

North Dakota Energy Conservation Grant/GHG April 2024

Section 1: Overall Project Summary and Approach

a. Description of GHG Reduction Measures

The Energy Conservation Grant is administered by the North Dakota Department of Commerce and focuses on assisting North Dakota political subdivisions (including tribal governments) with energy efficiency improvements to public buildings.¹ These energy efficiency measures include HVAC and boilers, more efficient lighting, installation of insulation, and other improvements that meet the program's requirements for a 10-year or less payback period. This program was started in 2013 and to date, approximately 245 energy efficiency projects have been funded statewide. Commerce will expand this program to provide a greater amount of project funding to support more upgrades, include larger county buildings and schools as eligible applicants, target LIDAC areas with additional points in applications, and provide workforce training opportunities in schools.

North Dakota believes the ability to protect human health and the environment requires all sectors of the energy industry working in partnership with state and federal government. This includes private and public entities. As our global needs shift and impact the state, the State Energy Office and Commerce work closely with local governments to create value opportunities both in development along with implementation.

One of the underfunded, yet successful programs, is the State Energy Conservation Grant program. This grant works jointly with public sector entities to improve the energy efficiency of existing facilities such as schools, county and city administration buildings, staff working areas and public use buildings including but not limited to senior citizen facilities, public owned buildings, and community centers.

This grant is minimal funding each year of \$600,000, yet the improvements provide a return on investment both in fiscal return but also in health and safe working environments for public employees and students. To date, the state has been able to fund projects statewide in efficient heating system retrofits/upgrades, lighting, building envelope, air filtration repairs, insulation, door replacements and other needed improvements to increase efficiency and health standards and lower costs for the taxpayer.

¹ North Dakota Department of Commerce. "Energy Conservation Grants." Accessed March 2024. Retrieved from: <https://www.commerce.nd.gov/community-services/state-energy-programs/energy-conservation-grant>

The CPRG request for the State Energy Conservation Grant increases to provide subawards to meet the increased demands for aging public infrastructure and support low and moderate income-based communities maintain, if not lower, their general tax obligations. Each year, North Dakota receives requests from school districts where costs for improved efficient heating systems reach close to half a million dollars. The minimal amount we can provide with our biannual funding does not come close to meeting the needs across the state. While there are several loan funding sources both federally and statewide, the result if a school district or public body utilizes loan pools is an increase in property taxes to generate the income to cover the loan. While long term the benefits outweigh the costs, the increase in taxing directly impacts today's costs for low to moderate income communities.

As this program has been in implementation since 2013, the success ratios have been clearly achieved and proven. Unfortunately, the amount of allocation does not ensure widespread success across the state. Increased funding, tied to increased allocations to each project, creates a pool to meet the demands and support reduction in greenhouse gasses statewide within ten years.

The implementation of the program would begin immediately to meet the needs as outlined by the schools and public bodies. Additionally, the workplan for this project will include a request to increase funding levels in the 2025 legislative session, communication across the state to include underserved/J40 regions and layering the funding with other state and private/nonprofit entities that share similar goals of healthy environments.

b. Demonstration of Funding Need (10 possible points)

North Dakota legislature, since 2013, had funded the program at a consistent rate of \$600,000 per year. With limited funding, the maximum amount that has been authorized for each project has capped at \$100,000. Current estimates for energy efficient boiler systems in school range from \$300,000 to \$500,000. With increased cost and no additional funding, 12 projects could deplete the entire biennium funds.

While other federal funds can possibly be available to support these efficiency measures, the high demand in all political subdivision and school entities quickly usurps the minimal funding. The benefits of this program and the opportunity with this funding will be the support through contracts which can reach into underserved regions where there are minimal resources to provide insight into grant opportunities along with support the application and implementation. In the ten years this funding from the state has been available, only two native American school/public buildings have been able to access the resources and limited amounts of J40 populations have utilized this grant. These additional resources and dedicated staff/contractors will allow outreach to the highest areas of need across the state.

The state of North Dakota also did not have the resources to pursue the non-formula fund granting opportunities where dollars could have been matched or used in conjunction with this fund. By maximizing the dollars available with the long-lasting impacts on a lower than average cost, expanding this program and the energy efficiency measures to subgrantees will have long term impacts.

c. Transformative Impact

The greenhouse gas reduction method through this program have supported considerable reduction measures the past ten years. The barrier to future reductions on a larger scale is the amount of funding and ability to participate in the projects. With the continued minimal funding and increased cost in projects, local leadership and engineers for projects so not apply for the funding as the amount of dollars are not considered worth the paperwork. This disinterest leads project and local management to look for the cheapest solutions vs. the best solutions in order to minimize the burden on local citizens and taxpayers. With increased funding and ability to provide larger amounts to projects, the incentive to utilize the newest and best technology, along with unique state-of-the art solutions not affordable or even considered without additional funding.

One-third (146) of North Dakota's communities are at least 51% low income. With limited income and the reluctance to increase taxes to pay for energy efficiency and health improvements to public facilities. This short term view for long term benefits continues to defer reduction in environmental hazards, but creates atmospheres where public health could be a concern.

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

a. Magnitude of GHG Reductions from 2025 through 2030

The following table summarizes total GHG emissions reduced associated with expansion of the program. Total cumulative GHG emissions reduced were estimated to be 217,737 MT CO₂e from 2025-2030 and 1,221,621 MT CO₂e from 2025 to 2050. Results are shown for each separate measure within the program analyzed that, supported by additional funding, would result in GHG emissions reductions. These measures include HVAC upgrades, boiler upgrades, LED lighting installations, insulation installation and window upgrades.

Table 1. GHG Emission Reductions by Energy Efficiency Measure

MT CO ₂ e	Cumulative 2025-2030	Cumulative 2025-2050
1. HVAC Upgrades	160,957	965,745
2. Boiler Upgrades	924	5,543
3. LED Lighting Installations	53,272	234,833
4. Insulation Installations	2,492	14,952
5. Window Upgrades	91	548
Program Total	217,737	1,221,621

Emissions reductions from HVAC upgrades make up the largest share of total emission reductions from the program expansion with additional funding over time. LED lighting installations also result in meaningful emissions reductions. Analysis methodology for each measure and the program as a whole is

described in the following section. See Table 2 below for more detail on the GHG emissions reductions estimates, including annual savings by measure.

b. Magnitude of GHG Reductions from 2025 through 2050

Table 2. Annual and Cumulative GHG Emissions Reductions (MT CO₂e)

Year	Annual by Measure					Cumulative for Program
	HVAC Upgrades	Boiler Upgrades	LED Lighting	Insulation Installations	Windows Upgrades	
2025	8,048	46	4,728	125	5	12,951
2026	16,096	92	7,793	249	9	37,190
2027	24,144	139	10,433	374	14	72,292
2028	32,192	185	11,444	498	18	116,629
2029	40,239	231	9,511	623	23	167,256
2030	40,239	231	9,365	623	23	217,737
2031	40,239	231	9,005	623	23	267,858
2032	40,239	231	9,230	623	23	318,204
2033	40,239	231	9,951	623	23	369,271
2034	40,239	231	10,017	623	23	420,404
2035	40,239	231	11,109	623	23	472,630
2036	40,239	231	11,177	623	23	524,923
2037	40,239	231	10,969	623	23	577,007
2038	40,239	231	8,706	623	23	626,830
2039	40,239	231	9,229	623	23	677,175
2040	40,239	231	8,625	623	23	726,916
2041	40,239	231	8,589	623	23	776,621
2042	40,239	231	8,611	623	23	826,347
2043	40,239	231	8,377	623	23	875,841
2044	40,239	231	8,279	623	23	925,236
2045	40,239	231	8,364	623	23	974,716
2046	40,239	231	8,267	623	23	1,024,099
2047	40,239	231	8,271	623	23	1,073,486
2048	40,239	231	8,257	623	23	1,122,860
2049	40,239	231	8,313	623	23	1,172,289
2050	40,239	231	8,217	623	23	1,221,621

c. Cost Effectiveness of GHG Reductions

Table 10 below includes information regarding the cost effectiveness of the program's GHG reductions. These dollar per MT CO₂e values were calculated based on the additional funds requested divided by the cumulative GHG emissions reduced from 2025-2030 and 2025-2050.

Table 10. Cost Effectiveness

Funds Requested	\$/MT CO₂e for GHG Reductions 2025-2030	\$/MT CO₂e for GHG Reductions 2025-2050
Program Total (\$20,000,000)	\$92	\$16
For GHG Reduction Measures (\$19,000,000)	\$87	\$16

d. Documentation of GHG Reduction Assumptions

Analysis Methodology

GHG emissions reductions for the program expansion were estimated based on representative data from actual energy efficiency projects that were implemented in recent years due to the program's existing funding. GHG emissions reductions were estimated separately for each type of energy efficiency measure that may be funded by the expanded program, as listed in Table 3. Data used to inform the analysis from each previous project included grant funds received and estimated annual energy savings. Past project costs were converted to 2023 dollars using the Customer Price Index (CPI) based on the year the project was implemented.² See the following subsections for details on the assumptions and approach used to estimate GHG emissions reductions for each representative project implemented by measure.

Total GHG emissions reductions for the program expansion as a whole were estimated based on summing the GHG emissions reductions by each measure for all projects implemented over time, with savings accumulating over time. There are uncertainties around the types of measures that will actually get implemented in the future, therefore past program data were used to inform the types of measures that may be implemented most with the program expansion, based on where funding has previously been dispensed. These data indicated that the majority of funding has been used for projects that result in meaningful GHG emissions reductions, particularly LED lighting installations and HVAC upgrades. This information was used to estimate the available total share of additional funding that each measure may have access to in the future, as detailed in Table 3. Total funding requested for the program expansion is \$20 million, which includes \$1 million estimated for program administration. The remaining \$19 million is assumed to be available for implementation-ready projects that would contribute to GHG emissions reductions.

² U.S. Bureau of Labor Statistics. 2024. "Consumer Price Index." Accessed March 2024. Retrieved from: <https://www.bls.gov/cpi/>

Table 3. Assumed Total Funds Available by Implementation-Ready Measure

	Share of Funding for Projects (%)	Funds for Projects (\$)
1. HVAC Upgrades	35%	\$6,650,000
2. Boiler Upgrades	2%	\$380,000
3. LED Lighting Installations	60%	\$11,400,000
4. Insulation Installations	2%	\$380,000
5. Window Upgrades	1%	\$190,000
Program Total	100%	\$19,000,000

Each type of energy efficiency measure is implementation-ready and has been supported by the program in the past. The program is ready to dispense more funds to these kinds of projects beginning in 2025. The analysis assumes all funding would be dispensed before 2030, with 20% (i.e., \$3.8 million) of available funds spent based on the split by measure as noted in Table 3, in each year from 2025-2029. The total number of projects by measure implemented in each year of this 5-year period was based on the average cost assumed per representative project and up to the 20% share of funding assumed to be spent in that year.

All projects were assumed to have at least a 25-year lifespan, thus projects implemented in 2025 were assumed to maintain GHG emissions reductions compared to baseline throughout the time horizon of the analysis. In reality, the lifespan of a measure is uncertain and could vary by location, use, technology, and other factors.

GHG emissions reductions estimated from avoided fuel use only account for emissions from avoided fuel combustion. There would also be additional avoided emissions upstream of this fuel use due to avoided well to pump activities, such as production and transport of the fuel. These are assumed to be insignificant emissions and de minimis to this analysis as combustion accounts for the vast majority of emissions from fuel.³

³ Wang, Michael. 13 April 2021. "Life-cycle Analysis of Vehicle/Fuel Systems Using the GREET Model." *Argonne National Laboratory*. Accessed March 2024. Retrieved from: <https://www.itf-oecd.org/sites/default/files/docs/analysis-vehicle-fuel-systems-anl.pdf>

Section 3: Environmental Results – Outputs, Outcomes, and Performance Measures

- a. **Expected Outputs and Outcomes:** The following subsections describe how GHG emissions reductions were estimated for each energy efficiency measure to estimate GHG emission reductions for the program expansion.

Measure 1: HVAC Upgrades

Upgrades and replacements of HVAC systems to newer models can improve efficiency, reduce fuel usage, and result in lower operational costs as well as reduced GHG emissions. For the HVAC upgrades, representative project data was used for a natural gas HVAC replacement based on the past Cooperstown City Hall Fire and Ambulance Departments project implemented using the Energy Conservation Grant program funds in 2020. Annual fuel savings for the upgrade was calculated based on comparing the old system's fuel usage to the improved projected fuel usage after the project was completed. These data and project cost were provided by the grant recipient based on engineering estimates for the upgraded HVAC unit and are included in Table 4. In reality, HVAC system cost, size, efficiency, and fuel savings compared to older models will all vary by project, though this example was used as a representative average for the analysis.

To estimate annual GHG emissions reductions, this representative project's estimated fuel savings was multiplied by the emission factor of CO₂e per MMBtu for natural gas from the EPA's Center for Corporate Climate Leadership, also shown in Table 4.⁴

Table 4. HVAC Upgrades – Representative Project Information

	Grant Funding Received (\$)	Annual Fuel Savings (MMBtu)	Emission Factor (MT CO ₂ e/MMBtu)	Annual GHG Savings (MT CO ₂ e)
Project	\$34,194	3,896	0.05311	206.9

Based on the representative project's grant funding received and the \$6,650,000 share of total program expansion funds assumed to be allocated for HVAC upgrades, up to 195 similar projects were assumed to be implemented, with 20% added in each year from 2025-2029. The roughly 39 projects added in each year save over 8,000 MT CO₂e in the year implemented and each year thereafter. Total cumulative GHG emissions reductions for this measure contributing to the expanded program's total impact are shown in Table 1, with annual reductions detailed in Table 2.

Measure 2: Boiler Upgrades

Similar to HVAC upgrades, upgrades and replacements of boiler systems to newer models can improve efficiency, reduce fuel usage, and result in lower operation costs as well as reduced GHG emissions. For

⁴ US EPA Center for Corporate Climate Leadership. 12 September 2023. "Emission Factors for Greenhouse Gas Inventories." Accessed March 2024. Retrieved from: https://www.epa.gov/system/files/documents/2023-03/ghg_emission_factors_hub.pdf

the boiler upgrades, representative project data was used for a fuel oil boiler replacement based on the past Midkota School District project implemented using program funds in 2023. Based on information provided by this grant recipient, the new boiler would be 33% more fuel efficient than the existing 62-year-old boiler. Fuel consumption for the existing boiler was estimated by the school district at 1,000 MMBtu/yr, while the new boiler would use 611 MMBtu/yr, resulting in a reduction of 389 MMBtu/yr of fuel oil combustion, shown in Table 5, along with the funding received by this representative project. In reality, boiler costs, size, efficiency, and fuel savings compared to older models will all vary by project, though this example was used as a representative average for the analysis.

To estimate annual GHG emissions reductions, this representative project's estimated fuel savings was multiplied by the emission factor of CO₂e per MMBtu for fuel oil from the EPA's Center for Corporate Climate Leadership, also shown in Table 5.⁵

Table 5. Boiler Replacement – Representative Project Information

	Grant Funding Received (\$)	Annual Fuel Savings (MMBtu)	Emission Factor (MT CO₂e/MMBtu)	Annual GHG Savings (MT CO₂e)
Project	\$47,448	389	0.07420	28.8

Based on the representative project's grant funding received and the \$380,000 share of total program expansion funds assumed to be allocated for boiler upgrades, up to 8 similar projects were assumed to be implemented, with 20% added in each year 2025 through 2029. The roughly two projects added in each year save over 46 MT CO₂e in the year implemented and each year thereafter. Total cumulative GHG emissions reductions for this measure contributing to the Program's total impact are shown in Table 1, with annual reductions detailed in Table 2.

Measure 3: LED Lighting Installations

LED lightbulbs use less electricity and are longer lasting than incandescent or fluorescent lightbulbs, while maintaining the same brightness. For the LED lighting upgrades, GHG emissions reductions were estimated based on the amount of electricity consumption saved by installing more efficient LED lights in place of existing incandescent and fluorescent lights. Cooperstown City Hall completed the replacement of 81 existing incandescent and fluorescent with LED lighting throughout the building in 2020. The grant recipient indicated that the old incandescent and fluorescent lights used 8,536 watts while new LEDs after the project implementation would use 3,991 watts. Assuming 3,000 hours of lighting operation per year, as estimated by the City of Cooperstown, this reduction in wattage amounts to a savings of 13,635

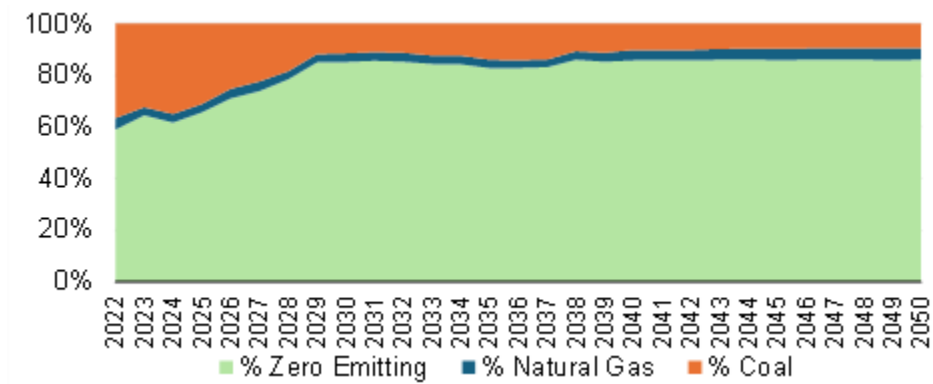
⁵ US EPA Center for Corporate Climate Leadership. 12 September 2023. "Emission Factors for Greenhouse Gas Inventories." Accessed March 2024. Retrieved from: https://www.epa.gov/system/files/documents/2023-03/ghg_emission_factors_hub.pdf

kilowatt-hours (kWh) per year of electricity. In reality, lighting changes, costs, and electricity savings will all vary by project, though this example was used as a representative average for the analysis.

To determine annual GHG reductions from the annual electricity savings, first change over time of the GHG emissions rate for associated electricity generation was estimated. The Energy Conservation Grant program expansion funding can support projects anywhere throughout the state of North Dakota. Without knowing where future projects may be implemented, projections of North Dakota's state-wide average electricity grid mix were estimated and then used to inform an average grid GHG emission rate applied to the electricity savings from lighting replacement over time.

EIA's Annual Energy Outlook (AEO) 2023 Reference Case was used to inform the projected state grid mix.⁶ EIA provides electric power projections by Electricity Market Module Regions in Tables 54.01 to 54.25. These regions broadly do not align with state boundaries.⁷ The electricity generation by resource type projections for the regions in which North Dakota is located were used to inform an estimate of the state's projected grid mix. A weighting of 95% was given to the projected grid mix of the Southwest Power Pool/North (SPPN) Region as this covers the vast majority of the state. The remainder weights the projected grid mix of the Midcontinent ISO/West (MISW). The resulting estimated grid mix for the state of North Dakota informed by EIA AEO2023 is shown below in Figure 1, depicting a significant increase in zero-emitting resources over the next decade with a decline in fossil fuel-fired generation. This is in-line with broad findings from EIA, driven by increasing clean energy investments due to incentives from the Inflation Reduction Act of 2022 as well as accounting for planned changes, such as Xcel Energy's commitment to coal retirements and wind expansion across the central U.S.

Figure 1. North Dakota Estimated Electricity Grid Mix



An average electricity grid emission rate was calculated for each year based on the above electricity generation mix and average emission factors for end use of natural gas, coal, and zero-emitting electricity. Zero emitting electricity generation sources do not have any GHG emissions associated with

⁶ US Energy Information Administration (EIA). 16 March 2023. "Annual Energy Outlook 2023." Accessed March 2024. Retrieved from: https://www.eia.gov/outlooks/aeo/tables_ref.php

⁷ US EIA. "Electricity Market Module Regions." Accessed March 2024. Retrieved from: https://www.eia.gov/outlooks/aeo/pdf/nerc_map.pdf

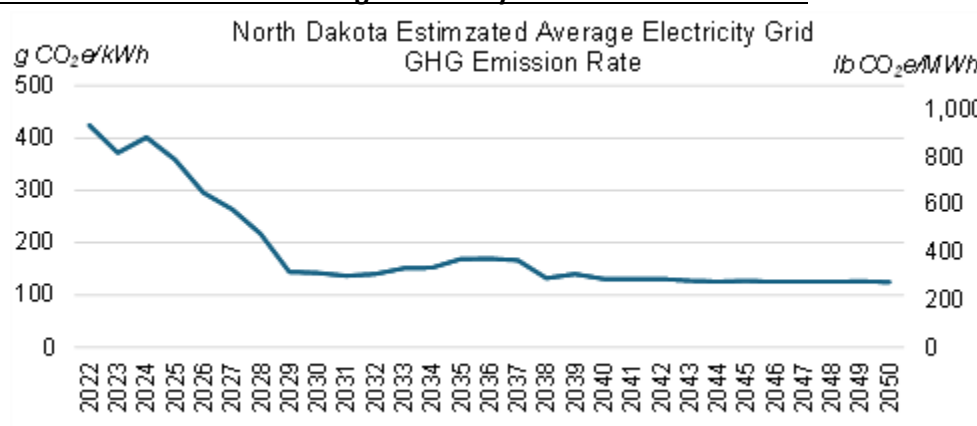
them. Average U.S. natural gas combined cycle facility and coal-fired electricity generation emission factors of carbon dioxide(CO₂), methane (CH₄), and nitrous oxide (N₂O) for electricity generation were taken from GREET, a life cycle analysis model created by the Department of Energy’s Argonne National Laboratory.⁸ For the GHG emission rate for each fuel in grams of CO₂e per kilowatt hour (kWh), global warming potentials for the 100-year time horizon from IPCC 5th Assessment Report were used.⁹ The emissions factors used by resource type are shown in Table 6.

Table 6. Emission Rates for Electricity Generation

Electricity Generating Resource Type	Emission Rates (grams of pollutant per kWh)			
	CO ₂	CH ₄	N ₂ O	CO ₂ e
Zero-Emitting	0	0	0	0
Natural Gas	450	0.89	0.01	477
Coal	1,050	1.70	0.02	1,104

These resulting GHG emission rates in grams of CO₂e per kWh were applied to the associated resource type’s estimated share of electricity generation for a given year to estimate the state average electricity grid GHG emission rate, as shown in Figure 2.

Figure 2. North Dakota Estimated Average Electricity Grid GHG Emission Rate



The above emission rate was then multiplied by the electricity savings to calculate the GHG emissions reduction due to more efficient LED lighting. Standard conversion factors were used to align units from grams to metric tons and kWh to MWh. GHG emissions reductions were calculated for each year from 2025-2050 based on the electricity savings for this representative project.

⁸ US Department of Energy, Office of Energy Efficiency & Renewable Energy. “GREET.” Accessed March 2024. Retrieved from: <https://www.energy.gov/eere/greet>

⁹ Intergovernmental Panel on Climate Change. 2016. “Global Warming Potential Values.” Accessed March 2024. Retrieved from: https://ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%20%28Feb%2016%202016%29_1.pdf

Table 7. LED Lighting Installations – Representative Project Information

	Grant Funding Received (\$)	Annual Elec. Savings (kWh)	Emission Factor (MT CO ₂ e/MMBtu)	Annual GHG Savings (MT CO ₂ e)
Project	\$2,359	13,635	See Table 6	4.9

Based on the representative project’s grant funding received and the \$11,400,000 share of total program expansion funds assumed to be allocated for LED projects, more than 4,832 similar projects were assumed to be implemented, with 20% added in each year from 2025-2029. The roughly 966 projects added in each year save over 4,727 MT CO₂e in the year implemented and each year thereafter. Total cumulative GHG emissions reductions for this measure contributing to the expanded program’s total impact are shown in Table 1, with annual reductions detailed in Table 2.

Measure 4: Insulation Installations

GHG emissions reductions from the installation of insulation are achieved through the reduction in the amount of heating and cooling air lost through the building’s envelope. Estimates were based on the past insulation installation project for the Nelson County Highway Department shop and storage building in 2023. The grant recipient provided the R-value of the existing insulation and the anticipated improved R-value of the new insulation. The higher the R-value, the better insulation, allowing better temperature regulation, resulting in reduced fuel use for heating and cooling. The building is heated by propane and fuel oil and the improvements allow the heating system to operate less as the after-project insulation allows the building to stay warmer longer, thus reducing fuel consumption, costs, and GHG emissions. The grant recipient provided the heat loss saved, as well as project cost, shown in Table 8. In reality, insulation upgrade costs, amount, efficiency, and fuel savings will all vary by project, though this example was used as a representative average for the analysis.

Table 8. Insulation Installations – Representative Project Information

	Grant Funding Received (\$)	Hourly Fuel Loss (Btu/hr)	Operating Hours Per Year (hours)	Annual Fuel Loss (MMBtu)	Emission Factor (MT CO ₂ e/MMBtu)	Annual GHG Savings (MT CO ₂ e)
Before	-	-296,338	2,913	-863	-	-
After	-	-158,341	1,987	-315	-	-
Project	\$23,395	-	-	549 saved	0.06195 (LP Gas) 0.07420 (Fuel Oil)	38.4

Annual savings in fuel usage was calculated using annual fuel loss values for before and after the project implementation. It was indicated that the representative project's building is heated by a mixture of fuels; roughly 35% LP gas and 65% fuel oil. The reduced fuel loss (i.e., saved) per project implemented assumed this same split to estimate annual GHG emissions reductions for reduced consumption of each fuel. Emission factors of CO₂e per MMBtu for each fuel were used from the EPA's Center for Corporate Climate Leadership and are shown in Table 8.¹⁰

Based on the representative project's grant funding received and the \$380,000 share of total Program funds assumed to be allocated for insulation installations, more than 16 similar projects were assumed to be implemented, with 20% added in each year from 2025-2029. The roughly three projects added in each year save nearly 125 MT CO₂e in the year implemented and each year thereafter. Total cumulative GHG emissions reductions for this measure contributing to the Program's total impact are shown in Table 1, with annual reductions detailed in Table 2.

Measure 5: Window Upgrades

In addition to the representative projects for HVAC upgrades and LED lighting installations described above, the Cooperstown City Hall also received grant funding to upgrade six existing windows to new windows providing better insulation in 2020. The grant recipient provided the R-value of the existing windows and the anticipated improved R-value of the new windows. The higher the R-value, the better insulation from the windows, allowing better temperature regulation, resulting in reduced fuel use for heating and cooling. Window upgrades also result in infiltration improvements, which reduce the amount of air that can pass through the windows. The grant recipient provided the heat loss saved for both the R-value and infiltration condition improvements, as well as project cost, as shown below in Table 9. In reality, window upgrade costs, size, efficiency, and fuel savings compared to older models will all vary by project, though this example was used as a representative average for the analysis.

To estimate annual GHG emissions reductions, this representative project's estimated fuel savings was multiplied by the emission factor of CO₂e per MMBtu for natural gas from the EPA's Center for Corporate Climate Leadership, shown in Table 9.¹¹

¹⁰ US EPA Center for Corporate Climate Leadership. 12 September 2023. "Emission Factors for Greenhouse Gas Inventories." Accessed March 2024. Retrieved from: https://www.epa.gov/system/files/documents/2023-03/ghg_emission_factors_hub.pdf

¹¹ US EPA Center for Corporate Climate Leadership. 12 September 2023. "Emission Factors for Greenhouse Gas Inventories." Accessed March 2024. Retrieved from: https://www.epa.gov/system/files/documents/2023-03/ghg_emission_factors_hub.pdf

Table 9. Window Upgrades – Representative Project Information

	Grant Funding Received (\$)	Before Project	After Project	Annual Fuel Savings (MMBtu)	Emission Factor (MT CO ₂ e/MMBtu)	Annual GHG Savings (MT CO ₂ e)
R-value Improvement	-	1.00	3.00	23.13	-	-
Infiltration Condition Improvement	-	0.25	0.01	8.99	-	-
Project	\$14,204	-	-	32.12	0.05311	1.7

Based on the representative project’s grant funding received and the \$190,000 share of total program funds assumed to be allocated for window upgrades, more than 13 similar projects were assumed to be implemented, with 20% added in each year from 2025-2029. The nearly three projects added in each year save over 4.5 MT CO₂e in the year implemented and each year thereafter. Total cumulative GHG emissions reductions for this measure contributing to the expanded program’s total impact are shown in Table 1, with annual reductions detailed in Table 2.

Cost-Effectiveness of GHG Emissions Reductions

Table 10 below includes information regarding the cost effectiveness of the program’s GHG reductions. These dollar per MT CO₂e values were calculated based on the additional funds requested divided by the cumulative GHG emissions reduced from 2025-2030 and 2025-2050.

Table 10. Cost Effectiveness

Funds Requested	\$/MT CO ₂ e for GHG Reductions 2025-2030	\$/MT CO ₂ e for GHG Reductions 2025-2050
Program Total (\$20,000,000)	\$92	\$16
For GHG Reduction Measures (\$19,000,000)	\$87	\$16

b. Performance Measures and Plan

Performance measures will be based on successful past implementation (as noted in above documentation). Each project is required to provide anticipated energy efficiency in the subaward applications where standards are provided. With the additional resources provided in this grant, contract analysis will occur on efficiency and now include the greenhouse gas reductions occurring with those energy efficiencies.

Additional staffing will allow individual visits and promotion of the opportunity for efficiency to include use of renewable energy and return of energy to the grid. Past limitations on funding did not allow extensive review or analysis of use of renewable production and projects were limited to traditional energy efficiency measure.

Each measure will be separated in analysis to showcase best practices for political subdivisions to explore use beyond the life of this award.

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

implementation of the program will be the responsibility of the Department of Commerce Division of Community Services/State Energy Program. Reporting of completion will be the responsibility of the sub awardees and contractors responsible for final reporting of the implementation. Commerce and the state currently have all authority required to complete and report on this application through legislative mandates and legislation.

If awarded, additional legislative authority will be requested in the 2025 North Dakota legislative session to increase the subaward grant ability. If the ability to repay shows the long-term increase in greenhouse gases with new technology and innovative approaches, DCS, in consultation with the Energy and Environment Resource Center, will request extending the ability to repay from 10 years to 15 years.

Timeline if awarded:

Q4 2024: Initiate study to determine the return on investment with increased ability to repay initiated in law, request authority to accept funds and increase staffing to promote and administer grant.

Q1 2025: Initiate promotion and awareness of increased grant funding, determine final analysis if legislative changes should occur on increased timeframe for ability to repay, request legislative action to increase amount of funding available for each subrecipient.

Q2-4: Continued promotion and study of individual return on investment with each measure along with total greenhouse gas emission reduction through standard energy efficient methods and any new methods proposed.

Year 2-3: continued promotion, analysis and publishing of best practices to increase awareness of energy efficiency standards and increase community awareness of energy efficiency values beyond public buildings

Year 4-5: Final analysis of greenhouse gas benefits and return on investment for public benefits. Pending ability to impact and adjust public perceptions, move forward with increased awareness of building standards and energy efficient building codes in communities.

Reporting: Each quarter or as required, reporting will be filed with EPA and additionally, with the state leadership to highlight the success stories and public benefits.

Section 4: Low-income and Disadvantaged Communities

a. Community Benefits:

North Dakota's economy is extremely mixed with opportunity in the western edge in oil and gas and eastern edge with technology and value added agriculture production. Unfortunately, much of the middle sections, including the some of the Native American reservations, do not have natural economic drivers. This grant in the form of subawards will take into consideration the ability for the community to pay and add points for identified underserved areas. As a statewide grant, our benefits with reduction of greenhouse gasses and improved efficiency in the long term benefits everyone but consideration will be provided to areas of concern.

Table 1: North Dakota CEJST Census tract IDs and Census block group IDs for areas that may be affected by the proposed GHG reduction measures.

Census tract 2010 ID	County Name	Identified as disadvantaged due to tribal overlap	Percentage of tract that is disadvantaged by area	Is low income?
38,005,940,100	Benson County	FALSE	100	TRUE
38,005,940,200	Benson County	FALSE	100	TRUE
38,017,010,106	Cass County		100	TRUE
38,017,010,107	Cass County		100	TRUE
38,035,010,600	Grand Forks Co.		100	TRUE
38,043,966,800	Kidder County		100	TRUE
38,053,940,100	McKenzie County	TRUE	100	TRUE
38,061,940,300	Mountrail County	TRUE	100	TRUE
38,061,940,400	Mountrail County	TRUE	100	FALSE
38,069,956,100	Pierce County		100	TRUE
38,077,971,000	Richland County		100	TRUE
38,079,941,800	Rolette County	TRUE	100	TRUE
38,079,951,600	Rolette County	FALSE	100	TRUE
38,079,951,700	Rolette County	FALSE	100	TRUE
38,079,951,900	Rolette County	FALSE	100	TRUE
38,085,940,800	Sioux County	TRUE	100	TRUE
38,085,940,900	Sioux County	FALSE	100	TRUE
38,093,967,800	Stutsman County		100	TRUE
38,099,957,900	Walsh County		100	TRUE
38,099,958,000	Walsh County		100	TRUE

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North Dakota's plan to continue to assess, quantify and report benefits to impacted communities includes continued advocacy for the program through public and private partners including the North Dakota Superintendent Association, North Dakota League of Cities, North Dakota Association of Counties, North Dakota Association of Professional Engineers, North Dakota Indian Affairs office, local and social media targeted to the impacted areas.

Assessment and quantification of CAP and HAP emission reductions will be completed by contract with a qualified entity on an annual basis.

Overall, the increased resilience to climate change from GHG reduction measures implemented in this program is a strategy where local, statewide and regionwide mitigation and improvements can be measured in significant amounts over a short period. The benefits of this program will immediately improve the health of the citizens and students in the buildings. Long term benefits can be measured by reducing energy demand from fossil fuels, decreased energy costs and improved energy resilience for the entire grid system.

The program does not directly request funding for workforce as several other statewide and federal initiatives are being utilized for programs and training to support the opportunities created with increased efficiency measures. It is the intent of this program to encourage local contractors and training for skills development through the school systems as much as feasible.

b. Community engagement

Community engagement requires meaningful involvement with a variety of citizens who will benefit and will be impacted by decisions from this grant to subaward recipients. To move forward with any project in this process, public meetings are required by the entities who apply for funds. This means people have multiple opportunity to participate in decisions about activities that may affect their local school district, county, city and overall, for the environment.

To continue this direct involvement with projects, applicants for this funding are required to submit approval letters and/or minutes from the sponsoring entities where public have been engaged through either public meeting process, public notices or community meetings. Specifically for disadvantaged communities:

1. How input by low-income and disadvantaged communities has been incorporated into this application: Additional points will be added to applicants from disadvantaged and/or low-income communities as identified by the federal government.
2. How meaningful engagement with low-income and disadvantaged communities will be continuously included in the development and implementation of the GHG reduction measures throughout the life of this grant: The programs proposed in this request are long term benefits with one time funding. By increasing the benefits of the facility, they are working in through improved efficiencies, the public entities will see both immediate and long-term benefits. Our team, if funded, will follow up with each subaward recipient to explore other options with this and other funding to continue to improve their facilities and look toward environment and energy efficiency education.

Plan for reporting community engagement:

- Direct engagement has occurred on a minimal level with the existing funding. If funded, the state will be able to meet the demands throughout the state and will increase their communication to include grant supported energy audits on-site to identify direct efficiency eligible grant funded benefits. Currently, the program due to lack of adequate funding, the state does not complete the energy audits, and this can create a lack resources to complete the application in the low income and underserved areas. To directly support the underserved populations/facilities state staff and/or contractors are required, and current resources do not provide this level of support.
- A community advisory board will be created to promote, review and audit the applications. With the additional funding, increased workload will require multiple views on promotional avenues and material review. This board provides an opportunity to include a diverse set of individuals in public and private environments to support the outreach and review of applications.
- With this funding and other federal programing and resources, the state will be creating a simple, direct portal for any citizen and eligible entity to direct questions along with make applications for funding. In addition, outreach to larger targeted audiences will occur with presentations and one-on-one support.
- North Dakota Commerce includes several entities including the statewide marketing team. Utilizing these resources, this program will have access to statewide press, newsletters, webinars, and Governor's communication to do outreach in multiple facets and avenues.
- Collaboration with the Indian Affairs office and directly with Tribal energy managers and Tribal school systems will be necessary to meet many of the state's objectives in this and other community engagement programs. This program will be part of the engagement contracts and discussion as Commerce staff do outreach for any workforce, tourism and community and economic development programs.

Section 5: Job Quality

This application creates numerous skilled and technical workforce opportunities across in the short and long term from installation to maintenance to operations. In some cases, specifically where the systems are being improved from coal to high efficiency electric, the skills of the operator in the facility are required to be improved and creates more valuable employee who has a higher skill level.

CPRG implementation to sub awardees will increase the demands for high quality, skilled workforce in several areas including electrician, boilermaker, energy efficiency technician. Increased demand for some of the components of energy efficient systems, combined with the local technical skills training in place through state energy program funding, should encourage entrepreneurship and increased availability in rural and remote areas.

Each recipient will require considerable number of contractors to complete the projects. Our goals or targeting resources and projects in low income and disadvantaged communities creates greater opportunity for local work and apprenticeships.

As part of larger projects and federal requirements, strategies include, but are not limited to:

- Where applicable, partnerships will be extended with labor organizations and other workers' rights groups;
- The projects will administer and require labor and job quality standards into procurement activities associated with the projects;
- The state will take on the role of active recruitment for advanced skill training on underserved, native and low income areas including providing wrap around services for electrical and energy efficiency training programs;
- The state has entered into partnerships with local college and Native American colleges to promote and expand training programs for apprentices.

Section 6: Programmatic Capability and Past Performance

a. Past performance

All parties and agreements below have been successfully implemented or continue to be successfully implemented through ongoing agreements. The Commerce team has extensive training in grant management, communication and fiscally sound practices. Additionally, the Division of Community Services team has managed energy efficiency related programs for the past 20 years.

- State Energy Program (SEP) Department of Energy
 - Increase the use of energy efficiency and renewable energy across the state. Utilized the funds for energy efficient subawards to public entities for programmatic and implementation of energy efficiency training, workforce development and education.
 - Robyn Reyes-Boyle, Project Officer State Energy Program
 - Office of State and Community Energy Programs (SCEP)
 - U.S. Department of Energy, Office of the Under Secretary for Infrastructure
 - 240-243-8915 (c) robyn.reyes-boyle@hq.doe.gov
- Economic Development Authority (EDA) ARPA Statewide Planning Grant
 - Administer and deliver statewide planning for placemaking on behalf of the Governor's allocation. Created eight community placemaking grants, provided two statewide summits on community development and hosted multiple webinars and in person training on best practices on placemaking for rural communities.
 - Jane Reimer; Economic Development and Community Planner and UC Program Coordinator
 - Denver Regional Office
 - jreimer@eda.gov/ 303-844-4090
- Community Development Block Grant (CDBG) North Dakota administration U.S. Housing and Urban Development
 - The Community Development Block Grant program provides annual grants on a formula basis to North Dakota to develop viable communities in housing, living environments,

- communities, and economic development for low to moderate income persons. Commerce-Division of Community Services manages the statewide allocation.
- Elizabeth Clark, Senior CPD Representative, Region VIII Community Planning & Development
 - U.S. Department of Housing & Urban Development
 - Elizabeth.clark.hud.gov/ 303-672-5067
- Community Services Block Grant (CSGB) Office of Community Services/Administration for Children and Families
 - CSBG is a federally funded block grant in the Office of Community Services, Administration for Children and Families, United States Department of Health and Human Services that provides funds North Dakota to administer to support services that alleviate the causes and conditions of poverty in under resourced communities.
 - Jessica Cain, Program Specialist
 - Region VIII – Denver
 - 202-205-1815
- b. Reporting requirements

All of the above agency agreements have resulted in final and/or quarterly reports under the agreements. In every agency agreement above, Commerce has not missed a reporting timeline and has managed the accounts in a fiscally and timely manner in compliance with the state and federal requirement.
- c. Staff expertise

Commerce staff have the experience on managing federal programs and statewide energy conservation grants along with state energy program (DOE) programming and grant delivery. Additionally, the fiscal department of Commerce has extensive experience with federal fiscal accounting and management to assure accurate and correct accounting practices.

Key staff associated with this program:

Maria Effertz, Director, Division of Community Services (20+ years)

Program manager and oversight: Community development Block Grant (CDBG), Community Services Block Grant (CSGB), Director State Energy Program, Acting Administrator Office of Community Development and Rural Prosperity

Kevin Iverson, State Energy Program Administrator and North Dakota Demographer

Program lead for State Energy Program grant projects and former lead on Energy Conservation Grant program

Cameron Hayes, State Energy Program Administrator

Lead on Energy Conservation Grant deliverables and administration and staff lead for Department of Energy IRA HOMES/HERA grant administration

Alison Widmer, CPS, Director Administrative Services

Director fiscal and administrative services and will provide lead in fiscal management for project

Section 7: Budget Narrative

a. Budget detail

- i. Personnel: A fulltime staff in DCS along with fiscal support will be required to fully implement and manage this program. Additionally, contractors will be hired to monitor and support compliance with federal requirements such as Davis Bacon, Buy American and promotion of the project.
- ii. Fringe Benefits: As state employees, they will receive full benefits package and this is calculated by the Office of Management and Budget.
<https://www.omb.nd.gov/team-nd-careers/team-nd-benefits>
- iii. Travel: Travel across the state to review and promote the program will be required. Additionally, travel to appropriate conferences has been budgeted.
- iv. Supplies: Minimal supplies will be needed for operation
- v. Contractual: Supplemental staffing will be contracted to assure all federal requirements have been completed
- vi. Other: Direct subawards to political subdivisions for greenhouse gas reductions and energy efficiency measures
- vii. Indirect: The state has an indirect contact in place for all federal management and is available at request.

Budget Categories

Personnel and Fringe – Existing staff members Cameron Hayes and Maria Effertz currently manage the program and will continue until the award is received and additional executive staff can be hired to oversee the federal portion of the program.

All State of North Dakota employees receive full family medical, annual and sick leave and participation in retirement benefits. Commerce works remote and has office locations, if desired, in several communities throughout the state.

Total cost for personal, fringe and indirect expenses are \$172,668 the first year with incremental increases each year for salary and cost of living adjustments.

Consideration will be given to seek out applicants that will be from underserved and J40 areas to maximize the utilization of the program across the state.

1. Energy Conservation Grant Administrator (to be hired)
Duties: Promotion of the grant to areas identified, with emphasis placed on underserved and low income communities. The administrator will supervise any contract work and assure that all projects are in compliance with federal and state requirements. This administrator will also assure projects fully close out and meet the greenhouse gas reduction anticipated outcomes.
Salary: \$75,000/year plus full benefits staff positions by title.
100% time on program
2. Account Budget Specialist (shared existing position)

Salary: \$60,000

50% time on program

Duties: This position will be shared with other federal grant requirements, allowing for cross training and understanding of the federal accounting needs.

Indirect: The State of North Dakota Division of Community Services has an approved indirect agreement which takes into consideration all indirect associated costs. This indirect rate for all federal programs is 60.28% and the agreement can be provided at request.

Contractual – Commerce administers a variety of federal and state grants. In order to do outreach and assure all federal requirements are met, local administrative contracts are issued to support the communities and political subdivisions in planning, applying and implementing the grants. This same protocol will be followed with all contractors procured using state standards. It is anticipated these contractors will be throughout the state and will spend more resources and time in underserved and rural areas where staffing is limited.

Travel – In order provide support and outreach the range of areas in the state, travel will be required by the administrator. In-state travel will be completed by state car in most cases. This will include regularly scheduled conferences such as the North Dakota League of Cities, North Dakota Association of Counties and Townships, Greater North Dakota Chamber of Commerce and the North Dakota Superintendent and School Board Associations. This person will also be called upon to provide presentations on statewide initiatives and federal programs that support underserved populations including the Native American areas.

Travel to training and nationally recognized learning opportunities are also budgeted for the staff to increase their knowledge and provide additional resources to areas of need in the state.

No travel reimbursements will be allowed under the Energy Conservation Grant or will be separately awarded to contractors.

Supplies: minimal supplies will be needed for this position and are limited to a state issued laptop computer and screens. Office space will be provided if the staff hired wishes to work in an office.

Subawards/Other: The majority of funding in this program goes directly to support sub awardees, the political subdivision, schools, cities and counties where energy efficiency grants will provide the greatest greenhouse gas reduction in a very short timeframe.

As this program is established, it is anticipated the additional funding can be delivered quickly to entities where either the funding wasn't enough to support the projects or new initiatives where out of questions with existing budgets.

The budget sets aside \$18,875,123 for reimbursable grants to subaward recipients for energy efficiency delivery.

Expenditure of Awarded Funds

Current grant delivery is quick and utilizes local promotion and online applications. Commerce does not anticipate any change in delivery of the granting system outside of increased capacity in resources to assure larger projects can be completed, thus further reducing greenhouse gas emissions.

The current application process requires five simple steps and reviews. Applicants are requested to do the following simple protocols to apply. The only additional step(s) which will be added will be assurances for Buy American and reporting of their payrolls to comply with Davis Bacon. Local contractors will be available to support the application process, review and final reporting.

- Review the **Qualifications & Guidelines** below to determine if the project is a fit for the Energy Conservation Grant Program.
- Determine the energy savings estimated for the project and have the appropriate entity complete the [Energy Savings Analysis](#) form.
- Complete the [Section 106 Clearance](#) form if the building is more than 49 years old.
- Obtain a bid(s) for work to be done.
- Complete the [application form](#) and send it along with the documents to DCS staff at the state.

Qualifications & Guidelines for existing grant

- Projects must be an energy efficiency retrofit to a facility owned by a nonfederal political subdivision.
- Projects need to have a combined payback period of 10 years or less for the total estimated cost of the project. Only one building is allowed per application, however, multiple energy conservation measures can be combined on that building to determine the overall energy savings.
- Projects must save energy and will need to have proper analysis conducted to verify energy savings. Community Services reserves the right to review all energy savings calculations.
- Projects under \$50,000 will require confirmation of energy savings and payback period from Community Services or other appropriate entity as approved by Community Services. Complete the [Energy Saving Analysis Application](#) to request confirmation.
- Projects \$50,000 and over will require confirmation of energy savings and payback period from an engineering firm. [SEP grants](#) are available to assist with the associated costs.
- Projects with buildings on the National Register of Historic Places, or 50 years old or older will need approval from the State Historical Society.

- Applicants must certify that projects will comply with [State solid waste management requirements](#).
- Applicants must certify that projects will comply with [EPA's Renovation, Repair, and Painting rule](#)
- If there is no activity within 3 months of award, the award may be terminated and the funds may be reallocated.
- Funds will be provided on a reimbursement basis with appropriate supporting documentation.