Workplan: Climate Pollution Reduction by Weatherization and Improved Energy Efficiency of University of Alaska Buildings and Assets

Section 1: Overall Project Summary and Approach (45 points possible)

Overall Project Summary

The State of Alaska Priority Sustainable Energy Action Plan, section III. Emission Reduction Strategies includes the overarching strategy of "Public Building and Asset Weatherization, Energy Efficiency, and Beneficial Electrification." Within that, the University of Alaska is specifically addressed under Part B. Non-Residential. The University of Alaska projects proposed in this application address deferred maintenance, energy efficiency, and alternative energy projects with the greatest potential for affordable GHG emissions reductions in the next five years. The Measures proposed include: an alternative energy project that would use seawater to heat a University of Alaska Fairbanks (UAF) research building at the Seward Marine Center; replacement of energy-inefficient ultra-low temperature freezers at UAF; replacement of exterior lighting at UAF with LEDs; installing energy efficient ventilation at the UAF Kodiak Seafood and Marine Science Center; replacing inefficient lighting and motors at UAF's Kuskokwim Campus in Bethel; weatherizing three older UAF buildings that currently waste heat through minimally insulated exterior walls; replacement of an inefficient boiler in Rasmuson Hall at UAA in Anchorage; and installing an innovative microturbine combined heat and power plant in the UAA Conoco Phillips Integrated Science Building. Community engagement staff located in Fairbanks, Anchorage, Bethel, Kodiak, and Seward will maintain an extensive website describing the projects and their outcomes and will work with Low-Income and Disadvantaged Communities (LIDAC) to provide information about these projects and the—primarily economic—local impacts. They will also create multiple opportunities for LIDAC members to provide positive or negative viewpoints about the specific measures proposed in this application, and, more broadly, to express concerns about GHG, CAP, and HAP impacts on their communities and the mitigation measures they support or oppose. The funds requested in this application would also support a K-12 outreach program serving children and youth from LIDAC areas of Fairbanks.

Reduction Measures (Section 1.B) (20 points possible)

Measure 1: Seward Marine Center Seawater Heat Pump

The University of Alaska Fairbanks' (UAF) Seward Marine Center (SMC) supports research and education in fisheries, marine biology and oceanography. It is the homeport of the 261-foot, global class, ice-capable R/V Sikuliaq. This ship is part of the US academic research fleet, owned by the National Science Foundation and operated by the College of Fisheries and Ocean Sciences (CFOS). CFOS also operates R/V Nanuq, a 40-foot research vessel based at the SMC and operating along the north coast of the Gulf of Alaska. The Donald W. Hood Laboratory provides shoreside facilities to support research cruise preparations or the immediate preservation or analysis of collected samples. The building is heated by >40 year-old oil-fired boilers that are very energy inefficient. Measure 1 will install a seawater heat pump and reduce the oil-fired boilers down to one smaller, more efficient unit that would be used only on the coldest days. The building-wide heating controls system would also be retrofitted to optimize the heating systems and reduce energy usage in the lab ventilation system.

Resurrection Bay is a deep (>250 meters) fjord that opens into the Gulf of Alaska. Using seawater as a heat source is feasible because, below a depth of 50 meters, the Resurrection Bay water temperature is normally 5 degrees Centigrade or above even in winter.[1] The Alaska SeaLife Center (ASLC) installed a similar heat pump system in 2012, taking advantage of relatively warm water to provide steady low-cost heat to the center. UAF participated in that project as a research partner. Leveraging the knowledge

[1] http://research.cfos.uaf.edu/gak1/.

gained and industry improvements to the seawater heat pumps, the project at the Hood building would follow a similar plan. Beyond reducing the GHG emissions from the Hood Building with a system that should last at least 25 years (and would be replaced with a like system if it is successful), a goal of Measure 1 is to demonstrate that seawater heat pumps are a practical alternative, with a reasonably short payback, to drastically reduce the need for oil-fired boilers in Seward and other similarly situated coastal Alaska communities like Valdez and some in Southeast Alaska, the Alaska Peninsula, and the Aleutians. Although this approach to heating is uncommon in Alaska, it is much more widely used in Europe and China.[2] It is more economic to implement as a community utility, with central source(s) of seawater.

Measure 2: Replace Inefficient Ultra Low Temperature Freezers

Ultra-low temperature (ULT) freezers hold sensitive samples that must remain at very low temperature (usually -80 degrees Centigrade) to prevent degradation. ULT freezers are some of the most energy-intensive pieces of equipment in a laboratory; a 2020 survey at UAF showed that these freezers are responsible for a significant part of campus energy use. UAF research and academic departments have 98 ULT freezers, located across campus.

The project will replace about forty (the exact number depending on bid prices) of the least energy-efficient units during a three-year replacement program. The replacement freezer units are super-insulated and consume substantially less electricity than older models. The project will also reduce reliance on GWP hydrofluorocarbons used in the existing fleet of freezers, recovering these refrigerants prior to the units' disposal. The new units would have modern refrigerants. Further, a user committee will be engaged to establish institutional, energy-saving policies. The 2020 study recommended, for example, requiring that only energy efficient ULT freezers are purchased; monitoring of each freezer for degrading performance; a replacement policy and funding pool for degrading freezers; preventative maintenance; and systematic sample inventory and retention policies. Together with the replacement of the existing inefficient freezers, this should allow the GHG emission reductions to last indefinitely.

Although ULT freezers are not common outside universities and medical facilities, even conventional freezers use more energy than most appliances. Outreach effort connected with this Measure will disseminate information on GHG emission reductions and cost savings with replacement of older, conventional freezers as well.

Measure 3: Pathways and Parking Lots LED Lighting Conversion

During the academic year, when the UAF Troth Yeddha'[3] campus is most populated, the days are short lasting just 3 hours around the winter solstice in December and January. In order to ensure a safe and secure campus, there must be an abundance of exterior lights in parking lots and along pedestrian pathways. Currently, there are approximately 422 lights that utilize inefficient metal halide and high-pressure sodium lamps. Measure 3 would replace these with LED fixtures. Although the lamps will need occasional replacement they will last longer than the current lamp types, and the fixtures should last for

[2] Luigi Schibuola, Chiara Tambani*, and Antonio Buggin. Seawater Opportunities to Increase Heating, Ventilation, and Air Conditioning System Efficiency in Buildings and Urban Resilience. Front. Energy Res., 01 July 2022 Volume 10 – 2022, www.frontiersin.org https://www.frontiersin.org/articles/10.3389/fenrg.2022.913411/full

[3] Troth Yeddha' is the name of the ridge where the largest campus of UAF is located. The name includes the Lower Tanana Athabascan words troth, 'wild potato' and yeddha', 'ridge'.

decades, so the realized GHG emission reduction should last indefinitely. An additional goal of Measure 3 will be outreach to show the cost-effectiveness of replacing outdoor lighting, intended to spur wider adoption of LED lighting.

Measure 4: Kodiak Laboratory Ventilation Upgrade

UAF's Kodiak Seafood and Marine Science Center (KSMSC) is located on Near Island in Kodiak, Alaska. KSMSC works year-round to discover better methods to harvest, preserve, process, and package Alaska's seafoods. KSMSC has research kitchens, biochemistry labs and food labs with experimental seafood processing equipment researchers use to test production techniques and develop new seafood products. KSMSC staff work closely with the industry to convey research results and provide educational opportunities that help seafood workers improve efficiency and the quality of their products.

The complex lab ventilation system relies on oil-fired boilers to provide heat to a major portion of the building. While the building is small, the average fuel usage is over 40,000 gallons annually. An energy audit identified various opportunities to reduce fuel usage and thus carbon footprint. Most notably, the laboratory ventilation system is running at a constant volume of outside air, regardless of the lab occupancy or use. The project proposed project will replace the supply air fan and laboratory variable air supply and exhaust air valves, connecting the air system to occupancy sensors, room temperature thermostats, and lab pressure controllers that optimize the supply air. The new ventilation system will also add safety features that ensure the lab is ventilated at the required minimums but stop wasting the fuel oil that is heating unnecessary outside air. UA plans to maintain this type of ventilation system as long as it owns the building. Beyond the impact of this Measure on the Kodiak facility, outreach efforts will emphasize that managing ventilation is a key strategy for reducing GHG emissions more broadly.

Measure 5: Kuskokwim Campus Lighting Conversion to LED and Motor Replacement

The UAF Kuskokwim Campus serves areas of southwestern Alaska near the Kuskokwim River, with facilities located in the small city of Bethel (population of about 6,300). According to the US Census Bureau, 84.8% of the Bethel Census Area population is Alaska Native or American Indian (predominantly the former); 21.9% of the population lives in poverty. Bethel is not on a road system nor is it connected to a larger electrical grid. Electrical power production utilizes costly and GHG emitting diesel engine generation. The average kilowatt cost is over 50 cents per kWh and using diesel fuel emits 2.4 pounds of CO_2 emissions per kWh. To reduce electrical consumption, two projects are proposed.

Approximately 450 lights in six buildings utilize inefficient fluorescent tubes and nearly half of those do not have occupancy sensors. The project will perform an electrical lighting upgrade to reduce energy usage. Some fixtures will allow an easy bulb-for-bulb swap and some fixtures must be replaced. The project will also include installation of lighting controls that sense both occupancy and perform daylight harvesting to eliminate a substantial amount of energy consumption.

The 60,000-square-foot campus has pump and air handler motors that run constantly at the same speed, set up on legacy controllers when they were installed. The project will replace the largest motors with more efficient units and add variable speed controllers to optimize loads (reduce RPM and amps) and eliminate runtime when the systems are not needed. UA plans to maintain the new energy efficient lighting, motors, and controls indefinitely and would replace any that fail with energy-efficient items.

Many of Alaska's small, remote communities have very high electricity costs. UA researchers with the Alaska Center for Energy and Power[4] and other units are working to develop alternative energy sources that are both lest costly and carbon neutral. However, meanwhile, the outreach connected with Measure 5 will present information on how individuals and communities can benefit from thoroughly assessing consumption and making the most cost-effective changes.

Measure 6. Exterior Wall Replacements to Reduce Heat Loss.

Three of UAF's oldest but most utilized facilities have substantial thermal losses, well beyond modern energy codes and standards. Eielson Building is the second oldest facility on campus, built between 1938 and 1948. The concrete exterior has minimal insulation and the windows, original the building, are all single pane, double hung windows. The building uses a disproportionate amount of steam to remain warm in the winter, while occupants use dozens of inefficient window air conditioning units to remain cool in the summer. Built in the late 1950's, the Bunnell Building was the first modern curtain wall-clad building in Alaska. While the curtain wall has served the building well, it does not have the thermal characteristics of today's exterior wall systems. The curtain wall has very little thermal R-value and the aluminum mullions and framing are not constructed with thermal breaks. The glazing has a low R-value and the overall system suffers from leakage. Patty Center was completed in 1963 and its curtain wall is very similar to that of Bunnell and also has substantial thermal losses.

The proposed project will replace the exterior wall systems with a modern system that has substantially more thermal value and much less air leakage. At Eielson, the project will apply insulation and new panels on the interior and exterior and update windows to modern triple-pane construction. For Patty and Bunnell, the project will install a system similar to that on the Usibelli Engineering Building (completed in 2017) next to Bunnell. It is the model for high-performance curtain wall systems. The overall R-value of that system is three times the current walls on Patty and Bunnell and it has no leakage of interior heated air. A new curtain wall system will allow the implementation of building energy management and the application of current energy codes and standards that guide the overall reduction of building steam usage.[5] The new walls and resulting GHG emission reductions should last >50 years.

Alaskans are already very familiar with low-cost weatherization strategies like weatherstripping and adding attic insulation, and there have been many programs to encourage and fund those approaches. Replacing a building envelope is a major investment that is not commonly done. Nevertheless, it can have substantial energy cost reduction benefits in addition to the GHG emission reduction. Although payback may be longer than for some other Measures, outreach efforts will emphasize the outcome that this is an economic approach in some situations.

Measure 7: Rasmuson Hall Boiler Replacement

UAA Rasmuson Hall is a four-story building built in the early 1990s. The building is about 80,000 square feet in size, and contains classrooms, offices, and lecture halls. Measure 7 would reduce greenhouse gas (GHG) emissions by replacing the existing cast iron sectional boilers with high efficiency condensing boilers. The building is currently heated by two natural gas Weil-McClain 1188 cast iron sectional boilers. Each boiler has a gas input of 3,428 MBH and a gross output of 2,848 MBH. Condensing boilers have features, such as a higher turn down ratio, which allow them to operate with greater modu-

[4] https://www.uaf.edu/acep/

[5] Troth Yeddha' campus is heated by co-generated steam from the UAF Heat and Power Plant.

lation, reducing fuel consumption. The new boiler should last at least 30 years, and would be replaced with an economic, GHG efficient alternative at that time. Condensing boilers are a mature and widely adopted technology. Nonetheless, building owners hesitate to replace older boilers that still function because of the expense. A goal of Measure 7 is to demonstrate and publicize that, even for a large and costly installation, the payback time is short enough to make replacement worth doing.

Measure 8: Conoco Phillips Integrated Science Building Combined Heat and Power Plant

Measure 8 aims to reduce greenhouse gas (GHG) emissions by installing a gas-fired microturbine in the Conoco Phillips Integrated Science Building (CPISB) on the UAA campus. A microturbine is about the size of heating boiler suitable for the CPISB. It burns natural gas to generate electricity, and the type intended for use in the CPISB is designed to capture heat from the combustion exhaust and transfer it into a fluid-based (i.e. hydronic) building heating system through a heat exchanger. Such microturbines are also called "combined heat and power" devices, or CHP. CHP have a higher efficiency of natural gas utilization due to the simultaneous production of electricity and usable heat. Also, localized generation of power provided by the CHP will reduce the overall peak electrical demand and eliminate energy transmission losses experienced through standard electrical distribution grids. The site-based power generation reduces power consumption from the electric utility but usually does not eliminate it entirely, especially in months when heating needs are minimal. In some circumstances, the financial savings from reduced utility demand can pay for the installation of CHP within a reasonable period of time. An additional aim of Measure 8 is to demonstrate that for a large building under Anchorage climate conditions. The CHP should last for decades, and UA would ultimately replace it with an economic, GHG efficient alternative.

All of the measures employ tested approaches to reduced GHG emissions. For Measures 2, 3, 4, 5, 6, and 7, the technologies are widely used and highly likely to achieve the calculated GHG emissions reductions. Measures 1 and 8 employ much less common approaches, at least in the US, which nonetheless are also very likely to succeed in reducing GHG emissions. UAF and UAA Facilities departments have extensive experience in managing and completing capital projects in the range of $1 million to $16 million; all 21st century projects have been completed successfully, and most have been completed on time and within budget.

The major assumption of this application is that project costs have been accurately estimated and that leads to the largest risk, contractor bids that are higher than the amount of funding requested. Equipment, material, and labor costs have increased rapidly since the Pandemic and it is difficult to predict future increases. Contingency has been included in the Measure capital budgets, but conservatively based on recent inflation and standard practice. In general, UA has two approaches to high bids: reissuing the bid solicitation, with changes in the scope of the project, or accepting a higher-than-expected bid and making up the difference with unrestricted funds. If this application is funded UA would use the latter approach unless it was financially infeasible, in which case project scope would be reduced if allowed in consultation with the EPA program manager. Supply chain problems are a potential source of delay, but these are much less prevalent than they were a year ago, and so unacceptable delays are unlikely.

Another risk is that there is an unknown issue, discovered during a project, that increases its cost or delays it. For renovation projects in general, discovery of hazardous materials like asbestos or PCBs is an example. However, UA has good records and HAZMAT assessments for all buildings; asbestos is a known and budgeted issue for Patty Center, but not elsewhere. Facilities monitors the condition of buildings closely, so hidden problems like water damage, mold, and so on are very unlikely.

In summary, UA's assessment of risks leads to the conclusion that the projected GHG emission reductions will not be affected. They could be delayed, but probably by not more than a year.

This application is not from a coalition. While UAF and UAA have separate regional accreditation from the Northwest Commission on Colleges and Universities, UA is a single financial, legal, and administrative unit under the UA Board of Regents, UA System President, and the State of Alaska.

The State of Alaska Priority Sustainable Energy Action Plan, section III. Emission Reduction Strategies includes the overarching strategy of "Public Building and Asset Weatherization, Energy Efficiency, and Beneficial Electrification." Within that, the University of Alaska is specifically addressed under Part B. Non-Residential. The plan states that "The proposed UA projects would address deferred maintenance, energy efficiency, and alternative energy projects with the greatest potential for emissions reductions in the immediate future. UA's measures are well positioned to be implemented within 1-3 years." Measure 1 is an alternative energy project, Measures 2, 3, 4, 5, 7, and 8 improve energy efficiency, and Measure 6 weatherizes three older, very "leaky" buildings.

UA selected its priorities based on its annually updated Capital Improvement Plan, which includes the System's highest priority deferred maintenance, renewal, and repurposing projects (DM/R&R). From that list a smaller group of projects that would lead to significant GHG emission reductions was identified. Then, using estimates of GHG emission reduction and cost, the projects with the largest emission reductions/dollar were selected for further analysis. Some projects were dropped at that stage because GHG savings were too small or difficult to calculate, leaving the eight measures included in the UA proposal.

UA also considered whether it could take different, larger steps to reduce GHG emissions, but none appear practical at this time. The UAF Troth Yeddha' campus in Fairbanks has its own coal fired heat and power plant, which was completed in 2018 and is among the most efficient fossil fuel systems nationwide in terms of amount of fuel consumed for both heating and electricity produced. Options that might reduce emissions of GHG and CAP were thoroughly considered during the permitting process, but no economically feasible alternative was available. There is no uninterruptable source of natural gas in Fairbanks, but should that change, the plant can be converted. Ultimately, carbon capture seems the most likely approach to reaching carbon neutrality, given the Interior Alaska climate and darkness in winter, but it is not economically nor technically feasible at this time. UA does not control available energy sources in Anchorage, Bethel, Kodiak, and Seward, and so it lacks the ability to make major changes.

Demonstration of Funding Need (10 points possible)

GHG reduction is a high priority for the University of Alaska (UA). However, the Deferred Maintenance, Repurposing & Renewal (DM/R&R) capital funding available is so limited relative to the need that the measures for which this application requests funding have not been implemented, despite being part of the Capital Improvement Plan for decades in some cases. It is unlikely these critical efforts will receive State funding in the foreseeable future, limiting UAF's ability to make a meaningful impact on GHG emissions.

Funding for GHG emissions reduction measures is consistently requested in the UA Board of Regents' capital "Renewal" category, with a focus on replacement of existing infrastructure and equipment with much more energy efficient alternatives. UA has a regular process of identifying infrastructure and equipment that needs renewal, the highest priorities are reported to the Board of Regents annually, and every year State funding is requested to address the most urgent needs. However, as reported to the Board at its November 2023 meeting, the UA DM/R&R backlog now stands at $1.435 billion and contin-

ues to grow. Over the past decade, the average annual State appropriation to the University System for all DM/R&R needs has been just $8.2 million (split among three universities), despite average Regents' requests of $56.2 million per year.

UA has recognized that it must use other funding sources to address the most critical deficiencies. UA borrowed $15 million total in FY2017-2018 and earlier borrowed $50 million in FY2012 to address impending building and infrastructure failure, replacing sewers, electrical distribution systems, roofs, and other critical items. Buildings and land outside the campus core areas have been sold, with much of the proceeds being used for DM/R&R. A student facilities fee was instituted in 2014 that provides a modest amount of annual revenue, about $2 million, across the UA system. For the past year UA has employed a retired administrator part-time to pursue grant opportunities; this is the second proposal submitted due to that investment. In addition, the UA Board of Regents charged the University Chancellors with reallocating operating funding to meet DM/R&R needs, initially setting a target of $15 million annually. However, that was not possible to sustain over the past decade, since State unrestricted general fund appropriations to UA have decreased by $51.2 million (13.4%) since FY2014, while costs have increased markedly due to inflation.

Other than the annual State capital budget request described above, there are no Alaska State funding sources for UA implementation of GHG reduction measures. UA is not eligible for most tax incentive programs, but we are working on identifying projects that qualify for the Energy Incentive Program from the Inflation Reduction Act. Other than this opportunity UA has not been able to find another Federal grant opportunity that might fund the GHG reduction projects.

There are no other active UA grant applications for funding the GHG reduction measures.

Transformative Impact (15 points possible)

In each case the success of Measures 1 through 8 will be used during outreach and engagement efforts as examples of approaches that can reduce GHG emissions in many other applications, especially in larger public and commercial buildings. GHG emissions and climate change would motivate many to undertake these projects if resources were available, but the strongest point about these measures is that all can pay back the initial investment in time, given the right conditions. Although there are many other examples of energy-saving projects nationally, there are relatively few that are selected specifically based on unusual conditions in Alaska: long, cold, dark winters; costly fuel oil and limited availability and likely increasing price of natural gas; and proximity to relatively warm seawater in south coastal communities.

Semiannual reports, and later, graphics illustrating reduced energy consumption, cost reduction, and GHG emissions due to the Measures will be published on the project website. UAF commits to maintaining the website for at least double the project length (eight years) and will transfer materials that continue to be accessed to other outreach websites when the project website is retired.

A goal of both broad outreach efforts and the K-12 outreach component is to increase public awareness of GHG emissions and how they can be mitigated. This should lead to change, not only at the individual level, but also at community and higher levels through regulations and changes in public investment.

Section 2: Impact of GHG Reduction Measures (60 points possible)

Table 1. Quantitative totals of estimated GHG emission reductions in terms of metric tons of CO2. UA emission reductions in this table are based on CO_2 only.

	2025-2030 GHG emission reduction (metric tons of CO_2)	2025-2050 GHG emission reduction (metric tons of CO_2)	2025-2030 Cost per metric ton of CO_2 emission reduction	2025-2030 Cost per metric ton of CO_2 emission reduction
Measure 1	254	1,523		
Measure 2	1,713	10,280		
Measure 3	420	3,219		
Measure 4	237	1,591		
Measure 5	178	1,363		
Measure 6	686	6,075		
Measure 7	428	2,138		
Measure 8	831	4,155		
TOTAL	**4,734**	**30,245**	**$7,096**	**$1,111**

Estimated reductions for CO_2 emissions are summarized in the table above. The UA Measures would not result in significant reductions of hydrofluorocarbons, methane, nitrous oxide, perfluorocarbons, and sulfur hexafluoride.

As described more fully in the Technical Appendix, reasonable assumptions and calculations were used to estimate the GHG emission reductions in Table 1. A brief summary of the methods is provided for each Measure in the Documentation of GHG Reductions Assumptions subsection.

Magnitude of GHG Reductions from 2025 through 2030 (20 points possible)

The cumulative 2025-2030 GHG emission reduction (metric tons of CO_2) estimated for each Measure and the total for all measures is shown in Table 1; the total is 4,734 metric tons. The method of calculating emission reductions over this period includes appropriate reductions for projects that will be completed between 2025 and 2030, i.e., some of the Measures will not be effective until 2026 or later. All of the UA Measures are durable and will result in emissions reductions from the time of renovation completion until 2030 and beyond. While the UA point score would benefit from an accelerated renovation timeline, that was not feasible in terms of Facilities staffing and also the capacity of likely contractors in some cases.

For scale, the average annual per capita energy-related CO_2 emission per Alaskan is about 53 metric tons per year,[6] or 265 metric tons/5 years. This is high relative to the US average of about 15 metric tons per year (or75 metric tons/ 5 years), in part due to the cold climate and large distances, but in large part to Alaska's oil and natural gas industry that exports fossil fuels to the rest of the US.

Magnitude of GHG Reductions from 2025 through 2050 (10 points possible)

The 2025-2050 GHG emission reduction (metric tons of CO2) estimated for each Measure and the total for all measures is shown in Table 1; the total is 30,245 metric tons. All of the Measures are expected to be durable through 2050 and most will last longer. UA will be responsible for necessary maintenance

[6] https://www.eia.gov/environment/emissions/state/excel/table4.xlsx

and repair or component replacement; it is expected that some lamps, motors, and pumps will need replacement and UA does that as part of routine maintenance.[7] The shortest equipment lifetime (but up to 25 years based on UA experience with the equipment) is for the ULT freezers. When replacement is necessary, it is almost certain that the replacement will be even more energy efficient. However, over time, some of the capacity will probably be replaced by storage in liquid nitrogen or other approaches that have a smaller carbon footprint.

Cost Effectiveness of GHG Reductions (15 points possible)

The total 2025-2030 emission reduction and the total project cost yield a ratio of $7,096 per metric ton. A mitigating factor is the high cost of renovation projects in Alaska in general and in rural Alaska in particular. These costs include higher labor and shipping costs and travel and subsistence costs for workers with specialized skills that are unavailable in small communities, along with overtime costs in completing outdoor projects during a short construction season (May-September).

Because all of the Measures yield durable reductions in carbon emissions, the long-term 2025-2050 cost/metric ton is more favorable, just $1,111. From the UA perspective the costs are a worthwhile investment, since fuel and electrical cost reductions will lead to project-level cost savings in as little as 5 years, but more commonly 10 to 25 years, depending on prices. This would create a modest pool of funds annually (on the order of $1 million per year at 2024 prices) that could be used for other GHG or CAP emission reduction projects.

Documentation of GHG Reduction Assumptions (15 points possible)

More extensive discussion of the assumptions made in GHG emissions calculations is provided in the Technical Appendix. The calculation method is briefly summarized here for each Measure.

Measure 1. Seward Marine Center Seawater Heat Pump. The annual reduction in fuel oil consumption was estimated from the proportional reduction (about 80%) achieved by a neighboring facility, the Alaska SeaLife Center, which installed a similar seawater heat pump system in 2012. The fuel oil consumption reduction was converted to CO_2 emission reduction using a standard factor of 10.19 kg of CO_2 emitted per gallon.

Measure 2. Replace Inefficient Ultra Low Temperature Freezers. The power consumption of a representative selection of the existing freezers was measured during 2020.[8] The per unit consumption was multiplied times the number of freezers to be replaced (about 38) to obtain the total baseline consumption. Manufacturer specifications (average of two) of modern ULT freezer power consumption multiplied by 38 (the minimum number of new freezers) gave the predicted power consumption after replacement. The power use reduction estimate was multiplied by 2.3 lbs. of CO_2 per KWh, the EIA value for a coal-fired power plant. However, this is conservative since the UAF Power Plant ratio measured in 2023 is about 3.0 lbs. of CO2 per kWh.[9]

Measure 3. Pathways and Parking Lots LED Lighting Conversion. The lights operate for about 4200 hours per year; they are centrally controlled and metered. The wattage of current lamps was taken from manufacturer specifications, and the resulting power consumption was compared to metering data as a check. The power consumption of new lights was from manufacturer specifications. The total

[7] The large DM/R&R backlog comprises costly projects, generally $1 million and up. UA is diligent about routine maintenance using the small funding sources described in the "Demonstration of Funding Need" section.
[8] Results were reported in "Research and Academic Sample Preservation", which has been uploaded as an optional appendix to this application.
[9] The UAF power plant provides not only electricity, but also co-generated steam used for heating and cooling.

difference for 422 lights was multiplied by multiplied by 2.3 lbs. of CO_2 per KWh, the EIA value for a coal-fired power plant.

Measure 4: Kodiak Laboratory Ventilation Upgrade. The current fuel oil consumption was based on actual use. The fuel oil energy consumption after the renovation was estimated by a design consultant (Bell Design Group),[10] based on the projected decrease in exhaust air, in a schematic design completed in 2010. The difference in fuel consumption per year and the EIA ratio 10.19 kg of CO_2 per gallon of fuel oil was used to calculate the CO_2 emission reduction.

Measure 5. Kuksokwim Campus Lighting Conversion to LED and Motors Replacement. The energy savings were calculated based on the lighting renovations only, because information on the existing pumps and fans is not readily available; many could not be accessed by local administrative staff. So, this is a conservative estimate. There are 800 T8 28 W tubes installed at present, consuming 224 kW hours per day for assumed use of 10 hours/day. They would be replaced with 10 W LED, consuming only 64 kWh/day, assuming that automatic controls will reduce use to 8 h per day. The reduction in kWh was used to calculate CO_2 emission reduction using the EIA CO_2 emission/kWh for diesel engine generators, which are the source of Bethel power.

Measure 6. Exterior Wall Replacements to Reduce Heat Loss. Steam consumption is metered for each building, and those data were used for baseline. The reduction in total steam consumption due to reduced air exchange through the envelope was estimated at 18%. The steam consumption reduction estimate was used to calculate the reduction in CO_2 emissions using the ratio 137 lbs. of CO_2 emitted per 1000 pounds of steam; that ratio was derived from measurements at the UAF CHP.

Measure 7: Rasmuson Hall Boiler Replacement. The AKWarm software[11] was used for the estimate. It examines only perimeter heat loss and ventilation heat loads. The manufacturer specifications of efficiency for the existing and replacement natural gas fired boilers were used. The software uses heating degree days to project the amount of fuel consumed annually. To convert the difference in fuel consumption by the two boilers to GHG emission reduction, the ratio 117 lbs. of CO_2 produced per million BTU of natural gas consumed was used.

Measure 8: Conoco Phillips Integrated Science Building Combined Heat and Power Plant. The reduction in Chugach Electric utility power consumption and increase in natural gas consumption was calculated by a microturbine project design consultant in 2020.[12] The net energy savings was converted to the CO_2 emission reduction using the ratio 117 lbs. CO_2/MMBtu.

Section 3: Environmental Results – Outputs, Outcomes, and Performance Measures (30 points)

Expected Outputs and Outcomes

Output:

- Completed renovations, as described in Section 1.
- Completed installation of replacement and new equipment, as described in Section 1.
- A project website describing the renovations and installations, their purpose, and the funding source, and including public feedback.

[10] "Kodiak FITC Boiler Conversion Analysis" was uploaded as an optional appendix. UA acknowledges that installing an electric heating system in addition to the ventilation changes would add substantially to the GHG emission reduction, since Kodiak power is hydroelectric, but the operating cost is uneconomic at this time.
[11] https://www.analysisnorth.com/AkWarm/AkWarm2downloadPublic.html
[12] CHP Technical Assistance Partnerships Northwest Report, included in the optional appendices.

- Thousands of LIDAC residents who have attended open forums, public presentations, other community engagement events organized by this project, addressing impacts of GHG and CAP emissions, emission reduction strategies, and other relevant topics.
- At least 400 children and youth from LIDAC who have attended Kids Camps or Smart Academies about GHG emission impacts and emission reduction strategies.

Outcomes:

- Reduction in cumulative metric tons of GHG emissions from 2025 through 2030:
- Reduction in cumulative metric tons of GHG emissions from 2025 through 2050:
- Reduction in annual amount of PM2.5 emissions due to the UAF Heat and Power Plant in Fairbanks in 2025 through 2030 and 2025 through 2050.
- Greater community (including LIDAC) understanding of the impacts of GHG and CAP emissions and the wide variety of mitigation measures that can be undertaken, with community input on the measures that would be most beneficial.

Performance Measures and Plan (10 points possible)

- Monitoring progress. The following will be included in each semiannual report:
  - % completion of renovation or equipment replacement for each measure.
  - % completion of milestones listed in the timelines prior to the date of report.
  - Summary of outreach and engagement, including description of activity, number of participants, and their systematic feedback; tracking of website use.
  - Narrative discussion of any barriers or risks to timely progress that have arisen.
  - Financial report including funds received, encumbered, and expended.
- Tracking outputs and outcomes. The following will be included in each semiannual report.
  - Records of natural gas, fuel oil, electricity, or steam consumption for the preceding six month period that are relevant to the particular renovations or equipment replacements for each of the measures. All buildings included in this application are individually metered for gas or steam, as applicable. The KSMSC, Seward Hood lab, and the Kuskokwim Campus cluster of buildings have their own heating fuel tanks. Most buildings have individual electric meters but Rasmuson Hall shares with several others in the west campus area.
  - GHG emissions/year calculated from the fuel, steam, or electricity consumption, as appropriate. Initially, these will be baseline values. As the projects are completed, there will be reductions in consumption and GHG emission.
  - Estimates of prior winter PM 2.5 emissions from the UAF Power Plant.
  - When a year or more of reduced consumption is available, 5 and 20-year reductions will be extrapolated. This will be updated semi-annually until at least a year after the project is concluded.
  - Assessment of LIDAC member and group input and UA responses or changes in actions, when applicable.

Each Measure will be evaluated by comparing the actual GHG emission reductions, for the 5 and 25 year intervals, and cost per unit GHG reduction to those predicted in this application and to those of other projects of similar cost undertaken in Alaska with public funding during approximately 2020 to 2030. Five-year emission reductions will be impacted by late completion so there is a built-in assessment of timeliness. CAP (PM2.5) reductions from the UAF power plant will be evaluated for any significance relative to other PM2.5 mitigations being instituted by the community. Public feedback on each measure will be summarized and characterized on two five-point scales, ranging from unfavorable to

favorable views of the Measure and from very little to almost complete understanding of the Measure and its goals. UA responses or actions relative to these will be assessed by a group of LIDAC members recruited for that purpose.

Authorities, Implementation Timeline, and Milestones (10 points possible)

The co-principal investigators, Kellie Fritzie, UAF Associate Vice Chancellor (AVC) for Facilities, and Kimberly Mahoney, UAA Vice Chancellor for Facilities, have the primary responsibility for implementing the Measures. AVC Fritze will have responsibility for Measures 1 through 6 and AVC Mahoney will have responsibility for Measures 7 and 8. Their direct reports UAF Director of Design and Construction Cameron Wohlford and UAA Director of Facilities, Planning, and Construction Christopher McConnell will have day-to-day responsibility for supervising implementation and for ensuring that interim and final reports are drafted according to the schedule, for AVC review, approval, and submission. Staff reporting to these two directors will complete key tasks, such as outreach and community engagement, contracting, accounting, project management, and engineering review and inspection. Contractors will carry out the contractually required work, such as design, renovation, or installation of equipment. UAF Summer Sessions will implement outreach efforts at the K-12 level.

The co-principal investigators, Kellie Fritzie, UAF Associate Vice Chancellor for Facilities, and Kimberly Mahoney, UAA Vice Chancellor for Facilities, have the authority for implementing the Measures. Any successors in their positions would assume that authority, and in case of a vacancy, their authority would be delegated by either the Vice Chancellor for Administrative Services or the Chancellor.

Cooperation or participation of other entities is not needed for UA GHG reduction implementation. Detailed timelines for implementation are shown on the next five pages. Months without milestones are not shown.

Workplan: Climate Pollution Reduction by Weatherization and Improved Energy Efficiency of University of Alaska Buildings and Assets

Measures 1 through 8. Community Engagement Implementation.

	Year 1	**Year 2**	**Year 3**	**Year 4**
November	Hiring process for community engagement staff.	Fall Smart Academy Completed	Fall Smart Academy Completed	Fall Smart Academy Completed
January	Community engagement staff create a plan. Summer Sessions completes Smart Academy Curriculum for Spring.	Community engagement plan is updated. Additional Smart Academy Curriculum completed.	Community engagement plan is updated. Smart Academy Curriculum updated.	Smart Academy Curriculum updated.
February	Initial project website published. The website will be continuously updated.			
March	Submit semiannual report to EPA through Director and AVC. Summer Sessions completes curriculum for Kids Camps.	Submit semiannual report to EPA through Director and AVC. Additional Kids Camps curriculum completed.	Submit semiannual report to EPA through Director and AVC. Kids Camps curriculum updated.	Submit semiannual report to EPA through Director and AVC. Kids Camps curriculum updated.
April	First Smart Academy completed.	Spring Smart Academy Completed	Spring Smart Academy Completed	Spring Smart Academy Completed
August	First Kids Camps Completed.	Kids Camps Completed	Kids Camps Completed	Kids Camps Completed
September	Submit semiannual report to EPA through Director and AVC.	Submit semiannual report to EPA through Director and AVC.	Submit semiannual report to EPA through Director and AVC.	Submit semiannual report to EPA through Director and AVC.

Workplan: Climate Pollution Reduction by Weatherization and Improved Energy Efficiency of University of Alaska Buildings and Assets

Measure 1. SMC Seawater Heat Pump

	Year 1	Year 2	Year 3	Year 4
November	Bid solicitation for design contract	Final design completed and installation begins.		
January	Design contract awarded			
March	Submit semiannual report to EPA through AVC. Initial design completed	Submit semiannual report to EPA.	Submit semiannual report to EPA. (outcomes)	Submit semiannual report to EPA. (outcomes)
April	Bid solicitation for installation.			
June	Installation contract awarded			
July	Major equipment ordered by contractor			
September	Submit semiannual report to EPA.	Submit semiannual report to EPA. Installation complete.	Submit semiannual report to EPA. (outcomes)	Submit final report to EPA

Measure 2: Replace Inefficient Ultra Low Temperature Freezers

	Year 1	Year 2	Year 3	Year 4
October	Project manager (PM) meets with users.	Order second group of freezers.		
November	PM and users decide purchase schedule.	Installation of first group of freezers completed.		
December	PM and Purchasing order about half of the freezers.	Second group of freezers arrive and installations begin.		
March	Submit semiannual report.	Submit semiannual report.	Submit semiannual report (outcomes)	Submit semiannual report (outcomes)
April	Freezer installations begin.			
May	PM and user group send policy recommendations to responsible administrators.			
September	Submit semiannual report to EPA.	Submit semiannual report. Installations completed.	Submit semiannual report (outcomes)	Submit semiannual report (outcomes)

Workplan: Climate Pollution Reduction by Weatherization and Improved Energy Efficiency of University of Alaska Buildings and Assets

Measure 3: Pathways and Parking Lots LED Lighting Conversion

	Year 1	Year 2	Year 3	Year 4
October		Contractor orders poles, heads, controls.		
November	Bid solicitation for design contract			
January	Design contract awarded			
March	Submit semiannual report	Submit semiannual report	Submit semiannual report	Submit semiannual report (outcomes)
May	Design complete.	Installation begins		
June	Bid solicitation for installation contract			
August	Installation contract awarded.			
September	Submit semiannual report	Submit semiannual report	Submit semiannual report. Installation complete.	Submit final report

Measure 4: Kodiak Laboratory Ventilation Upgrade

	Year 1	Year 2	Year 3	Year 4
October		Contractor orders controllers, air handlers, fans, motors, other items needed.		
November	Bid solicitation for design contract			
January	Design contract awarded			
February				
March	Submit semiannual report	Submit semiannual report	Submit semiannual report	Submit semiannual report (outcomes)
May	Design complete.	Installation begins		
June	Bid solicitation for installation contract			
August	Installation contract awarded. Control contract awarded.		Installation complete	
September	Submit semiannual report	Submit semiannual report	Submit semiannual report. Upgrade of laboratory controls complete.	Submit final report

Workplan: Climate Pollution Reduction by Weatherization and Improved Energy Efficiency of University of Alaska Buildings and Assets

Measure 5: Kuskokwim Campus Lighting Conversion to LED and Motor Replacement

	Year 1	Year 2	Year 3	Year 4
October		Contractor orders lights, motors, other needed items.		
November	Bid solicitation for design contract			
January	Design contract awarded			
March	Submit semiannual report	Submit semiannual report	Submit semiannual report	Submit semiannual report (outcomes)
May	Design complete.	Installation begins		
June	Bid solicitation for in-stallation contract			
August	Installation contract awarded.			
September	Submit semiannual report	Submit semiannual report	Submit semiannual report. Installation complete.	Submit final report

Measure 6. Exterior Wall Replacements to Reduce Heat Loss

	Year 1	Year 2	Year 3	Year 4
October		Contractor orders materials for Eielson.	Eielson installation complete. Contractor orders materials for Patty.	Patty installation complete. Contractor orders materials for Bunnell.
November	Bid solicitation for ini-tial design contract			
January	Design contract awarded			
March	Submit semiannual report	Submit semiannual report	Submit semiannual report	Submit semiannual report
May	Design complete.	Eielson installation begins	Patty installation begins	Bunnell installation begins
June	Bid solicitation for Eielson installation contract	Bid solicitation for Patty installation contract	Bid solicitation for Bunnell installation contract	
August	Eielson installation contract awarded.	Patty installation contract awarded.	Bunnell installation contract awarded.	
September	Submit semiannual report	Submit semiannual report.	Submit semiannual report.	Bunnell installation complete. Submit final report.

Measure 7: Rasmuson Hall Boiler Replacement
Measure 8: Conoco Phillips Integrated Science Building Combined Heat and Power Plant
[The timeline for both of these measures is the same.]

	Year 1	Year 2	Year 3	Year 4
October	Request for proposals, design contracts		Installations complete	
November	Design contracts awarded			
February	Designs complete.			
March	Submit semiannual report. Bid solicitations for installation contracts.	Submit semiannual report	Submit semiannual report (outcomes)	Submit semiannual report (outcomes)
May	Installation contracts awarded.	Equipment has arrived, installations begin.		
June	Contractors order equipment and other items needed for projects.			
September	Submit semiannual report	Submit semiannual report	Submit semiannual report (outcomes)	Submit final report

Section 4: Low-Income and Disadvantaged Communities (35 points possible)

Community Benefits (25 points possible)

The most immediate benefit to LIDAC will be economic. There will be broad stimulus to Anchorage and Fairbanks, including the LIDAC areas within them, and to Bethel, Seward and Kodiak. The stimulus will be proportionally greatest in the latter three communities because of their relatively small economic bases. Alaska does not have manufacturers for the materials and equipment that are needed for the measures, so that portion of the expenditures will not help locally, although there would be national benefits. UA cannot rule out a low bid from an out-of-state contractor for the renovation projects. However, the majority of smaller contracts in the range of the Measures go to Alaska firms, and contractors and their subcontractors will hire many Alaskans including LIDAC residents. Certain highly skilled workers (e.g., licensed electricians) are often unavailable in communities like Bethel, but even non-resident workers are an economic benefit to a community, buying food, lodging, and other needs.

Several of the budgeted positions (community engagement and liaison positions; Yup'ik translation; consultants to review websites and other materials relative to community information needs) should attract well-qualified applicants from LIDAC communities and recruiting for those positions will be carried out accordingly.

UA offers a substantial number of certificates and degrees relevant to the construction industry, such as basic carpentry (targeted at rural students), construction management, and a vari-

ety of business-related programs, and so UA considered an education component to recruit and fund LIDAC community members for skilled jobs in completing the Measures. However, the timing was not practical, since CPRG goals (GHG emission reductions as soon as possible) were at odds with the time to recruit and graduate LIDAC students, so UA would not be able to demonstrate that such funding directly related to the success of the Measures. Nonetheless it is and will continue to be UA's mission to prepare Alaskans for good jobs. UA enrolls many economically disadvantaged students; 34% of undergraduate certificate or degree seeking students were Pell Grant recipients in the 2022-2023 academic year.

Alaska and its disadvantaged communities are already experiencing serious impacts due to climate change and will have even greater challenges in the future.[13] These impacts include but are not limited to collapse of several subsistence and commercial fisheries, notably salmon in the Yukon River; rapid coastal erosion due to decreased sea ice cover, melting permafrost that damages buildings, roads, airports, and other infrastructure; and more frequent large wildfire seasons. The UA reductions in GHG emissions will be small in the global context, even when added to broader implementation of the Measures that this project will encourage. However, attainment of carbon neutrality will require implementing many such small reductions nationwide, as well as larger scale efforts like carbon capture, for which technologies are still being developed.

Fairbanks is a non-attainment area for PM 2.5. The proposed Measures 2, 3, and 6 will reduce UAF Troth Yeddha' campus demand for steam and electricity. The campus power plant emits PM 2.5 but is only a small part of the total Fairbanks emissions, which are mainly from residential wood burning for heat. The power plant stack is tall, so little of its emissions reach ground level. However, there will be a small positive effect for the whole community including LIDAC.

UA has not identified any negative impacts to low-income and disadvantaged communities.

The renovation projects will occur within the following Census Tracts:

Census tract ID	Census Area Name	City or Borough
02050000200	Bethel Census Area	Bethel
02122001300	Kenai Peninsula Borough	Seward
02150000100	Kodiak Island Borough	Kodiak

These census tracts are located within a short commuting distance of renovation projects.

Census tract ID	Census Area Name	City or Borough
02020000600	Anchorage Municipality	Anchorage Municipality
02020000703	Anchorage Municipality	Anchorage Municipality
02020000801	Anchorage Municipality	Anchorage Municipality
02020000802	Anchorage Municipality	Anchorage Municipality
02020000901	Anchorage Municipality	Anchorage Municipality
02020001000	Anchorage Municipality	Anchorage Municipality
02020001100	Anchorage Municipality	Anchorage Municipality
02020002000	Anchorage Municipality	Anchorage Municipality
02090000100	Fairbanks North Star Borough	Fairbanks North Star Borough
02090000300	Fairbanks North Star Borough	Fairbanks North Star Borough

[13] https://uaf-iarc.org/2019/08/alaskas-changing-environment/

02090000500 Fairbanks North Star Borough Fairbanks North Star Borough

Bethel Census Tract 1 surrounds the City of Bethel. It is sparsely populated and there is no road access. Residents of small villages such as Kwethluk might seek temporary employment in Bethel, but commuting is impractical and so direct impacts of the renovation projects will likely be small or absent.

Census tract ID	Census Area Name	City or Borough
02050000100	Bethel Census Area	None

Further assessment and quantification of associated community benefits will be carried out as each of the projects is implemented and reported in the semi-annual reports. The Directors of Design and Construction and Facilities, Planning and Construction will be responsible for the first three, and the community engagement lead will be responsible the fourth and fifth, assisted by consultants or other UA offices as needed. Assessment will include, but will not necessarily be limited to:

- Quantification of impacts on emissions of co-pollutants, specifically PM2.5 in the Fairbanks area.
- Contractors and subcontractors of renovation projects, whether local, Alaska, or non-Alaska
- Employment (contractor, subcontractor and UA) on each renovation project, job title & duration, and residence location (census tract) of employees.
- Enrollment of economically disadvantaged students in Kids Camps and Smart Academy.
    - Parent and child/youth feedback on benefits (or not)
- Participation of LIDAC members in community forums, presentations, and website use.
    - Participant feedback on the forum, presentation, or event
    - For the forums and website, input on GHG and CAP impacts and suggestions for future mitigation strategies.

Community Engagement (10 points possible)

The State of Alaska Priority Sustainable Energy Action Plan, which UA reviewed in the course of preparing this application, was based on broad input. "The Alaska Department of Environmental Conservation, in carrying out this planning effort on behalf of the State of Alaska, recognizes the individual efforts of state agencies, local governments, and Tribes in contributing mitigation measures that respond to the EPA's goals of climate pollution reduction and the State's goal of energy affordability…" UA has helped to document many of the concerns of Alaskans, and especially rural Alaskans, relative to impacts of climate change, air pollution and the economic impacts of PM2.5 mitigation in Fairbanks, and high energy costs, and UA considered these serious concerns in deciding to prepare an application.[14] UA did not have time to systematically and broadly consult with LIDAC members concerning the specifics of this CPRG application, but the UA campus or research unit staff in each location have been consulted about the Measures and think they would have substantial community benefits.

As described in more detail in other sections of this application, community engagement staff will be hired and charged with disseminating information about the eight Measures and their impacts, particularly the one(s) in their location, to the LIDAC designated areas as well as more broadly. At least one open forum per year (with provision for participation for those who cannot attend in person) will be

[14] Examples of publications consulted include https://uaf-iarc.org/2019/08/alaskas-changing-environment/; https://live.laborstats.alaska.gov/trends-magazine/2023/July/the-cost-of-living-in-alaska; https://dec.alaska.gov/air/anpms/communities/fbks-pm2-5-serious-sip/).

held in Anchorage, Bethel, Fairbanks, Kodiak, and Seward. For Fairbanks and Anchorage, the venue will be within a LIDAC area. For example, the UAF Community and Technical College is located centrally in the LIDAC areas there. The forums will invite comments on the Measures that UA is employing to reduce GHG emissions and will offer opportunities for people to suggest additional efforts. The website will also include a feedback opportunity, although our experience is that responses often do not include requested demographic information. Feedback will be curated and accessible from the website. [Curation will not screen out negative feedback, but will eliminate irrelevant material and inappropriate expression, as well as repetitious responses from individuals.] The K-12 outreach program will enroll at least 100 economically disadvantaged students from LIDAC schools and as many others as can be accommodated. The community engagement will occur throughout the four-year duration of the proposed project, and via the website and K-12 materials prepared for students outside Fairbanks, will continue until at least 2033.

Description of outreach activities:

The community engagement efforts related to the Measures will be assessed and revised as UA gains experience with the specific subject matter and interest groups, although UA already has extensive experience reaching out to nearly all Alaska communities in a variety of contexts. The initial plans include:

- Develop and maintain an extensive website. It will initially include the Measure descriptions—in more detail than shown in this application—and baseline information on energy use and GHG emissions. As work proceeds, the semiannual reports and visuals showing progress on the renovation and equipment installation projects will be added, along with community input as described above. Once a Measure is completed, data and graphics showing the GHG emission and energy cost reductions will be added. The website will include links to high-quality information on climate change impacts on Alaska, practical energy conservation strategies, alternative energy sources appropriate to Alaska, and other relevant topics.
- At least one public forum in each city each year, as described in the preceding section. In Anchorage and Fairbanks, the forums will take place at a venue within a LIDAC. The public feedback will be recorded (with permission) and preserved.
- Public presentations by experts on relevant topics. Lecture series will be organized in Fairbanks and Anchorage, where the Universities offer a wide variety of public events on a regular basis, and webstreamed. The community liasons in Bethel, Kodiak, and Seward will consult locally to determine what kinds of public events would attract residents.
- Booths or tables at large community events such as fairs, university or campus “open house”, and the like.
- Meetings between community engagement leads or liaisons and community leaders or groups, to present information on the Measures and receive input on concerns about GHG, CAP, energy costs, and other relevant topics. These will be summarized and preserved. University or campus leaders will also attend some meetings as appropriate.
- Community engagement staff response to inquiries from members of the public.
- Displays explaining and illustrating the Measures relevant to each community will be placed in central locations. At minimum those will include the buildings where renovations are being carried out and at least one location, such as a community center, where the general public is likely to go.

The proposed K-12 outreach activities are extracurricular enrichment classes that will address climate change and PM 2.5 impacts on Alaskans as well as the efforts that are being undertaken to mitigate those impacts and additional, future efforts that could be made to further reduce harmful emissions.

Although there are many resources available nationally, the unique challenges in Alaska are not fully addressed in ways suitable for K-12 students. UAF Summer Sessions & Lifelong Learning has extensive experience in providing extracurricular programming for K-12 students. Two major types of programs are well-established. First, there are summer [day] camps. These are offered on varying schedules determined by the type of activities, but typically are 5 half-days or five full days. Camps based on field trips may operate on a different schedule. Second are the 365 Smart Academies, which operate during the school year. These are often offered half-days on five Saturdays per semester for in-person classes. Zoom offerings for students who cannot attend in person often occur on Saturdays as well. The latter are available to students in remote communities and are sometimes scheduled during the school day by arrangement with rural schools. Zoom students receive learning kits including printed materials and supplies for hands-on activities. UAF Summer Sessions & Lifelong Learning serves approximately 2000 K-12 students per year and regularly works with K-12 schools to enroll disadvantaged students, partnering with the Alaska Native Education Program and with the McKinney Vento program for students experiencing housing insecurity.

The specific objectives for the CPRG funding requested are to enroll at least 100 additional LIDAC students/year in the new climate change/mitigation classes, by recruiting in schools serving students from those communities and selecting students who are eligible for free or reduced-price school lunches for grant-paid fee waivers; to develop curriculum for at least four new modules closely related to the CPRG program, which will then be regularly offered for the four years of the grant. In addition, a version of each module will be made available online for the use of teachers, homeschools, or students.

As discussed in the preceding paragraph, UA will be conducting community engagement activities in-person in Anchorage (southcentral Alaska), Bethel (western Alaska), Fairbanks (interior Alaska), Kodiak (island south of Alaska), and Seward (southcentral Alaska), beginning within a few months of the start of the project. Bethel is a majority Yup'ik community where many residents speak Yup'ik, although most speak English as well. Public forums and presentations will have Yup'ik translation, and printed materials and the website for Measure 5 and connected topics will also be translated.

Section 5: Job Quality (5 points possible)

Renovation project contractors and their subcontractors will hire many Alaskans including LIDAC residents. Although UA cannot require local or Alaska hire, it will be encouraged as much as legally allowed, for example, by requiring positions to be posted or advertised in ways that are readily accessible to community members. The project managers will gather information from contractors on how and when they will be hiring and provide it to the community engagement staff for dissemination. The University of Alaska complies with the Davis-Bacon Act.

Several of the budgeted positions (community engagement and liaison positions; Yup'ik translation; consultants to review websites and other materials relative to community information needs) should attract well-qualified applicants from LIDAC. Qualifications for the positions will include experience with and knowledge of LIDAC. Recruiting for those positions will have a focus on media (including social media), gathering places, and organizations that community members frequent. UA as a public employer offers competitive wages and benefits for >50% FTE positions. Although the community liaison positions and the consultancies are part-time, the likeliest people to fill them will be those with other <100% positions, such as teachers or UA staff with 9-month contracts. If well-qualified candidates wanting part-time positions are

not found, UA can combine the positions with other duties to create benefitted positions and readvertise. It is not possible to specify combinations in this application because it will depend on what is needed at the time.

Section 6: Programmatic Capability and Past Performance (30 points possible)

Past Performance (10 possible points)

The University of Alaska Facilities units typically manage millions to tens of millions of dollars of State appropriation for capital projects each year. During most years they are also responsible for millions in externally-funded projects, but much of that funding is allocated from large research or research facility operations contracts, rather than grants or cooperative agreements. UA as a whole has had more than a thousand grants, cooperative agreements, and contracts active during the past three years. Five examples, ranging from medium to large in scope, have been selected that have some relevance to the proposed project, as noted in the short description.

1. EPA grant including Division of Design and Construction renovation project

Principal Investigator	David Barnes
Title	University of Alaska for Alaska PFAS Remediation Facility Feasibility Study
End Date	9/30/2025
Assistance Agreement/award#	84053201
Federal Funding Agency	EPA
Contact Name from Agency	Flora Barrow barrow.flora@epa.gov
CFDA	66.202

This grant is the only larger amount of EPA funding ($2,000,000 awarded) that UA currently has. This project has three objectives, each with an associated primary project task as identified in the Quality Assurance Project Plan (QAPP). These objectives/tasks are to (1) Evaluate effective PFAS contaminated soil and groundwater treatment options for use in Alaska; (2) Work with state agencies to develop a strategy for treating PFAS contaminated soil, surface water, and groundwater in urban and remote areas in Alaska; and (3) Establish a laboratory at the University of Alaska Fairbanks (UAF) for analysis of PFAS compounds in water and soil. The facility renovations to the Usibelli Building being carried out by UAF DDC are progressing as planned except that a new fume hood was ordered but is 6 months delayed due to manufacturing shortages. Work on the three research objectives is progressing mostly on schedule, with some delays due to the procurement issues and other uncontrollable challenges.

2. NSF cooperative agreement for operation of the Toolik Field Station

co-Principal Investigators	Marion Bret-Harte; Brian Barnes
Title	Toolik Field Station, 5th Cooperative Agreement
End Date	7/31/2027
Assistance Agreement/award#	2221133
Federal Funding Agency	NSF
Contact Name from Agency	Angela Turner aturner@nsf.gov
CFDA	47.078

Toolik Field Station (TFS) is operated and managed by the UAF Institute of Arctic Biology under a cooperative agreement National Science Foundation (NSF), providing housing, meals, laboratories and science support to researchers and students from the U.S. and other nations. TFS is located 370 miles north of Fairbanks and is an important resource for research on the impacts of climate change in the Arctic. TFS has been funded by a series of cooperative agreements for more than 20 years. All have been successful and well-managed.

3. NSF EPSCOR Grant (a UA System grant)

Principal Investigator	Brenda Konar
Title	EPSCoR RII Track-1: Fire and Ice: Navigating Variability in Boreal Wildfire Regimes and Subarctic Coastal Ecosystems
End Date	9/30/2024
Assistance Agreement/award#	1757348
Federal Funding Agency	NSF
Contact Name from Agency	Michael Horneffer mhorneff@nsf.gov
CFDA	47.083

Alaska has had an NSF EPSCoR program since 2001. Alaska's current EPSCoR funding includes a 5-year "Track-1" project ($20,000,000 over five years) that has been studying the impacts of climate change on boreal forest wildfires and on coastal ecosystems affected by glacial meltwater and the change in precipitation from snow to rain. Fire & Ice includes a Diversity, Education and Workforce Development team that is working to increase key competencies of K-12 through college level students and to broaden participation in science, technology, engineering and math fields.

4. NSF Navigating the New Arctic, Displacing Wood Use

Principal Investigator	Dominique Pride
Title	NNA Research: Collaborative Research: Displacing Wood Use with Electric Thermal Storage Heating to Improve Ambient Air Quality
End Date	8/31/2025
Assistance Agreement/award#	2127430
Federal Funding Agency	NSF
Contact Name from Agency	Angela Turner aturner@nsf.gov
CFDA	47.05

Burning wood is the largest source of PM2.5 in the Fairbanks North Star Borough, which is a nonattainment area for this pollutant. The aim of the research is to study Electric Thermal Storage Heater (ETSH) use in homes to find out whether they reduce home heating costs and, by reducing wood burning, PM2.5 emissions. The project commenced in September, 2021 and has been successful to date, but field work was delayed by one year due to permitting and recruiting delays.

5. Navigating the New Arctic, Reducing Fuel Oil Consumption

Principal Investigator	Dominique Pride
Title	NNA Research: Reducing Fuel Oil Consumption in Rural Arctic Communities
End Date	8/31/2026
Assistance Agreement/award#	2220615
Federal Funding Agency	NSF
Contact Name from Agency	Angela Turner aturner@nsf.gov
CFDA	47.05

This project also aims to study the use of Electric Thermal Storage Heaters, but in the context of the Arctic community of Kotzebue, and includes a strong community engagement component. Fuel oil is very costly in remote rural Alaska and fuel oil heaters produce GHG and other pollutant emissions. Wind and other renewable sources of electricity are increasingly used in rural areas, but are variable, so the ETSH may enable homes to use more electricity when renewable sources are greatest. This project has been operating for just 18 months but has been successful to date.

Reporting Requirements (10 points possible)

1. EPA Grant with Division of Design and Construction renovation

The first year of the grant ended in fall, 2023. As explained above, the lab renovations have been completed except for the delayed fume hood. EPA has required two reports to date: a Quality Assurance Project Plan (QAPP), and an annual report. Both reports were submitted on time, though the annual report required a new current and pending form from the co-PI, who was on emergency family leave. The missing form resulted in the inability of the EPA to sign off on the report until the form was submitted, approximately 3 weeks after the report was turned into EPA.

2. NSF grant for operation of the Toolik Field Station

The TFS staff is just wrapping up final reporting on the 4th Cooperative agreement, which recently finished a no-cost extension. Despite the pandemic, TFS continued to operate successfully, albeit with necessary restrictions. For the 4th Cooperative Agreement, all interim reports were submitted and approved. The final report was submitted on time, but our Program Officer has asked for a change in how we report the financial information. The changes were made but not yet approved. On the current 5th Cooperative Agreement, the first interim report was submitted on time and approved.

3. NSF EPSCOR Grant

The current EPSCoR track 1 grant is in a no-cost extension year that ends 9/30/24. Five annual reports have been submitted on time and all of the reports have been approved and accepted by the NSF EPSCoR program officer. The researchers and staff are currently working on the final report for Fire & Ice, which will be submitted in the fall.

4. NNA Research: Collaborative Research: Displacing Wood Use with Electric Thermal Storage Heating to Improve Ambient Air Quality

The Year 1 interim progress report was submitted on the required schedule and was deemed acceptable by the NSF. The field study was delayed by one year due to difficulties with recruitment and land permitting delays. The Year 2 interim progress report was submitted on the required schedule and was deemed acceptable by the NSF.

5. NNA Research: Reducing Fuel Oil Consumption in Rural Arctic Communities

The Year 1 interim progress report was submitted on the required schedule and was deemed acceptable by the NSF.

Staff Expertise (10 points possible):

The University of Alaska is a land-, sea- and space-grant system of higher education. The UA system's three universities, UAA headquartered in Anchorage, UAF headquartered in Fairbanks, and UAS headquartered in Juneau, are separately accredited institutions with 13 community campuses and additional learning, research, outreach, and extension centers located across the state. System-wide, more than 20,700 full- and part-time students are enrolled, earning credentials ranging from workforce certificates to doctoral degrees. As of October 2023, the UA system had 6,678 employees, of which 61% were regular, benefitted employees and the remaining 39% were in temporary or extended temporary assignments.

In terms of restricted fund research expenditures, UAF is in the top 150 of nearly 700 U.S. institutions that conduct research. UAF has a particular focus on the Arctic and its climate and has ranked in the top 11 of more than 10,000 institutions worldwide for number of citations in climate change publications. It is also the home of the Alaska Center for Energy and Power, which has the mission of developing and disseminating practical, cost-effective and innovative energy solutions for Alaska and beyond. UAA has a variety of complementary strengths, including health and economics education and research. Hence, community engagement staff of this proposed project have a broad and deep expertise available to them in developing the website, educational materials, public events, curriculum for the Summer Sessions K-12 outreach, and other efforts. The community engagement staff would be new hires, but UA includes several major units responsible for community engagement, such as UAF Cooperative Extension, UAF Marine Advisory Program, UAF Summer Sessions and Lifelong Learning, and the UAA Alaska Small Business Development Center. There are many highly experienced staff members to consult.

The Facilities staffs at both UAA and UAF have extensive experience managing and administering renovation projects similar to those proposed here and have averaged more than $8 million in successfully completed DM/R&R projects annually for the past decade. Resumés for the unit leaders Fritze, Mahoney, Wohlford, and McConnell are included in the proposal package. Fritze and Mahoney are Associate Vice Chancellors, each of whom report to a Vice Chancellor directly under the Chancellor who is the CEO of each university. Each AVC has considerable responsibility, authority, and financial and staff resources within the Facilities units, and in addition has ready access to higher authority. While UA is confident that it will be able to achieve the goals of the application with the funds granted by the EPA, there are options to deal with unexpected circumstances.