RESOLUTION OF THE
NAABIK'ÍYÁTI' STANDING COMMITTEE
24th NAVAJO NATION COUNCIL -- Fourth Year, 2022

AN ACTION RELATING TO THE NAABIK'ÍYÁTI' COMMITTEE; SUPPORTING THE KAYENTA CHAPTER'S APPLICATION TO THE NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION FOR TRIBAL BROADBAND CONNECTIVITY PROGRAM FUNDING; AUTHORIZING THE KAYENTA CHAPTER TO ACCESS AND BUILD THE INFRASTRUCTURE NECESSARY FOR "A RESILIENT BROADBAND SOLUTION FOR KAYENTA CHAPTER" IN THE BLACK MESA AND COMB RIDGE/EL CAPITAN REGIONS

WHEREAS:

A. The Naabik'íyáti' Committee is a standing committee of the Navajo Nation Council empowered to coordinate all federal, county and state programs with other standing committees and branches to provide the most efficient delivery of services to the Navajo Nation; and to review and continually monitor the programs and activities of federal and state departments and to assist development of such programs designed to serve the Navajo People and the Navajo Nation through intergovernmental relationships between the Navajo Nation and such departments. 2 N.N.C. §§ 700(A), 701(A)(4) and (A)(7).

B. The Kayenta Chapter of the Navajo Nation was officially certified as a Local Governance Act ("LGA") Certified Chapter in August 2010. As an LGA Certified Chapter, 26 N.N.C. §§ 101 – 103, the Kayenta Chapter has the delegated authority to enter into intergovernmental agreements with federal, state, tribal entities and/or their agencies, subject to the approval of the Naabik'íyáti' Committee of the Navajo Nation Council.

C. The Kayenta Chapter has applied to the National Telecommunications and Information Administration (NTIA), U.S. Department of Commerce under Funding Opportunity Number ("FOA"), NTIA-TBC-TBCPO-2021-2006948, for Tribal Broadband Connectivity Program funding. The Notice of Funding Opportunity ("NOFO") Executive Summary is attached as **Exhibit A.** The Kayenta Chapter's application is attached as **Exhibit B.**

D. The Kayenta Chapter's application for Tribal Broadband Connectivity Program funding is to build and develop the infrastructure for "A Resilient Broadband Solution for Kayenta Chapter" in the Black Mesa and Comb Ridge/El Capitan regions.

E. Black Mesa is located at 36°33′35.62′′N, 110°24′28.24′′W with an area of 68,860 acres; Comb Ridge/El Capitan is located at 36°46′49.96′′N, 110°10′8.38′′W with an area of 10,579 acres.

F. Kayenta Chapter's goal is to establish a combined solution, with fast-speed broadband connectivity and supporting power infrastructure, covering residential communities in both Comb Ridge/El Capitan and Black Mesa regions with 120 and 100 multi-family houses, respectively.

G. The broadband connectivity will ensure upwards of 100 Mbps download and 20 Mbps upload speeds. The broadband deployment will utilize satellite connection and build four transmitters (two in each community), which includes two primary transmitters and two intermediate sites with towers, Ethernet switches, wireless equipment, IP and security installment.

H. The goal and final outcome of the "A Resilient Broadband Solution for Kayenta Chapter" ("Project") is a reliable and resilient broadband network coupled with power infrastructure that offers internet connectivity and electricity access to residents in the targeted regions.

I. The scope of the Project will serve at least 1053.8 people out of which 296.38 are K-12 students and 478.9 are of working age adults.

J. The Kayenta Chapter is locally governed by 2 full-time and 3 part-time administrative staff. The staff is overseen by three (3) elected officials, i.e., Chapter President, Chapter Vice-President, and Chapter Secretary-Treasurer.

K. The Project is part of Kayenta Chapter's 5-year economic development plan and is expected to generate economic prosperity, provide access to education, jobs, basic convenience, emergency public safety assistance and health, and to significantly improve the quality of life of residents.

L. Broadband will also open up new opportunities for information exchange whose importance has become particularly critical during COVID 19 pandemic. For example, broadband will connect local residents, many of whom are farmers, to various online platforms of trading; facilitating purchases and sales of agrarian and handmade products without being constrained to local markets.

M. The broadband connection will also promote distant learning programs and expand overall education levels, which provides

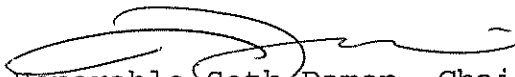important and long-term engines to improve the well-being of residents.

N. In the future, the developed education programs set forth in the Project will help indigenous residents to preserve their cultural memory and knowledge systems while mastering new knowledge and skills with the support of higher education agencies, such as universities, and other non-profit or free education organizations.

THEREFORE, BE IT RESOLVED THAT:

A. The Navajo Nation supports the Kayenta Chapter's application to the National Telecommunications and Information Administration, Funding Opportunity Number NTIA-TBC-TBCPO-2021-2006948, for Tribal Broadband Connectivity Program funding.

B. The Navajo Nation also authorizes and allows the Kayenta Chapter to access and build the infrastructure necessary to implement "A Resilient Broadband Solution for Kayenta Chapter" in the Black Mesa and Comb Ridge/El Capitan regions.

CERTIFICATION

I, hereby certify that the foregoing resolution was duly considered by the Naabik'íyáti' Committee of the 24th Navajo Nation Council at a duly called meeting in Window Rock, Navajo Nation (Arizona), at which a quorum was present and that the same was passed by a vote of 19 in Favor, and 00 Opposed, on this 26th day of May 2022.

Honorable Seth Damon, Chairman
Naabik'íyáti' Committee

May 26, 2022
Date

Motion: Honorable Elmer P. Begay
Second: Honorable Eugene Tso

Chairman Seth Damon not voting
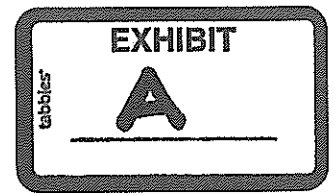
NOTICE OF FUNDING OPPORTUNITY

TRIBAL BROADBAND CONNECTIVITY PROGRAM

EXECUTIVE SUMMARY

A. Federal Agency Name

National Telecommunications and Information Administration (NTIA), U.S. Department of Commerce

B. Funding Opportunity Title

Tribal Broadband Connectivity Program

C. Announcement Type

Initial

D. Funding Opportunity Number

NTIA-TBC-TBCPO-2021-2006948

E. Assistance Listing (CFDA Number)

11.029, Tribal Broadband Connectivity Program

F. Key Dates

- Applications submitted online through the Grants.gov system must be received no later than 11:59 p.m. Pacific Daylight Time (PDT) on **September 1, 2021.**
- Applications submitted by postal mail or by courier service must be postmarked (for postal mail) or show clear evidence of mailing (for courier submissions) no later than 11:59 p.m. Pacific Daylight Time (PDT) on **September 1, 2021.**
- Applications submitted by electronic mail must be received no later than 11:59 p.m. Pacific Daylight Time (PDT) on **September 1, 2021.**
- *See* Section D in the Full Announcement Text of this Notice of Funding Opportunity (NOFO) for detailed information concerning application submission requirements.

Eligible entities must submit a single application by the application deadline to be eligible for program funding. The Tribal Broadband Connectivity Program is not a formula or block grant program and a single application for funding must be timely submitted by an eligible entity to receive funding consideration from NTIA.

G. Application Submission Address

Complete application packages may be submitted: (i) electronically through www.grants.gov; (ii) through electronic mail; or (iii) by postal mail or courier. NTIA prefers that applicants use Grants.gov to submit their applications; however, applicants must submit complete application packages using only one of these methods and may not submit partial or duplicate applications using multiple methods of transmission. *See* Section D. of this NOFO for detailed information concerning application submission requirements.

Eligible entities may only submit a single application for funding pursuant to this program. Accordingly, an eligible entities' single application must include the total amount of funding being requested and must account for all projects that will utilize the requested funding. *See* Section C.3.a of this NOFO for additional information on the single application requirement.

H. Funding Opportunity Description

NTIA issues this NOFO to describe the requirements under which it will award grants for the Tribal Broadband Connectivity Program, authorized by the Consolidated Appropriations Act, 2021, Division N, Title IX, Section 905(c), Public Law 116-260, 134 Stat. 1182 (Dec. 27, 2020) (Act). The Tribal Broadband Connectivity Program provides new federal funding for grants to eligible entities to expand access to and adoption of: (i) broadband service on Tribal Land; or (ii) for programs that promote the use of broadband to access remote learning, telework, or telehealth resources during the COVID–19 pandemic. *See* Section A. of this NOFO for the full description of this program.

Additionally, the American Rescue Plan Act of 2021 appropriated $10 billion to the U.S. Department of the Treasury (Treasury) to establish the Coronavirus Capital Projects Fund to provide funding to states, territories, and Tribal Governments to carry out critical capital projects directly enabling work, education, and health monitoring, including remote options, in response to the public health emergency with respect to the Coronavirus Disease (COVID-19).[1] NTIA is coordinating with Treasury to allow Tribal Governments to indicate their interest in receiving funding under the Treasury program when they submit their application for NTIA's Tribal Broadband Connectivity Program in accordance with the process outlined in this NOFO. *See* Sections B.1 and D.2.d.3 of this NOFO for more information.

I. Funding Instrument

Grant.

J. Eligibility

Section 905(a)(8) of the Act specifies the following entities as eligible to receive grants pursuant to the Tribal Broadband Connectivity Program: (i) a Tribal Government; (ii) a Tribal College or

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[1] American Rescue Plan Act of 2021, Title IX, Subtitle M, Section 9901, Public Law 117-2 (March 11, 2021). Section 9901 of the Act amends Title VI of the Social Security Act (42 U.S.C. 801 *et seq.*) to add Section 604, which establishes the Coronavirus Capital Projects Fund.

University; (iii) the Department of Hawaiian Home Lands on behalf of the Native Hawaiian Community, including Native Hawaiian Education Programs; (iv) a Tribal organization; or (v) an Alaska Native Corporation. There are several instances where applicants will need to obtain a Tribal Government Resolution. Each "eligible entity" must coordinate internally (which includes all departments, subsidiaries, etc.) in submitting its single application. In an instance where one "eligible entity" is a subsidiary of another (*e.g.*, a Tribal Government and a subsidiary Tribal College or University), this shall not affect the subsidiary's eligibility to submit its own application, so long as it includes the requisite Tribal Government Resolution. *See* Section C of this NOFO for additional information concerning the eligibility requirements for this program.

K. Anticipated Amounts

NTIA will make up to $980,000,000 available for federal assistance under the Tribal Broadband Connectivity Program. In accordance with Section 905(c)(3)(A) of the Act, NTIA will allocate not less than 3% of the funds, or not less than $30,000,000, for the benefit of Native Hawaiians.

To further meet the equitable distribution requirement of the Act, NTIA will allocate up to $500,000 to each of the Federally Recognized Tribes delineated by the Department of the Interior's Bureau of Indian Affairs in accordance with Section B.3 of this NOFO. The $500,000 allocation is not a funding cap for Federally Recognized Tribes, but rather is intended to ensure that program funding is equitably distributed by NTIA to all eligible entities, including Federally Recognized Tribes. The $30,000,000 and $500,000 allocations are not funding caps for the Department of Hawaiian Home Lands or for Federally Recognized Tribes, respectively, but rather are intended to ensure that program funding is equitably distributed by NTIA to all eligible entities.

NTIA expects to make awards under this program within the following funding ranges:

Broadband Infrastructure Deployment Projects: $1,000,000 to $50,000,000.
Broadband Adoption and Use Projects: $50,000 to $2,500,000.

These funding ranges are not required minimums and maximums, but eligible entities requesting funding for projects outside of these ranges must provide a reasonable explanation for the variance in their project size. The period of performance for grants issued pursuant to this program is one year; however, the Grants Officer may extend the period of performance beyond one year for broadband infrastructure projects. *See* Section B of this NOFO for additional information pertaining to award amounts and to the period of performance for grants issued pursuant to this NOFO.

L. Cost Sharing/Matching

The Act authorizing the establishment of the Tribal Broadband Connectivity Program does not contain a statutory cost sharing or matching funds requirement. NTIA will not require an eligible entity applying for a grant under the Tribal Broadband Connectivity Program to provide a non-federal cost contribution. *See* Section C of this NOFO for more information pertaining to the cost sharing requirements for this program.
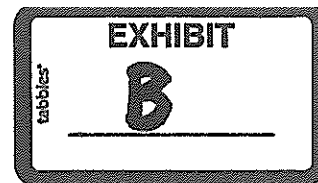
FOA Title: Tribal Broadband Connectivity Program
FOA Number: NTIA-TBC-TBCPO-2021-2006948
FOA Agency Name: National Telecommunications and Information Administration (NTIA), U.S. Department of Commerce
Project Title: A Resilient Broadband Solution for Kayenta Chapter of the Navajo Nation
Applicant: The Navajo Nation Tribal Government-Kayenta Chapter
Point of Contact: Dalton Singer, President Kayenta Chapter, dsinger@navajochapters.org 928-429-0293
Business Point of Contact: Mr. Dalton Singer

Key Participants:

Name	Type	Contact
The Navajo Nation Tribal Government-Kayenta Chapter	Indian Tribe	Mr. Dalton Singer, President Kayenta Chapter 1 Mile North Hwy 163, Kayenta, AZ 86033-1066 dsinger@navajochapters.org
University of Utah	Academic	Prof. Jianli Chen Prof. Shundana Yusaf Prof. Mostafa Sahraei-Ardakani Prof. Mingxi Liu 201 Presidents' Cir Salt Lake City, UT 84112 USA jianli.chen@utah.edu
New Sun Road	Small Business	Dr. Jalel Sager, CEO Mr. Jonathan Lee, Senior R&D Engineer Dr. Michael Goldbach, CPO 1301 South 46th St. Building 112 Richmond, CA 94804 USA jalel.sager@newsunroad.com
Native Network	Small Business	Andrew Metcalfe, President/CEO Native Network Inc, 250 Penny Road, Suite 200 Wenatchee WA, 98801 metcalfe@nativenetwork.com
Microsoft	Large Business	Rachna Vas, Business Program Manager Microsoft Airband US – Rural One Microsoft Way, Redmond, WA 98052 rachnavas@microsoft.com
Diné Energy	Small Business	Lauren Conklin, CEO P.O. Box 1042 Shiprock, NM 87420 USA lauren@dineenergy.com

This Full Application does not include confidential material

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1. Executive Summary

1.1 Project Overview

This proposal is submitted to Tribal Broadband Connectivity Program for <u>broadband deployment</u> and <u>broadband adoption</u> in the Black Mesa and Comb Ridge/El Capitan regions located in the Kayenta Chapter of the Navajo Nation. Black Mesa is located at 36°33'35.62''N, 110°24'28.24''W with an area of 68,860 acres; Comb Ridge/El Capitan is located at 36°46'49.96''N, 110°10'8.38''W with an area of 10,579 acres. Dedicated to introducing high speed broadband connection to the community to promote resilient economic development, education, telehealth, and well-being of the targeted areas, the Kayenta Chapter is partnering with Native Network, New Sun Road, Microsoft, the University of Utah, Nááts'ílid Initiative and Diné Energy. Our goal is to establish a combined solution with fast-speed broadband connectivity and supporting power infrastructure, covering residential communities in both Comb Ridge/El Capitan and Black Mesa regions with 120 and 100 multi-family houses respectively. The broadband deployment will utilize satellite connection and build four transmitters (two in each community), which include two primary transmitters and two intermediate sites with towers, Ethernet switches, wireless equipment, IP and security installment. Due to the limited access of electricity in the service areas, power infrastructure will be deployed as part of the solution, not only as a necessity for supporting broadband infrastructure operation, but also for enabling the electricity access in daily lives of local residents. Currently, only limited electricity is available from a weak distribution connection, requiring a reliable, distributed energy solution to offer significant resilience to the broadband infrastructure. Once the deployment of combined broadband and power infrastructure is complete, the project team will facilitate the broadband adoption in the Black Mesa and Comb Ridge/El Capitan area, starting from understanding the basic needs of broadband usage for residents, to broadband training program establishment for meeting critical needs of these residents, training of liaison trainers, residents, and job competency of local business for broadband operation sustainment. The final outcome of this project is a reliable and resilient broadband network coupled with power infrastructure that offers internet connectivity and electricity access to residents in the targeted regions. This will be coupled with a set of training programs for onboarding and capacity building for broadband adoption and project development; and local support system for regular maintenance.

1.2 Applicant Description

The Navajo Nation Tribal Government-Kayenta Chapter is the Applicant. The Applicant has not received any previous grants from NTIA, US Department of Commerce, Tribal Connectivity Program. The Kayenta Chapter has an estimated total population of 6,211, with the total of indigenous population of 5,907. The scope of this proposal will cover 120 houses in El Capitan/Comb Ridge and 100 houses in Black Mesa. It will serve at least 1053.8 people. The chapter is locally governed by 2 full-time and 3 part-time administrative staff. These are overseen by 3 elected officials. Kayenta is represented by Chapter President Dalton Singer, the PI of this project. This project is part of Kayenta's 5-year economic development plan. The chapter leadership aims to provide water, electricity, and septic tanks to 100% of all of the residents of Kayenta Chapter.

1.3 Benefits

This proposal envisions combining highspeed broadband deployment and adoption of broadband and power infrastructure. Accordingly, it is expected to generate economic prosperity, provide access to education, jobs, basic convenience, and health, significantly improving the quality of life of residents. One, the infrastructure for power capable of sustaining broadband connection and domestic energy usage will satisfy the basic electricity needs of local residents.

When combined with the deployment of high speed broadband, it would bring about widespread economic prosperity. Two, broadband will connect local residents, many of whom are farmers to various online platforms of trading; facilitating purchase and sale of agrarian and handmade products without being constrained to local markets. The internet service also opens up new opportunities for information exchange, whose importance, has become particularly critical during COVID 19 pandemic. Three, the broadband connection will promote distant learning programs and overall education levels, which provides important and long-term engines to improve well-beings of residents. The developed education programs in this proposal will help indigenous residents to preserve their cultural memory, knowledge system while mastering new knowledge and skills with the support of higher education agencies, such as universities, and other non-profit or free education organizations. Four, the internet service will enhance the quality of life of local residents, offering easier access to health professionals for humans, animals and plants alike. The broadband connection will provide residents in Black Mesa and Comb Ridge/El Capitan region ease of health management by reducing the need of residents to commute long distance for medical services. The successful completion and demonstration of this project will set up a model and template for other tribal and rural communities in the Navajo Nation and beyond. It will impact the lives of at least 1053.8 people; out of which 296.38 are K-12 students and 478.9 are of working age adults.

1.4 Impact of NTIA Funding

The NTIA funding is critical to the success of this project and long-term improvement of quality of lives in the targeted service regions. Our project proposes to build a combined solution with broadband and power infrastructure to facilitate local residents to access to internet connection and electricity, which will benefit regional development from numerous aspects mentioned above. Without support from NTIA, the Kayenta Chapter will need to find other sources to invest in the infrastructure, putting undue burden on the government and impeding its planning for regional development. The current budget of the Chapter does not allow for such an ambitious undertaking. If not funded, the broadband and electricity access to the local community will remain limited for a longer period of time until sufficient funding is collected and financial standings of local chapter government improves. These improvements are not expected to happen during the time of pandemic. The economy, education, health, and quality of life of proposed service areas will be significantly improved as the outcome of this project after the deployment of combined broadband and power infrastructure and training of broadband adoption for local residents.

2. Description of Eligible Entity and Qualification

Organization	Address	Role	Scope of Work	Funding Request
The Navajo Nation Government - Kayenta Chapter	1 Mile North Hwy 163, Kayenta, AZ 86033-1066	Applicant	Broadband Deployment and Adoption	$ 159,763.00
Diné Energy	P.O. Box 1042 Shiprock, NM 87420	Subrecipient	Broadband deployment	$ 520,000.00
Microsoft	One Microsoft Way, Redmond, WA 98052	Subrecipient	Broadband deployment	$ 764,331.40
Nááts'íilid Initiative	P.O. Box 2003, Dennehotso, AZ, 86535	Subrecipient	Broadband deployment	$ 37,733

Native Networks	250 Penny Road, Suite 200 Wenatchee WA, 98801	Subrecipient	Broadband deployment	$ 2,346,514.63
New Sun Road	1301 South 46th St. Building 112 Richmond, CA 94804	Subrecipient	Broadband deployment	$ 3,454,400.00
University of Utah	201 Presidents' Cir Salt Lake City, UT 84112	Subrecipient	Adoption	$ 398,978.00

The applicant of this project is **Navajo Nation Tribal Government-Kayenta Chapter**. Its staff and political representatives will lead the efforts and coordinate sub-recipients and required local resources to ensure the success of the project. Specifically, Mr. Dalton Singer from the Kayenta Chapter will supervise the overall task progress and be responsible for financial management.

Diné Energy is a sub-recipient, and will be responsible for all the onsite installation of power and broadband infrastructure. Diné Energy is a solar company with experts having over 20 years of experience in the solar industry, although it does not have experience in installation for internet. It will be supported in this endeavor by New Sun Road and Native Network. This element of our project is critical to our commitment to building capacity of indigenous enterprises, creating skilled and well-paying local jobs, developing plans for efficient and timely maintenance and expansions. Imbedded in Navajo Nation, Diné Energy understands the challenges of implementation and maintenance.

Microsoft is a sub-recipient, and will be responsible for digital literacy education for local residents. Microsoft is the world-renowned company that is leading in producing computer software, consumer electronics, personal computers, and related services.

Nááts'íld Initiative is an indigenous led and coalition-driven group of community activists, educators, designers and builders, embedded in Kayenta, Dennehotso and Chilchinbeto chapters and developed several partnerships with other organizations active in the area. All these are initiatives in the built environment that we have harnessed as occasions to strengthen the cultural and economic resilience of Dinétah through self-reliance. Its team has long standing experience in cultural mapping, culturally meaningful data gathering, community engaged workshops, and infrastructural and architectural design.

New Sun Road is a sub-recipient, and will work with the Native Network to develop broadband deployment. New Sun Road is a Public Benefit Corporation with the mission of accelerating energy and internet access for under-served communities around the world. It is an industry leader in remote microgrid management, operating more than 200 microgrids in over 16 countries on its Stellar Microgrid OS™. New Sun Road provides a broad array of engineering, project management, and community development services to complement its products, including microgrid analysis and design, data analytics, internet connectivity solutions, and education. As a lead on closely related projects, New Sun Road has delivered custom microgrids for rural development in Uganda dating back to 2014, and is currently leading a United States Agency for International Development (USAID) sponsored project to deliver power and connectivity solutions and digital literacy programs to 10 schools in rural Guatemala.

The University of Utah is a sub-recipient, and will be in charge of the adoption of the project through surveying and developing training programs. It will survey the targeted communities, their broadband needs, and employment training needs. It will workshop the barriers to development and

potential adoption challenges, develop and deliver training for liaison trainers, Navajo residents, Telehealth enabling, and broadband job competency. The team from the University of Utah is composed of four faculties from Department of Electric and Computer Engineering, School of Architecture, and Department of Civil Engineering. The team has rich experience in the research and implementation needs of Kayenta, Dennehotso, and Chilchinbeto chapters. It has expertise in energy audits, ethnographic surveys, cultural mapping, teaching, community engaged microgrid design and control, smart power system operation, and renewable energy and building integration. Team members have successfully managed and completed a number of previous DOE, ARPA-E, NSF, DOD, and California Energy Commission projects relevant to microgrid, renewable energy system design, and building operation.

Native Network has 30 years of experience and with recent discussions with engineering firms, fiber construction companies, equipment manufacturers and vendors. Native Network and Chief Engineer Andy Metcalfe have the requisite experience with industry standard construction methodology to design, plan and supervise the construction of the four monopole towers and installation of the communication site infrastructure including microwave and satellite connections. A track record of successful ISP operations in Indian County uniquely position Mr. Metcalfe in the project. The company's long standing industry relationships allow for accurate pricing accounting for regional variances, supply chain issues and current market conditions. The company is familiar with the regulatory requirements both on and off Reservation including federal agencies such as the FAA and FCC as well as state, county, and tribal authorities.

3. Project Goal

The goals of this project are to (1) establish a combined solution with reliable broadband connection and power infrastructure to residential communities in both Comb Ridge/El Capitan and Black Mesa region of Kayenta Chapter of Navajo Nation to enable the internet and electricity access for local residents, and (2) facilitate the adoption of internet service to boost the economic and education development in the service regions. Specifically, the deployed broadband network will provide internet services to an estimate of 1053.8 occupants in the service regions. The power infrastructure as part of the project solution will support 24/7 unintermittent internet connection, and also importantly, provide local residents with electricity access in daily energy usage. With the planned training programs for broadband adoption, the project targets to holistically benefit regional economy, education, life convenience, and health in both Comb Ridge/El Capitan and Black Mesa according to the identified needs of the community. With capacity building of local business (Diné Energy) and involvement of non-profit organizations in the university and Navajo Nation, the project aims to sustain the long-term operation of broadband and power infrastructure in the service regions and anticipate fulfilling the vision of the Kayenta Chapter government to improve the quality of life for its residents by offering stable internet connection and electricity access.

4. Project Activity and Timeline
For Resilient Broadband Deployment:
Task D1. Deploy Broadband Infrastructure

This task will design and deploy broadband infrastructure in the El Capitan and Black Mesa areas. Considering the highly remote and rugged terrain of the proposed network an all-wireless broadband network is proposed. The masterplan of the proposed network can be found in Attachment. The network will consist of a satellite link providing Internet connection to each tower. Each Community requires two towers for adequate coverage. Carrier grade internet in provided by Native Network via these satellite links that will meet or exceed the NTIA mandate of 25 Mbps/3 Mbps speed requirements to the approximate 240 homes within the communities. A point to multipoint radio fixed wireless system capable operating at 5 GHz will be utilized. This Fixed Wireless broadband solution will provide high speed Internet to the addressable unserved homes in

the two communities. The proposed network also requires a microwave system that inter-connects the towers in each community to provide network redundancy and bandwidth sharing between the satellite links. This task will be accomplished through the following 3 subtasks.

Subtask D1.1. Deploy satellite backhaul

Intelsat's Globalized Network combines the world's largest satellite backbone with terrestrial infrastructure, managed services and an open, interoperable architecture to enable customers to drive revenue and reach through a new generation of network service. Intelsat's Carrier Internet backhaul product with provide a highly resilient internet connection to each of the four towers in the project. A separate receiver + antenna structure is placed at each location and is capable of 40 Mbps/10 Mbps sustained. This connection is connected to the Fixed wireless for distribution. Native Network will provide its internet services utilizing this best-in-class infrastructure.

Subtask D1.2. Deploy towers

A fixed wireless network will provide a high-speed connection to the homes in the target communities due to the remoteness of the houses the only effective way to cover the tribal constituency living in these communities. These homes will receive fixed wireless connections capable of 25/3 Mbps download/upload speeds.

Due to the wide expanse of the Communities up to 16 miles multiple towers are required to cover targeted unserved homes. Two towers are located in each community to provide the coverage. The towers are 100-ft monopoles capable of a single carrier. They are strategically located in the communities to provide maximum coverage and located within line of site of each other. Line of site is important to allow the microwave interconnection to provide redundancy in the case of a failure in the satellite link.

These towers are planned to be 100-ft monopoles with a crow's nest near the top. The tower will be constructed to provide mounting infrastructure for three 90-degree sectors of 5GHz unlicensed radios providing a 360-degree radio coverage from each tower. Cambium MP450 Medusa radios equipment with MUMIMO and beamforming technology are to be installed on these mounts to provide a very high-quality wireless connection to each unserved household outside of the fiber footprint. Brackets for microwave systems are included and installed at 100 ft on the towers. Each tower will have a prefabricated 9'x15' communications shelter to house all required equipment. Key electronic equipment includes the Cambium radio indoor components, Ethernet switches and other various electronics. The shelter will also contain redundant HVAC.

Remote power systems will be provided by New Sun Road and contemplated to be collocated near tower site to provide power resilience.

The target sites are located on Tribal land and will need both environment impact and Tribal Historical review. The other tower will be near the Nation's Dump Site on the neck portion of Territory in an area of previously disturbed land that has undergone environment and historical preservation review. The area is planned to be purposed as an economic zone for the Navajo Nation.

Subtask D1.3. Deploy fixed distribution network

The fixed wireless network consists of four new towers built on reservation land. These towers will use a radio network built upon the Cambium MP450 MEDUSA Platform to provide the Point to Multipoint connections. The Cambium platform is a feature-rich carrier-grade platform utilizing state of the art wireless technology such as MU-MIMO and Beam Forming technology to ensure fast, stable connections at distances of several miles.

The tower sites with radio equipment transmit radio signals at a frequency of 5 GHz +/-. These signals are received by a Subscriber Unit (SU) at the customer's home which typically includes an integrated antenna and is mounted to the outside of the home at roof level using a j-pole bracket. An Ethernet cable is routed into the home where it is connected to a Power over Ethernet (POE) adapter and then into the home Wi-Fi router for Internet distribution within the home.

The network design for the two communities are planned to be fixed wireless sites using unlicensed spectrum in the 5 GHz band. The fixed wireless equipment is Cambium MP450 Medusa Access Points using MU-MIMO and Beam Forming along with proprietary software to provide a state-of-the-art robust wireless network. Each site will be feed from by an Intelsat Internet Backhaul Service. The service provides a wholesale carrier grade internet connection of 40Mbps/10Mbps transport service. The network connects into the Native Network POP Located at the Intelsat Teleport in Virginia. Native Network ISP services are provided over the transport network. Each site will support up to 60 homes with 25/3 internet services.

The ISP services consist of an ISP Core, Firewall, Billing and Operational Support Systems. A fully functional Turnkey ISP service. Monitoring and Management of the system is performed by Native Network with access to designated Kayenta IT professionals.

In the El Capitan community: There are two tower sites in the El Capitan Network. Each site has a Satellite connection with internet to serve up to 60 homes with 25/3 internet speeds. The two sites are connected with together with licensed microwave systems in order to share broadband load in times of heavy usage and to provide redundancy should one Satellite link go down for some reason. The sites labeled El Capitan #1 and #2 (in the .kmz file) are planned to be 100-ft monopole type structures. A 9'×15' turn-key communication shelter is located at each tower to locate the required equipment. A remote power system will be deployed by New Sun Road to provide uninterrupted, resilient power supply.

In the Black Mesa community: There are approximately 120 homes in the Black Mesa community spread out over a large geographic area. There are two tower sites in the Black Mesa Network. Each site has a Satellite connection with internet to serve up to 60 homes with 25/3 internet speeds. The two sites are connected with together with licensed microwave systems in order to share broadband load in times of heavy usage and to provide redundancy should one Satellite link go down for some reason. The sites labeled Black Mesa #1 and #2 (in the .kmz file) are planned to be 100-ft monopole type structures. A 9'×15' turn-key communication shelter is located at each tower to locate the required equipment. A remote power system will be deployed by New Sun Road to provide uninterrupted, resilient power supply.

Task D2. Deploy Microwave Redundancy

This task aims to construct a high-speed microwave link between the Black Mesa Towers and the El Capitan Towers. These links will serve to provide primary redundancy as well as bandwidth sharing via SDWAN between the respective sites.

The two links will be Cambium PTP820C radios operating at 18 GHz. The through put capacity exceeds the total bandwidth available to each tower so 100% backup is available across the links. Note that 18 GHz is a common carrier band and is available to Native American Tribes at no cost. The frequency coordination costs are minimal.

The network will be initially setup at with an aggregate throughput of 2.5 Gbps however are upgradeable to 5 Gbps without changing antenna configuration in the future. 3-foot parabolic high-performance antennas are to be used to establish an engineered link with sufficient fade margin to maintain 99.995% reliability.

Task D3. Enable ISP Network

The ISP network provides the necessary capability to provide a sustainable service to end users. This consists of a core router, Ethernet switches, satellite transport and the Fixed Wireless point to multipoint broadband delivery systems in the remote locations.

The ISP equipment will be hosted in the Native Network Tribal Hub site located in Teleport at 7625 Technology Blvd Hagerstown, MD. The Internet originates from the Native Network Internet and utilizes the Intelsat satellite network for backhaul between the remote base stations and the ISP Network. A Micro ISP will be established using the RG Nets RxG S4 platform and the Native

Network ISP in a box software suite. All components of a state of the are Internet Service Provider are provided across the satellite to each of the 4 base station sites.

The ISP will be initially set up to handle up to 500 users but is scalable to many thousands of subscribers. Additional services such as disaster recovery, VPN and data storage can also be accommodated.

Task D4. Deploy Power Systems

Subtask D4.1. Survey the solar for broadband infrastructure needs
All team members will meet at the community to conduct surveys to collect precise data to refine the design of the microgrid and project timeline. This effort will include:
- Measuring geographic information to draw a map reflecting the accurate distances between buildings and conduct archaeological clearance for determining appropriate locations for placing the solar-powered energy storage system and radios for enabling satellite internet.
- Collecting the solar irradiation data for the determination of the best solar panel tilt angle;
- Surveying each household to project the daily, monthly, and annually energy use patterns for the optimization design of the microgrid control platform.

Subtask D4.2. Workshop network power system design
Based on the collected field data, the team will refine the planned microgrid design by holistically considering the engineering aspects. First, the team will determine the location of the solar-based integrated energy system by consulting the Navajo Nation Land Administration for land use, counting in the additional cost of power lines to connect the integrated energy system, integrating the consideration of solar irradiation conditions in this area, and considering the needs of the Native Networks systems. The tilt angle of the solar will need subtle corrections to reach the maximum recipient of solar PV. New Sun Road with Native Networks will determine the placement of satellite radios for internet backhaul and placement of wireless access points to extend Wi-Fi coverage to the community. Robust ancillary equipment for space conditioning will need to be specified from a power needs and duty cycle perspective, adding to the constant radio loads needed to be powered.

Subtask D4.3. Power system final designs
Here the home power solutions and the radio tower receive final construction drawing treatment and pre-assembly plans. By the end of the period a final set of system plans enabling procurement and assembly are created.

Task D5. Procurement and Assembly
The scope of this task is to have all required equipment manufactured and shipped to the targeted community, and organize local electricians and engineers for the installation.

Subtask D5.1. Procurement
After the kick-off of this project, New Sun Road will coordinate with the manufacturers to have all customized essential components of the home solar and radio tower systems manufactured, including the solar panels, Lithium-ion batteries, propane generators, mounting frames, and Stellar Edge™ microgrid controllers. In the meantime, they will directly procure all other parts, including the inverters, wires, balance of systems, etc.

Subtask D5.2. Assembly
New Sun Road will pre-wire and pre-assemble the power systems, and test them to ensure proper functionality. They will then coordinate with the freight carrier to pack the equipment and get them shipped to the project location.

Task D6. Construction and Commissioning

The scope of this task is to install and commission off-grid power systems that enable internet connectivity for tribal members, commission all power systems onto Stellar Microgrid OS™, and expose a Stellar Microgrid OS™ interface that is accessible and valuable to Navajo users.

Subtask 6.1. Site Work

New Sun Road will work with Native Networks and Dine Energy to survey ground conditions and perform necessary clearing, grading, and foundations for the power systems at 84 sites.

Subtask D6.2. Construction

A three-person local crew from New Sun Road works closely with Dine Energy and Native Networks to commission 84 power system sites over a 150-day construction schedule.

Subtask D6.3. Commissioning

The 84 completed microgrids will be up and running 12 months after the project starts. Starting from then, the team will monitor the grid running status and record data through the installed Stellar Microgrid OSÔ where the broadband communication is powered by Stellar ISÔ and Native Networks. At the end of the period New Sun Road will prepare a technical report detailing the power systems' performance, resource utilization efficiency, reliability, and power quality. New Sun Road will prepare a second report detailing the internet network performance and options for network management. The team will meet with the community to collect additional user feedback, analyze the data with the Chapter, and make a system adjustment plan and an expansion plan for future development. All system data and lessons learned from this project will be recorded and reported to government stakeholders.

New Sun Road will develop and release a custom interface for the Stellar Microgrid OSTM for Navajo energy users and technicians. The specifications will be influenced by the design workshops, the interface will be used as a capacity building tool. The interface will provide a subset of the Stellar Microgrid OSTM monitoring, data visualization, and energy and connectivity reporting features tailored to the needs of tribal members for managing their energy and internet supply.

Task D7. Commissioning

Based on the collected field data, the team will design electrical plans for 65 homes and supervise their installation by the electricians of Diné Energy.

Task #	Activity	Timeline	Milestone
Task D1	Deploy broadband infrastructure	M1-M8	At the end of M8, the fixed wireless network for El Capitan and Black Mesa communities is established. The deployed network can provide 25 Mbps/3 Mbps internet service. *Deliverable:* Demonstrate to NTIA that the broadband infrastructure that can serve El Capitan and Black Mesa communities with 25 Mbps/3 Mbps.
Task D1.1	Deploy satellite backhaul	M1-M2	At the end of M2, Intelsat's Carrier Internet backhaul products are deployed at the locations of the four towers. A separate receiver+antenna structure is placed at each location and is capable of 40 Mbps/10Mbps.
Task D1.2	Deploy towers	M3-M6	At the end of M6, two towers in the El Capitan community and two towers in the Black Mesa community are constructed.

Task D1.3	Deploy fixed wireless distribution network	M7-M8	At the end of M8, the fixed wireless distribution networks in both communities are fully deployed. Each household will have 25 Mbps/3 Mbps internet service.
Task D2	Deploy microwave redundancy	M9-M10	At the end of M10, the high-speed microwave link is constructed between the Black Mesa towers and El Capitan towers. The two links will be Cambium PTP820C radios operating at 18Ghz. The through put capacity exceeds the total bandwidth available to each tower so 100% backup is available across the links. *Deliverable:* Demonstrate to NTIA that the through put capacity exceeds the total bandwidth available to each tower so 100% backup is available across the microwave links.
Task D3	Enable ISP network	M8-M12	At the end of M12, the ISP network is fully enabled. The ISP is initially set up to handle up to 500 users but is scalable to many thousands of subscribers. Additional services such as disaster recovery, VPN and data storage can be accommodated. *Deliverable:* Report to NTIA documenting the technical details of the ISP network.
Task D4	Design Power Systems	M1-M3	At the end of M3, a full knowledge cubic that contains needs for broadband and household power infrastructure. *Deliverable:* knowledge table and final power system design for these two uses.
Subtask D 4.1	Survey the solar for broadband infrastructure needs	M1	At the end of M1, surveys at El Capitan are accomplished. Information about residents' broadband and power needs is documented.
Subtask D 4.2	Workshop network power system design	M1-M2	At the end of M2, workshops on the radio tower power systems at the El Capitan and Black Mesa are completed.
Subtask D 4.3	Power system final designs	M2-M3	At the end of M3, the technical solutions for both the house and radio tower off-grid systems are completed.
Task D5	Procurement and Assembly	M3-M9	At the end of M9, all the equipment for the house and radio tower power systems has been ordered, pre-assembled, and shipped to El Capitan and Black Mesa. *Deliverables:* Bills of Lading for all site equipment.
Subtask D 5.1	Procurement	M3-M6	At the end of M6, all materials have been ordered from suppliers.
Subtask D 5.2	Assembly	M4-M9	At the end of M9, all pre-fabricated system components have been assembled and shipped to site for construction.
Task D6	Construction and Commissioning	M4-M12	At the end of M12, 80 smaller house power systems and 4 larger radio power sites have been installed and commissioned, onboarded to the Stellar Microgrid OS Fleet control system. *Deliverable:* Fully commissioned and operational solar home systems (80) and radio power systems (4), with NOC fleet view enabled for tribal authorities, Native Networks, other system operators and stakeholders.
Subtask D 6.1	Site Work	M4-M6	All groundwork is prepared for the deployment of home and radio systems, in coordination with Native Networks team.

Subtask D 6.2	Construction	M6-M11	All 80 home systems and 4 radio systems completed over a 150-day construction schedule.
Subtask D 6.3	Commissioning	M9-M12	All systems tested and fully operational with remote Stellar Microgrid OS control and monitoring.
Task D7	Internal Wiring	M3 – M12	At the end of M12, Diné Energy would have completed the internal wiring for 65 homes

For Broadband Adoption:
Task A1. Survey the Targeted Communities

The project team will conduct multi-facet surveys in the targeted communities to establish sound knowledge of the urgent needs of Native Americans for broadband connection, current and future technical and social barriers to broadband infrastructure deployment in the Navajo Nation, training needs of broadband usage and broadband infrastructure maintenance. The ultimate goal of the surveys is two-fold: **(1)** set the foundation for efficient adoption of the deployed broadband infrastructure in order to improve the quality of life and boost the economy in the area; **(2)** provide deployment and adoption guidance for other native American communities facing the same issues. The following subtasks will be conducted under the broadband adoption part of this project.

Subtask A1.1. Survey the broadband infrastructure needs

The project team has comprehensive knowledge about the broadband needs in the El Capitan area. However, only partial knowledge is available for Black Mesa. Therefore, in partnership with Náátsʼíilid Initiative, the University of Utah researchers will visit each household in Black Mesa to collect information about the number of students, unemployment status, knowledge level of computer use and internet use, and concerns about using the broadband connection.

Subtask A1.2. Workshop development barriers and potential adoption issues

Researchers from University of Utah, staff from Náátsʼíilid Initiative, authorities of the Kayenta Chapter, and the delegate of the Navajo Nation will organize workshops with representatives of both El Capitan and Black Mesa communities to summarize existing barriers to the broadband infrastructure deployment and brainstorm potential issues in future usage and maintenance of the deployed broadband infrastructure. Topics on the barriers will be multi-dimensional and covers technical barriers (e.g., the large area for efficient wireless network coverage and no electricity connection), geographic difficulties (e.g., soil not suitable for infrastructure placement), cultural resistance (e.g., residents' concerns about culture survival), homesite lease issues (e.g., who is eligible to have an internet account), and policy issues (e.g., regulations from Navajo Tribal Utility Authority). Topics on potential issues in infrastructure adoption include, but are not limited to, shortage of maintenance workforce, the sustainable economic mode of the broadband service, and culture resilience in the post-internet era.

Subtask A1.3. Survey the adoption training needs

In partnership with Náátsʼíilid Initiative, the University of Utah researchers will visit each household in El Capitan and Black Mesa to collect information about the residents' needs of adoption training. This information will include the training needs for the usage of job seeking platforms, professional (or competitive) skills, and advertising job openings and offerings. The collected information will assist the University of Utah researchers in designing training programs that can specifically fulfill actual resident needs.

Task A2. Broadband Adoption Training Programs

Acknowledging the fact that more than 80% Navajo people have no experience in Internet usage, the project team will initiate Internet usage training programs for residents in the targeted

communities. The development and execution of this unique training program consists of the following two subtasks.

Subtask A2.1. Training liaison trainers

In partnership with the American Indian Resource Center at the University of Utah, the project team will recruit undergraduate and graduate Navajo students at the University of Utah as "liaison trainers". The University of Utah team will develop a training program to train those liaison trainers with strong presentation and communication skills, and basic education methodologies. The outcome of this training is a team of liaison trainers that will be dispatched to the targeted communities to accomplish the broadband adoption training to local residents.

Subtask A2.2. Training Navajo residents

The University of Utah team will prepare an all-inclusive internet usage training kit for the liaison trainers. This training kit will cover basic knowledge of all levels of internet usage, including search engine use, email, online shopping, social media, streaming platforms, university application platforms, and job seeking platforms. The liaison trainers will leverage this training kit to organize a series of workshops to train residents with different needs.

Task A3. Organizing community leaders

Microsoft and NSR will be oriented to organize the groups of Women and Young Leaders Committee. The Committee in each community will be responsible for the Centers management, communications, and related tasks. NSR will conduct surveys and introductory focus group meetings with the communities to identify these women and young leaders and empower them during the project implementation. Participatory methods will be adapted to the community, using the snowflake model organization based on Marshall Ganz's theories. These leaders will work hand in hand with the New Sun Road team to ensure the sustainability of the Centers and harmonious collaboration with the community by working in these core areas, general coordination, services, maintenance, accounting, and community relations.

Task A4. Telehealth Enabling

In partnership with Nááts'íilid Initiative, the University of Utah researchers, will hold educational seminars that onboard the residents to the e-platforms of Telehealth providers in Navajo Nation. These will include training them to use platforms like My Chart; and its equivalent used by DeVita Healthcare Company in the area; Kayenta Health Center; and patient empowerment NGO like COPE.

Task A5. Training of Broadband Job Competency

The project team is dedicated to promoting job opportunities and competency in the Navajo Nation. Partner Diné Energy is led by Navajo people and aims at serving the Navajo Nation. Since Diné Energy mainly focuses on power infrastructure deployment, they lack experience in broadband infrastructure deployment. As a result, they have missed several project opportunities in this field in the past years. Therefore, using this opportunity, partners New Sun Road and Native Network will offer a training program to Diné Energy to equip them with broadband infrastructure deployment capabilities. This training program will train Diné Energy engineers with field skills of integration of power infrastructure and broadband infrastructure. At the end of this project, Diné Energy should have enough experience and skills to train their own engineers for future broadband related projects.

Task A6. Business Model Co-creation

Business model co-creation is identified services, entrepreneurial activities/business models on the Centers, and ICT services to boost current business from the local community. The NSR and

Microsoft team will work on this design, taking into consideration the results of focus groups and brainstorming workshops. The methodology will be a design thinking approach. This method is a socially innovative and progressive strategy involving the users' in-depth insights to understand their aspirations, all their ideas guided by a multidisciplinary team, and finally, conclude with a rapid solution. The business models chosen by the leaders in the community will allow NSR and Microsoft to guarantee the center's self-sustainability and the project in the long term. NSR and Microsoft are aware that this business model is subject to change as the project develops and lessons are learned during the implementation phase.

Task A7. Digital Literacy Program

Digital Literacy Program is the design of the curriculum and training materials based on results of community leader organization and business model co-creation. While invaluable for women and community members, technology availability alone will not enable greater productivity. The digital literacy programming and curricula invite participants to interact with the technology in a meaningful way, building their capacity through hand-on, informed engagement. NSR and Microsoft will open a call to identify the local trainers, technicians, community development, and manager, and the team will be online trained. Finally, the digital literacy program will be launched, adapting the training materials and curriculum to deliver a digital literacy program customized to the community

The proposed activities will be executed by following the timeline below.

Task #	Activity	Timeline	Milestone
Task A1	Survey the targeted communities	M1-M2	At the end of M2, a full knowledge bank that contains multi-purpose needs for broadband infrastructure, technical and social barriers to broadband infrastructure development, potential broadband adoption issues, and employment training needs are constructed. *Deliverable:* A report to NTIA detailing the survey findings.
Subtask A1.1	Survey the broadband infrastructure needs	M1	At the end of M1, surveys at the Black Mesa are accomplished. Information about residents' broadband needs is documented.
Subtask A1.2	Workshop development barriers and potential adoption issues	M1-M2	At the end of M2, workshops at the El Capitan and Black Mesa are finished. Collected information about technical and social barriers to broadband infrastructure development and potential adoption issues is documented.
Subtask A1.3	Survey the employment training needs	M2	At the end of M2, surveys at the El Capitan and Black Mesa are concluded. Information about residents' employment training needs is documented.
Task A2	Broadband adoption training programs	M3-M6 & M10-M12	At the end of M6, liaison trainers are recruited, training materials are developed, and the liaison trainers are fully trained. At the end of M12, all residents in the targeted communities are trained by the liaison trainers. *Deliverables:* A report to NTIA detailing the liaison trainer training program; A report to NTIA detailing the training outcome in the targeted communities.

Subtask A2.1	Training liaison trainers	M3-M6	At the end of M6, liaison trainers are recruited, training materials are developed, and the liaison trainers are fully trained.
Subtask A2.2	Training Navajo residents	M10-M12	At the end of M12, all residents in the targeted communities are trained by the liaison trainers.
Task A3	Organizing community leaders	M1 – M4	At the end of M4, the project team will finish identifying and organizing community leaders. *Deliverables:* A Report of organized leaders to NTIA
Task A4	Telehealth enabling	M10-M12	At the end of M12, residents will have access to telehealth facilities. *Deliverables:* A cheat sheet for residents to access telehealth facilities.
Task A5	Training of broadband job competency	M1-M10	At the end of M10, Diné Energy engineers are trained by New Sun Road and Native Network for broadband infrastructure deployment. *Deliverables:* A report to NTIA detailing the training program; A report to NTIA detailing Diné Energy's plan for broadband engineer training.
Task A6	Business Model Co-creation	M5 – M8	At the end of M8, the business model will be developed. *Deliverables:* Business models and value proposition canvas; Evaluation report (after 3 months of deploying the center); Indicator in percent of people using the centers for entrepreneurial activities; Number of people using the centers, etc.
Task A7	Digital Literacy Program	M9 – M12	At the end of M12, the digital literacy program will be established. *Deliverables:* Report with indicators regarding the improved digital literacy skills for local residents

5. Description of Service Area

Funding through The Tribal Broadband Connectivity Program will allow Kayenta Chapter, part of The Government of Navajo Nation, to provide broadband connectivity in two unserved areas within its jurisdiction: i) El Capitan also known as Comb Ridge and ii) Black Mesa. Kayenta is one of the 110 chapters of the federally recognized tribe of Navajo Nation. The chapter is a recognized by the Local Governance Act (LGA) under Navajo Nation Title 26, and has been operating as such since August 06, 2010. The chapter is a political division within the Navajo Nation and encompasses land in both the state of Arizona and Utah. Kayenta chapter has an estimated land of 353, 718.85 acres. This area was settled as a community with the state of Arizona in 1909. Its attraction lay in its prime location as a cross road to serve travelers in the isolated northern and western part of the Navajo Nation/ Arizona. Currently Kayenta chapter is continuing its efforts to find funding to give community members electricity, broadband, running water, septic tanks and homes as well as homesite leases. The chapter continues to communicate with all entities within the Navajo Nation to provide basic services to its members. The successful reception of this grant will facilitate the chapter on delivering on its mandate.
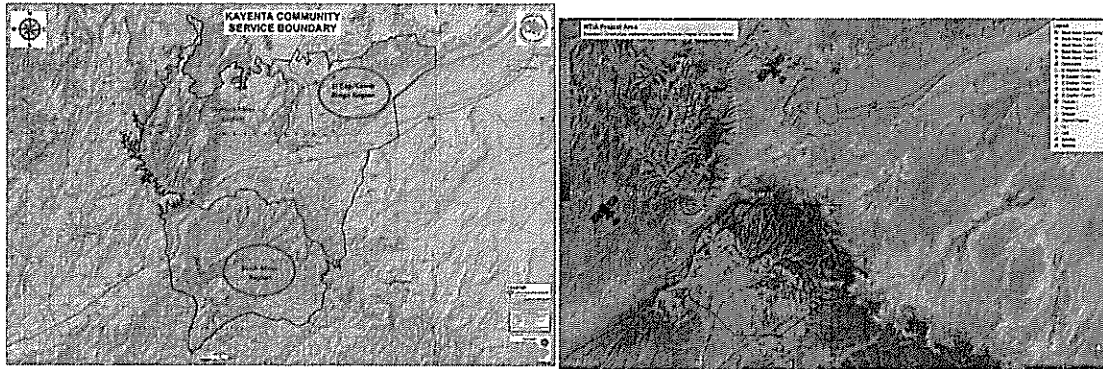
Figure 1: Map showing the rural areas of El Capitan/ Comb Ridge and Black Mesa in relationship to Kayenta Township and four other areas of the 353, 718.85 acres land comprising Kayenta Chapter

The scope of this proposal will cover 120 houses in El Capitan/Comb Ridge and 100 houses in Black Mesa. Unlike Puebloan tribes that live in dense and close-knit villages, Navajo people have historically spread out over home sites that may be as large as an acre. As a result, the average population of people in Kayenta is 418. 50 people per square miles. Average family size is 4.79 persons per household. This means that this project will serve at least 1053.8 people. This is a conservative estimate as anecdotal evidence gathered by Chapter staff in the past year during COVID-19 emergency outreach suggests that the number of persons per household in rural parts of the chapter is upwards of 7 persons and much higher than townships.

Both these localities are the least served parts of the chapter with regards to the infrastructure and fundamental amenities required for creating robust economies and hospitable neighborhoods. Both sprawl over large area that spread out into neighboring chapters. (Figure 1) Our proposal however is restricted to the 220 households in Kayenta Chapter only. Households in El Capitan are accessible on either side of Highway 160 towards Route 6450 and 6460, built at the North of the Kayenta Township, while Black Mesa is reached through Route 41, off Interstate 160. Route 6465, 6460 and 41 are dirt roads with sandy sections that can be difficult to navigate for smaller cars and non-locals. All the households in Black Mesa have electricity while none in Comb Ridge do. Furthermore, out of the 120 homes in need to broadband connection in the latter locality, 40 on Route 6450 have electricity; while the 80 along Route 6460, only 15 have internal wiring and are ready for a connection. The other 65 homes need electrical upgrades including electrical plans and implementation of those plans.

The largest number of Kayenta residents, age 25 and above, have high school education at 45.45% followed by some college education possessed by 23.33% population.[1] Extrapolating from the 2020 census, this project will reach 478.9 residents with high school education and 245.8 residents with college education. The median household income for high school education in the chapter is $32,587[2] compared to $48, 708 for the United States[3]; while with some college is $26,602 compared to $61,911. The income gap between the residents of the chapter and those of the United

[1] "Kayenta, Arizona Population 2021," https://worldpopulationreview.com/us-cities/kayenta-az-population (accessed Aug 24th, 2021)

[2] "Kayenta, Arizona Population 2021," https://worldpopulationreview.com/us-cities/kayenta-az-population (accessed Aug 24th, 2021)

[3] Statista Research Department, "Median household income in the United States in 2019, by educational attainment of householder," Jan 20, 202; https://www.statista.com/statistics/233301/median-household-income-in-the-united-states-by-education/ (accessed Aug 24th, 2021)

States increases exponentially as one goes up the educational ladder. Together with lack of basic amenities like water and broadband, lack of well-paying jobs has resulted in debilitating brain drain in the chapter.

Agriculture and life stock are a considerable part of the livelihood of the 220 households covered by this proposal. Like the rest of the Western United States, this area is suffering through a 30 years draught, whose effect is much greater here than the rest of the American West. It has decimated the community's ability to grow traditional sister crops of corn, squash and beans and modern crops of other vegetables and grains like watermelons and cantaloupes.[4] This is substantiated by the fact that 362 out of 455 total numbers of farms in Kayenta have less value than $1,000 by sales. Crop sales are responsible for 16.5 % of agrarian income while life stock sales account for 83.5% of sales. The result is that only 4.35% of the farmers in rural Kayenta are young producers (under the age of 35); 57.16%; 38.49%.[5] The unemployment in the area is upwards of 42%; and 43% of the residents live below the poverty rate;[6] while Kayenta chapter at large has 39.88% poverty.[7]

None of the 220 households in question have running water. Unsustainable water use practices by Peabody Western Coal Company involved wasting precious groundwater to transport coal from Black Mesa coal mine to Nevada. In place since the 1960s, the coal company pumped over a billion gallons of water from the Black Mesa aquifer each year, resulting in drying up the aquifers and springs on which life stock, wild animals and humans have relied over centuries.[8]

Figure 2: Typical homes in Comb Ridge with exposed electrical wiring running between exterior and interior and between homes; Direct TV Satellite Dish; Shrinking grazing grounds resulting in shrinking life stock pens

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[4] Navajo Nation Department of Fish and Wildlife, "Resources and Development Committee of the 24th Navajo Nation Council and the Division of Natural Resources Drought Tour," July 12-16, 2021; https://www.nndfw.org/docs/2021_RDC_drought_tour.pdf (accessed Aug 24th, 2021)

[5] "Census of Agriculture, "Kayenta Chapter: Navajo Nation Chapter Profile," 2017; https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/Navajo_Nation_Profiles/Western_Agency/Kayenta-Chapter.pdf (accessed Aug 24th, 2021)

[6] Navajo Nation: Economic Development, "Get the Facts about Navajo," https://www.census.gov/quickfacts/fact/table/navajocountyarizona,AZ,US/PST045219

[7] "Kayenta, Arizona Population 2021," https://worldpopulationreview.com/us-cities/kayenta-az-population (accessed Aug 24th, 2021)

[8] Natural Resources Defense Council report, "Drawdown: An Update on Groundwater Mining on Black Mesa," https://www.nrdc.org/resources/drawdown-update-groundwater-mining-black-mesa (accessed Aug 24th, 2021)

6. Description of Needs in the Service Area

El Capitan/ Comb Ridge and Black Mesa regions of Kayenta Chapter in the Navajo Nation in Northern Arizona is an at-risk rural community, whose physical and economic health is disproportionately undermined by lack of broadband. The quality of residents in both these areas is marred by the following conditions:

a) the combination of sparse **land use pattern**, that historically has been a source of the survival of people during previous but not the current spread of diseases and epidemics.

b) **geophysical features** of a high desert have made road access a particular challenge.

c) environmental impacts of more than half a century of strip **mining** for coal and run the aquifers dry whereby the communities have to choose between human and animal use.

d) the ongoing 30 years of **drought** has led to great paradox of these communities of farmers as they live in food deserts.

e) Compared to the better served parts of the chapter, these two areas lack **running water, gas, broadband and electricity** in Comb Ridge.

f) **Unpaved roadways** make access to schools, hospitals, and grocery stores in Kayenta Township (an average of 20 miles), an economic burden and time sink.

The combined effect of this context can be seen in the health and economic statistics. For example, compared to the 42.4% obesity in the wider American public, 87.5% of Navajo including those who live in our target area are obese or overweight. Compared to 10% diabetes in the rest of United States, more than 50% of Navajo adults suffer from Type 2 diabetes or are pre-diabetic.[9] 50 percent of the Navajo deaths occur among those 44 years or younger as compared to 13 percent of the general U.S. population. Compared to the per capita income of a US citizen in 2020 was $19,387.4, that of a Navajo citizen is $7,269, that is 2.66 times less. While the income increases with education, so does the gap between a higher educated American and Navajo.

It should not be surprising that these statistics make it difficult for the underserved families in El Capitan/Comb Ridge and Black Mesa to keep their youth and the most dynamic segments of the work force. Brain drain is a sinister force that does not only remove the best and most ambitious of their people from land, farming, and ancestral homes but also puts undue pressure on the cultural survival and cultural resilience of the indigenous people.
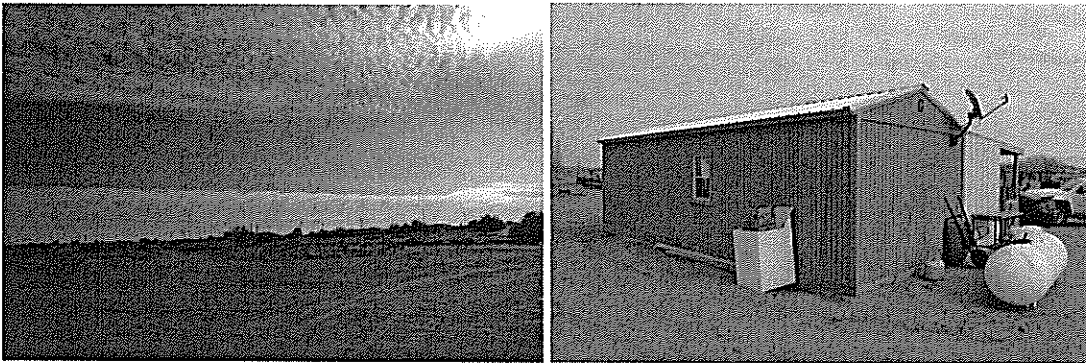
[9] Craig M. Hales, M.D., Margaret D. Carroll, M.S.P.H., Cheryl D. Fryar, M.S.P.H., and Cynthia L. Ogden, "U.S. Department of Health and Human Services Centers for Disease Control and Prevention National Center for Health Statistics Prevalence of Obesity and Severe Obesity Among Adults: United States, 2017–2018," *NCHS Data Brief,* No. 360 (February 2020).
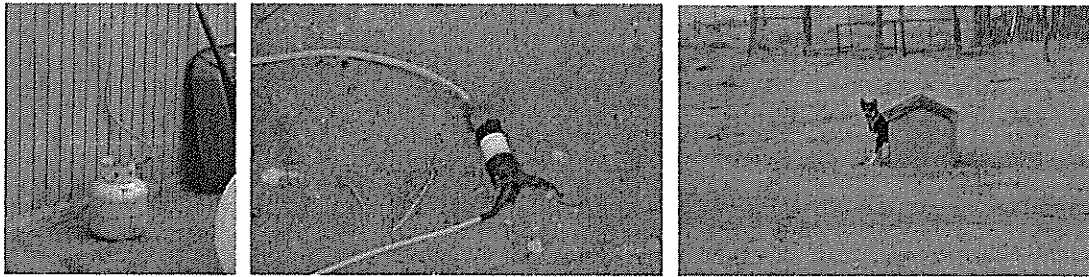
Figure 3: a) A typical unpaved sandy road in the two targeted area with overhead NTUA electrical poles and lines b) Current strategies for the provision of amenities incorporating a satellite dish, water tank, propane tank, and electrical connection c) Closeup of propane tank connected to the kitchen stove through an exposed hole drilled into the exterior wall d) electrification system for connecting the house to power line and other structures on the home site f) Home security system and guardroom

Resource access, which include both access to meet basic living needs (electricity, water) and access to various information and communication (education, business) is considered as one of the most important issue that imposes challenges to indigenous residents and governance. It limits the sales of crops and life stock and constrains the development of local economy. Most trade happens through the word of mouth rather than through connection with a larger marketplace. Traveling in these regions, even to neighborhood households, could take hours due to dirt roads and long distance.

Overall, the region has very high levels of poverty with 43% of the residents living below the poverty rate. The local economy heavily relies on vehicular transportation and movement, which pollutes the air and does relatively little for the quality of life. The overall education levels are low as well. 45.45% of the population only has high school education and only 5.24% have an associate's degree; 6.70% have a bachelor's degree; and 7.81% have graduate degree.

The quality of life is highly compromised by the absence of highspeed internet, critical to our ability to keep indigenous people connected to ancestral land, learning techniques of dry farming, to develop resilience for a drying locality and hotter planet. Most of the preemptive health management, diabetes treatment, and basic everyday consultation that does not require a visit to the hospital is also hampered.

Hence, first, local residents in the Black Mesa and Comb Ridge/El Capitan region are constrained by challenges to maintain and upgrade infrastructures, including power lines, roads, housing conditions, and waterlines etc., to meet the basic living needs. Second, the occlusion of modern modes of communication keeps them constrained in their current predicament. In this context, the internet is a critical need to enhance the ability of the residents to connect to external resources and the large market, health resources, and job options for remote working. It will connect farmers in the target areas to other indigenous farmers dealing with drought conditions. It will allow students to live at home during the school year and reduce the brain drain. It will create cultural solidarity between indigenous communities and build their capacity to participate in the global economy on their terms as opposed to Anglocentric United States.

7. Project Impact

This project will lead to multifarious impacts for the targeted community and the broader tribal communities across the country. First, the project will create 40 job opportunities of which 20 jobs are dedicated for Navajo electricians to complete electrical wiring in 65 homes over a period of 3 months; and comply with TERO. On the one hand, these TERO-compliance jobs will ensure a strong economy within the Navajo Nation in the project duration. Our team member Diné Energy, which is responsible for all internal home wiring, is led by Navajo women and dedicated to hiring and training Navajo staff. Though Diné Energy lacks experience in broadband infrastructure

installation, team members New Sun Road and Native Network, who are experienced in developing and deploying broadband infrastructure in rural areas, will provide a comprehensive training program to Diné Energy. This will qualify Diné Energy for future broadband related projects, creating a new revenue stream for Navajo led companies and long-term impacts. Second, the deployed broadband infrastructure will for the first time provide the targeted community with fast internet connection. Due to Covid-19, there are currently 296.38 up to high school students and college students in Black Mesa and El Capitan area who cannot attend schools. Due to the lack of internet in their community, they have no access to the learning materials and remote classes. These students have to travel hours for free public WiFi, e.g., café, to "attend" schools, which is a waste of time and energy as well as severely limits their learning ability. With the deployed broadband infrastructure, these students can enjoy efficient learning during Covid-19 and beyond. Third, this project will for the first time enable access to telehealth for the Navajo people. From the data, 1400 people in the Navajo Nation have died due to the delayed treatment, during the Covid-19 time. The broadband enabled telehealth system will significantly improve Navajo people's long-term quality of life. Moreover, this project will assist resolving the issue of high unemployment rate in the Navajo Nation. Currently, there are 42% people in the targeted communities who are unemployed, due to Covid-19 lay off or lack of competence, but are eager to work. This comes to 442.5 people. This project, particularly the training program the team will provide, will equip those people with sufficient knowledge to conduct remote learning for competence building and job seeking. Last but not the least, surveys conducted in this project will not only reveal technical and social barriers that the targeted communities are facing in broadband development, but also indicate common problems that the entire Navajo Nation and other Native American communities will encounter.

This project will provide a strong workforce training program to equip Navajo people with sufficient skills and fill in the labor shortage. It will reach 478.9 people who are currently of working age there. As aforementioned, NSR and Microsoft will train Diné Energy for broadband infrastructure installations. With this qualification, Diné Energy will have more opportunities in the future to take broadband related projects and expand the business. Team member University of Utah, through its American Indian Resource Center, will train Navajo students for training abilities. These students will go back to their communities to provide broadband training programs so that unemployed people in the community can have access to competence building materials and job seeking platforms. This will significantly help to resolve local high unemployment rate and fill in the labor shortage.

8. Labor Standard

The Kayenta Chapter suffers from sub-optimal job opportunities for both male and female employees of all different educational levels. 37.7% of Kayenta women are unemployed while the figures are much higher for men, the average reaching 42% for the entire population. High demand for jobs lowers the average wages. Average wage for women with High School education is only $10.5 per hour leading to an annual income of $22,054, while average wage for men with High School education is relatively higher at $16.29 per hour leading to an annual income of $34,018. For women with some college education, the average wage rises to $15.19 per hour, translating to an annual income of $ 31,731. The figures for men with some college however dramatically reduce with education. On average, their wages shrink to $10.5 per hour, reducing their annual income to only $21,923 annually.

Our project will pay Navajo and Non-Navajo labor the same salaries. These will be competitive with average national hourly rate for broadband and cable installers at $19 to $19.6. This leads to $38,849 - $40,945 annual income that is higher than both the average salaries for these positions in Utah and Arizona state.

9. Project Measures and Outcome

For broadband and power infrastructure deployment, the project will deliver (1) a fully operational broadband infrastructure, including satellite backhaul, towers, wireless distribution network, microwave system, and ISP network, (2) a complete design and infrastructure deployment of power system for broadband network operation, (3) 80 fully commissioned and operational solar home systems for daily energy usage of residents.

For the broadband use and adoption, this project will deliver (1) survey results to understand needs of local residents in adopting and using broadband communication in the Black Mesa and Comb Ridge/El Capitan regions, (2) a series of training and education programs with videos and distance learning workshops, covering basic education for digital literacy and broadband adoption, professional skills, information surfing and exchange, for local residents to effectively leverage broadband connection, (3) workforce training to local business in Navajo Nation for broadband deployment and maintenance, and (4) well-established training programs in American Indian Resource Center of University of Utah to cultivate liaison trainers for sustained program operation.

Specifically, the surveys will be distributed across the target regions, aiming to collect more than 300 effective responses from local residents. The survey results will be summarized to inform design of the training programs, which is expected to adequately benefit well-beings of more than 700 residents with broadband communication deployment. These benefits will promote education, life convenience and health improvement, and business development. The satisfaction of training and education programs will be evaluated through focus group discussions and follow-up surveys to ensure the success. The deployment and education programs will also directly benefit the local business Diné Energy led by Navajo people in establishing the capability of broadband deployment and maintenance while creating 40 jobs for this project.

10. Plan to Sustain Programs

The sustained benefits of the programs will be achieved by involving Nááts'íilid Initiative (NI), which is a non-profit organization embedded in three chapters of Navajo Nation including Kayenta to support the community development. They will be supported by American Indian Resource Center (AIRC) which is hosted at the University of Utah and serves as a vital link between American Indian students, the University, and the larger community. Diné Energy will provide the labor and technical expertise. NI, AIRC, and Diné Energy have longstanding relationship and trust amongst themselves and with the Chapter leadership. Nááts'íilid Initiative will provide standing support to the chapter the Chapter staff and representatives in ensuring timely maintenance, regular upkeep of the infrastructure, community needs, regular onboarding, and providing intermittent workshops to residents in the coming years. The established 'liaison trainers' program in American Indian Resource Center will also uninterruptedly operate to further ensure that the benefits of the programs will be continuously passed to Navajo people.

11. Project Influence on Surrounding Environment

There should be minimal to none influence on surrounding environment by the broadband infrastructure deployment component of this project. The proposed broadband infrastructure will adopt a distributed structure. Main interventions include a) Internal wiring of 65 homes b) install a small-scale integrated solar and energy storage system on each homesite and c) install internet backhaul radios and wireless access points. The size of an integrated system is small, and it does not need any ground disturbing work. It is simply being placed in the open area of each household.

The adoption part of the project will have a positive environmental impact as improved connectivity will reduce the need to undue carbon emission because of reduced commuting.

Amd# to Amd#	New Business: Item B.		PASSED

MOT Begay, E

SEC Tso, E

Legislation 0098-22: Authorizing
the Kayenta Chapter to Access
and Build Infrastructure . . .

Yeas : 19	Nays : 0	Excused : 2	Not Voting : 2

Yea : 19

Begay, E	Freeland, M	Slater, C	Tso, E
Begay, K	Halona, P	Smith	Tso, O
Begay, P	Henio, J	Stewart, W	Walker, T
Brown	James, V	Tso, C	Wauneka, E
Charles-Newton	Nez, R	Tso, D	

Nay : 0

Excused : 2

Crotty	Yazzie

Not Voting : 2

Daniels	Yellowhair

Presiding Speaker: Damon