Building a Modern Intelligent Distributed BESS for Resiliency

in Northern New Mexico

Announcement and Topic Area:
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BIL Grid Resilience and Innovation Partnerships (GRIP):
Grid Resilience Utility and Industry Grant

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Team Member Organizations:

Camus Energy

Microgrid Systems Laboratory

Entity Type:

Electric Cooperative – Small Utility

Project Locations:

Taos County, New Mexico: Village of Taos Ski Valley, Picuris Pueblo
Rio Arriba County, New Mexico: El Rito

1.0 Project Overview

1.1 Background

KCEC History with Resilience and Renewable Generation

Northern New Mexico is at a key point in history for the development of, and buy-in from the community for resilient renewable energy. Kit Carson Electric Cooperative (KCEC) has been a major player not only for the region in these efforts but also nationwide. Awarded the Governor's Environmental Excellence Award in Energy Conservation in 2015 and the Utility of the Year Award from the Solar Electric Power Association (SEPA) in 2013, KCEC builds on a legacy of engagement for the rural and tribal members that make up our cooperative to invest in the resilience of our community long term through renewable options.

In 2015, KCEC bought out of our Tri-State Generation and Transmission (TSG&T) Energy contract resulting in lower rates to our members by approximately 40%, and allowing us to act as an example for other cooperatives across the country to pursue a resilient energy future for our members and by our members. Since then, KCEC has been a key stakeholder for advancing the use of renewable energy and modernizing the grid to protect northern New Mexico from natural disasters. In summer of 2022, the Taos Mesa Solar Facility, allowed us to meet our goal of generating 100% daytime power supply from the sun. We have continued momentum on resilient energy generation with the Angel Fire Solar Facility completed in 2023, working toward our goal of being fully carbon free by 2030.

While efforts toward renewable energy generation have been successful, KCEC now faces an issue of accessible community energy storage in order to achieve our resilience goals. Increased storage throughout the region will ensure renewable energy can be used during nighttime or non-peak hours and to optimize the use of renewable energy resources in addition to building both reliability and resilience. A robust battery network throughout our service territory will enable renewable energy to be more successful and resilient against the increasing threats of natural disasters in the area.

Our Solution for Resilience

Due to the rural, geographically and demographically diverse nature of our service territory, we are especially vulnerable to impacts of power outage across the region. As the threat of wildfire, extreme drought, and high wind events increase in forested areas across the country and especially in our region, our aging electric infrastructure is experiencing increased strain in need of novel technology solutions to withstand and maintain electric service to our customers.

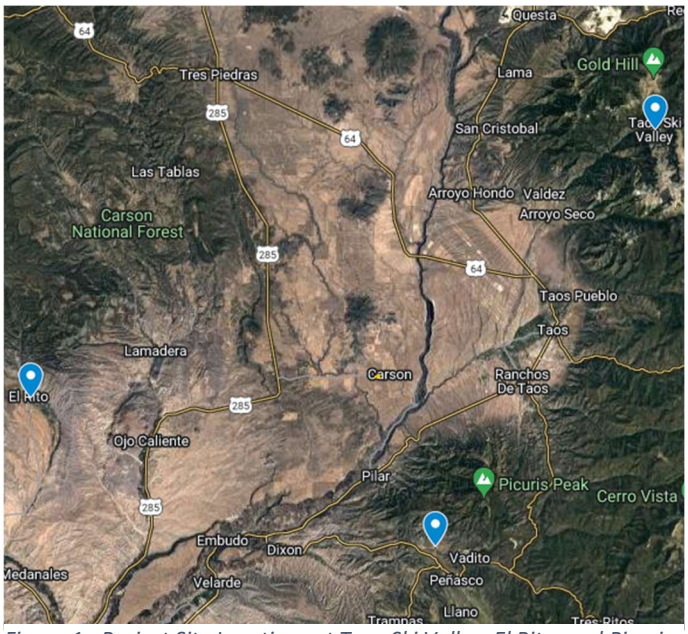


Figure 1 - Project Site Locations at Taos Ski Valley, El Rito, and Picuris

Kit Carson Electric Cooperative is uniquely positioned to act as a model to create a resilient grid structure for our customers and to pave the way for rural, tribal, and electric cooperative serviced regions to build similar resilience networks across the country. We have selected three locations in which to deploy Battery Energy Storage Systems (BESS) and microgrid capability, one tribal (Picuris), one a key tourist area (Taos Ski Valley), and one very rural (El Rito). Each of these locations has been a long-term partner to KCEC in our resilience effort, with two of the three areas currently offsetting their grid pull through photovoltaic (PV) arrays. We will deploy BESS to island these locations, in a protective sense, allowing for the lines feeding these areas to be shut down during periods of high-risk fire weather while continuing to serve key loads in these areas. In effect, this structure will allow us to perform public safety power shutoff (PSPS) while maintaining critical services locally. We plan to add solar PV to sites as needed to ensure full microgrid capability in the case of a full grid shutdown to the area; these regions will continue to source power from the PV array and use that power through the BESS. This will enable these communities to island in the event of an unplanned utility outage, while continuing to sustain critical loads and services.

In addition to the increased public safety and resilience provided through the BESS network, distributed batteries and paired orchestration software will allow us to ensure maximum life of machines and allow us to capture data to maximize technological efficiency. An Intelligent Distributed BESS model will allow us to build a more resilient, data informed grid against an increasingly volatile climate vulnerable to fires, extreme temperatures, and avalanche, while simultaneously allowing us to improve the distribution of renewable energy to households throughout the region. These developments will reduce operating costs while improving local resilience and lowering carbon emissions.

Resilience objectives for the three sites are as follows:

Taos Ski Valley: Support critical loads needed in the event of proximate wildfire and power outage to enable emergency services and evacuation of the population.

El Rito: Support community critical loads (e.g., fire station, health clinic, child care center, telecommunications link, commercial kitchen, college dormitories, home health equipment) indefinitely in the event of an outage or PSPS; and priority loads during daylight hours.

Picuris Pueblo: Critical and priority load support as in El Rito, providing indefinite support to critical loads and supporting priority loads during daytime hours, tailored for the Tribe's particular facilities, operations, and needs.

<u>Project Partners</u>

Kit Carson Electric Cooperative opened its doors in 1944 serving 618 customers. In the 1990s, KCEC expanded its offerings to include propane and internet. Now after 78 years in business, KCEC provides its services to over 59,763 members for electric, broadband, and propane services, including 20,500 households, 3,600 businesses and 183 anchor institutions, including schools, hospitals and local governments. KCEC's service territory includes 29 communities, including Taos and Picuris Pueblos, across 3 counties in Northern New Mexico. KCEC is the second largest cooperative in the state of New Mexico in number of consumers. Colfax, Taos

and Rio Arriba counties are two of New Mexico's 12 persistent poverty counties. These counties have high unemployment rates and low median household incomes.

As a Cooperative, KCEC's mission includes delivering products and services to those that are under-served by offering the best quality of life services in the telecommunications industry at the most affordable prices possible. Due to its dual role in provision of electric service and broadband, KCEC has a legacy of serving rural populations in Northern New Mexico with reliable electrical service, and high speed and cost-effective broadband. This mission and the solutions KCEC has designed to ensure equity and sustainability have gained nation-wide recognition. On October 22, 2013, KCEC won the prestigious Utility of the Year Award from the Solar Electric Power Association (SEPA). Since 2021, KCEC has been successfully managing three grants and loans from different funding sources including: a Rural Digital Opportunity Fund award of $18,102,076.90 to support expanded broadband delivery to 100% of its entire membership; an award of $634,687 from the New Mexico Public Regulatory Commission to support high-speed internet service for low-income residents, students, and tribal members, connecting 550 locations to broadband services; and a $7.5 million loan from the Rural Utilities Service to invest in fiber communications and establish 7,497 network drops within the service area.

The Microgrid Systems Laboratory is a non-profit cross-sector collaborative innovation lab dedicated to accelerating the transition to a more resilient, sustainable, and equitable energy system. For over seven years, MSL has led or participated in numerous projects in the programmatic areas of research, innovation, demonstration, and education. Current projects include the NM EPSCoR SMART Grid Center, a $24 million NSF-funded research collaborative focused on utility Distribution Feeder Microgrids, in which MSL is a Primary Partner; a DOE-funded Federated Machine Learning for the Energy Internet of Things research project led by NM State University with support from The National Renewable Energy Laboratory; and the Energy Sovereignty Institute, working with Native American communities to support their energy independence goals. MSL led the conceptual design and development of the Resilient El Rito community resilience microgrid demonstration project, co-founded the Distributed Energy and Smart Grid workforce training program at Santa Fe Community College (SFCC), and led the conceptual design for the educational microgrid and campus microgrid there. MSL continues to advise SFCC on program development, and also advises Northern New Mexico College (NNMC) on the workforce component of the Resilient El Rito project. In 2022, MSL received the Silver Award from the Energy Smart Communities Initiative of the Asia Pacific Economic Cooperation program, for Smart Grid Best Practices.

MSL will lead the workforce development component of this proposal, with support from SFCC, NNMC, and the University of New Mexico - Taos, with a particular emphasis on training underserved community members in technical trades skills needed for BESS and microgrid construction, operations and maintenance. MSL will also advise on resilient microgrid system design; serve on the project management team; participate in the community and tribal engagement process; and provide expert input and guidance on industry and utility trends, technologies, and finance as they evolve over the project period.

Camus Energy is a grid-management and situational awareness software-as-a-service provider focused on resilient, affordable, and equitable decarbonization. Founded in 2019, Camus's co-founders bring industry leading distributed computing expertise to ensure the scalability, adaptability, and reliability of our software platform. Our tools enable customers to transition to a Distribution System Operator (DSO) model to achieve a zero-carbon grid using the following:

- Insight into system operations and real-time network operation.
- Forecasting, procurement, and scheduling coordination.
- Managing local markets and integrating with bulk markets.

Our platform is designed to support shared situational awareness across utility organizations, offer analytics for DER planning, and provide orchestration of DER (customer and utility owned).

Camus will lead Monitoring and Control systems design and management for the Building a Modern Intelligent Distributed BESS for Resiliency in Northern New Mexico project.

<u>Development Baseline</u>:
*Hard Infrastructur*e— We will add BESS (and solar PV as needed) at three sites, as integrated microgrid systems capable of islanded autonomous operation,, and integrate their operations through a distributed orchestration system to enhance the resilience at those locations in our grid. Our planning for the hard infrastructure at the three BESS development sites is at the preliminary design stage. The installation at these sites will utilize KCEC's existing distribution grid. Although the BESS+PV sites are not fully designed, KCEC has extensive experience with solar PV + BESS project development and installation. Currently, KCEC is operating two different Solar plus BESS projects, one a 15 MW Solar with 12.5 MW BESS and 7.5 MW Solar with 3.75 MW BESS, which KCEC owns. KCEC managed these two projects, ensuring that the entire Engineering, Procurement, and Construction (EPC) process met all project deliverables in a timely manner. Through these projects, KCEC has collaborated with community partners, including Northern New Mexico College, The University of New Mexico - Taos, Los Alamos and Sandia National Laboratories. They have worked alongside local unions and trades organizations to ensure local labor and fair labor procurement, and prioritized local subcontractors to keep New Mexico business within the state.

Control/Software Systems—KCEC currently uses Camus Energy software for monitoring and controls of DERs - consolidating data into one common dashboard. Camus Energy has extended the capabilities of this software for other cooperatives to provide advanced situational awareness, analysis, and DER control. The BESS use case proposed here is currently being used at both the Taos Mesa and Angel Fire sites, providing significant recent experience with BESS and PV control and two test cases for integrating these systems into the current electrical grid. For example, the existing PV+BESS systems controls are utilized to charge the BESS from the peak PV generation times during KCEC's grid low demand times and discharged during KCEC peak demand times. KCEC is a winter nighttime peaking system which is when PV output is at zero. The BESS system discharges for a 2- to 4-hour time period during the peak times. Also, the current BESS systems can be utilized as grid resilient systems during catastrophic weather

events to island the grid. The current BESS capacity can be used on the CAISO market which brings value back to KCEC to reduce power costs to members. In KCEC's grid, BESS have been controlled on an individual basis, i.e., not as a coordinated set of resources. This control has been performed while the BESS has been grid connected, and the objective of the control has been primarily for the management of KCEC's power flows with its transmission provider and, to a limited extent, for management of flows on its distribution grid.

1.2 Project Goal

The deployment of our resilient solution will enable us to:

- Prevent utility-ignited wildfires, especially during periods of extreme wind events by proactively de-energizing key distribution power lines.
- During proactive shutdowns or naturally-caused wildfire, avoid impacts to vulnerable communities served by these key powerlines by supporting their critical loads with strategically placed BESS and supporting solar PV.
- Synergistically merge resilient solutions with KCEC's ongoing shift to community-sited solar PV and energy independence.
- Protect vital natural resources and tribal/cultural resources from utility-ignited wildfires.

Relative to the baseline infrastructure and control software, our project goals are:

<u>Baseline Infrastructure Improvement</u>:
Target—At the BESS microgrid sites KCEC will be able to support critical community loads indefinitely at El Rito and Picuris, and for 2-4 hours to ensure adequate evacuation time for Taos Ski Valley, in the event of proactive shutdowns during periods of extreme fire weather or unplanned utility outages. Addition of solar PV to the BESS as needed will ensure this indefinite critical load capacity and extend operational time for daytime power usage in an islanding event.

Success Factors—1) Successfully identify loads that the affected populations of each area considers critical through to pinpoint areas that should be high priority to be sustained during shutdown during our community engagement process (WBS 2.0); 2) Identify feasible and affordable solutions, through our project planning (WBS 3.0) to isolate loads so that they can be supported for a sufficient duration; 3) Deploy BESS (w/ a grid forming source) and quality check load capacity (WBS 3.6); 4) Gather data to anticipate critical shutoff, for example, during periods of high wind to prevent potential fire ignition (WBS 3.7) .

<u>Baseline Control/Software Improvement</u>:
Target—The control software will integrate with the KCEC SCADA system to demonstrate grid-connected and islanded operational modes, optimal control of the combined BESS + solar PV system in both modes (maximum lifetime for islanded operation and renewable integrations/revenue maximization for grid-connected operation), and safe transitions between the two operational modes.

Success Factors—1) Facilitate community meeting to address and sort all community-wide loads into critical, priority, and discretionary categories (WBS 2.1); 2) Design control objectives as to automatically island the distribution feeder in the event of a utility outage and maintain

autonomous operations, and shed load as needed according to the prioritization scheme (WBS 3.2). 3) Test control software in a safe, emulated disaster environment setting before integration into the KCEC's SCADA or the BESS site hardware (WBS 4.3); 4) Ensure the generation and transmission of appropriate signals to the control software of the KCEC SCADA system to permit/require switching of control modes between grid-connected and islanded/resilience operations (WBS 4.4)

1.3 DOE Impact

Impact on KCEC distribution grid resilience: Typically, rural cooperatives do not have access to sufficient capital funds to implement projects of this type and scale as quickly as in this project. DOE funds will transform the resilience posture of KCEC. The three communities we have identified are rural and rely on themselves for building their community. Bringing renewable energy and storage to these areas will not only create the direct impact of improved electrification, it will also improve resilience against impacts of natural disasters, and our ability to create a more robust grid.

Technology Risk Reduction: Using BESS plus a local voltage source to island a section of a distribution network under extreme weather conditions is not common and still presents a significant technical challenge. DOE funding will give us the opportunity to implement this resilience approach in three different locations in the KCEC grid and demonstrate to other cooperatives and utilities that this approach is not only technically feasible, but can be economically beneficial, in a variety of settings. These results will significantly reduce the level of both technology (and business model) risk associated with the application.

Impact on Private Investment: The reduction in technical and business model risk will demonstrate that BESS + solar PV is a technically and economically viable solution to resilience for vulnerable communities in remote areas, especially where utility PV has been or will be deployed. This implementation will highlight the "blue sky" benefits of the microgrids for local grid support and market participation that will help pay for the often difficult to justify resilience. The DOE investment will create additional momentum throughout northern New Mexico that renewable energy and local storage can be done economically in remote rural communities. We want to be the catalyst for these projects within our region and throughout New Mexico. With the success of this project, it gives us an additional step in that direction.

1.4 Community Benefits Plan

Community and Labor

Kit Carson Electric Cooperative relies on the pathways to the labor force supported by our local institutions of higher learning and apprenticeship programs. KCEC and MSL have been key community voices in the development of educational programs to ensure a trained labor force and pathways to work, partnering with Santa Fe Community College, the University of New Mexico – Taos, and Northern New Mexico College.

Most notably, KCEC has been working with Northern New Mexico College, MSL, and Sandia National Laboratory, for several years supporting the development of educational microgrid programs in rural Rio Arriba County through the Resilient El Rito project. This partnership not

only brings together the utility industry, higher education, unions, and the work of national labs, but provides a pathway for local students to find high wage jobs in their communities.

We look to support the work of Building a Modern Intelligent Distributed BESS for Resiliency in Northern New Mexico through these same avenues, prioritizing local individuals who have historically had low median household wages and high rates of unemployment. The negotiated agreements written through this grant will mirror those already in place for the collective effort toward renewable and sustainable energy in northern New Mexico.

KCEC plans to hire 10 to 15 additional electrical staff for this project and anticipates that our office will grow in staff by 5 people per year for the next 10 years[1]. These projections track with the state projections for major occupation groups of Construction and Installation, Maintenance and Repair, which are both projected to grow by 11 and 12 percent, respectively, in the next 10 years.

Diversity, Equity, Inclusion, and Accessibility

As a member-owned co-op, KCEC advances the values of equity and inclusion. Within KCEC's service territory of Colfax, Rio Arriba and Taos Counties, there is remarkable diversity, including large populations of Hispanic and Native communities, including Taos and Picuris Pueblos. 57% of the population of the service territory is Hispanic, and 6.5% identify as Native American or American Indian. More than 20% of the population of the service area is over 65 years of age. Taos, Colfax, and Rio Arriba counties are three of New Mexico's 12 persistent poverty counties. Based on 2020 US Census data, the median household income ranges from the lowest in Colfax County at $36,937 to $42,264 in Rio Arriba County. However, if looking at the Tribal Lands within the service area a more dramatic picture presents itself. The median household income for residents of Taos Pueblo is $33,056, while residents of Picuris Pueblo have a median household income of less than $35,625 per year. Poverty rates range from more than 19.7% in Rio Arriba County, to 18.9% in Taos County, and 17.2% in Colfax County. Again, looking at the Tribal Lands within the service area shows poverty rates of 43.7% in Taos Pueblo and 18.8% in Picuris Pueblo. The unemployment rate for the three counties represented in the KCEC service area range from 4.7% in Colfax County, 7% in Rio Arriba County, and 8.2% in Taos County.

KCEC strives to serve every household in its service territory, with the mission to deliver exceptional customer service with efficiency, professionalism, accountability and develop sustainable economic opportunities, which benefit its service communities. This includes delivering products and services to those that are under-served by offering the best quality of life services in the industry at the most affordable prices possible. Due to its dual role in provision of electric service and broadband, KCEC has a deep legacy of serving rural populations in Northern New Mexico with reliable electrical service, and high speed and cost-effective broadband. This mission and the solutions KCEC has designed to ensure equity and sustainability have gained nation-wide recognition. Internally, KCEC also strives to invest in the community by committing to hiring local talent and investing in students through a scholarship fund that supports their attendance in college or university.

[1] A total workforce growth of 65 individuals as linemen, engineers, technical professional, and IT staff.

Justice 40

KCEC's entire service area overlaps with the Justice 40 initiative's targeted areas. All of the designated sites for grid modernization and intelligent community storage for this project are designated as disadvantaged and especially vulnerable to climate change risks.

1.5 Community Distribution

Kit Carson Electric Cooperative has been a close partner to our local community offices since we opened our doors. Due to the rural and diverse nature of our cooperative members, we are required to maintain frequent communication with our customers to ensure their adequate connectivity. Within our current service area in Taos, Rio Arriba, and Colfax counties we have a very diverse cooperative member base. According to 2021 American Community Survey 5-year estimates, the three-county area is made up of 57.9% who identify as Hispanic and 10.8% who identify as Native American. We anticipate that this buildout will lower costs for all of our cooperative members, those affected by the Modern Intelligent Distributed BESS for Resiliency in Northern New Mexico project and those throughout the rest of our service area.

The number of tribal individuals affected by this project is hard to predict, but what we can substantiate is that two of the three battery and microgrid facilities (Picuris and the Village of Taos Ski Valley) will be stored on or within 10 miles of tribal land. We have worked with tribal partners to engage them in resilient and renewable infrastructure buildout and hope this can serve as a model and potential foundation for a renewable energy sovereignty model for other tribal communities throughout northern New Mexico and southern Colorado, and beyond.

1.6 Long-Term Constraints on Natural/Tribal Resources

The three proposed grid upgrades will have minimal to zero impact on access to natural resources and tribal cultural resources. These projects leverage existing distribution power lines and rights-of-way, and in two cases existing PV arrays. The BESS + grid forming systems are compact and will be sited in consultation with the local community. The additional solar PV, where needed, will be sited in consultation with the local community. We will use well-established construction methods in all phases of the project, and we do **not** anticipate long-term clean up processes.

1.7 Climate Resilience

All of the locations included in this plan are located in an area of high wildfire risk as identified by the New Mexico Forest Action Plan[2] including portions of the Chama and Cimarron Forest Legacy Areas. These areas of risk are expected to increase in size as the Southwest is subjected to longer and more intense periods of drought. By developing the ability to de-energize key power lines during periods of high-risk fire weather and extreme wind events, while maintaining power to anchor institutions such as schools, emergency services, and hospitals, we are removing a wildfire ignition source that often leads to the most destructive wildfires. These projects support and are coordinated with more traditional methods of preventing utility-ignited wildfires. Kit Carson Electric Cooperative is working closely with the New Mexico

[2] "Forest Action Plan." *New Mexico Energy, Minerals and Natural Resources Department*, 1 Sept. 2020, www.emnrd.nm.gov/sfd/forest-action-plan/#gsc.tab=0.

Energy, Minerals and Natural Resources Department as well as the NM State Forestry Service, Carson National Forest Service, and the Bureau of Land Management to ensure high risk areas are prioritized for tree and vegetation removal. Climate change effects will also increase the expected frequency and duration of unplanned outages, in which case resilient community energy supplies are critical.

2.0 Technical Description, Innovation, and Impact

2.1 Relevance and Outcomes

Grid benefits of this project are twofold. First, the project will provide more local control of both electricity resources and of the electric grid during extreme weather events. This increased flexibility in turn offers the community more options toward the development of a microgrid system or the establishment of safe zones in the community providing critical services given a power outage. We hope that the Kit Carson Intelligent Distributed BESS and microgrid model will be able to be reproduced throughout the region and possibly the state and beyond - breaking open wide adoption of renewable energy and storage, and enhanced resilience to catastrophic events.

The second benefit is to provide an economic boost to a historically underserved and low-income area in New Mexico. KCEC is constantly working to improve our grid. In the last few years, renewable energy and modernization has been our priority. Our customers are largely rural, making renewable energy a best case, though often a high upfront capital cost solution. With funds through this grant, we will be able to take the next step for our customers, providing the beginning of a community storage network throughout our service territory in northern New Mexico without placing a high financial burden on the customer. We anticipate that this project will also increase private home investment in renewable energy solutions to create a robust grid of energy generation, storage, and distribution. Economic benefits will also accrue to our Workforce Development graduates, and resilient community energy supplies can attract both residential and commercial development.

2.2 Feasibility

This project has a foundation to guarantee success. Each of the selected sites has a long history of collaboration with KCEC and an imperative need for BESS to support their resilient energy goals. Additionally, KCEC and partner organization MSL are working together on a baseline project in El Rito that incorporates a Northern New Mexico College campus microgrid and college facilities within a larger community Distribution Feeder Microgrid serving the village of El Rito more broadly. KCEC and MSL have developed the design of this project over a two-year period with Camus Energy and NNMC, and are now beginning the engineering study with funding from the New Mexico Energy, Minerals and Natural Resources Grid Modernization grant program.

This project will utilize the existing infrastructure at each site:
Picuris Pueblo - the first phase of the Picuris solar array was constructed in 2017 with phase II funding distributed in 2018. On the Pueblo, the fire station is currently 100% solar powered and stands as the first Net-Zero building in the state of New Mexico. We anticipate using not only

the physical infrastructure but the built knowledge from the Pueblo to ensure the success of this project.

Taos Ski Valley - The Taos Ski Valley Corporation was named a CarbonNeutral company[3] in 2022 creating a public private focus on the continuation of resilient, renewable sources of energy. Resort operations like chairlifts and snowmaking are currently supplied with 100 percent renewable daytime solar power and will be able to increase function once non-daytime power access is achieved through the goals of this project. In addition to the infrastructure and sentiment toward resilient energy, Taos Ski Valley, Carson National Forest, and the Taos Valley Watershed Coalition are partners to KCEC in the continuous forest maintenance to protect the mountain and mitigate fire and watershed impacts. Their additive community efforts to KCEC's mission helps to ensure long term reduction for potential fires, improvement in habitat for wildlife, and protection of local watersheds.

El Rito - The Resilient El Rito Project creates the framework for success for the Building a Modern Intelligent Distributed BESS for Resiliency In Northern New Mexico project. In El Rito, a microgrid analysis was conducted by Sandia National Laboratories in 2021 to outline the feasibility and requirements for a microgrid configuration on the campus of Northern New Mexico College and a community-wide distribution feeder microgrid as well. This initial assessment and simulations of the current PV structure (a 1.5 megaWatt utility array) revealed a need for energy storage to support the performance goals of the entire community microgrid. Northern New Mexico College, the site for the El Rito battery, has been a gracious host for the project and an enthusiastic partner in the anticipated development of college curriculum to support microgrid development and workforce pathways for students to support these efforts long term.

Kit Carson Electric Cooperative will staff the immediate planning, deployment, and construction from current full time and contracted staff. In order to ensure long term workforce pipeline sustainability, MSL will work with local institutions of higher learning (Santa Fe Community College, Northern New Mexico College, and the University of New Mexico - Taos) to develop curriculum and training programs. These pipelines will have a dedicated emphasis to serving historically underserved community members in technical trades skills needed for BESS and microgrid construction, operations and maintenance.

2.3 Innovation and Impacts

The PV, battery and other generators will be deployed in locations that maximize grid and societal benefits during islanded operations. The DERs will also be strategically programmed or controlled in real-time to provide specific grid support services, such as reactive power injection or absorption or to interact with the wholesale market. Community microgrids that leverage renewable energy resources and flexible loads will also improve community resilience in areas that are in remote and/or isolated areas. Under normal operating conditions (i.e. blue sky conditions), the microgrid infrastructure will be useful for improving system performance and ultimately avoiding more costly transmission or substation build-outs in areas that are difficult to serve. As utilities consider how to effectively and holistically deploy DERs, there is a natural

[3] Distinction announced by Climate Impact Partners on September 13, 2022.

opening to conduct meaningful engagement with local and tribal governments, regional entities, and communities to ensure their needs and goals are concurrently addressed. This engagement, which can inform program designs and priority investments, will uplift areas of alignment on how and where to deploy resources to advance equitable outcomes.

2.4 Support of Regional and Local Plans

To highlight the importance of this project to state and local plans we are able to draw from plans addressing energy, economics, and mitigation of effects from natural disasters.

To address state energy plans, the proposed project is fully aligned with the State of New Mexico's grid modernization plans, as reflected in the grant awarded by the Energy, Minerals and Natural Resources Department's Grid Modernization grant program (grant # ECMD-GSA 23-521-0300-0043 NNMC) to Northern New Mexico College for the Resilient El Rito project engineering study. The grant program was created by state legislative mandate in 2020 as part of a grid modernization roadmap. The engineering study is currently being performed by KCEC with assistance from Camus and the Microgrid Systems Lab.

To address state and local Economic plans, we focus on three key documents: the New Mexico Statewide Strategic Plan, the North Central New Mexico Economic Development District 2021 Comprehensive Economic Development Strategy, and the 2011 Comprehensive Community Economic Development Plan for the Town of Taos. Each of these three plans expresses the significant potential in New Mexico for using renewable energy options. These opportunities are ripe for collecting, but few organizations have the capacity and experience to gather, store, and disseminate that energy like Kit Carson Electric Cooperative. Each of these three plans highlights sustainable and green energy as one of the key target areas, underscoring the potential economic impacts and job growth, especially in rural and tribal communities, associated with investment in renewable and resilient energy solutions.

To address plans to mitigate effects from natural disasters, we highlight the alignment to the 2020 New Mexico Forest Action Plan, which pinpoints electricity distribution lines as "both an asset/resource and a source of ignition for wildfire." Through the plan in place, we will be able to leverage the assets of our electric grid and protect against the potential sourcing of ignition for wildfires in the region.

2.5 Project Impact and deployment

The Modern Intelligent Distributed BESS projects will enable KCEC to de-energize the overhead electrical feed to three communities to reduce the risk of wildfire while still providing power through the BESS systems and PV arrays. This will allow for residences and businesses to evacuate safely if required, and also allow emergency personnel to access the areas, have power for communication, and be able to pump water in the event of a wildfire. This also enables these communities to become more resilient when grid power needs to be shut off whether planned due to weather events or unplanned due to emergency situations.

Heightened risk of extreme weather events has disincentivized business growth in El Rito, Picuris, and the Village of Taos Ski Valley. With increased confidence in these mitigation efforts and the buy-in of local businesses, especially large businesses like the Taos Ski Valley

Corporation and Chevron which works in Questa, New Mexico, we anticipate the development of a Modern Intelligent Distributed BESS will spark business growth and investment in the region.

Through our partnerships, KCEC has vowed to match the small utility rate of 1:3 required using both private funding and using available community development funds raised through our local government offices. We have worked diligently to strengthen public and private relationships ensuring the sustainable development of renewable energy in our service territory.

2.6 Topic Area 1 Specifics

2.6.a Resilience Benefit

This grant will fund three utility owned storage and microgrid systems, one in the Village of Taos Ski Valley, one in the village of El Rito, and one on Picuris Pueblo. Each of these locations are rural, populated by people who have lived off the land and their own grit for centuries. In the case of Picuris Pueblo and the sacred area around Blue Lake, near Taos Ski Valley, utility storage will create resilience to the grid, protecting thousands of years of protected indigenous land. With the development of long-lasting renewable energy solutions, we pay respect to the people and the lands themselves and look toward a future of opportunities in energy sovereignty for rural and indigenous people in New Mexico.

In addition to this project being vitally important to human tradition and sustainability, it will also help to protect our wilderness areas which have become increasingly threatened by fires in recent years. Carson National Forest surrounds El Rito, the Village of Taos Ski Valley and Picuris Pueblo. All these areas are protected by the United States Forestry Service and by volunteer firefighters. There is limited access for fire crews in Taos Ski Valley; a single, two-lane access road allows trucks into and out of the valley. This limited capacity for firefighting requires that we, as the electric utility provider, do everything in our capacity to ensure the safety of our grid. Improved battery storage in these areas will allow for better segmentation of the grid system, allowing us to toggle certain sections on or off in times of high wind or high threat of fire - in turn helping to protect our forests.

KCEC and our partner organizations and local governments working on the grid modernization effort will work with local community organizations, such as Taos Public Schools, and Holy Cross Hospital to engage community members in the development and deployment of new programs and distributed energy resources. KCEC will partner with community organizations and private financing partners to deploy robust storage in all three designated development locations. This development will create accessible renewable and resilient energy to 1,564 homes and develop three utility owned and resilience focused battery energy storage systems with associated microgrid controls: 2.5 MW at Picuris Pueblo, 3.75 MW at Taos Ski Valley, and 1.25 MW at El Rito.

2.6.b Hazard Mitigation

Kit Carson Electric Cooperative is dedicated to the mitigation of impact caused by the electric grid to our service territory. The Building a Modern Intelligent Distributed BESS for Resiliency in

Northern New Mexico project adds to the ongoing effort for hazard mitigation set forth through our Vegetation Management Plan, and higher-level cooperative goals. KCEC maintains a relationship with local fire officials and immediately reports any dangers noted to these officials. Our office conducts ongoing employee training to ensure staff ability to operate, report, and respond to situations in a professional and efficient manner.

The impacts of this project will greatly benefit existing efforts, allowing us to have a data-informed approach to understanding areas that may be particularly vulnerable to impacts of wind, avalanche, heavy snow, or wildfire. This information will allow us to proactively shut down functions of the grid, in order to greatly reduce risk of sparks increasing wildfire potential, without putting our cooperative members at risk.

2.6.c Residual Community Impact

This project will have a huge level of residual community impact, allowing our rural and tribal communities to have autonomy over their integrated microgrid and the piece of mind that comes with resilience against increasing extreme weather. Our goals during the project for workforce are: 1) Increase the northern New Mexico electric and technical workforce by at least 15 full staff and five apprentices per year. 2) Integrate current curriculum with resilient energy workforce needs alongside Northern NM College, Santa Fe Community College, and the University of New Mexico – Taos. Our in-project goals for community are 1) Reduce death due to grid shutdown during extreme weather events to zero. 2) Provide our Pueblo, Rural, and Tourist communities with peace of mind during wind storms and fire. 3) Allow for individuals to evacuate from Taos Ski Resort safely during periods of natural disaster. These goals, while simple, have the potential to transform employment opportunities in our region, will protect our vulnerable community members well into the future, and will allow northern New Mexico to write a new narrative on innovation, resilience, and energy for our region.

3.0 Workplan

3.1 Project Objectives

Taos Ski Valley: Support critical loads needed in the event of proximate wildfire and power outage or PSPS to enable emergency services and evacuation of the population.
El Rito: Support community critical loads (e.g., fire station, health clinic, child care center, telecommunications link, commercial kitchen, college dormitories, home health equipment) indefinitely in the event of an outage or PSPS; and priority loads during daylight hours.
Picuris Pueblo: Critical and priority load support as in El Rito, providing indefinite support to critical loads and supporting priority loads during daytime hours, tailored for and in consultation with the Tribe's particular facilities, operations, and needs.

3.2 Technical Scope Summary

KCEC is looking at increasing grid resilience and reliability to several communities that may be impacted by the threat of wildfire and long-term power outages due to extreme weather events. KCEC is looking at adding BESS to existing PV facilities and standalone BESS to address one of the communities that has land constraints to install PV. The Taos Ski Valley project will be a standalone BESS project that will have the capability to sustain power in the event of a wildfire in this area. The BESS will power identified critical loads (i.e. clinic, fire station,

communication towers and water pumping stations) to allow the evacuation of residents and allow first responders to start firefighting activities. The Picuris Pueblo project will have BESS added to an existing PV array to increase grid reliability and resilience in the event of a utility outage or wildfire and power shut off due to extreme weather events. In the past KCEC has been approached by the Carson National Forest officials to shut off power to this area as a precaution due to a wildfire that was approaching this area. By installing BESS to the area, KCEC can shut off power and still support critical community loads and assist in firefighting efforts. Also, this area is prone to high wind events that may require KCEC to de-energize overhead lines that supply power to this area which run through National Forest lands. Due to extreme drought conditions, KCEC may implement Public Safety Power Shutoffs to some of these areas to mitigate the chances of a wildfire due to the electric infrastructure. The El Rito project is similar to Picuris in adding BESS to an existing PV array. This area is prone to high wind events and its power supply runs through rural areas that are suspect to wildfire due to the current drought conditions. KCEC is working with Northern New Mexico College on this project and has identified critical loads that will need to have power in emergency weather situations or other utility outages. All necessary grid interconnection equipment and communications equipment will be installed in order to monitor and operate the systems remotely and as autonomous islanded microgrids.

3.3 WBS and Task Description Summary

Task 1. Project Management

- **Task 1.1**: *Kickoff Meeting*—Kickoff meeting with all project participants. At the kickoff meeting we will ensure submission of the Project Management Plan (PMP) and National Environmental Policy Act (NEPA) compliance.
- **Task 1.2**: Quarterly Updates/Reporting—Collect quarterly performance, schedule, and financial reporting data from all of the cooperative subprojects and prepare and present quarterly updates to DOE.
- **Task 1.3**: *Annual Reports and Final Report*—Collect annual performance, schedule, and financial reporting data from all of the cooperative subprojects and prepare written annual and final project reports.

Task 2. Community Engagement

- **Task 2.1**: *Community Scoping Meeting*—Identify community needs and prioritize loads
- **Task 2.2**: *Community Design Review*—Present KCEC plan to the community and seek feedback on community benefit.
- **Task 2.3**: *Community Updates*—Meet during key parts of the project to update community on progress and/or accrued benefits.

Task 3. Infrastructure Planning, Design, Deployment

- **Task 3.1**: *Conceptual Design*—Create rough sizing and siting so it can be presented to the community in WBS 2.1 to gain feedback. The content of the plan will include: geospatial representation of the upgrade and areas potentially affected by construction, affected customers, justification for the upgrade based on past or expected grid and community impacts, engineering approach and expected performance improvements, and estimated cost.

- **Task 3.2**: *Preliminary Design*—Develop BESS sizing and PV sizing, specify grid upgrades (topology/load switching), site drawings for BESS. Possible second round of community engagement.
- **Task 3.3** *Site/System Modeling*—Model the three independent sites, e.g. using Sandia National Laboratories or similar microgrid modeling tools, to confirm preliminary design.
- **Task 3.4**: *Final Design and Project Approvals*—Complete project final engineering and gain approval for grid upgrade plan through cooperatives' existing internal processes. Gain all necessary approvals from local, state, or federal agencies to proceed with construction.
- **Task 3.5**: *Construction*— Based on the approved project plan (3.4), complete site preparation, equipment procurement, grid upgrade construction, and quality assurance using KCEC procedures. Track project costs (equipment, labor hours, etc). Track the apprentice and internship jobs and hours for quantification of workforce development and community benefits.
- **Task 3.6**: *Testing and Acceptance*— Perform preliminary testing of the BESS site hardware and microgrid controls and remediate any deficiencies. Any remediation will be followed by acceptance testing to confirm project performance. (This will be coordinated with WBS 4.5)
- **Task 3.7**: *Operations and Data Collection—P*roject is put into routine operation, collect operational data sets to confirm site modeling in WBS 3.3. Collect data on events/failures that could lead to utility-ignition events and/or actual ignition events. Additional data may be collected on equipment, advanced technology, and project performance as it affects both wildfire resilience and day-to-day reliability

Task 4. Monitoring and Control System

- **Task 4.1**: *Develop System Specifications*—Leverage the Conceptual Design (WBS 3.1) to develop specifications for microgrid monitoring and control for resilience operations. Specifications will include conditions/methods for integration with KCEC SCADA system to enable islanded operation, e.g., permissive signals for triggering different control schemes.
- **Task 4.2**: *Adapt Current Monitoring and Control*—Modify and extend Camus Energy's current monitoring and control systems to manage BESS+PV islanded operations at a single BESS site.
- **Task 4.3**: *Offline/Emulated Testing*—Control system is tested in an emulated environment to verify control signals and logical functionality
- **Task 4.4**: *System Integration*—The control system is integrated with the BESS site hardware, KCEC SCADA, and other communications networks to enable control over BESS operations.
- **Task 4.5**: *Testing and Acceptance*—Perform preliminary testing of the integrated BESS site hardware and control systems and remediate any deficiencies. Any remediation will be followed by acceptance testing to confirm project performance.

Task 5. Workforce Development

- **Task 5.1**: *Develop Near-Term/Long-Term Workforce Requirements*—Leverage KCEC ongoing and long-term resource planning to forecast near-term and long-term workforce needs. Engage with New Mexico cooperatives with similar vision of renewables deployment to verify workforce needs.
- **Task 5.2**: *Training Centers*—Work with training centers and resources (Santa Fe Community College, Northern New Mexico College, the University of New Mexico - Taos, International

Brotherhood of Electrical Workers, lineman training, IT training, etc) to adapt/develop trial curriculum that meets the needs defined in WBS 5.1.

- **Task 5.3**: *Outreach and Recruiting*—Recruit workforce training candidates from KCEC service territory and surrounding areas.
- **Task 5.4**: *Workforce Training*—Enroll candidates in workforce training and provide support during training and post-training job placement.

Task 6. Dissemination

- **Task 6.1**: *Develop Dissemination Plan*—Develop plan for dissemination of technology and workforce training results to other cooperatives and communities, including site tours, online seminars, and sharing of modeling and operational performance data.
- **Task 6.2**: T*echnology/Methods Dissemination*—Execute dissemination plan, including presentations at two national conferences at which we will present results from this project as well as presentations to local institutions to further develop workforce pathways.

3.4 Milestone Summary

A kickoff meeting is scheduled for November 1, 2023 at which time tasks will be assigned to project team members. The Design tasks will start on November 1, 2023 and run through Final Design on September 30, 2024. The design tasks will determine the project details (system specifications) and deliverables at which point long lead time equipment will be ordered. Construction is scheduled to commence on May 5, 2025 and complete on February 28, 2026. Testing will overlap the construction phase commencing December 1, 2025 through May 1 ,2026. The Monitoring and Control System integration and testing will commence on October 1, 2025 and run through December 1, 2026. Workforce Development will commence on November 1, 2023 and continue through the duration of the project through June, 1 , 2027. All major milestones will be tracked and reporting submitted on a continuous basis.

3.5 Go/No Go Decision Point

The first Go/No Go decision point, at the end of the first project period (12 months), is the Finalization of the Specifications to order the battery packs and determining the lead time for delivery. At this point a decision will be made to extend the installation and testing of the BESS equipment.

S: Batteries have been delivered and are ready for installation;
M: Shipped status of battery packs;
A: Technical plans, community input, permits, and specifications will be completed;
R: Batteries must be delivered before construction and installation begins;
T: Month 12 of project plan.

The second Go/No Go decision point, at the end of the second project period (24 months), is Construction of the facilities. The BESS and major equipment delivery will determine if the construction time period will need to be extended. Which will affect the operational schedule. All other construction activities can proceed until equipment delivery is received.

S: Construction of all three facilities has started;
M: Broken ground on all three BESS sites;

A: Hiring of required staff and permitting for construction activities will be completed;
R: Construction during phase II will ensure project is not impeded by weather nor will extend the full project timeline;
T: Start construction month 19 of project.

The third Go/No Go decision point, at the end of the third project period (36 months), is the Operational task. If the delivery and construction are delayed due to availability of equipment the time period will need to be extended.

S: Successful installation of battery and integration to KCEC grid;
M: Camus Dashboards are enabled to record information from new BESS locations;
A: Construction will be completed, Camus systems are already integrated to existing KCEC PV facilities;
R: Integration of BESS data will enable resilient, proactive grid response;
T: Full integration will be complete and tested by month 44 of project.

3.6 End of project goal

Our end of project goal is to have three BESS and microgrid systems to support critical loads at Picuris Pueblo (2.5 MW), El Rito (1.25 MW), and Taos Ski Valley (3.75 MW). These systems, by the end of the project period, will be integrated into the larger KCEC grid but also have full islanding capacity for autonomous operationduring periods of high-risk fire weather, PSPS events, and other utility outages, to serve critical loads in these areas.

3.7 Project schedule

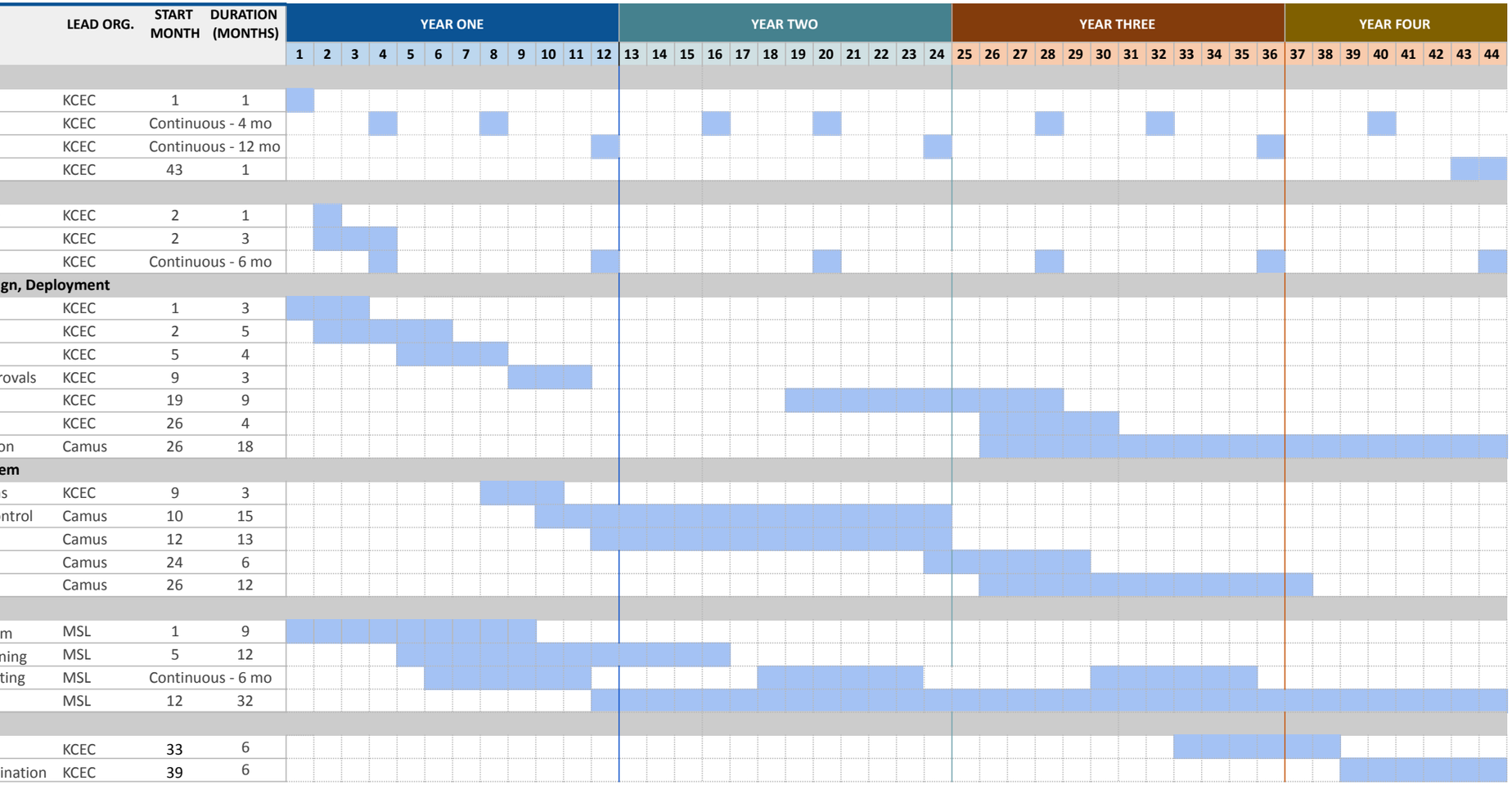
(see next page)

3.8 Buy America

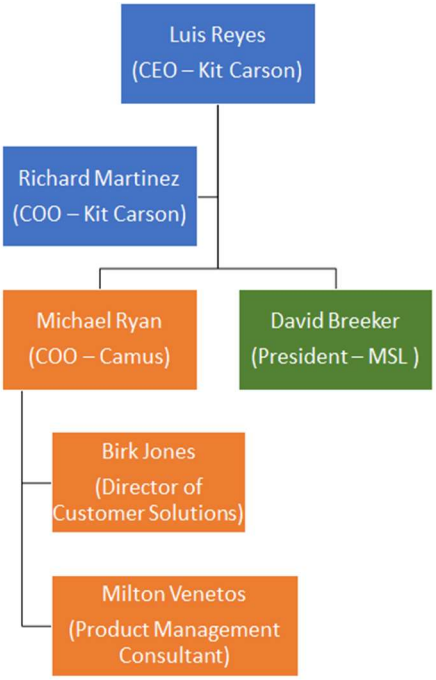
This project will adhere to the Buy America Requirement in the procurement and construction of new energy collection and deployment systems.

3.7 Project Schedule

WBS NUMBER	TASK TITLE	LEAD ORG.	START MONTH	DURATION (MONTHS)
1	**Project Management**			
1.1	Kickoff Meeting	KCEC	1	1
1.2	Quarterly Updates	KCEC	Continuous - 4 mo	
1.3	Annual Report	KCEC	Continuous - 12 mo	
1.3	Final Report	KCEC	43	1
2	**Community Engagement**			
2.1	Community Scoping Meeting	KCEC	2	1
2.2	Community Design Review	KCEC	2	3
2.3	Community Updates	KCEC	Continuous - 6 mo	
3	**Infrastructure Planning, Design, Deployment**			
3.1	Conceptual Design	KCEC	1	3
3.2	Preliminary Design	KCEC	2	5
3.3	Site/System Modeling	KCEC	5	4
3.4	Final Design and Project Approvals	KCEC	9	3
3.5	Construction	KCEC	19	9
3.6	Testing and Acceptance	KCEC	26	4
3.7	Operations and Data Collection	Camus	26	18
4	**Monitoring and Control System**			
4.1	Develop System Specifications	KCEC	9	3
4.2	Adapt Current Monitoring Control	Camus	10	15
4.3	Offline/Emulated Testing	Camus	12	13
4.4	System Integration	Camus	24	6
4.5	Testing and Acceptance	Camus	26	12
5	**Workforce Development**			
5.1	Develop Near-Term/Long-Term	MSL	1	9
5.2	Develop curriculum with Training	MSL	5	12
5.3	Outreach and Student Recruiting	MSL	Continuous - 6 mo	
5.4	Workforce Training	MSL	12	32
6	**Dissemination**			
6.1	Develop Dissemination Plan	KCEC	33	6
6.2	Technology/Methods Dissemination	KCEC	39	6



3.9 Project management



As the applicant and main recipient of funds, Kit Carson Electric Cooperative will be the lead organization for this project. All hiring, project management, and reporting will be done through Kit Carson Electric Cooperative under CEO, Luis Reyes.

WBS 1 - Project Management: All project management tasks will be led by KCEC staff. In place we have administrators, finance professionals, and support staff who will be key for maintaining active lines of communication with the Department of Energy and community members.

WBS 2 - Community Engagement: Kit Carson Electric Cooperative will continue to engage the local communities, key institutions of learning, and critical load facilities. KCEC will hold community scoping meetings (WBS 2.1) alongside listed community partners (Taos Pueblo, Taos Ski Valley, Picuris Pueblo, North Central NM Economic Development District, and local Institutions of higher learning) to ensure accessibility to all community members. Community updates (WBS 2.3) will be produced on a six-month basis.

WBS 3 - Infrastructure Planning, Design, Deployment: Chief Operating Officer of KCEC will manage the engineering staff, project partners Camus and Microgrid Systems Laboratories, and technical assistance partners to develop the Conceptual (WBS 3.1), Preliminary (WBS 3.2), and Site and System Modeling (WBS 3.3). All design and approvals will be sent through Luis Reyes for final approval.

Construction (WBS 3.5) and infrastructure testing and acceptance (WBS 3.6) will be managed and staffed by KCEC up to our current standard of excellence. Operations and Data Collection will be a collaborative effort between KCEC and Camus Energy.

WBS 4 - Monitoring and Control System: Camus Energy will be the lead partner for monitoring and control of BESS and microgrid systems, including adaptation of current monitoring control (WBS 4.2), offline/emulated testing (WBS 4.3), system integration (WBS 4.4), and testing (WBS 4.5). KCEC will develop system specifications alongside Camus and oversee the integration of new data into the existing system (WBS 4.1).

WBS 5 - Workforce Development: Microgrid Systems Laboratory will be the lead partner for workforce development serving as a point of contact for project workforce partners at Santa Fe Community College (SFCC), Northern New Mexico College – El Rito (NNMC), and the University of New Mexico – Taos (UNM). MSL will work with these partners to develop workforce requirements (WBS 5.1), ensure streamlined curriculum integration and training plans (WBS 5.2, 5.4), and assist with student recruitment (WBS 5.3).

WBS 6 - Dissemination: Each of the three partners of this grant, with collaboration from the workforce partners and community partners will develop a dissemination plan - including two conferences at which to present results from this project as well as local institutions to further develop workforce pathways.

KCEC adheres to the standard of the Davis-Bacon and Related Acts and Reorganization Plan No. 14 of 1950 and prioritizes local workers. KCEC ensures their subcontractors adhere to prevailing wages and the Davis-Bacon Act. We adhere to strict contractor requirements including: 1. Experience of the contractor in similar projects in size and scope. 2. Experience of individuals employed by the contractor on similar projects. 3. Implementation of current safety program that the contractor now utilizes. 4. A complete and comprehensive knowledge of the Davis-Bacon and Related Acts, and the related responsibilities of the contractor and any of their subs for proper reporting and documentation of prevailing wage. 5. Bonding capability of the contractor in line with guidelines for working on a federally funded project. The contractors will also have to be prepared to submit references from trade, vendor, banking, and industry sources.

For internal staff and hiring, KCEC has policies positioned to ensure and maintain a safe and healthy working environment for all employees, which also ensures time and cost efficient completion of proposed projects. The employee practices policy outlines requirements for safe and healthy behavior and responsibility for others and their property, requirements for using safety equipment and protective devices available to them, causes for termination of employment, and rules of work. KCEC holds safety meetings at least once a month for all employees to receive safety instruction.

The KCEC Safety Committee is composed of at least five employees, tasked with encouraging proper observance of safety rules at all times among fellow employees. The Safety Committee developed a safety incentive program where individuals and groups can be identified and financially recognized for periods of time during which no work related/compensable injuries or illnesses are recorded that result in a loss of one or more full days of work per on the job injury or illness.

4.0 Technical Qualifications and Resources

4.1 Key Personnel—Qualifications and Expertise

Luis Reyes and Richard Martinez, bring a combined 52 years of work experience at the electric cooperative forming deep knowledge of the business, and a deep connection to the community.

Mr. Luis Reyes (KCEC) has been Chief Executive Officer and General Manager at Kit Carson Electric since 1993. Mr. Reyes graduated from New Mexico State University with a Bachelor of Engineering. Mr. Reyes began his work with KCEC in 1984 as a System Engineer. He serves as Chairman and Director of National Rural Telecommunications Cooperative. He also serves on the boards of the Connect New Mexico Broadband Council, Kit Carson Museum, the Taos Business Alliance, Citizens of Economic Diversity, Leadership New Mexico.

As CEO of Kit Carson Rural Electric Cooperative in Northern, New Mexico, Luis Reyes has provided vision and leadership to turn the co-op into a company that offers a variety of diverse, competitive services including broadband Internet, renewable energy alternatives, and low-cost propane. His dedication to the co-op's mission is to deliver exceptional customer service with efficiency, professionalism, accountability and develop sustainable economic opportunities, which benefit its service communities. He has thrust the co-op into the limelight regionally and nationally.

KCEC and Mr. Reyes were recognized in November 2002 by the New Mexico Association of Commerce and Industry, for their work in helping build strong, vital communities in Northern New Mexico. Reyes also accepted the VIVA award which recognizes businesses that demonstrate their unique vision or corporate philosophy, their investment in the community, their vitality through the organization's growth or financial strength, and their action to make New Mexico a better place to live.

Richard Martinez (KCEC), graduated from Taos High School with the class of 1994. He studied electrical engineering at New Mexico State University, where he received his bachelor's degree in 2002. After college he was employed by El Paso Electric, followed by the White Sands Testing Facility NASA Site. He continued his education in 2006, receiving his Masters of Business Arts in 2008. He began his KCEC career as System Engineer in August of 2008. He was promoted to COO in 2012. Mr. Martinez has been a pioneer in the expansion of broadband services using existing electrical networks for KCEC.

Birk Jones (Camus Energy) is Director, Customer Solutions at Camus Energy. He is an expert in Distributed Energy Resource (DER) and Electric Vehicle (EV) grid integration analytics. He is also an expert in building heating/cooling control systems and fault detection using Machine Learning algorithms. Dr. Jones worked at Sandia National Laboratories in the Renewable, Distributed Systems Integration group as a research & development engineer prior to joining Camus Energy where he led multiple research projects focused on Photovoltaic (PV) and EV reliability, integration and control. He received a Civil and Environmental Engineering Bachelor's from the University of California, Davis. His graduate work at the University of New Mexico includes a Masters of Science in Civil & Construction Engineering and a Ph.D. in Mechanical Engineering.

Michael Ryan (Camus Energy) is the COO and a co-founder of Camus Energy. He has over 20 years of experience in software development, service delivery, business operations and executive leadership in the areas of data integration, business process management, Web, IOT and industrial data management. He has delivered key strategies, products, and programs for Xerox, NetApp, BD Biosciences, WellPoint, 2lemetry, GE, and Sony Biotechnology. Michael received his degree in Electrical Engineering and Computer Science from the University of California, Berkeley, has been certified as a Stanford Advanced Project Manager, and received an MBA at Santa Clara University.

Milton Venetos (Camus Energy) is a product management and customer solution consultant at Camus. He is a skilled engineer specializing in the creation and use of analytical modeling software packages within the energy industry. He has 20-plus years experience launching,

building and selling new hardware and software products and companies including GateCycle, acquired by GE Energy, and Linear Fresnel Solar at Ausra. He is a certified Six Sigma Greenbelt. He received a BSME, Mechanical Engineering from Worcester Polytechnic Institute and an MSME, Mechanical Engineering from Stanford University.

David Breecker (MSL) is the founder and President of the Microgrid Systems Laboratory. Mr. Breecker has successfully developed MSL's programmatic activities in research, innovation, demonstration, and education over the past seven years. He serves on the Management Team and Executive Committee for the NM EPSCoR SMART Grid Center, for which he also organized and leads the Industry Advisory Board, and for the past two years has led the Resilient El Rito Management Team and Technical Team. He previously founded the Santa Fe Innovation Park, and has consulted extensively in the strategic industry planning, economic development, and technology transfer and commercialization areas for over 20 years. Mr. Breecker has lived in El Rito and the surrounding region for over 30 years. He earned an MBA from Harvard Business School in 1982.

4.2 Existing Facilities and Equipment

KCEC will be executing BESS construction on their existing electric grid and primarily in existing right of ways. KCEC has developed and executed similar and larger capital improvement projects as part of their day-to-day utility operations and have the equipment and facilities necessary to complete this project.

The El Rito Project will utilize the existing 1.5 MW solar array for daytime power which is currently at 100% renewable. The NNMC El Rito Campus along with the El Rito community are powered 100% by this array during daytime solar generation hours. This community is approximately 20-line miles from the substation which makes it vulnerable during extreme weather events. During high wind events, KCEC can shut down the utility power and island the campus and critical loads to reduce the risk of wildfire caused by the electric grid. The BESS coupled with the existing solar array will provide green renewable energy by charging the BESS from the solar array and discharging the BESS during nighttime system peak demands periods to reduce the peak demand.

The Picuris Project will utilize the existing 1 MW solar array and the additional 1 MW solar array that is in the design stage and will be built in 2024 to power the Picuris Pueblo 100% solar during daytime solar generation hours. The BESS coupled with the existing solar array will provide green renewable energy by charging the BESS from the solar array and discharging the BESS during night time system peak demands periods to reduce the peak demand. Also, during high wind events, KCEC can shut down the utility power and island the reservation and critical loads to reduce the risk of wildfire caused by the electric grid. This area is also prone to wildfire since the 69 kV transmission and 24.9 kV distribution lines run through Carson National Forest. With current drought conditions coupled with extreme weather events, KCEC may have to shut off power. With the BESS microgrid installed KCEC can power critical loads identified by the community.

The Taos Ski Valley Project will utilize BESS as a standalone to power the community during extreme weather events and emergency situations. The Village of Taos Ski Valley is served by a radial electric line approximately 24 miles from the substation. In the event of a wildfire this area has a two-lane road and one way out. If power is shut down, the BESS can be utilized to power critical loads such as the medical clinic and emergency services (water pumping) to assist in firefighting and evacuation activities.

Camus Energy's "facilities" exist in the cloud. Our software team's expertise in pioneering the hyperscale cloud computing model at multiple tech companies gives us unique experience with building, operating, and securing highly reliable software systems at global scale. This pedigree ensures we are entering this innovative project with well-developed relationships, technical foundations, and project coordination skills to deliver project success. As reliable electricity is more important than ever, we manage a system of unreliable parts to enhance reliability and forecasting using approaches pioneered by team members to manage the largest technology software systems in the world. We integrate across various data silos and apply ML-driven data analysis to provide a holistic view of the grid and bridge the gap between DER planning and operations. Leveraging and extending the existing software platform provides a tested, scale-ready software foundation which will help utilities identify and operationalize grid value of DERs through reliable automation.

MSL will work with Santa Fe Community College to enable the use of the Educational Microgrid on its campus for workforce training purposes. This microgrid provides resilient power to the Controlled Environment Agriculture greenhouse utilizing a tracking PV array, a BESS, relay breaker, and switchgear, and is fully islandable. A Siemens MGMS microgrid controller will be integrated in the near future, as part of a campus-wide microgrid in development at SFCC.

4.3 Relevant Prior Work

Kit Carson Electric Cooperative has a long history of working alongside local government and community entities to ensure cooperative members have safe, reliable energy to their homes and community facilities.

Kit Carson Electric Cooperative is currently working on four projects with the listed project partners:

Resilient El Rito Microgrid - KCEC is partnering with Northern New Mexico College, Camus Energy, and the Microgrid Systems Laboratory on a community resilience microgrid project in the village of El Rito, New Mexico, based on and around the El Rito campus of Northern New Mexico College. The system architecture will incorporate a NNMC campus microgrid and college facilities within a larger community Distribution Feeder Microgrid serving all El Rito loads, and capable of load-shedding to support critical facilities in a nested architecture. An existing solar array will serve as the primary local generation source, and will be complemented by a BESS and switchgear, communications and controls. KCEC also serves on the project's advisory Technical Team, which is charged with evaluating all technical aspects of the system architecture.

Sandia AgriVoltaics - KCEC has partnered with Sandia Labs on a Renewable Energy Program in Questa, New Mexico with three goals in mind: to reduce the cost, to improve resilience and reliability, and to decrease the regulatory burden of renewable energy. This project was greatly research based, seeking to expand electrical production and agriculture through agrivoltaics by mounting elevated photovoltaics systems above crops, providing optimum light access for crop production. While the results from this research have morphed to an increased focus toward Green Hydrogen, due to the existing community assets in Questa, KCEC and Sandia Labs expect to see forward movement toward new renewable energy based economic opportunities for the community of Questa.

Questa Green Hydrogen - After receiving a technical assistance grant from DOE to explore clean energy development projects, the National Renewable Energy Laboratory, Sandia National Labs, Los Alamos National Labs, Chevron, KCEC, the Village of Questa, and the Questa Economic Development Fund have partnered to conduct a hydrogen feasibility study with the hope of opening a green hydrogen production facility in Questa.

Picuris Solar Array - Picuris Pueblo and Northern Pueblos Housing Authority partnered with KCEC to develop a Tribal Energy Plan through BIA and DOE funding for Clean Energy & Efficiency Projects on Indian Lands. On a 10 acre project site, KCEC developed a solar project that provides the Pueblo with secure energy, helps in efforts toward diversification of tribal investments, creates jobs, and attracts business to the area.

4.4 Time Commitments

Kit Carson Electric Cooperative

- Luis Reyes will commit 25% of his time over the project period to community engagement efforts and high-level administration of the grant. Luis Reyes will act as the Authorized Representative for this grant, ensuring that all progress reports and presentations are done on time. He will be the key point of contact for community members and DOE staff throughout the duration of the grant period.
- Richard Martinez will commit 30% of his time over the project period to oversee planning, construction, and deployment of the project. Richard will supervise workforce hiring, training, and management throughout the duration of the grant period.

Camus Energy

- Birk Jones will commit 25% FTE in the first year and 40% FTE for years two and three.
- Michael Ryan will commit 20% FTE for the full grant period.
- Milton Venetos will commit 25% FTE in the first year and 40% FTE for years two and three.
- Senior Staff Engineer will 30% FTE in the first year and 60% FTE for years two and three.

Microgrid Systems Laboratory

- David Breecker will commit one day per month over the project period to coordinate Workforce Development, and provide input on microgrid design, industry trends, and community economic development.