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**CPRG IMPLEMENTATION GRANTS COMPETITION
COVER PAGE FOR APPLICATION**

APPLICANT INFORMATION

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TYPE OF APPLICATION ☒ Individual Applicant ☐ Lead Applicant for a Coalition

If lead applicant for a coalition, provide a list of the coalition members below.

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FUNDING REQUESTED: *Provide total EPA CPRG Implementation Grant funding requested.*

\$ 42,669,319

APPLICATION TITLE: *Provide the title of your proposed project.*

Northern Cheyenne Tribe: Greenhouse Gas Reduction Measure to Create New,
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BRIEF DESCRIPTION OF GHG MEASURES: *Describe each GHG reduction measure contained in the application (1-2 sentences each).*

The Tribe proposes developing new, highly insulated, high-performance, affordable homes for tribal members with the pairing of a localized microgrid system powered by solar energy for heating and cooling for these homes. These new homes will follow the US Department of Energy's Zero Energy Ready Home Program. Zero Energy Ready Homes are high-performance homes that are so energy efficient that a renewable energy system could offset most or all the home's annual energy use.
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SECTORS: *Identify the sector(s) associated with the GHG reduction measures included in the application.*

- | | |
|--|--|
| <input type="checkbox"/> Industry | <input checked="" type="checkbox"/> Commercial and Residential Buildings |
| <input checked="" type="checkbox"/> Electricity Generation | <input type="checkbox"/> Agriculture/Natural and Working Lands |
| <input type="checkbox"/> Transportation | <input type="checkbox"/> Waste and Materials Management |
| <input type="checkbox"/> Other (please describe) | <div></div> |

EXPECTED TOTAL CUMULATIVE GHG EMISSION REDUCTIONS

For all proposed measures combined, provide the estimated cumulative GHG reductions:

Estimated cumulative GHG reductions for 2025-2030 (in metric tons)

870

Estimated cumulative GHG reductions from 2025-2050 (in metric tons)

5,450

LOCATIONS: *List the primary location(s) where the proposed measures will be implemented*

City

Northern Cheyenne Reservation

State; Territory; Federally recognized Tribe

APPLICABLE PRIORITY CLIMATE ACTION PLAN(S) (PCAP) ON WHICH MEASURES ARE BASED

PCAP Lead Organization(s):

Northern Cheyenne Environmental Protection Department

PCAP Title(s):

Northern Cheyenne Tribe Priority Climate Action Plan

PCAP Website link(s) (if applicable):

List of GHG reduction measures and PCAP page reference for each measure:

GHG Reduction Measure - PCAP page 14 and page 16.

Northern Cheyenne Tribe: Greenhouse Gas Reduction Measure to Create New, Culturally Appropriate, “Zero Energy Ready” Level Housing with a Localized MicroGrid Powered by Solar Energy

Workplan

1. OVERALL PROJECT SUMMARY AND APPROACH

Building on a long history of environmental protection and interest in clean energy sources, and efforts to preserve the Cheyenne traditional way of life, in 2016 the Northern Cheyenne Tribe launched a sustainable energy development initiative to promote a resilient and diversified new “green energy” economy. While Cheyenne traditional homelands territory is much larger, the Tribe’s sustainable energy initiative is initially targeted to improve the quality of life on the 440,000-acre Northern Cheyenne Reservation located in remote southeast Montana, 20 miles south of the Colstrip coal-fired power plant which was partially ramped-down in 2020 and is expected to be closed in the coming years.

The Northern Cheyenne Tribe currently has more than 11,000 enrolled Tribal members, with about 5,000 living on the Reservation, with many struggling to pay energy bills and some unable to stay in their homes due to the high cost of heat during harsh winters. This project plans to tackle these issues in two ways: (1) to provide sustainable, reliable electricity to communities on the Reservation and (2) to provide culturally appropriate, efficient housing that designed for the harsh weather conditions in southeastern Montana. Applying cutting edge technologies and architecture, these initiatives should serve as a model for tribes and other communities.

a. Description of the GHG Reduction Measure

Based on the GHG inventory included in the PCAP, 87% of the Tribe’s CO₂e emissions are from building electricity and heating needs. As identified by tribal members and tribal staff, key stakeholders have determined that reducing building energy use is the Tribe’s highest priority. With the exception of the approximate 100 tribal members that remain working at the Colstrip power plant or associated mine, the Tribe has rejected a fossil-fuel economy for fundamental environmental and traditional reasons. As a result, the Tribe and its membership face some of the most severe socio-economic challenges in the United States. With inefficient homes and other buildings comes very high energy bills that have been a major contributor to homelessness and homes being overcrowded well beyond their intended occupancy. This grant presents an opportunity to fulfill the Tribe’s goals of reducing GHG emissions and continuing its quest for a green community and economy while efficiently housing its members.

The Tribe proposes developing new, highly insulated, high-performance, affordable homes for tribal members with the pairing of a localized microgrid system powered by solar energy for heating and cooling for these homes. These new homes will follow the US Department of Energy’s Zero Energy Ready Home Program.¹ Zero Energy Ready Homes are high-performance homes that are so energy efficient that a renewable energy system could offset most or all the home's annual energy use. To achieve the level of high performance required to achieve this level, the home designs will follow Passive House principles for

¹ U.S. Department of Energy, Zero Energy Ready Home Program, <https://www.energy.gov/eere/buildings/zero-energy-ready-home-program>.

thermal, air, radiation, and moisture control.² With the implementation of a district microgrid system, the combined effort will ultimately result in 25-30 new zero net energy homes on the Reservation. The intent is to build the homes within a community where power and heat generation assets are shared among all the properties. As the Tribe considers land communal rather than belonging outright to individual homeowners, the goals of the development are to utilize communal renewable energy and a fossil fuel free district energy system to provide all the home's power, heating, and cooling needs. The homes are planned to be located on former brownfield sites that have been recently and successfully cleaned up with the assistance of EPA grant funding.

Major Features of the Measure:

The PCAP GHG Inventory does not include private homes, however, increased energy efficiency brings a net benefit to the Tribal community and the PCAP did identify utilities as the one of the largest greenhouse gas emission sectors on the Reservation. In addition to reducing overall GHG emissions from across the Reservation, many of the Northern Cheyenne buildings on the Reservation do not adequately protect their occupants from the long, harsh Montana winters, major storm events, or internal pollution sources (cooking and other appliances, finish materials, mold, etc.). This is not only an environmental and energy use issue but a critical public health issue. The EPA identifies the Northern Cheyenne Tribe, and its members, as an Environmental Justice Disadvantaged Community.

The home designs would respond to the specific needs of the Northern Cheyenne in several ways, including but not limited to:

- Unique Tribal needs would be considered to create housing types that allow for multi-generational families to share a safe, healthy home. Home designs will consider aging-in-place and universal accessibility guidelines.
- Homes will include climate-specific, high performance building envelopes to provide the most economically feasible response to the demands of the southeastern Montana climate.
- Reduced utility bills.
- Homes will utilize high efficiency, non-fossil-fuel heating, and ventilation systems to minimize energy use. The design will follow Passive House (Phius) strategies and recommendations, reducing energy use by up to 85%.
- Increased indoor-air-quality. The design team plans to use a continuously operating heat-recovery ventilation system with high MERV filtration to reduce indoor pollutants and increase available fresh air. Much of the Northern Cheyenne Reservation has asthma rates above the 95th percentile nationally, per the EPA's EJ Screen.
- Increased resiliency. Highly insulated, low energy use buildings can more easily "ride out" power failures during inclement weather by minimizing heat energy losses to the exterior. This is a major public health issue on the Reservation throughout the long winter season.
- Develop community amenity buildings that support families and aging populations such as daycare and community buildings. Locate these buildings to promote local development density and minimize driving.

² Passive Building Principles, <https://www.phius.org/passive-building/what-passive-building/passive-building-principles>.

- Construction methods for combining the advantages of prefabrication with site specificity will be explored. Creating long-term, skilled, on-reservation jobs is a priority. This project may provide a toe-hold in the burgeoning pre-fabricated building industry.

The Northern Cheyenne Reservation sits within Northwest Power Pool (NWPP) eGRID Subregion. This subregion is largely dependent on fossil fuels (40.1%) for electricity generation and produces 638.34 lbs of CO₂e per MWh as provided by the EPA³. The local energy cooperatives, such as the Tongue River Electric Cooperative that provides most of the power to the Reservation, are heavily dependent on fossil-fuels. To combat this, the approach to reducing a home's GHG and ecological footprint looks to include on site renewable electricity generation.

A microgrid is a group of interconnected loads and distributed energy resources that acts as a single controllable entity with respect to the primary utility grid. It can connect and disconnect from the grid to operate in grid-connected or island mode. Microgrids can improve customer reliability and resilience to grid disturbances and enable local power generation assets, such as renewables and battery storage, to keep the local grid running even when the larger grid experiences interruptions. In addition, microgrids allow local assets to work together to save costs, extend duration of energy supplies, and produce revenue via market participation. Microgrid projects continue to gain prominence in the energy sector due to the increased resilience, flexibility, and efficiency these localized energy systems offer, incentivized further by federal and state support for their development. Microgrid installations are expected to grow dramatically as distributed energy prices drop and worries heighten about electric reliability because of severe storms, cyberattacks, and other threats.

The microgrid envisioned will serve the residential loads behind a point of common coupling with the local electric distribution grid and distribute power across the community via underground electrical cabling for added resiliency against weather events. An initial feasibility study conducted as part of this project will determine total electrical loads, appropriate asset mix of PVs and storage, and approaches to ride-through an extended grid outage to meet community needs and be in compliance with local utility and other regulations which the team will use to develop the final budget and implementation schedule.

A district energy system utilizes a site-wide ground-coupled (aka "geothermal") wellfield and heat pump system for the heating and cooling needs. This ground-coupled condenser water system is used to transfer heat between buildings and among various system components. The primary benefits of this approach are the inherent energy efficiency benefit of moving thermal energy rather than creating it, and the flexibility to add both sources and sinks of thermal energy to the same shared infrastructure, with each drawing or rejecting heat to the central loop at any time as needed.

³ U.S. EPA Power Profiler, <https://www.epa.gov/egrid/power-profiler#/NWPP>. Note the value indicated on the website is CO₂ only. Per the EPA's Tribal GHG Inventory Tool (<https://www.epa.gov/statelocalenergy/tribal-greenhouse-gas-inventory-tool>) used to determine total GHG emissions for the PCAP, the value also includes 0.058 lbs/MWh of Methane (CH₄) and 0.008 of Nitrous Oxide (N₂O) for a CO₂e of 638.34 lbs of CO₂e per MWh.

The geothermal system is a centralized heating and cooling infrastructure that allows heat exchange with the relatively constant temperature earth throughout the year. It uses the earth, without any intermittency, as a heat source (in the winter) or a heat sink (in the summer). The average annual effect on the ground temperature is minimal because of cyclical nature of the seasons and an ideal design will generally result in a seasonal balance of total heat extraction and total heat injection.

The network of underground piping is a closed loop system consisting of individual boreholes, piping loops, and interconnecting piping acts as a large heat exchanger, allowing the HVAC systems (primarily water source heat pumps) to take advantage of the moderate year-round ground temperatures to boost efficiency and reduce operational costs. Water is circulated through the wellfield network to exchange heat between the earth and the buildings on the site. The entire system of piping (both vertical loops and horizontal interconnecting piping) is located below ground and provides excellent resiliency to weather events as only the pumping stations are above ground.

Building energy efficiency will thus be a primary driver to reduce consumption. Homes will follow the Passive House design standards to perform up to 85% better than average homes. Initial concepts include utilizing an offsite pre-fabricated structure manufactured from Fiber Reinforced Polymers (FRP)⁴ and Advanced Building Construction methods⁵ to meet required efficiency and air tightness standards as well as aid in scheduling construction around the harsh Montana winters. In addition to increased thermal properties, this system provides an additional layer of resiliency due to its inherent properties to withstand high winds and impact from extreme weather events, which are becoming more prevalent on the Reservation⁶.

However, efficiency is not limited to building design, high performance envelopes and systems. Building user behavior can increase the efficiency of the energy used in the buildings. Different strategies will need to address and support this issue. Achieving and maintaining energy-efficient behavior without decreasing the comfort of building occupants will remain a primary focus.

The benefits of utilizing a communal renewable and district energy approach and their inherent efficiencies allows residents to minimize, even eliminate, utility bills to further incentivize living in this community and influence occupant behavior.

Milestones and Tasks:

The Tribe has identified the following milestones and tasks for this GHG reduction measure:

- Host a Kick-Off Design Meeting with Tribal staff and key stakeholders.

⁴ Examples include Northstar Technologies: <https://www.northstartgi.com/>.

⁵ U.S. DOE, What is the Advanced Building Construction Initiative, <https://www.energy.gov/eere/buildings/what-advanced-building-construction-initiative>

⁶ Big Horn County News, Baseball-sized hail in Lame Deer (June 6, 2023), https://www.bighorncountynews.com/news/baseball-sized-hail-in-lame-deer/image_7e8b31a4-049f-11ee-87df-c312dc73bb35.html

- Prepare the Schematic Design, Design Development, and Construction documentation for all homes and interior mechanical, electrical, and plumbing systems.
- Develop Microgrid concept, feasibility study, and budget.
- Meeting with utilities and associated tribal regulatory agencies.
- Determine the engineering required to design the wellfield and piping distribution to individual homes.
- Begin Hosting regular meetings with tribal permitting agencies.
- Begin bidding process in phased packages.
- Conduct all site work, including roads, utility infrastructure, to get the site "pad ready" to accept homes. This milestone includes basecourse paving of roads for deliveries and allow phased home occupancy.
- Bore Hole Drilling and installation of horizontal loop piping.
- Off site fabrication.
- On-site construction of individual home foundations.
- Home Component Delivery. Complete each home's exterior envelope cladding, and interior-fit out.
- Install PV system, batteries, and related equipment procurement and installation for the localized microgrid.

Risks Associated with this Measure:

In order to successfully complete this project, the Tribe will need to make significant investments in the Reservation infrastructure - beyond the required renewable energy microgrid. Tribal leadership believes that the existing aquifer / ground water resources are close to exhausted, and the Tribe has suffered through periods without adequate water supply in recent years. Additionally, new infrastructure for the management of sewage is needed across the Reservation to reduce health risks and decrease methane emissions. These infrastructure projects are a necessary part of the new mixed income, higher density housing that the Tribe needs. Although the requirement of new infrastructure poses a risk, the Tribe through the Northern Cheyenne Environmental Protection Department and the Northern Cheyenne Tribe Utilities Commission, is prepared to expand these resources to meet the needs of the future residents living in these homes.

Microgrid design and site work are included in this project as rough order of magnitude estimates due to pending decisions regarding location and suitability. Budget contingency is identified for the project to cover any variance to the total cost for site work and microgrid design decisions, permitting, environmental, and other tasks.

Environmental permitting, historic preservation, and other natural resources and utility approvals depend on location and suitability decisions for the project. The award of this grant will trigger decisions about location and suitability that will bring these factors into scope and cost control.

Electric utility interconnection studies, permitting, licensing, and long-term operation plans and costs will be developed as part of this award in deep collaboration with the selected design/build consultant. Currently, the suitability and sustainability of the program's operation require the funding from this award to be fully elaborated and planned for into the future.

The Measure Meets All Four Goals of the CPRG:

This measure meets all four goals of the CPRG program. As discussed these energy efficient homes, with the implementation of a localized microgrid powered by solar energy will result in 25-30 net zero emission homes by 2050, conservatively. The Northern Cheyenne Reservation has high energy costs despite the Tribe's high rate of poverty and unemployment, leaving many tribal members without sufficient heating and cooling, or utility bills they cannot afford, during the extreme weather events in southeastern Montana. Additionally, there is not enough housing on the Reservation for all of the Tribe's members meaning current homes are overcrowded, unsafe, and delapidated. This project would amount in an immense community benefit as the homes would be tailored to the needs and climate of the Reservation while having a renewable energy component that would eliminate the stress of high utility bills for residents. For the Tribe, this measure is exciting as it could be replicated across multiple locations on the Reservation. Currently, there are multiple centrally-located sites, previously labelled as brownfield sites, that could be developed with 25-30 efficient homes and have a localized microgrid component. This measure could build upon current US HUD funding received by the Northern Cheyenne Tribal Authority to develop an inventory of residential housing needs on the Reservation, and the homes and localized microgrid would be built on brownfield sites that were previously remediated with EPA funding awarded to the NCEPD in October 2021.

b. Demonstration of Funding Need

The Northern Cheyenne Tribe has identified housing and a localized renewable energy powered microgrid as a top priority. However, there is little funding opportunities that would facilitate the implementation of this measure. The Tribe's housing authority has pursued federal funding, from the U.S. Department of Housing and Urban Development (HUD), to conduct a feasibility study to determine the residential housing needs on the Reservation. However, if the Tribe receives this award, the study would only assess the housing needs rather than cover the costs to construct solar-powered energy efficient homes.

Additionally, as part of a Tribal consortium, the Tribe is participating in the EPA Solar for All grant opportunity. However, this is to provide solar power to existing homes. It would not fund the project described in this grant application.

The Tribe has recognized the CPRG Implementation Grant as a unique funding opportunity in which it can prioritize sustainability and combat climate change, while also serving the direct needs of the tribal members.

c. Transformative Impact

For the Northern Cheyenne Tribe, high utility bills and a lack of safe, reliable housing is a constant issue for the Tribe's members. The implementation of this GHG reduction measure, would serve as a model for tribes and beyond in developing zero emission communities in harsh climate conditions. For example, many plains tribes suffer from similarly harsh climate conditions including harsh winters and due to their economic challenges and geographical location are forced to utilize fossil fuels to heat their buildings and homes. This GHG reduction measure could solve those problems across the region.

Additionally, establishing a microgrid and district energy to produce renewable energy, heating, and cooling in an area without other options than fossil fuels. The development of this microgrid will establish authorities, operating procedures, and scalability that will support future funding to move the Tribe towards 100% renewable energy generated and managed within their sovereignty, uplifting our community and creating tangible economic opportunity.

2. IMPACT OF GHG REDUCTION MEASURES

To determine potential GHG reductions, the below calculations are organized to reflect project development milestones that provide a gradual reduction in GHG emissions. The schedule milestones include 1) immediate post construction where each home will remain grid-tied for all electrical needs, 2) after the microgrid comes online to provide 100% renewable electricity to the development.

a. Magnitude of GHG Reductions from 2025 through 2030

During initial home occupancy after construction of the homes and district energy system is complete, but while the renewable microgrid is still in development, the homes will utilize the utility electrical supply to provide all electrical needs, including those for heating.

Assuming an 85% efficiency factor for designing to Passive House standards, utilizing the EPA's Household Carbon Footprint Calculator, there is a potential GHG reduction of up to 319,875 to 383,850 pounds of CO₂e/year (145.1 to 174.1 MT CO₂e /year) prior to the development of the microgrid.

Total emissions reduction for this period Estimated at 145.1 to 174.1 MT of CO₂e per year X 5 years = 725.5 to 870.5 MT.

b. Magnitude of GHG Reductions from 2025 through 2050

When the proposed affordable home development is paired with the renewable microgrid after it comes online, the assumption is that this would supply 100% of the development's electrical needs with renewable electricity. With this assumption, the proposed housing will achieve Net-Zero energy and carbon resulting in a potential annual GHG reduction of 401,175 to 481,410 pounds CO₂e/year (182 to 218.4 MT CO₂e/year) in total for the entire development (16,047 pounds CO₂e/year (*baseline*)).

c. Cost Effectiveness of GHG Reductions

Cost effectiveness of GHG reductions = \$42, 669, 319 / 145.1 to 174.1 MT CO₂e = \$294, 068.36 to \$245,085.118.

d. Documentation of GHG Reduction Assumptions (see Appendix A)

Please see the attached Appendix A for further information on the GHG reduction assumptions.

3. ENVIRONMENTAL RESULTS – OUTPUTS, OUTCOMES, AND PERFORMANCE MEASURES

a. Expected Outputs and Outcomes

Benefits Analysis:

Direct GHG benefits:

- Eliminate fossil fuel usage for new buildings (DOE Zero Energy Ready Homes)
- Reduce inefficient electrical usage, deploy high efficiency electrical HVAC systems and appliances.
- Reduce individual home electrical use compared with the average metered use of similar homes in the area.

Co-benefits:

- Reduction in pollutant emissions other than GHG from burning fossil fuels to generate electricity, including Sulfur Dioxide (SO₂), Nitrogen Oxides (NO_x), Particulate Matter (PM), and Mercury (Hg).
- Increase community health through improved resiliency, and less dependence on existing grid power
- Increase community health through improved indoor air quality
- Create construction jobs
- Workforce training in emerging technologies
- Provide non-traditional, multi-generational housing opportunities
- Provide new, safe healthy, and desirable housing within the community
- Spur development of other efficient homes with geothermal and solar energy on the Northern Cheyenne Reservation and across the region

b. Performance Measures and Plan

The Priority Action can be subdivided into the following projects:

- Phase 1 Zero Energy Ready Housing Project
Design and construction of 25-30 multi-generational mixed income homes
- Potable Water Infrastructure
Conduct study assessing and locating available ground water
Design and construct new extraction, storage, and distribution infrastructure
- Sanitary Sewage Treatment
Design and construct new sanitary sewage treatment infrastructure for Phase One of the Housing Project.

c. Authorities, Implementation Timeline, and Milestones

Implementation Timeline

The Tribe plans to begin the Phase One design process as soon as is possible following award of federal funding, ideally the CPRG Implementation Grant. The timeline for the performance period is October 1, 2024 through October 1, 2029 inclusive of grant reporting requirements and closeout of the grant.

The process will begin with a programming conversation to ensure that the housing design responds to the unique cultural and climatic needs of the Northern Cheyenne, rather than being a typical subsidized housing solution.

The following parties' cooperation and participation will be necessary for the GHG reduction measure implementation:

- Northern Cheyenne Environmental Protection Department (NCEPD)
- Northern Cheyenne Tribal Housing Authority
- Northern Cheyenne Tribal Council
- Chief Dull Knife College

These parties have played an integral role in the development of this GHG reduction measure and are prepared to participate and facilitate the implementation of the measure.

The implementation of the GHG will then follow the proposed schedule:

Activity	Detail	Start	Finish	Implementing Agency	Contractor Involved
Design: Site/Civil	Civil Engineering for site design, including infrastructure (water, sewer, electricity, telecomm)	Fall 2024	Summer 2025	NCEPD	Outside contractor, TBD.
Design: Project Management, Architecture/MEP/Structural	Schematic Design, Design Development and Construction Documentation for all the homes and interior Mechanical, Electrical, and Plumbing (MEP) systems. Included within this milestone are kick-off design meetings and period reviews with the Tribe and stakeholders.	Fall 2024	Fall 2025	NCEPD	Outside contractor, TBD.
Design: District Energy	Engineering required to design wellfield and piping distribution to individual homes	Fall 2024	Fall 2025	NCEPD	Outside Contractor, TBD
Design: Microgrid Development and Design.	Develop microgrid concept, feasibility study, and budget (incorporating all	Fall 2024	2027	NCEPD	Outside Contractor, TBD

	incentives and other factors to derive ultimate costs and benefits)				
Quarterly Report to EPA	Concurrently with other projects NCEPD staff will prepare regular reporting to EPA on the project's status.	Fall 2024	Fall 2024	NCEPD	
Design: Permitting	Start meeting with associated permitting agencies ASAP - particularly with borefield required for ground source heat pump system. Includes meeting with utilities (electric, sewer, and telecomm, and water as applicable). Not permitting, per se, but included in this timeline is registering and required reviews with Passive House Institute (Phius) on architectural design. Building permitting managed by the Tribe	Spring 2025	Winter 2025/2026	NCEPD, Northern Cheyenne Tribal Council, Northern Cheyenne Housing Authority	Outside Attorneys
Quarterly Report	Concurrently with other projects NCEPD staff will prepare regular reporting to EPA on the project's status.	Spring 2025	Spring 2025	NCEPD	
Design: Bidding	Initial assumption is to bid this in phased packages: 1. Site work/infrastructure (inclusive of wellfield boreholes) 2. Home fabrication (off-site)	1. Summer 2025 2/3. Fall/Winter 2025	1. Fall 2025 2/3. Winter 2026	NCEPD, Northern Cheyenne Tribal Council	Outside Attorneys.

	3. Home erection and interior fit-out				
Quarterly Reporting	Concurrently with other projects NCEPD staff will prepare regular reporting to EPA on the project's status.	Summer 2025	Summer 2025	NCEPD	
Design: Microgrid Regulatory Process	Meet with utilities and associated regulatory agencies ASAP after NTP. Process varies by state and initial meetings will determine the ultimate project scope and schedule	2025	2029	NCEPD	Outside Attorneys.
Construction: Infrastructure/Site work	Site staging and early site prep to occur late fall, with major work commencing in the spring 2026 after the winter season. All site work, including roads, utility infrastructure, to get the site "pad ready" to accept homes. Includes basecourse paving of roads for deliveries and allow phased home occupancy	Late Fall 2025	Fall 2027	NCEPD	Outside contractors, outside attorneys.
Quarterly Reporting	Concurrently with other projects NCEPD staff will prepare regular reporting to EPA on the project's status.	Fall 2025	Fall 2025	NCEPD	
Construction: District Energy Borefield	Bore hole drilling and installation of horizontal loop piping - concurrent with sitework activities	Spring 2026	Fall 2026	NCEPD	Outside contractors.
Construction: Home Fabrication	Off-site fabrication	Spring 2026	Fall 2028	N/A	N/A

Construction: Home Foundations	On-site construction of individual home foundations systems to be ready to accept building components upon delivery, incorporating 4-6 month break for winter	Late Summer 2026	Spring 2028	NCEPD	Outside contractors.
Construction: Home Component Delivery, Erection, and Interior Fit-Out	Requires on-site workforce to erect, complete each home's exterior cladding, and interior fit-out (interior wiring, plumbing, HVAC, finishes, appliances)	Late Summer 2026	Summer 2029	NCEPD	Outside contractors
Occupancy	Phase occupancy as homes are completed	Summer 2027	Fall 2029	NCEPD, Northern Cheyenne Housing Authority	
Quarterly Reporting	During this time period, and concurrently with other projects NCEPD staff will prepare regular reporting to EPA on the project's status.	Winter 2025	Summer 2029	NCEPD	
Microgrid Installation	Panel, batteries, and related equipment procurement and installation. Note infrastructure (distribution cabling) will be installed as a part of the overall site construction and infrastructure work. Microgrid will essentially be 'plug and play.'	TBD	TBD	NCEPD	Outside contractor.
Preparation and Submission of the Final Report	Concurrently with other projects NCEPD	Summer 2029	Fall 2029	NCEPD	

	staff will prepare the final to EPA.				
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Authorities

The Northern Cheyenne Tribe, as a sovereign, federally recognized Indian nation has the authority to enact GHG reduction measures on the Northern Cheyenne Reservation for the benefit of the Tribe's members. The Northern Cheyenne Tribal Council is empowered under the Tribe's Constitution to "[t]o protect and preserve the property, wildlife, and natural resources of the Tribe and to regulate the conduct of trade and the use and disposition of property upon the reservation."⁷ Tribal Council Resolution No. DOI-140 (2016), approved by the Council and signed by the President on May 26, 2016, which resolves that the Tribe "agrees to establish renewable and sustainable energy industries on the Northern Cheyenne Reservation as part of a long-range effort for a sustainable, viable economic venture that includes but [is] not limited to employment and training activities." That Resolution also sets forth the need for compatibility with Tribal cultural and spiritual beliefs, demonstration of financial feasibility, consideration of proposals from developers, and consideration of input from the general membership.

The Tribal Council has designated a Sustainable Energy Committee, which meets regularly and makes recommendations to the Council on actions necessary to expedite project implementation. The Committee will help to ensure consistent attention from Tribal leadership over time. With these measures in place, the Tribe expects that any lengthy or costly delays due to regulatory issues are very unlikely. Indeed, since 2016 the Tribe has repeatedly passed Resolution affirming these principles. The Tribe is also one of the few Tribes in the United States with a full-time Renewable Energy Manager position.

Additionally, under the Northern Cheyenne Tribal Leasing Act which was approved by the United States under the authority of the HEARTH Act, the Tribe has broad authority to engage in the leasing of lands and the issuance of environmental permits on lands beneficially owned by the Tribe. In furtherance of this authority, the Northern Cheyenne Tribal Code affords many governmental departments the authority to carry out the specific GHG reduction measures identified in this application. Where a project occurs within the Northern Cheyenne Reservation for the benefit of the Tribe's members the Tribe, its Council, and its governmental departments have broad authority to carry out these measures.

Therefore, the Northern Cheyenne Tribe has the authority to construct energy developments and energy efficient residential buildings on the Reservation for the benefit of the Tribe's members. To enact and construct this specific measure, the Tribe would adhere to the authorities and guidance provided in the Northern Cheyenne Tribal Leasing Act, federal statutes promulgated by the U.S. Department of Housing and Urban Development, the International Building Code, and the Tribe's Landlord and Tenant Code (Ordinance DOI-011 (06)). The Tribal Council has broad authority, under the Northern Cheyenne Constitution, to enter into agreements with private partners and carry out the requirements of federal grant assistance. NCT Const. Art. IV (1)(k). Therefore, the Northern Cheyenne Tribe, and its governmental departments, possess the authority to execute all aspects of a green, efficient housing project on the Northern Cheyenne Reservation.

⁷ Amended Constitution and Bylaws of the Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Article IV(1)(k).

Furthermore, for the microgrid component of the housing project, the Northern Cheyenne Environmental Protection Department has broad authority to oversee the construction and operation of a renewable energy project on the Reservation and can conduct environmental review where appropriate, most prominently the Northern Cheyenne Tribal Leasing Act which includes a robust environmental review component.

4. LOW-INCOME AND DISADVANTAGED COMMUNITIES

The Northern Cheyenne Tribe (NCT) currently has more than 11,000 enrolled Tribal members, with about 5,000 living on the 440,000-acre Northern Cheyenne Reservation in remote southeast Montana. Identified as a disadvantaged community, the Northern Cheyenne Tribe is challenged with persistent poverty and economic hardship, with many struggling to pay bills and some unable to stay in their homes due to the high cost of heat during harsh winters. This is in part due to the ramping down of the Colstrip power plant and the associated job losses that have occurred and will continue to occur at the plant and the associated mine.

More than 40% of the Tribe's population is under the age of 18 and at least one-third of households are overcrowded. Life expectancy on the Reservation is 55 years, 23 years less than the average American lifespan. According to the Climate and Economic Justice Screening Tool, most of the Reservation is in the 87th percentile for low-income households, meaning that households on the Reservation have an income that is less than or equal to twice the federal poverty level.⁸ Compounding this, the Northern Cheyenne Reservation is in the 97th percentile for a lack of indoor plumbing and in the 99th percentile for average annual energy costs divided by household income.⁹ With limited economic development, poor housing, and high utilities costs, the tribal members living on the Reservation are extremely susceptible to the expected high flood risk, wildfire risk, and expected building loss due to forecasted impacts of climate change.¹⁰ In attempt to mitigate these challenges, the Northern Cheyenne Tribe has identified the creation of a sustainable microgrid and weather-resistant, efficient housing as the most promising pathway for improving the quality of life of the Tribe's members and securing their safety as climate change progresses.

The U.S. Census 2017-2021 American Community Survey 5-Year Estimates show that although incomes have increased across the country, the median household income on the Northern Cheyenne Reservation has actually shrunk by 7% since the prior survey to \$43,542, compared to \$70,784 nationally in 2021. Additionally, 27.5% of Reservation families live below the poverty line and 69.5% of the Reservation population qualify as low- or moderate-income according to HUD Policy Development & Research. The Northern Cheyenne Tribal Housing Authority reports that out of the 284 low-rent units managed for the benefit of tribal members, 94 were rated as poor, 126 were rated fair, and only 64 were rated good. Fair units need a small or moderate amount rehabilitation and poor need a substantial amount of rehabilitation. Currently, many homes on the Reservation are at least twice the occupancy rate

⁸ *Climate and Economic Justice Screening Tool*, Tract Number: 30087940400 (last accessed March 22, 2024), <https://screeningtool.geoplatform.gov/en/#9.34/45.5332/-106.4987>.

⁹ *Id.*

¹⁰ *Climate and Economic Justice Screening Tool*, Tract Number: 30087940400, 30087000200, 30003940400 (last accessed March 22, 2024), <https://screeningtool.geoplatform.gov/en/#9.34/45.5332/-106.4987>.

of the original design, with residents sleeping in living rooms and hallways. The Tribal Housing Authority has identified over two hundred tribal members on the waitlist for housing on the Reservation.

a. Community Benefits

Housing on the Reservation is a desperate need due to the challenging economic conditions faced by the Tribe and its members detailed above. The construction of housing that is safe, efficient, and up to traditional building code standards is a direct community benefit. Not only will these homes lower greenhouse gas emissions on the Reservation, but tribal families will not have a safe home during the weather disasters that plague the Reservation. For example, the design team plans to use a continuously operating heat-recovery ventilation system with high MERV filtration to reduce indoor pollutants and increase available fresh air. Much of the Northern Cheyenne Reservation has asthma rates above the 95th percentile nationally, per the EPAs EJ Screen. Furthermore, with homes that are culturally and spiritually appropriate, by for example facing east and allowing multi-generational living, these homes benefit the tribal members in more ways than just shelter. These energy efficient homes will have low or no associated energy bills. The combination of quality, safe, culturally appropriate and affordable homes will serve as a springboard for opportunities for the families living in them to thrive socially and economically.

Workforce Programs On and Off the Reservation

A key workforce development opportunity arises from repurposing the skills of tribal members previously employed in the coal mining and power plant industries. With the planned ramp-down of the nearby Colstrip coal plant, many experienced workers are seeking employment. Their expertise in operating heavy machinery, maintaining industrial facilities, and understanding power systems is directly transferable to the construction, operation, and maintenance needs of the proposed microgrid and housing projects. This strategic repurposing of the local workforce's industrial experience can ensure the tribal community directly benefits from the transition towards sustainable energy sources. It builds on existing competencies while developing new marketable skills aligned with the long-term goals of reducing greenhouse gas emissions and improving housing quality.

The Tribe will also collaborate with local labor unions, trade organizations, and employee transition programs to identify these displaced workers from mining and coal power. Customized training programs will be developed in partnership with Chief Dull Knife College, a tribal college located on the Reservation, to bridge their existing skills to renewable energy and building construction and retrofitting. Hands-on apprenticeships and on-the-job training components will enable these workers to directly apply their previous experience while upskilling for the new green economy jobs. For those facing barriers like lack of transportation or need for childcare, the program will offer supportive services through flexible online and immersive course provided through the Chief Dull Knife College, making use of the technical building to provide access and availability for internet connection and technological device availability. Outreach efforts will focus on including other underemployed tribal members as well, creating opportunities for economic mobility.

The critical workforce development component will be collaborating with the local Chief Dull Knife College to establish vocational training and academic programs directly aligned with the long-term skilled labor needs for operating and maintaining the microgrid and energy-efficient housing units. Beyond the immediate job creation from the construction phase, these projects aim to seed an enduring career pipeline for the next generation of the tribal workforce. For example, the College could develop a

Renewable Energy Technician certificate program that provides hands-on instruction using the microgrid as a living learning lab. Students would gain expertise in solar photovoltaic systems, battery storage, grid control systems and more - preparing them for the technical roles required to keep this sustainable power source running reliably for decades. Similarly, a Green Construction and Retrofitting program would teach in-demand skills like energy auditing, insulation, electrification, and building control integration vital for constructing and upgrading housing to meet efficiency standards.

In addition to the longer-term vocational and academic programs, the workforce strategy will incorporate short-term job training certifications to prepare tribal members for a variety of supporting roles needed during the construction and operations phases. For the construction workforce, partnerships will be established with unions and job training providers to offer OSHA 10 and OSHA 30 courses that cover essential construction site safety. Quick-track programs for traffic control, flagging, and basic construction skills will enable tribal members to work as laborers, spotters, and on road crews supporting the housing developments. On the security and administrative side, the tribe will facilitate training in areas like security guard certification, basic office administration, and customer service to staff the workforce for patrolling sites, managing entrances, handling paperwork, and providing support services across the housing and microgrid operations. These short-term certification courses create low-barrier entry points into the projects' workforce stream. They offer an avenue for rapidly upskilling tribal members, including those facing employment challenges, to get their foot in the door. On-the-job experience gained can then motivate continued education or pursuit of more advanced skilled trades down the line.

Partnering with the tribal schools, these programs can be promoted through career counseling and STEM curriculum in K-12 schools to spark interest among Reservation youth. Internships, apprenticeships, and job shadowing opportunities will be built into the college initiatives - allowing students to get paid, practical experience working on these pioneering tribal projects. This deep integration creates intrinsic value by enabling youth to develop expertise in fields that will directly improve their communities while providing pathways to quality, in-demand green jobs.

The comprehensive approach, combining academic and vocational offerings with hands-on training using the funded initiatives as learning laboratories, can uplift the socioeconomic standing of the Northern Cheyenne community. It develops a sustainable pipeline of skilled workers prepared to operate and maintain these modern systems for the long-term while planting seeds of interest among the next generation to continue driving the tribe's transition to a resilient, clean energy economy. These workforce opportunities represent more than just jobs - they symbolize a pathway to true independence, healing, and self-determination for the Northern Cheyenne people. For too long, the combination of poverty, substandard housing, and lack of economic mobility has contributed to mental health struggles, substance abuse issues, and an erosion of hope on the Reservation. But the recharged sense of purpose ignited by building a sustainable future will provide a source of pride and dignity that can help address those afflictions. Having a stable career, providing for one's family, and contributing to an environmentally resilient way of life lays the groundwork for improved well-being and sobriety. No longer will tribal members feel trapped by their circumstances.

b. Community Engagement

The Northern Cheyenne Tribe held a key stakeholder meeting on February 29th, 2024, attended by tribal leadership, tribal agency heads, other tribal staff and members of the tribal community. The parties received a presentation on the Climate Pollution Reduction Grant, the completed GHG inventory

and other pertinent information, and brainstormed on the GHG-reduction priorities for the Reservation. The key stakeholders concluded that a green housing project with a microgrid component was the best project to counter greenhouse gas emissions on the Reservation and solve a rampant problem felt daily by the tribal members. This key stakeholder engagement, therefore, directed both the Priority Climate Action Plan and this application.

As a close-knit community with regular public meetings at the tribal headquarters and the five Reservation districts, the Northern Cheyenne Tribe plans to include consultation with the broader Tribal membership throughout the implementation of the greenhouse gas reduction measure. This would include job fairs, input on the final design of the residential housing, and information sessions on the microgrid.

5. JOB QUALITY

The vocational training and workforce development programs catalyzed by these projects will equip tribal members with highly marketable skills that extend far beyond the construction phase. Expertise in areas like renewable energy systems, residential retrofitting, energy auditing, and green construction practices are seeing exponential demand as the transition to a sustainable economy accelerates across industries.

These specialized yet adaptable skills create diversified career opportunities both within the Northern Cheyenne community and wherever sustainable development projects are taking root. Armed with certificates, hands-on experience, and a comprehensive understanding of cutting-edge technologies and building science principles, tribal members can market themselves as highly sought-after technicians, tradespeople, and consultants regionally and beyond. These trained professionals will be able to launch their own small businesses providing niche construction, installation, and maintenance services. The microgrid, efficient housing units, and future projects can serve as living showcases for their expertise - enabling tribal enterprises to secure contracts and build reputations as sustainable industry leaders. From energy auditing firms to specialty insulation companies to solar startups, possibilities abound.

This training ecosystem nurtures not just workers, but a new generation of Native American small business owners catalyzing sustainable development in their communities and beyond. The unique skills and real-world experience enable self-determination while addressing industry labor gaps hindering the proliferation of clean energy and green construction. Doors open to consulting roles, public-private partnerships, co-op businesses models, and more. What starts as a job can blossom into economic empowerment and entrepreneurial momentum for decades to come.

6. PROGRAMMATIC CAPABILITY AND PAST PERFORMANCE

a. Past Performance

Given that the Northern Cheyenne Environmental Protection Department (NCEPD) will be charged with administration and reporting for this award, this section will focus on NCEPD's past grant performance.

The NCEPD office has successfully applied for and implemented several EPA funded projects in the last 3 years. A list of the recent funded grant initiatives is provided below. NCEPD has successfully

completed projects on-time and on-budget by identifying realistic goals (outputs and outcomes) and scheduling our work using a milestone framework. Engagement with EPA support staff and liaisons has also assisted NCEPD's efforts as has the expertise of its team here at the tribal level. NCEPD documents its progress on funded projects by developing both quarterly and annual technical reports that summarize its work and financial expenditures on each element of the project.

1. EPA, Brownsfield Multipurpose Assessment, \$300,000.00, 10/01/2017-12/30/22.

The grant was funded to assess tribal properties for contaminants. Quality assurance plans and standard operating procedures were developed to identify and assesses the properties. The grant objectives were successfully completed within the timeframe. Quarterly reports were completely throughout the grant period. NCEPD's point of contact at EPA was Greg Davis.

2. EPA Brownfield Clean-up Grant, \$364,500.00, 10/1/2021-9/30/23.

The grant was funded to clean-up the properties that had asbestos, lead paint, or burnt out/abandoned buildings. The program successfully cleaned seven contaminated sites. The grant objectives were successfully achieved within the timeframe. Quarterly reports were completely throughout the grant period. NCEPD's point of contact at EPA was Babara Benoy.

3. EPA PPG Grant, \$4,296,038.00 10/1/2016-9/30/22.

The PPG grant was funded to provide an environmental presence on the Northern Cheyenne Reservation. The media programs included Administration, Water Quality, Air Quality, Non-point Source pollution, Brownfield Administrative Program, and Special Projects i.e., Solid Waste management, Watershed management, etc. The grant objectives were completed within the timeframe. Semi-Annual reports were completely throughout the grant period. NCEPD's point of contact at EPA was Monia Ben-Kahid.

4. EPA Clean Air Grant, \$321,662.00, 10/1/2018-9/30/22.

This grant was funded to monitor and protect the Tribes Class one air designation. Grant objectives were successfully achieved. Quarterly reports were completed throughout the grant period. NCEPD's point of contact at EPA was Monia Ben-Kahid.

5. EPA Lame Deer Creek Restoration Grant, \$100,000.00, 10/1/2022-9/30/25.

The grant was funded to address the deficiency of the Lame Deer Creek Watershed. The main objective of this grant was to create a 9-point watershed document to assist the program in restoration efforts. While grant objectives are ongoing, phases 1 and 2 of this project have been successfully completed. Quarterly reports were completed throughout the grant period. NCEPD's point of contact at EPA is Monia Ben-Kahid and Peter Ismert.

b. Reporting Requirements

For all of the above projects, NCEPD met all reporting requirements. Throughout the grant period, NCEPD timely reported on its progress towards the identified outputs and outcomes and submitted final reports to close out the award requirements. NCEPD has had a stellar record of meeting reporting requirements for federal awards, and has the requisite expertise to meet all reporting deadlines under the CPRG Implementation Grant.

c. Staff Expertise

NCEPD was established in 1990 to ensure environmental protection within the boundaries of the Reservation. NCEPD works to protect the Northern Cheyenne Tribe's water, air, and lands by administering water quality, wetland, air quality, and Brownfields programs.

Charlene Alden, Director of the Northern Cheyenne Environmental Protection Department (NCEPD), is a member of the Northern Cheyenne Tribe and longstanding advocate of the Tribe, the environment, and spokesperson of the community. Ms. Alden has a B.S. Degree in Business Management from Rocky Mountain College and more than 40 years of experience working with the Tribe's Finance, Gaming, Treasurer, and Environmental Protection Offices. Ms. Alden has administered numerous federal grants, supervised employees, coordinated with other tribal programs, and is an experienced public outreach and education coordinator. Ms. Alden is well-versed in both State and EPA environmental program and reporting regulations. Ms. Alden approves all construction and environmental permits on the Reservation and oversees all actions on the Reservation that may have a direct impact on the environment. Ms. Alden is an elder in the Tribe and a language keeper. 520 hours FTE.

Scott Williams, is the NCPED Air Quality Administrator. Mr. Williams graduated from the University of Idaho in 1988 with a degree in Computer Science. Mr. Williams served as the Tribe's Air Quality Technician from 1996 until 2019 and was responsible for the Prevention of Significant Deterioration (PSD) monitoring sites. This included collecting SO₂ and NO₂ data, calibrating said analyzers, and reporting this data to the EPA. Mr. Williams also manages the IMPROVE monitoring sites and Mercury Wet Deposition Program. Mr. Williams now serves as the Tribe's Air Quality Administrator and supervises air quality technicians, participate in the hiring of contractors, grant facilitation, and reporting of data to EPA.

7. BUDGET

Below, the budget will be described in detail. For additional information, please see the attached budget spreadsheet.

a. Budget Narrative

i. Personnel

NCEPD Program Manager, 1.0 FTE. This employee will work approximately 10,400 hours at \$35.00 an hour total amount \$364,000 over the life of the award. The NCEPD Program Manager will oversee the implementation of the GHG reduction measure, monitoring that the project is meeting identified tasks and milestones and will oversee grant compliance.

NCEPD Director Charlene Alden at .20 FTE. As the Director of NCEPD, Ms. Alden will work approximately 416 hours on this grant. Ms. Alden will review all permits, quarterly reports, contracts and agreements with outside parties, environmental review, and budgetary requests. Ms. Alden's work on this grant is budgeted at hour for \$95,680 total. The non-federal component of this work for Ms. Alden will be \$7,800 as it is

estimated Ms. Alden will contribute 600 hours on this project that will be covered by other, non-federal sources.

NCEPD Air Administrator will work approximately 2,080 hours, at \$38.00 an hour, on this GHG reduction measure, contributing to analyses and data collection related to air quality on the Reservation. The total budgeted amount over the life of the award is \$79,040.00.

NCEPD Administrative Assistant will assist with the preparation of quarterly reports, communication with outside contractors, and other grant compliance tasks at the direction of the Director and Program Manager. At \$26.00 an hour it is expected the administrative assistant would work approximately 2,080 hours on this award for a total budgeted amount over the life of the grant of \$54,080.00

NCEPD expects to hire temporary employees throughout the life of the award. These employees may assist with administrative tasks, communication with outside contractors, or document review. NCEPD usually hires tribal members to serve in these positions. It is estimated these employees will work approximately 2080 hours, at \$26.00, for a total budgetary amount of \$270,400 over the duration of the performance period.

ii. Fringe Benefits

Fringe benefits have been identified as salaries for NCEPD staff and temporary employees who will be working on this project throughout the duration of the performance period. The basis for this computation is the gross salaries of \$863, 200.00 at the rate of 28% for total estimated fringe benefits costs of \$241,696.00.

iii. Travel

NCEPD expects staff to travel both in-state and out-of-state to attend regional EPA conferences, meetings with outside contractors, on-site warehouse reviews of the pre-fabrication homes, and other relevant trainings. This amount totals \$85,000 with \$35,000 for in-state travel and \$50,000 for out-of-state travel.

iv. Equipment

To facilitate the implementation of this GHG reduction measure, NCEPD will require the acquisition of an additional program vehicle. This vehicle will allow NCEPD staff to travel to the job site, conduct environmental permitting reviews, and travel to meet with contractors on-site. The total, one-time cost of this vehicle is \$70,000.

v. Supplies

NCEPD expects the following supplies will be needed for the implementation of the GHG reduction measure:

Office supplies- ie. Desks, phones, printers, chairs, computers, software which will total \$50,000 over the performance period. These items will be used by NCEPD staff.

Field supplies – boots, clothing, hats, gloves, testing kits, etc which will total \$40,000 over the performance period. These items will be used by NCEPD staff.

The total budgeted amount for supplies is \$90,000.

vi. Contractual

a. *Consulting for the Pre-Fabrication Homes.*

The homes used in the GHG reduction measure will be pre-fabricated. Therefore, the company from which the Tribe procures the homes will provide consulting to the Tribe to determine the layout of the homes, the delivery method, and provide directions on erection on site. These costs are included in the construction costs below.

b. *Architectural and Civil Engineering.*

To facilitate the design and engineering of the homes, the Tribe will employ an architectural firm that also provides civil engineering consulting. This service will be critical to the implementation of the measure as the homes must be culturally appropriate, compatible with the localized microgrid, energy efficient, and structurally sound at the site. The Tribe will follow the Tribe's procurement procedures to hire the firm.

The budget for this work is a total amount of \$229,000

c. *Microgrid Feasibility and Design.*

To determine the feasibility and design of the microgrid, the Tribe will employ an outside contractor with expertise in localized, district scale microgrids. The Tribe will follow the Tribe's procurement procedures to hire the firm. The total budget for this work over the grant period is \$150,000.

d. *Legal Fees.*

The Tribe will incur legal fees to ensure all of the actions taken to implement the GHG reduction measure are inline with applicable regulations and have the necessary permits. Attorneys will review contracts between the Tribe and outside contractors, procure and review necessary permits, and guarantee that all statutory requirements are met throughout the grant period.

The budget for this work is: \$40,000 for all five years.

Total: \$200,000

vii. Other

NCEPD expects the following "other" costs throughout the period of performance to be:

Equipment maintenance & repair– fluid changes, tires, tune-ups, etc at approximately \$3,000 a year for a total budget amount of \$15,000.

Operation of the Program vehicle – fuel, washes, etc at approximately \$5000 a year for a total of \$25,0000.

NCEPD expects to train new, and existing staff, throughout the duration of the project period on the microgrid, data collection, and installation of data monitoring devices. This will cost \$6,000 a year for a total of Training of \$30,000.

NCEPD expects to host meetings with potential and hired contractors, key stakeholders, and the public throughout the project performance period. The Tribe will need to rent rooms and provide refreshments for these meetings. This will total \$12,500 over the performance period.

NCEPD expects to upgrade the water and sewage infrastructure near the site for a total cost to be determined after the necessary permits and site assessments are completed.

NCEPD expects a total of \$7,000,000 . This assumption includes the development of a thirty-acre site, water, sewer, and electrical infrastructure, minimal grading, and single road access curbing. NCEPD will hire outside contractors for this work which is included in the budget.

The construction for the district energy component will total \$875,000. This includes borehole drilling and horizontal loop pipping. NCEPD will hire outside contractors for this work which is included in the budget.

Working alongside the contractor who will develop the microgrid feasibility study and design, NCEPD will construct and deploy the solar array and microgrid. This is expected to cost a total of \$12,000,000 over the performance period with the majority of the costs consolidated into the last three years of the grant period. This inclusive of the PVs, batteries, and related equipment procurement and installation.

Finally, NCPED plans for a construction contingency at 15% for a total of \$5,231,250 for the total performance period.

viii. Indirect Charges

The Tribe applies the FY2019 Indirect Cost Rate of 25.97% using the base amount of \$863, 200.00 the indirect costs amount to \$224,173.00.

Northern Cheyene Tribe

Appendix A: Technical Appendix

Priority Action Create New DOE “Zero Energy Ready” Level Homes for Tribal Members

GHG Reduction Estimate

During the design phase the team will perform calculations to estimate both (1) the energy use of the proposed design, and (2) that of a typical existing home, quantifying the annual electrical and fossil fuel savings of the proposed design, and its GHG reduction. Prior to the design, GHG reductions will rely on the below strategy to estimate potential savings.

Estimating the GHG reduction measures for this Priority Action is difficult to quantify for many reasons as residential GHG emissions vary among individuals depending on the home's location, number of occupants, their habits, and personal choices. For example:

- The quantity of GHG gas emissions from home electricity use depends on the types of fuel utilized by the local electrical grid power plant to generate the electricity and the amount the home uses;
- The quantity of GHG emitted from heating the home depends on the fuel source, the equipment efficiency, and the home's size and exterior envelope insulation factor.
- Total occupants and their behavior far outweighs any other factors.

The below estimated GHG emission calculations utilizes the EPA's Household Carbon Footprint Calculator¹ to provide a baseline GHG emissions factor. The inputs include home location, number of people in the household, fuel for primary heating source, and average monthly natural gas, electricity, fuel oil, and/or propane usage.

Based on the utility data gathered for the Priority Climate Action Plan GHG Inventory, the primary residential utilities in this geographic area are electric and propane for heating. To provide baseline usage, the calculations utilize data via the US Energy Information Administration (EIA) for average US residential electrical² and propane³ usage for the state of Montana.

Baseline:

Based on the above, the EPA Household Carbon Footprint Calculator includes the following inputs to create the baseline:

- *Location:* 59043 zip code for Lame Deer, MT– proposed location for the proposed housing within the Northern Cheyenne Reservation.
- *Number of People in the Household:* Six (6). Based on information provided by the Northern Cheyenne Tribal Housing Authority, Tribal managed housing are multigenerational. The figure is an assumed average which includes a family of 4, plus either parents and/or extended family.

¹ <https://www.epa.gov/ghgemissions/household-carbon-footprint-calculator>

² www.eia.gov/electricity/sales_revenue_price/pdf/table_5A.pdf

³ www.eia.gov/consumption/residential/data/2020/state/pdf/ce4.6.lp.st.pdf

- *Electricity*: 908 kWh/month, or \$102.94/month⁴, per 2022 EIA data for the state of Montana.

2022 Average Monthly Bill- Residential

(Data from forms EIA-861- schedules 4A-D, EIA-861S and EIA-861U)

State	Number of Customers	Average Monthly Consumption (kWh)	Average Price (cents/kWh)	Average Monthly Bill (Dollar and cents)
Montana	540,745	908	11.33	102.94
Nevada	1,270,155	939	13.78	129.35
New Mexico	921,109	659	13.84	91.21
Utah	1,207,878	783	10.84	84.87
Wyoming	281,464	891	11.09	98.78

- *Propane*: 50.2 MBtu/household annually⁵ or 4.18 MBtu/month per 2020 EIA data for the state of Montana (note 2020 is the latest data available, released on June 23, 2023). The EPA calculator requires propane usage in gallons, thus, using a conversion factor of 91,452 Btu/gallon, this equates to an average of 45.71 gallons/month.

CE4.6.LP.ST Annual household site propane end-use consumption in the United States by state—averages, 2020

	Number of housing units (million)	Average site propane consumption (million Btu per household using the end use)			
		Total U.S. ^a	Total	Space heating ^b	Water heating Other ^c
Montana	0.43	50.2	43.3	Q	Q

The baseline carbon emissions per the EPA Household Carbon Footprint Calculator is **16,047 pounds CO₂e/year (7.28 MT CO₂e/year)**.

Proposed

To determine potential GHG reductions, the below calculations are organized to reflect project development milestones that provide a gradual reduction in GHG emissions. The schedule milestones include 1) immediate post construction where each home will remain grid-tied for all electrical needs, 2) after the microgrid comes online to provide 100% renewable electricity to the development.

GHG Reductions 2025-2030 (Grid Tied):

During initial home occupancy after construction of the homes and district energy system is complete, but while the renewable microgrid is still in development, the homes will utilize the utility electrical supply to provide all electrical needs, including those for heating.

⁴ In calculating the average use/cost per state for both electricity and propane, the EIA's information is unclear as to the average number of occupants per household that contributed to the calculation. This provides a variable to the overall GHG calculations.

⁵ See above.

As the project has yet to be designed to determine equipment efficiencies and strategies, it is not possible to determine an accurate reduction in energy use from the baseline. However, for the purposes of these calculations, the proposed reductions utilize the Passive House stated performance efficiency of up to 85% better than average homes⁶.

As the proposed development will utilize electricity as the primary heating source, the calculations include a conversion of the baseline propane consumption into an equivalent kWh added to the total baseline electrical consumption to determine an overall kWh energy usage for comparison.

Baseline in kWh:

- Propane: 4.18 MBtu/month * 0.000293071 kWh/Btu = 1225.04 kWh/month
- Electricity: 908 kWh/month
- Total: 2,133.04 kWh/month total

As noted above, assuming an 85% efficiency factor for designing to Passive House standards, utilizing the EPA's Household Carbon Footprint Calculator with the same zip code and home occupancy, the proposed reductions are as follows:

Reduction of Home Energy GHG emissions:

- 2,133.04 kWh * 85% = 319.96 kWh/month
- Carbon emissions: up to 3252 pounds CO₂e/year (per the EPA Household Carbon Footprint Calculator)
- Reduction: 16,047 pounds CO₂e/year (*baseline*) - 3252 pounds CO₂e/year = up to **12,795 pounds CO₂e/year per home (5.8 MT CO₂e/year).**

As the proposed development is for 25-30 new homes, **there is a potential GHG reduction of up to 319,875 to 383,850 pounds CO₂e/year (145.1 to 174.1 MT CO₂e /year).**

GHG Reductions 2025-2050 (100% Renewable Microgrid)

When the proposed affordable home development is paired with the renewable microgrid after it comes online, the assumption is that this would supply 100% of the development's electrical needs with renewable electricity. With this assumption, the proposed housing will achieve Net-Zero energy and carbon resulting in a **potential annual GHG reduction of 401,175 to 481,410 pounds CO₂e/year (182 to 218.4 MT CO₂e/year)** in total for the entire development (16,047 pounds CO₂e/year (*baseline*) * 25-30 homes).

⁶ <https://www.phius.org/passive-building/what-passive-building/passive-building-principles>