air Force as the government agent **overseeing the design of a microgrid**, and has **led one energy resilience design effort** at an Air Force installation. He has proposed strategies for investigating on-site generation, to include **renewables and energy storage**, and **assessing the risks to mission degradation** to determine the appropriate level of energy resilience at installations across the nation. He utilizes his 25 years of military engineering experience (5 years in the Army and 20 years in the Air Force) to give him a mission-oriented perspective on energy and water resilience requirements for the military.



#### **Deputy Project Manager**

**Role:** Manage the day-to-day efforts of Tetra Tech's IEWP and energy audit team, as well as guide efforts based on his years of experience with the ARNG.

**John Havens Jr., CEM [Secret Clearance]** – Mr. Havens is an energy consultant, Certified Energy Manager, former LEED Green Associate, project manager and program manager providing technical and administrative support to the government sector. His background as a former HVAC technician who specialized in direct digital control systems gives him a unique perspective when performing analysis of critical building energy systems. Mr. Havens has been providing energy consulting since 1995, with over 12 years as the Energy Manager for the ARNG in Washington state and another 5 plus years as the National Guard Bureau (NGB) Energy and Water Conservation Program Manager for the 54 states and territories. Prior to becoming a Senior Project Manager, he served as the Resource Efficiency Manager for 3 years for the Army Reserve's 88th Readiness Division which is responsible for a 19-state region from Ohio to Washington state. His portfolio of facilities with the Army Reserve included over 300 individual sites and over 900 buildings comprising over 3 million square feet. He was instrumental in analyzing and identifying energy and water deficiencies and suggested improvements in all of these facilities. He identified capital improvement projects across the 19-state region that once implemented will save over \$3 million in avoided costs. Projects included multiple energy management system/direct digital control implementations, retro-commissioning, lighting upgrades, HVAC upgrades, water efficiency upgrades, and two microgrid projects. He was also instrumental in the writing of the most recent Installation Energy and Water Plan for the virtual installation that he served in and was heavily involved in the proposal of two microgrid projects for critical facilities, one of which was selected for ERCIP funding. His deep understanding of the ARNG's four distinct funding types allows him to properly identify project funding streams for potential projects and with over 18 years working with the ARNG, he also understands the dual roles and responsibilities of the ARNG.



#### **Program Manager, Energy Services**

**Role:** Provide corporate support to the project, meet with the Project Lead at least weekly, manage all contractual and financial aspects of the project, oversee Tetra Tech's 3-step quality control process, review work products, and maintain communications with WVARNG staff to ensure top performance.

**Jim Perkins, CEM, CBCP, CORS in EM, LEED AP [Secret Clearance]** – Mr. Perkins is the Program Manager overseeing all of the Energy Programs including energy resilience, audits, retrocommissioning, Resource Efficiency Manager (REM), and energy master planning supporting a wide range of clients including the Army, Army Reserves, Army National Guard, Navy, Marine Corps, Coast Guard, Air National Guard, Department of Veterans Affairs, and various state and city agencies. Mr. Perkins supports Tetra Tech's clients' efforts to improve the security of their mission critical operations by increasing energy resilience. Mr. Perkins supports the evaluation and implementation of microgrids, distributed generation assets, and various energy storage technologies. Mr. Perkins is a Certified Energy Manager and a Certified Building Commissioning Professional as well as a Certified Organizational Resilience Specialist in Emergency Management: Continuity of Governmental Operations. He has extensive experience performing and overseeing millions of square feet of energy and water assessments and identifying energy and water capital improvement projects. Mr. Perkins has also led efforts to complete Installation Energy and Water Plans for the Army and Army Reserves.



### **Energy Resilience Lead**

**Role:** Lead analysis of electrical distribution system for energy resilience. Conduct data analysis, develop solutions, collaborate with team, and document findings in IEWP.

**Duan Phan, BSEE** – Mr. Phan is an electrical engineer with 12 years' experience with mixed electrical engineering designs, commissioning, and start-up of electrical instrumentation and control for utilities, buildings, wastewater plants, and oil and gas facilities. He has supported projects for power and utility facilities, water and wastewater facilities, oil and gas facilities, and renewable energy. He has conducted studies to analyze power system dynamics, transients, and protection and is currently supporting the IEWPs for IDARNG.



### **Thermal Resilience Lead**

**Role:** Lead analysis of HVAC and controls. Conduct data analysis, develop solutions, collaborate with team, and document findings in IEWP.

**Bruce Boerner, PE [Secret Clearance]** – Mr. Boerner is a Licensed Mechanical Engineer with over 30 years of project and construction management experience. His comprehensive experience in the construction industry includes project and facility planning, construction and project management, operation and troubleshooting of HVAC, energy management and lighting control systems, and building commissioning. Prior to becoming an Energy Consultant, Mr. Boerner was a Senior Energy Efficiency Engineer at Xcel Energy, focusing on data center, commercial and industrial refrigeration, lighting, and retro-commissioning energy conservation programs. Previous experience also includes Project Manager positions at mechanical contracting companies and a Project Engineer position at an architectural engineering consulting firm. He has extensive experience working with large central steam, hot water, and chilled water systems as well as smaller decentralized systems including packaged heating and cooling systems and variable refrigerant flow systems. Throughout his career, Mr. Boerner has successfully completed complex projects for university, hospital, mission critical, and multifamily residential projects in the public and private sectors. Mr. Boerner was a key team member during the three Michigan Army National Guard IEWP projects that were completed recently.



### **Water/Wastewater Resilience Lead**

**Role:** Lead analysis of water and wastewater. Conduct data analysis, develop solutions, collaborate with team, and document findings in IEWP.

**Geoff Wilkins, PE, CEM [Secret Clearance]** – Mr. Wilkins is a Certified Energy Manager (CEM) and licensed mechanical engineer with significant experience in energy and water analysis. Through previous energy audits, infrastructure studies, energy project management, and installation and energy water planning efforts, Mr. Wilkins has gained considerable experience and expertise in analyzing energy and water use and developing creative solutions to improve resilience and operational effectiveness. He provides technical prowess and keen insight to every project he is involved with. He was also a key team member during the three Michigan Army National Guard IEWP projects that were completed recently.


**Renewables Lead**

**Role:** Lead analysis of renewable options, including combined heat and power. Conduct data analysis, develop solutions, collaborate with team, and document findings in IEWP.

**Kristin Webster, CEM, EIT [Secret Clearance]** – Ms. Webster is a Certified Energy Manager (CEM) with 19 years of experience in energy efficiency, renewable energy sector and industrial manufacturing. She has experience performing feasibility studies for alternative power generation including photovoltaic (PV), fuel cell, advanced energy storage, and combined heat and power (CHP) technologies. She has conducted energy audits, data collection, interval data analysis, and detailed analysis of energy efficiency measures. Ms. Webster has extensive experience identifying energy conservation projects, developing scopes of work, and performing lifecycle cost analysis for energy projects. Current experience includes energy resilience studies at two California Air National Guard bases and one Oregon Air National Guard base. Ms. Webster has recently participated in three IEWP studies for the Michigan Army National Guard and three IEWP studies for California Army installations.


**Cybersecurity Lead**

**Role:** Lead cybersecurity assessment to determine critical communication vulnerabilities and solutions.

**Elmer (Kevin) Davis** – Mr. Davis is a Network Professional with over 20 years of cybersecurity focused engineering, design and successful implementation of secure voice and data networks for both private and government agencies. Skilled in secure implementation for Virtualization, LAN/WAN Management, switching/routing, Exchange/SQL server implementation/support, Risk Management Framework (RMF), control family policy and technical procedures using current NIST guidance. He possesses a thorough understanding of Network Security and keeps current military rules and regulations. He has supported IEWP development for Michigan ARNG through cybersecurity assessments


**Quality Control/Document Manager**

**Role:** Oversee quality control process on all deliverables, to include a Technical Review, and Editorial Review, and a final Quality Control Coordinator review.

**Jennifer Brainerd** – As the Deputy Program Manager, Energy Services, Ms. Brainerd has over 24 years of experience, including quality control; program management; project management; document editing; public participation and community relations; contract administration; fact sheet, newsletter, and article development; meeting facilitation; legislative and policy development and analysis; and recruiting. She is currently providing program management, quality control, document editing, community relations, and contract administration support for multiple energy management services contracts for multiple federal agencies. Ms. Brainerd manages the development, quality control, and submittal of monthly status reports, including administering a web-based online monthly reporting administration system. She ensures that all team contracts have appropriate quality control systems in place for all deliverables.



## 2. APPROACH AND METHODOLOGY FOR MEETING GOALS AND OBJECTIVES

To accomplish the IEWPs and meeting WVARNG goals and objectives, Tetra Tech will build on our 20 years of experience supporting energy and water efficiency, conservation, and management programs, along with our 3 years of experience completing IEWPs for Army and ARNG facilities.

Understanding the military mission from a former military engineer's and senior leader's perspectives allows Tetra Tech to accomplish IEWPs with a focus on the mission and develop resilience and energy conservation projects that support the mission, while appropriately addressing risks and energy efficiency. Resilience is a multi-faceted undertaking that includes improving existing infrastructure, installing on-site generation and storage assets, and reducing the chances of a successful cyberattack against the control systems. Energy efficiency reduces the demand and consumption of a mission, making resilience attainable at a lower price. In the case of the ARNG's IEWPs, it is important for the contractor to understand that these are a mission-focused look at the energy and water requirements for keeping an installation's mission operational without interruption for a duration of 14-days.

IEWP execution will follow specific DoD and NGB Guidance and meet or exceed all requirements of the AR 420-1. The IEWP for West Virginia has been split into two separate documents, one for Camp Dawson and another for the other seven sites listed in the solicitation documents in order to address resilience properly for these mission critical sites.

### *Tetra Tech IEWP Best Practice Example*

*A good IEWP looks at both the energy and water conservation potential of the sites as well as the resilience of a given site from several interwoven perspectives. All energy sources and all water sources and systems are looked at for critical sites, but this isn't always necessary for sites that aren't critical. A couple of examples of often overlooked resilience aspects are wastewater and communications. If a site has water but the wastewater can't be pumped away from the site because a city lift station isn't operating during a power outage, the site becomes untenable in rather short order. Likewise, if one of the communications networks such as phone or internet become unavailable because a building on the site that wasn't considered critical but houses communication relay equipment and isn't powered by renewable or backup generation systems, the mission can be compromised. An IEWP requires a deep look at every aspect of the mission in order to identify all potential failure points and the plan also needs to identify one or more paths to mitigate these failure points. In this way an IEWP can contribute heavily to future master planning efforts.*

## Resilience Assessment

The resilience assessment process can be divided into four basic tasks.

### Task 1: Identify Requirements

#### **Work Plan and Kickoff Teleconference Meeting.**

Starting with a finalized work plan submitted to the contracting officer (KO) and the contracting officer's representative (COR) after the notice to proceed (NTP), Tetra Tech then will coordinate a kick-off meeting. This virtual meeting will discuss the goals and scope of the contract, the work plan, and key

milestones, methodology, analysis, and software. Tetra Tech will lead the meeting with a PowerPoint presentation talking about all the important aspects of the project. This meeting will also serve to introduce government points of contact and contractor team members and to disseminate contact information for the installation points of contact and roles and responsibilities.

At this kickoff meeting, Tetra Tech will address the specific mission critical facilities list identified by the state and pose the question that logistical, communications nodes, maintenance facilities, and troop support or community support facilities may need to be added to the mission critical facilities listing. We will bring this topic up as a result of past IEWP experience and past military planning experience. This topic will be addressed further during the site visit and Stakeholder Meeting #1

#### **Initial Data Request, Review, and Performance Metrics.**

Tetra Tech will submit our Initial Data Request (IDR) electronically not later than Day 10 after NTP and will work with the COR should questions arise on the request or where to get the information. Tetra Tech will review the data the government submits – to include utility data (Army Energy and Water Reporting System [AEWRS] and utility billing data), Real Property Development Plans, past energy audit findings, and Installation Status Report – Mission Capacity (ISR-MC) reports, installation infrastructure drawings for mechanical, electrical, natural gas, water and wastewater system, building control systems, a list of on-site generators, fuel storage capacities, renewable energy, and energy storage assets, to name some of the more important data required. It is anticipated that the initial data request will cover at least 90 percent of the data required from the team, as our goal is to impact the installation personnel's mission requirements as few times as possible. Tetra Tech will create a list of gaps in the data and will work to obtain that information while on the initial site visit. From these documents, Tetra Tech will create the energy and water resilience performance metrics and energy and water use intensity baselines.

#### **Establish Energy and Water Needs for Critical Missions.**

Tetra Tech will gather all the electric, natural gas and water consumption information available for the past 3 years from AEWRS and utility bills in order to determine energy and water baseline use. We also determine the peak electric demand, including when that occurred, and ask the mission owners what was going on at that point in time to determine if this is "typical." We also gather the highest 30-day water and natural gas consumption over these years to get a basis for the 14-day gas and water usage requirements. During the site visit and Stakeholder Meeting #1, we talk with the mission owners and the CFMO to get a feel for what will happen to the mission should there be a utility outage. For example, will the mission increase in intensity or will there be a decrease in energy and water needs. We will work with them to propose a planning factor to apply to the steady state energy and water consumption and demand. This is important because you cannot plan emergency loads based on steady state conditions.

Tetra Tech prefers to review and analyze at least 3 years of past utility history to ensure we are looking at a proper sample of energy and water consumption and look for trends as well. The anomalies and trends will be discussed with the CFMO and stakeholders during the initial site visit and the first stakeholder's meeting. During the site visit, Tetra Tech will talk with the stakeholders, CFMO and mission commanders to try to ascertain if there are any other loads or facilities that are mission critical – these are typically related to small communications nodes, logistics facilities, and troop support facilities that become very important after a few days of power outage. We look both on-site and off-site for potential failure points in order to identify all possible mission risks. Tetra Tech understands that some of the information at these sites could be classified in nature and that this information will be briefed to a person with a SECRET clearance that can be validated in Join Personnel Adjudication System (JPAS). This information will be handled at the appropriate level of classification and sanitized, if needed, so the report will be written at a For Official Use Only (FOUO) level of content. Any questions on classification will be directed to the Facility Security Officer for clarification.

These mission critical energy and water resilience requirements are one of the cornerstones of the IEWP and as such will be specifically called out in the Preliminary IEWP Reports (50 percent), as well as the final IEWPs. The power, thermal, water, and wastewater requirements and the requirements to get to a full 14-day resilience capacity will be clearly identified and presented. This includes the diesel fuel storage requirements for a generator, water requirements, and the natural gas, propane or diesel fuel requirements to keep the building heated if the event happens during the winter months. We look at system design and anticipated use of all utilities during an outage or event in order to identify possible operational changes that could positively affect the outcome. Tetra Tech will also discuss with the mission owners what level of resilience is required for each mission. A typical planning factor for missions that require resilience is to provide N+1 redundancy, however some missions are so critical that they require additional resilience. Tetra Tech will discuss, in unclassified terms and without needing to know specifics of the mission within the facility, what level of resilience is required and then we will write the plan to support that level of resilience.

**Onsite Energy and Water Workshop – Stakeholders, Scope, Goals, etc. (Stakeholder Meeting # 1).** Stakeholder Meeting #1 for each of the two IEWPs will be conducted at the conclusion of the site visit. Tetra Tech will coordinate the initial site visits and initial stakeholder meetings to be held roughly 7 weeks after NTP, assuming the initial data is obtained within 20 days of request and based on availability of the CFMO and stakeholders. Tetra Tech anticipates accomplishing the site visits and the first Stakeholder Meeting during the same trip. If energy audits are required, Tetra Tech anticipates conducting the audits at the same time. During these site visits, Tetra Tech will discuss the list of Mission Critical Facilities with the COR, CFMO, and senior mission commanders to ensure all mission-critical facilities have been included. Tetra Tech believes leaning toward the inclusion, rather than the exclusion, of more mission support functions better supports the 14-day mission resilience planning criteria. We will discuss the potential additions of front gates, dining facilities, refueling operations, motor pools, Civil Support Teams (CST), Army Aviation Support Facilities (AASF) and troop support facilities with the senior mission commanders for the various sites. We will also discuss communications and radio towers, if applicable. Tetra Tech will provide a workshop out brief for the CFMO summarizing the activities, topics discussed, and key findings from the workshop.

#### *Installation Site Visit – Data Gathering*

The team will look at the installation infrastructure condition and capacity, look closely at the mission-critical facilities, obtain information regarding facility renovations within the past 3 years, gather specific information on equipment that plays a role in a facilities resilience, and talk with the communications personnel to determine where communications nodes exist. In every IEWP we've accomplished to date, we have identified mission critical communications nodes that are not part of the operational mission critical facilities listing. Our team will talk to site maintenance personnel and facilities personnel and gather additional data identified as necessary for each site. The team will look at the states' operations and maintenance procedures and status, personnel training and experience on the infrastructure, and critical components of the building systems. Specific meetings will be held with the CFMO and maintenance personnel to talk about maintenance issues and get an understanding of what technologies the personnel have experience with.

Tetra Tech will also evaluate renewable energy systems or energy storage systems on the ARNG properties. Tetra Tech will assess the rate structure and renewable potential to determine if the site could benefit from such assets being installed or added to in order to promote these excellent resilience assets to the mission-critical loads. At the same time, Tetra Tech is very cognizant of the fact that whatever solutions we may propose, they have to be able to be maintained for the life of the equipment in order to be real solutions. We will also talk to the utility companies to learn what we can about their systems' resilience as it directly affects the risk associated with the installations losing electric, natural gas, water

and wastewater services. We'll ask the master planning personnel about future projects scheduled for the sites to ensure we've got a complete picture of the facilities. From all of these data and investigations, Tetra Tech will establish the baseline for power resilience, thermal resilience, and water and wastewater resilience for both the current and future installation requirements.

### *Stakeholder Meeting #1*

In conjunction with the on-site data collection, Tetra Tech will facilitate a Stakeholder Meeting that will be scheduled around the site investigations for each IEWP to accommodate the most stakeholders' schedules. Tetra Tech will assist the CFMO in identifying which participants should be involved in the Stakeholder Meeting. Tetra Tech will provide a read-ahead package for all participants addressing the goals of the IEWP, the purpose of the meeting, the expectations of the stakeholders, and the resulting information that will help Tetra Tech complete the Preliminary IEWP. Tetra Tech will kick off the Stakeholder Meeting, reiterating the goals of the IEWP and presenting:

- ✓ Overview of the process
- ✓ Important data points discovered to date
- ✓ Energy and water security and efficiency and how that plays into the resilience of the installation
- ✓ The way forward to meet the vision and Installation Master Plan.

During the Stakeholder Meeting, Tetra Tech's team will lead two tabletop exercise scenarios – one scenario will focus on the implications to the federal training mission and one will address the state mission. The various threats and hazards will be incorporated into these scenarios and the Stakeholders will identify the risks and implications to the mission to qualitatively assess the mission impact and guide resilience priorities. Since resilience is not localized to a specific, predetermined area and solutions can be expensive and affect multiple organizations, Tetra Tech will seek out partnership opportunities with the utility companies and other agencies.

Following the Stakeholder Meeting #1, Tetra Tech will identify any additional data gaps and investigate additional items and data requirements that arise from these stakeholder meetings.

## **Task 2: Assess Risks and Opportunities (accomplished concurrently with Task 1)**

The first step to identifying risks is to identify the threats and hazards. It is important to understand that risk is a landscape, not a number. Risk is constantly changing and impossible to quantify, but it is possible to address risk from a qualitative perspective that allows recommended courses of action to be prioritized.

### **Identify Threats and Hazards.**

During the course of the first stakeholder meetings, Tetra Tech's team will seek to draw out the threats and hazards that are possible to the areas surrounding the sites identified as critical. Some threats to a site or facility may be common across a broad area, but we will attempt to obtain the local threat information that is relevant to energy and water security as well. Our team will use both our personal knowledge of the hazards common to the military as a whole and draw from the CFMO and stakeholders' knowledge base to identify the specific natural hazards that can threaten energy and water services in the region.

To assess the risk to the mission, Tetra Tech will ask the stakeholders in Stakeholder Meeting #1 about the effects of the loss of utilities on the various mission-critical facilities. We will also get input from the stakeholders on the duration of outage that can be sustained without mission implications, as well as

special power criteria for mission loads, for example equipment that cannot withstand voltage fluctuations. We will do this for both the federal and the state missions. We will also determine the breadth of the mission critical facilities that are affected by a threat or vulnerability. We look at risks from both a severity of impact perspective and a breadth of effect perspective to allow us to propose priorities of solutions. We will follow the Army Installation Energy and Water Resilience Assessment Guide, Appendix P - Mission Impact and Solution Prioritization Worksheets to identify risks and solutions, and to prioritize the solutions identified.

After the stakeholder meeting and the collection of additional information, Tetra Tech will assess the information gathered and we will consolidate our assessment of the following items to include in the Preliminary IEWP Report:

Items to Assess	To Include:
Energy and water efficiency measures that can significantly support resilience	<ul style="list-style-type: none"> <li>✓ Audits previously accomplished by others</li> <li>✓ Audits accomplished by Tetra Tech as part of this contract</li> </ul>
Energy and water resilience baseline	<ul style="list-style-type: none"> <li>✓ Resilience of utilities for supporting existing missions – consumption based</li> </ul>
Metering	<ul style="list-style-type: none"> <li>✓ Identify additional metering that will be required to design solutions in the future</li> </ul>
Infrastructure condition	<ul style="list-style-type: none"> <li>✓ Age, condition, maintenance history and issues</li> </ul>
Assured access to energy and water baseline	<ul style="list-style-type: none"> <li>✓ Assessment of power, fuel, water supply to the source</li> </ul>
Operational procedures	<ul style="list-style-type: none"> <li>✓ Processes, procedures, training, best management practices</li> </ul>
Future requirements	<ul style="list-style-type: none"> <li>✓ Resilience of the utilities for supporting future mission loads as identified in the IDP</li> </ul>

A summary of these findings will be presented to the WV ARNG for review and comments. Tetra Tech will develop Preliminary IEWP Reports (50 percent report) for the state, which will present the information gathered through the first Stakeholder Meeting and the assessment of that information. These reports will be submitted to the client for review and comment and will be the focus of discussion during the second set of stakeholder meetings. Included with these reports will be a section on the lessons learned that will identify constraints and obstacles to help with future work.

#### **On-site Review Board Meeting – Stakeholder Meeting #2.**

Tetra Tech will coordinate with the CFMO COR and the stakeholders to schedule the second stakeholder meeting for each IEWP. We will attempt to schedule these meetings for 2 weeks after the submittal of the Preliminary IEWP Reports. During these meetings, Tetra Tech will provide an overview of the Preliminary IEWP Report. We will discuss the main points of the seven areas of the report to obtain concurrence and feedback, as well as present issues not previously known. This important step will make sure resilience solutions and efforts to complete the IEWP are focused in the right direction. Tetra Tech will utilize the Army's draft IEWP format for this report. Following approval or adjustments at this meeting, Tetra Tech will move on to Steps 3 and 4.

Mission Critical Facilities being addressed are those identified in the solicitation.

## Task 3: Generate Solutions

In this phase of the project, the Tetra Tech team will address the client's comments to the Preliminary IEWP Reports. We will write about the best management practices observed during the site visit and develop project concepts.

### Scope Best Management Practices.

The best management practices will be identified and will focus on the operations and maintenance, risk management strategies, stakeholder and contract support strategies that can be implemented to improve resilience.

An overview of the culture of energy and water awareness on the installation will be addressed here as well as possible methods for improving stakeholder buy-in to energy resilience and conservation. Tetra Tech will document the operations and maintenance practices that enhance the resilience of the installations as well as those that can be improved. We will assess the utility rate structures to identify cost reduction strategies separate from energy efficiency measures, and we will identify program support strategies that reduce the risk to a loss of energy and/or water.

### Develop Project Concepts.

At this point, Tetra Tech will develop a list of actionable measures that the installations can address. Tetra Tech will develop solutions to the energy resilience gaps identified during the site investigation and confirmed by Stakeholder Meetings #1 and #2, which will improve the energy and water resilience from the baseline status. Our team will develop a scope for these projects that will close the gaps in the baseline energy and water resilience and the current and long-term resilience requirements. Solutions can range from O&M procedure changes and additional training to infrastructure upgrades, to smaller O&M projects to larger Energy Resilience and Conservation Investment Program (ERCIP) projects – potentially a microgrid with multiple on-site generation and storage assets. Projects that will include on-site generation and storage will be guided by Tetra Tech's proprietary method of optimizing solutions that include on-site distributed generation assets, renewable energy, and energy storage systems. These analyses will indicate, at a conceptual design level, how the assets can be integrated and used most efficiently during day-to-day, grid-connected operations for reducing demand charges and energy consumption, and for saving money. The algorithm programmed during construction will operate the system differently in island mode and will be done to reduce fuel consumption in order to extend the duration of the capabilities of the assets. The list of projects could include suggesting the relocation or consolidation of mission critical loads within facilities that can be more easily provided energy resilient solutions. During this phase, Tetra Tech's IEWP team will be guided by the Mission Impact and Solution Prioritization Worksheets to evaluate the improved resilience by risk reduction. Tetra Tech may propose some high-tech solutions but wants to know which solutions would be able to be operated and maintained over time by the state work force or through contract maintenance so that the solution works when it is required. Those systems for which the CFMO does not feel a successful operations and maintenance plan can be implemented will not move forward and Tetra Tech will pursue other technological solutions.

Tetra Tech's team of resilience experts have learned to identify resilience opportunities that fall in four main lanes: infrastructure condition and capacity, operations and maintenance, training of maintenance personnel, and cyber security considerations. Infrastructure, to include main HVAC systems, is assessed to determine if it needs repair or upgrade to ensure operational effectiveness. The team also looks at the steady state and guaranteed energy and water supply to determine the risk of the utilities being able to provide adequate energy and water to the installation. This off-post assessment determines the need to provide on-post energy resilience assets. Projects, operations and maintenance procedure changes, and potential training requirements for personnel to ensure they can properly operate and maintain

equipment is addressed. The past experience of our team ensures a more complete list of concepts is generated.

**Prioritize Solutions.**

The list of projects will be prioritized based on the Mission Impact and Solution Prioritization Worksheets, relative improvement in resilience, and cost. Tetra Tech will assemble the final tables and charts addressing these three metrics for the resilience measures and projects supporting the mission critical loads and will discuss these with the COR during the weekly meetings that will be held throughout this project. Tetra Tech will propose priorities based on the relative improvement in resilience with cost being the secondary factor. This prioritized list of projects will be revised through discussions with the client throughout Steps 3 and 4 and will be the basis for the implementation plan.

**Document Step 3 – Generating Solutions Document.**

Tetra Tech will document the approach, analysis, software, cost estimating methods, O&M costs, and final project listing of Step 3 and include this in the final IEWP.

**Task 4: Develop Implementation Plan****Document IEWP.**

Tetra Tech will develop the final IEWPs that will clearly present the process and results of the entire IEWP process – from the holistic perspective to the list of projects and measures that can be implemented to improve the energy and water resilience of the installations. This plan will identify any solutions that need to be implemented in order to achieve the energy and water resilience goals and, separately, will identify alternatives that have multiple solutions that add varying levels of resilience and varying implementation costs. Tetra Tech will submit a 95-percent document that addresses all previous comments in the Preliminary IEWP, as well as all other stakeholder and CFMO comments made during Step 3. Tetra Tech will coordinate a teleconference or Microsoft Teams conference call with the COR, CFMO, and appropriate mission owners to go through each of the documents and answer questions or clarify and make final changes or corrections. Tetra Tech will immediately make final changes and submit the final reports to the client.

**Define implementation and funding approach.**

In the prefinal and final reports, Tetra Tech will identify the possible funding sources that are available for the solutions presented to meet the energy and water resilience requirements of the missions. Tetra Tech has decades worth of recent and relevant experience on the team to identify these funding sources. We will use this experience to create a time-phased plan that is realistic and executable.

Tetra Tech will propose the implementation and funding approach for projects identified in Step 3 using our extensive background knowledge and experience with the ARNG and ANG. Once we identify the list of projects, we will talk with the CFMO to determine if there are any projects on the books or in planning that can incorporate all or portions of energy resilience upgrades. Energy resilience is not an all-or-nothing proposition, nor do you ever achieve guaranteed resilience. Therefore, Tetra Tech will assist the WVARNG in working within existing projects and programs that can speed up the process of implementation without creating additional workload – essentially eating the elephant one bite at a time. Tetra Tech will work with the CFMO to identify potential fiscal years where there is capacity to add energy resilience projects to the program. Similar to Tetra Tech efforts on the Michigan ARNG and Presidio of Monterey IEWPs and the Channel Islands ANG energy resilience study, we will look at all possible funding streams that could fit these projects. We will look at the typical government funding streams, as well as third party financed and partnering opportunities. These latter funding streams may require

modification of the scope of the projects, but Tetra Tech can assist the WVARNG with ensuring they still meet the energy resilience goals of the installations.

### **Prefinal Report Reviews.**

During the pre-final conference call with the COR and stakeholders, Tetra Tech will lead the discussions to walk through the pre-final report. We will take note of all comments brought up and will address those comments immediately after the call. Tetra Tech will revise the final report as appropriate and submit a final report that addresses all final comments.

## **Audits – EISA 2007 or ASHRAE Level II Audits**

Should audits of the WVARNG facilities be necessary, our team has the experience and skill set to accomplish either EISA 2007 or ASHRAE Level II audits. The difference between the two is mainly in the financial payback side of the equation. ASHRAE Level II audits have a more developed life cycle cost analysis and result in a very close to bid ready project list than the EISA audits, but both can be used to identify energy and water projects that should be done for conservation and resilience purposes.

There is no good reason to build more resilience than is necessary, and audits will identify projects that when implemented will reduce the energy and water usage at a given site to its lowest level so you can build the resilience level that is actually required. Energy and water audits on specific buildings or sites, as identified by the state, will utilize the same Tetra Tech team members to perform the audits on those state identified facilities, as this team has extensive auditing experience as well. These audits can be combined with the resilience assessments where possible or performed separately, depending on site criticality. ASHRAE Level II audits more than meet the audit requirements of the Energy Independence and Security Act of 2007 and enable the projects identified during the audits to be incorporated into the IEWP which can then be incorporated into the master plan. Audits follow a similar four step approach as compared to the resilience assessment process:

1. Identify requirements – the energy and water baseline and the facility usage and needs are identified in this step
2. Assess opportunities – identify the potential energy and water conservation projects that can be achieved – a site visit is required during this step to see what the current technology and efficiency levels are of the various energy and water systems and to interact with the occupants and facility maintenance personnel to find out what issues the site has
3. Generate the solutions – identify potential projects based on the site visit and, using the baseline identified in step one to assess savings potential, perform a life-cycle cost analysis on all projects identified to see if they make good financial sense
4. Generate the audit report – The report will include all projects identified, even the ones that don't make financial sense. All projects are included both to satisfy a federal requirement to look at renewable energy, but also to provide a glimpse into the potential possibilities of the site, should its mission change.

Tetra Tech will develop stand-alone energy and water reports for each facility audited to document the audit findings and recommendations



### 3. PROPOSED PROJECT MANAGEMENT, QUALITY, AND COST CONTROL PLANS

As an established government consulting contractor, Tetra Tech has proven systems in place to manage costs, meet demanding schedules, ensure health and safety, and deliver high quality products and services.

We train our project managers to manage projects based on proven standard operating protocols. Our project management tools include procedures for project cost control, project scheduling, project file management, and document/deliverable quality control review.

Tetra Tech's project management approach and tools are critical to our success. Tetra Tech strongly believes that most common concerns and problems can be resolved through disciplined project management and the communication of key information at the proper time in the planning process. As such, our project management approach includes several key elements:

- Early integrated planning
- Regular, frequent communications and reporting
- Clear overall objectives, short-term milestones, and transparent, robust decision-making
- High-level project management, technical oversight, and quality control functions to ensure that clients are delivered a sustainable and cost-effective project

**Cost and Schedule Control.** To ensure that budgets and schedules are met, Tetra Tech project managers prepare a Project Management Plan at the start of every project. In addition to allowing the project manager to review the project schedule and make corrections to assure that the schedule is maintained, the plan also includes the overall budget, the budget for each task, and anticipated billings. The plan closely coordinates the schedule and the budget so that as the project progresses, the project manager can easily monitor billings versus the anticipated budget. The plan is enhanced by our computer-based accounting system which is tied directly to employee time sheets and billing information and is updated on a weekly basis. This electronic system reduces delays in getting the budget information to project managers.

Historically, Tetra Tech has provided IEWP, energy audit, and other master planning services for federal government agencies for a firm fixed price, putting the responsibility on us to clearly communicate our understanding of the scope and approach when negotiating price, and to complete the scope within our budget. Change orders only happen when

**Quality Control (QC).** Tetra Tech's quality philosophy is to understand the client's objectives at the inception of the project so that all work can be performed to meet the client's needs and specifications the first time. We completely understand that our reputation is only as good as the quality of our last project. We used established procedures to collect field data. All deliverables, including IEWPs, Energy Audit Reports, and Monthly Status Reports (MSR), will be processed through Tetra Tech's established three-tiered quality control (QC) procedure. Tetra Tech has a dedicated Document Manager who monitors all deliverables and reviews to ensure that all deliverables receive a thorough Technical Review, Editorial Review, and final QC Review.

**Culture of Communication:** Teamwork is facilitated through weekly conference calls where lessons learned are shared, solutions are brainstormed, and advancements in technology are discussed in real

time. We actively manage our employees and use a web of communication tools, including regular conference calls, e-mails, a web forum to conduct technical team discussions, and individual interactions to facilitate effective teamwork. Our enthusiasm for communication translates to our client interactions, including weekly e-mail updates when appropriate, 24-hour access to MSRs through a password protected website, and secure websites to facilitate file sharing. We also engage installation stakeholders during data collection and stakeholder meetings to ensure that all perspectives are included to achieve the best planning outcomes for the mission critical functions.