IMPLEMENTATION GRANT APPLICATION TECHNICAL APPENDIX

This technical appendix explains the methodology and assumptions used for developing the estimated greenhouse gas (GHG) emissions and co-pollutant emissions reduced for each measure included in the proposal. The "GHG Emission Reduction Calculation Spreadsheet" included with this application provides the specific GHG emission reduction calculations for each measure.

i. Statewide Public Fleet Zero Emission Vehicle (ZEV) & Infrastructure Rebates and
ii. Statewide Medium- and Heavy-Duty vehicle (MHDV) ZEV Incentive Program

The CMAQ Air Quality Toolkit, *Electric Vehicles and EV Charging Infrastructure* tool was used to estimate emission reduction rates for each vehicle type and expected charging infrastructure, which relies on emission rate assumptions and activity rates within MOVES to produce emission reduction estimates.

GHG and CAP reduction rates were estimated for each vehicle and fuel type in tons/year based on average annual Vehicle Miles Traveled (VMT) and average model year. Associated upstream emissions expected from the increased use of electricity needed to power the ZEVs were estimated and subtracted from the emission reductions. eGRID data was used to determine the carbon intensity of Nevada's grid, assuming a mix of the NWPP and AZNM subregions, in MT CO_2e/GWh. Carbon intensity of the grid forecasted by eGRID was used to determine average values for the 2025-2030 and 2025-2050 time periods to estimate upstream emission increases. The expected life of each vehicle type was applied to its associated net emission reduction rate to determine cumulative, lifetime emission reductions. Two sets of cost-effectiveness values ($/ton) were calculated, one for the 2025-2030 period and the other for 2025-2050, for each vehicle type based on average vehicle costs and lifetime emission reductions.

For each proposed program, the total budget amount was divided by the average $/ton values of the vehicle types that would be covered by said program to estimate total cumulative emissions. Applying the average of the two cost-effectiveness values produces a cumulative reduction estimate for the 2025-2030 and 2025-2050 periods. This approach ensures that NDEP is only accounting for reductions directly tied to CPRG funds spent, as required by Section 2 of the NOFO.

The following key assumptions about measure implementation were used to quantify emissions reductions for this measure:

- Average annual VMT estimates for each vehicle type as provided by FHWA[1]
- Model years 2004-2014 for replaced vehicles
- Expected life of vehicles ranging from 14-16 years, considering lifetime mileage estimates as provided by NHTSA[2] and FTA[3]
- Average MY for replaced school buses (2006) and average electric school bus capital cost ($420,000) based on NV DERA Projects since 2020.
- Capital cost estimates for each electric vehicle type as provided by US DOE[4]
- Assume all vehicles are purchased between 2025-2030

The assumed reference case scenario is that public and private fleets do not adopt additional ZEVs, and no additional charging stations are installed. Transportation emissions continue business as usual. There would also be no increase in electricity consumption tied to ZEV charging.

Implementation of the public fleet ZEV program is anticipated to reduce 7,437 cumulative $mtCO_2e$ for the period between 2025 – 2030, and 22,723 cumulative $mtCO_2e$ for the period between 2025 – 2050. The following CAP emissions are expected to decrease on an annual basis (kg/year): 18,964 CO, 4,043 NO_X, 238 $PM_{2.5}$, 252 PM_{10}, and 1,897 VOC.

Implementation of the MHDV ZEV program is anticipated to reduce 4,618 cumulative $mtCO_2e$ for the period between 2025 – 2030, and 13,438 cumulative $mtCO_2e$ for the period between 2025 – 2050. The following CAP emissions are expected to decrease on an annual basis (kg/year): 4,276 CO, 8,508 NO_X, 536 $PM_{2.5}$, 583 PM_{10}, and 1,044 VOC.

[1] Alternative Fuels Data Center: Maps and Data - Average Annual Vehicle Miles Traveled by Major Vehicle Category (energy.gov)
[2] https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/809952#page45 for passenger cars and trucks
[3] Default Useful Life Benchmark (ULB) Cheat Sheet (dot.gov) for school buses
[4] 2022 Incremental Purchase Cost Methodology and Results for Clean Vehicles (energy.gov)

iii. Statewide ZEV Revolving Loan

The CMAQ Air Quality Toolkit, *Electric Vehicles and EV Charging Infrastructure* tool was also used to calculate the associated emissions reductions captured by the ZEV revolving loan fund. GHG and CAP reductions estimates by vehicle type use the same data calculated from the Support Public Fleet to ZEVs measure, including upstream emissions.

The following key assumptions about measure implementation were used to quantify emissions reductions for this measure:

- A total of 1,150 light-duty vehicles, Class 3 vehicles, Class 4-6 vehicles, Class 7 vehicles, and Class 8 vehicles are deployed over five years.
- The ZEV revolving loan fund covers the tax credit portion of the vehicle purchase.
- Recycling of the tax credit through bridge loans enables an additional 920 zero-emission vehicles to be deployed over 5 years, after an initial 230 vehicles deployed.

The following key assumptions about emission reductions were used to quantify emission reductions for this measure:

- Light-duty vehicles and heavy-duty vehicles are assumed to have an annual Vehicle Miles Traveled (VMT) of 11,000 miles per year and 60,000 miles per year, respectively.
- The 45W Commercial Clean Vehicle Credit provides between $7,500 and $40,000 for new zero-emission vehicles deployed. The 30C Alternative Fueling Infrastructure tax credit provides up to $100,000 for electric vehicle charging infrastructure. The forthcoming Nevada Clean Trucks and Buses Incentive Program provides up to $175,000 in rebates for heavy duty vehicle replacements.

As shown in the Business as Usual scenario outlined in the PCAP, Nevada would have emissions of 34.0 $MmtCO_2e$ and 24.4 $MMtCO_2e$ in 2030 and 2050, respectively. Tracking of electric vehicle deployment by vehicle class, gross vehicle weight rating, and anticipated vehicle miles traveled will enable estimation of GHG emissions reduction for measure-specific activity data and tracking metrics.

Implementation of this measure is anticipated to a cumulative 14,018 $mtCO_2e$ for the period between 2025 – 2030, and 58,803 cumulative $mtCO_2e$ for the period between 2025 – 2050. The following CAP emissions are expected to decrease on an annual basis (kg/year): 16,144 CO, 10,872 NO_X, 670 $PM_{2.5}$, 730 PM_{10}, and 2,211 VOC.

iv. Statewide ZEV Education & Workforce Development for Public Entities

Support measure for ZEV programs, no direct emission reductions as a result of this measure.

v. Greater Nevada Clean Cities Coalition Development

Support measure for ZEV programs, no direct emission reductions as a result of this measure.

vi. Downtown Reno Micromobility

The GHG reduction estimates were developed using Congestion Mitigation and Air Quality Improvement (CMAQ) toolkit developed by Federal Highway Administration (FHWA) Office of Natural Environment.[5] The Bicycle, Pedestrian, and Shared Micromobility tool was used to calculate CO_2e reductions. The Bicycle and Pedestrian Improvements Tool relies on running, start, evaporative, and crankcase exhaust emission rates as well as default-scale2 activity rates from MOVES3.

The following key assumptions about measure implementation were used to quantify emissions reductions for this measure:

- The estimates were calculated assuming the construction is completed at the end of 2026. Benefits were included starting in 2027.
- Measure lifetime: 30 to 50 years

[5] https://www.fhwa.dot.gov/environment/air_quality/cmaq/toolkit/bikeped_emissions_data_documentation_update.pdf

- Capital cost assumptions: $20 million project cost. The project has been programmed for implementation. Cost estimates are provided by the project team. The project is currently being designed. The application requests $5,000,000 CPRG funding amount.
- Operations and maintenance costs are accounted for in local public works operating budgets and the RTC Pavement Preservation Program.

Assumptions are based on a micro-mobility study in Reno using LiDAR data where vehicle traffic was reduced by an average of 10% after the installation of bike lane infrastructure near downtown Reno. A 10% reduction in AADT was used in the calculation with the CMAQ tool. Average trip lengths are set to be the project length to be conservative, even though actual trip lengths are likely much longer than the project limits. Reno is a city with over 300 days of sunny days. 300 is used as the annual factor to convert daily GHG reduction to annual reduction. The approach focuses solely on reductions along the project corridors, utilizing the project limits as trip lengths for computation. However, in practice, as the project fills gaps within a broader micro-mobility network, it encourages longer non-vehicle trips that were not factored into the calculation, leading to additional reductions in greenhouse gas emissions.

Without the requested CPRG implementation grant funding, the reference case scenario of the project may only be partially completed, leading to an incomplete network with gaps that could reduce mode share and hinder the total reduction of greenhouse gas emissions.

Multimodal data collection results are attached in calculations spreadsheet to demonstrate a previous before-after study. Similar studies will be conducted for tracking metrics to accurately estimate the mode shift from vehicles to zero-emission forms of transportation to calculate actual GHG emissions reductions.

Implementation of this measure is anticipated to reduce 293 $mtCO_2$ e per year with 878 cumulative $mtCO_2e$ for the period between 2025 – 2030, and 6734 cumulative $mtCO_2e$ for the period between 2025 – 2050. The following CAP emissions are expected to decrease on an annual basis (kg/year): 712 CO, 37 NO_X, 2 $PM_{2.5}$, 9 PM_{10}, and 30 VOC. The requested amount is about 25% of the total cost, the GHG and CAP reductions associated to the funded portion is 25% of the values above.

vii. Free Public Transit Fares for Youth

RTC applies the formula (Emissions=Passenger Miles Traveled (PMT) × Emission Factor) to estimate CO_2 emissions. The emission factor often refers to lbs CO_2 per miles traveled.

This methodology has been widely used in transit agencies and governments at different levels. For example, Bay Area Rapid Transit (BART) applies this methodology to calculate emissions from the last stop of each transit line to Embarcadero Station in San Francisco. BART firstly estimates their own emission factor using the GHG emissions for the whole transit system divided by the total number of passenger miles traveled in 2020. Then, the emissions per passenger mile, i.e., emission factor, was multiplies by distance between these stations.[6]

In EPA's document Emissions Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations. The section 2.5.6 Throughput and Activity support this estimation methodology: "Throughput is also called activity……It may also refer to population, employment, miles travelled, or number of existing units. Activity throughput is typically the value that is multiplied against an emission factor to generate an emissions estimate."[7]

The American Public Transportation Association also discussed the emission estimates associated miles traveled in its document Quantifying Greenhouse Gas Emissions from Transit at the national level, regional level, and agency level.[8] The document also identifies emission factors for different regions: "480 g CO_2/PMT in the Bay Area, 440 g CO_2/PMT for Chicago, and 410 g CO_2/PMT in New York."

For the Youth Transit measure, RTC adopts the emission factors from 2008 EPA Highway Vehicle Emission Factor Model. The Emission factor for CO_2 is 458 g /PMT, which is equivalent to 0.94 lbs /PMT.

[6] https://www.bart.gov/news/articles/2022/news20220422

[7] https://www.epa.gov/sites/default/files/2016-12/documents/2016_ei_guidance_for_naaqs.pdf

[8] p3- p4, section 1.3.2 – 1.3.4 https://www.apta.com/wp-content/uploads/Standards_Documents/APTA-SUDS-CC-RP-001-09_Rev-1.pdf

In 2023, RTC Fixed Route saved PMT is 13,692,023 and thus CO_2 (lbs) saved is estimated as 12,870,501 (=13,692,023* 0.94). Again, we assume 12% of pollution saving is associated with youth program. Therefore, the annual CO_2 (lbs) saved for youth program is 1,544,460.

It is assumed that youth ridership will remain consistent with the current level, with a slight 3.5% increase each year. However, in reality, with no cost associated with transit use, there is the potential for a significant increase in youth ridership, which has not been factored into the calculation. Furthermore, the program presents an educational opportunity, fostering a habit of using public transit that may continue into adulthood, thus contributing to sustained reductions in greenhouse gas emissions. It is assumed that the measure will have a lifetime of 5 years, with no additional capital cost, and assumes that operation and maintenance costs are already covered.

The reference case is the Business-as-Usual scenario for transportation sector emissions as outlined in the Nevada PCAP. Lack of the CPRG implementation grant funding means missing out on the chance to educate and encourage a larger number of youths to use transit, especially during a post-pandemic period where transit usage has dwindled. This could result in a surge in car usage, leading to continued growth in vehicle miles traveled (VMT) and greenhouse gas (GHG) emissions in the region.

The performance tracking metrics used for estimation is the youth ridership counts. Currently the counts are estimated by youth transit passes sale. Once the program is implemented, direct youth transit counts will be collected to demonstrate effectiveness.

Implementation of this measure is anticipated to reduce 700 $mtCO_2$ e per year with 3,500 cumulative $mtCO_2e$ for the period between 2025 – 2030, and 3,500 cumulative $mtCO_2e$ for the period between 2025 – 2050. Although not quantitatively provided, CAP emission reductions are expected, as the increase in public transportation ridership will lead to a decrease in CAP emissions from personal vehicle use.

viii. Dickerson Road Micromobility

Emission reduction estimates were calculated using the CMAQ Air Quality Toolkit, Bike and Pedestrian Improvements Tool. The following assumptions were inputted into the tool:

- 2025 project evaluation year
- 4760 daily passenger vehicle trips before the project
- 4036 daily passenger vehicle trips after the project
- And an average trip distance of 1.5 miles

Daily passenger vehicle trip estimates were retrieved from a LiDAR Micromobility study of the intersection of Virginia Street and the riverwalk. This intersection was used because it's most representative of potential mode shift near the river, where Dickerson Road is. Since Dickerson Road is not as frequently traveled as the referenced study area, only 50% of daily trips before and after the study were used. The studies before count is 9521 and after count is 8072.

Estimates are provided by the CMAQ tool in kg/day. GHG reductions were scaled up to mt CO2e and CAP reductions scaled up to kg/year assuming 365 days in a year.

The reference case scenario assumes no increase in bike or pedestrian mode travel and no decrease in vehicle mode travel. Baseline emissions for the transportation sector are outlined in Nevada's PCAP.

Implementation of this measure is anticipated to reduce 146 mt CO_2 e per year with 728 cumulative $mtCO_2e$ for the period between 2025 – 2030, and 3641 cumulative $mtCO_2e$ for the period between 2025 – 2050. The following CAP emissions are expected to decrease on an annual basis (kg/year): 3,259 CO, 163 NO_X, 10 $PM_{2.5}$, 46 PM_{10}, and 120 VOC.

ix. GOE Solar Parking Garage with EV Charging

The emission reduction estimate method used modeled the avoided GHG emissions from solar installation and power generation, e.g. GHG emissions the grid would generate to provide the annual output generated by the solar project. The model utilized output data from the National Renewable Energy Laboratory (NREL). Average possible outputs from the solar generation were used to forecast generation out to 2050.

The following key assumptions about measure implementation were used to quantify emissions reductions for this measure:

- 1,053 20 sq ft PV panels.
- 20 Degree PV panel tilt.
- 14% system loss.
- Construction complete by late 2026.
- Solar panels have a lifespan of approximately 30 years.

Total annual electricity consumption reductions, as a result of on sight renewable solar energy productions, in kWh were converted into GHG emission reductions by using an emission factor that represents the carbon intensity of Nevada's grid, which is assumed at 213 mt CO_2e/GWh based on eGRID data for the NWPP and AZNM subregions from 2025 through 2050.

Unapproved, the southern Nevada government campus will continue to rely on the grid for an average of 636,565 kWh per year. GOE will provide energy production data as measure-specific activity data and tracking metrics for this project.

Implementation of this measure is anticipated to reduce 1350 cumulative $mtCO_2e$ for the period between 2025 – 2030, and 5,850 cumulative $mtCO_2e$ for the period between 2025 – 2050. Estimated CAP emissions are provided in Section XX of this document.

x. Photovoltaic Solar Project at UNR

Energy consumption reductions were estimated by calculating the annual energy production output of the solar project. It assumes that the production of renewable energy offsets the university's reliance on the grid and it's associated GHG emissions. Expected energy production from the solar panels were estimated using the NREL PV Watts Calculator Tool.[9] The following were assumed: 1.2 MW solar PV output, premium bi-facial modules with 21% efficiency, 10 degree tilt, 180 degree azimuth, 14.08% loss, 1.3 DC to AC ratio, and 96% inverter efficiency. It is assumed that the array can be installed and running by October 2026 based on project timeline estimates established by UNR's Planning & Construction department. The lifetime of the PV panels is assumed at 30-40 years. Capital cost assumptions are based on a similar quote obtained by legislative project manager in December 2023. After array install, $10,000 are assumed for monitoring, maintenance, and repair industry costs. Tracking metrics include production tracking completed through the NV Energy net meter data and/or solar monitoring software.

Implementation of this measure is anticipated to reduce a cumulative 1,357 $mtCO_2e$ for the period between 2025 – 2030, and 9,840 cumulative $mtCO_2e$ for the period between 2025 – 2050. Estimated CAP emissions are provided in Section XX of this document.

Business as usual scenario based on UNR's historic energy usage from 2009-2023 and using the average growth rate over the 2009-2023 time period to estimate future energy demand. The business as usual scenario assumes no major energy reduction measures are taken and UNR follows the same energy trendline set between 2009-2023.

xi. Washoe County – Public Building Retrofit Paired with On-Site Renewable Energy, and
xii. Washoe County – Municipal Building Energy Retrofits, and
xiii. Washoe County – All New Electric Building

All Washoe County facilities energy use is monitored by two contracted systems: nZero and Energy Master. Emissions reductions were calculated using estimates from County facilities experts and asset inventory spreadsheets, and by using nZero's Planning and Forecasting module and the EPA's GHG Equivalencies Calculator. Solar production for new PV systems was estimated using NREL's PVWatts calculator.

Baseline emissions are actual facility emissions as reported by nZero, with reduction assumptions applied to the baseline that reflect the energy efficient retrofits. Varying reduction assumptions depending on the type of retrofit (e.g., better insulation, window replacements, HVAC replacement, heat pump replacement, etc.) were used and were informed by the American Council for an Energy-Efficient Economy and models based on Washoe County actual reduction estimates from similar projects.

The following key assumptions about measure implementation were used to quantify emissions reductions for this measure:

- Supply chain cooperation and the availability of higher-efficiency equipment

[9] *Solar siting and production calculated with the NREL PV Watts tool: https://pvwatts.nrel.gov/index.php*

- Implementation milestones according to the County's standard Capital Improvements Projects and facilities management schedules. Schedule flexibility is built in to allow for supply chain or construction delays while still implementing these projects within the grant period of 5 years.
- HVAC systems are expected to last 15-18 years. Windows and insulation expected to last 30-50 years.

The following key assumptions about emission reductions were used to quantify emission reductions for this measure:

- Emission rates are calculated by nZero based on standard, national factor sets and based on the metered energy use in scopes 1 and 2. Scope 3 emissions not considered for this project
- Reduction rates based on timely completion of projects and accurate estimation of reductions by intervention (windows, insulation, HVAC and chiller use rates and efficiencies, etc.)
- Emission factors of Scope 2 grid energy assumed to be ~58% derived from natural/methane gas based on EIA state profile data.

Without the requested CPRG funding, Washoe County will move forward with all projects using our standard lowest-cost budgeting and procurement for all equipment and materials – standard business-as-usual procurement. Standard-efficiency HVAC systems will be procured. The County has not budgeted for, and will not procure, higher R-value roofs, windows, and insulation panels. Nor will we purchase and install Main or Intermediate Distribution Frames or Building Control Systems. We will continue to pursue other funding opportunities, equipment efficiency will continue to improve, and energy from the grid will continue to become cleaner. But we will not meet national, state and County goals to meet reduction goals by 2030 without generous support.

Calculated emission reductions only account for the incremental reductions achieved beyond the standard lowest-cost budgeting and procurement by upgrading to higher efficiency alternatives that CPRG funds would unlock. Reductions are also only accounted for the years after the project is complete depending on the nature of the project, with reductions beginning anywhere between 2026 and 2028.

Washoe County will measure the progress and success of our activities related to this grant by tracking all Capital Improvement expenditures and installation activities and the reductions in both energy use and emissions using nZero and Energy Master platforms.

Implementation of the all new electric buildings projects is anticipated to reduce 379 $mtCO_2e$ per year with 1,138 cumulative $mtCO_2e$ for the period between 2025 – 2030, and 8,724 cumulative $mtCO_2e$ for the period between 2025 – 2050. Implementation of the building retrofit projects is anticipated to reduce 2,484 $mtCO_2e$ per year with 10,453 cumulative $mtCO_2e$ for the period between 2025 – 2030, and 60,140 cumulative $mtCO_2e$ for the period between 2025 – 2050. Implementation of the on-site solar projects is anticipated to reduce 303 $mtCO_2e$ per year with 910 cumulative $mtCO_2e$ for the period between 2025 – 2030, and 6,978 cumulative $mtCO_2e$ for the period between 2025 – 2050. For Washoe's solar project, estimated CAP emissions are provided in Section XX of this document. Although not quantitatively provided for the other projects, CAP emission reductions are expected, as the avoided energy consumption from a carbon-intensive grid will lead to a decrease in CAP emissions at fossil-fueled power plants.

xiv. NCEF – Statewide Clean Energy Revolving Loan for Affordable Housing and School Buildings

To accurately assess the emissions reductions attributed to solar rooftop installations on buildings, the methodology incorporates capacity factors for each county as provided by the NREL PVWatts Calculator. These factors are critical in estimating the energy generation potential of solar installations, taking into account geographical and climatic variations that affect solar irradiance and, consequently, energy production.

The emissions reduction potential of these solar installations is calculated by considering the grid's emission factor, which is obtained from the EPA eGRID database. This factor represents the average emissions intensity of electricity generation and distribution on the grid, providing a baseline against which the impact of solar-generated electricity can be measured. Additionally, projections of emission factors from the RMI Energy Policy Simulator are used to anticipate future changes in the grid's carbon intensity.

The performed emission reduction modeling relies on the following:

Source	Data Set
Environmental Protection Agency's (EPA) inventory tool	eGRID electricity and fossil fuel emission factors
NREL PVWatts Calculator	Energy production potential of solar rooftop installations

Rocky Mountain Institute's Energy Policy Simulator	Grid electricity emission projections
EPA Avoided Emissions and generation Tool (AVERT)	Co-pollutants emissions rates for integration of solar rooftop

The following key assumptions about measure implementation were used to quantify emissions reductions for this measure:

- 20 building clean energy projects are financed initially, with recycled funds (e.g., tax credits) used to finance an additional 13 building clean energy projects over 5 years.
- Monetization and recycling the Investment Tax Credit allows for 40% of each project's capital cost to be used for additional projects (reflecting available bonuses above the base 30% ITC)

The following key assumptions about emission reductions were used to quantify emission reductions for this measure:

- CAPEX ($/kW) of $1,731 (NREL) for commercial buildings
- Capacity factor of 19.9%

As shown in the Business as Usual scenario outlined in the PCAP, Nevada's reference case scenario would have emissions of 34.0 $MmtCO_2e$ and 24.4 $MMtCO_2e$ in 2030 and 2050, respectively.

Implementation of this measure is anticipated to reduce a cumulative 5,339 $mtCO_2e$ for the period between 2025 – 2030, and 55,089 cumulative $mtCO_2e$ for the period between 2025 – 2050. Estimated CAP emissions are provided in Section XX of this document. These values understate total potential emissions reduction because NCEF intends to redeploy the revolving loan funds at the end of the period of performance, subject to the terms of a closeout agreement.

xv. NCEF – Statewide Home Energy Audit Program

No direct emission reductions as a result of this measure.

xvi. GOE – Statewide Pre-weatherization Program

GOE utilized an emissions modeling to forecast the average energy savings per household per program served based on expected energy efficiency measures to be installed. The emissions model utilized data from U.S. Energy Information Administration (EIA)'s 2020 Residential Energy Consumption Survey, and DOE Guidance on the programs this project will be connected to.

The following key assumptions about measure implementation were used to quantify emissions reductions for this measure:

- 250 HOMES, 250 HEAR, 25 HEROS related projects.
- Most projects should be complete in weeks to months.
- Measure lifetime ranges, but most are 30 years+.

The following key assumptions about emission reductions were used to quantify emission reductions for this measure:

- Average energy savings per home.
- Average energy consumption per home.
- Modeled energy savings utilizing DOE guidance and EIA's RECS.

Total annual electricity consumption reductions in kWh were converted into GHG emission reductions by using an emission factor that represents the carbon intensity of Nevada's grid, which is assumed at 213 mt CO_2e/GWh based on eGRID data for the NWPP and AZNM subregions from 2025 through 2050.

All GHG reductions claimed in this proposal will not be possible without CPRG funding. Applicants to energy efficiency programs that have been deferred due to issues halting installation that cannot afford the efficient measures or the correction of the issues will utilize cheaper, less efficient options or go without entirely.

GOE will provide energy savings data for all installations made possible by this project as measure-specific activity data and tracking metrics.

Implementation of this measure is anticipated to reduce 118 $mtCO_2$ e per year with 2,359 cumulative $mtCO_2e$ for the period between 2025 – 2030, and 14,155 cumulative $mtCO_2e$ for the period between 2025 – 2050. Estimated CAP emissions are provided in Section XX of this document.

xvii. UNR – LED Lighting Retrofit at Lawlor Events Center, and
xviii. UNR – Strategic Energy Management Enrollment

Expected emission reductions were calculated by estimating the expected energy consumption reductions associated with the implementation of LED lighting retrofits and strategic energy management, as well as expected energy reductions associated with producing onsite renewable solar energy. Total annual electricity consumption reductions in kWh were converted into GHG emission reductions by using an emission factor that represents the carbon intensity of Nevada's grid, which is assumed at 213 mt CO2e/GWh based on eGRID data for the NWPP and AZNM subregions from 2025 through 2050.

Energy consumption reductions were estimated by calculating the difference between existing lighting at Lawlor and LED replacements. A lighting survey completed in 2017 at the university determined that current lighting includes 104 1000W metal halide fixtures, 2211 F34 T12, F96 T12, and H100 fixtures, and 4,815 annual operating hours, and that the replacement LED lighting would include 68 600W LED fixtures, 2175 LED bulbs, 3650 annual operating hours with the use of lighting timers. This results in an estimated energy reduction of 618,553 kWh per year. Capital cost assumptions were also informed by the 2017 study scope of work, with adjustments made for inflation (rate of inflation from 2017-2024 identified in Nevada Contractor's Association data).[10] A lighting study will be performed to track actual hours the replacement lighting is in use to determine the actual reduction in wattage. Implementation of this measure is anticipated to reduce a cumulative 433 $mtCO_2e$ for the period between 2025 – 2030, and 3,197 cumulative $mtCO_2e$ for the period between 2025 – 2050.

Energy consumption reductions were estimated by modeling the expected increases in energy efficiency as a result of maintenance and operations best practices implemented under the Strategic Energy Management program. For universities, this program on average results in 7% total energy reduction annually. For the sake of estimating reductions, it is assumed that a conservative 5% total energy reduction is realized annually for 4 of the 5 performance years (2026-2029). This assumes 1 year to hire and onboard staff based on UNR HR procedures and Sponsored Projects guidelines. The hired Energy Manager and SEM program enrollment will be used to track activities and reductions through utility data and program linear regression model. Implementation of this measure is anticipated to reduce a cumulative 7,442 $mtCO_2e$ for the period between 2025 – 2030, and 68,377 cumulative $mtCO_2e$ for the period between 2025 – 2050. Estimated CAP emissions are provided in Section XX of this document.

Business as usual scenario based on UNR's historic energy usage from 2009-2023 and using the average growth rate over the 2009-2023 time period to estimate future energy demand. The business as usual scenario assumes no major energy reduction measures are taken and UNR follows the same energy trendline set between 2009-2023.

xix. Reno – LED Project at Reno Sports Complex

The City of Reno knows the real time, hourly energy consumption and correlating GHGs for the Reno Sports Complex (Month of August 2023 provided in attached Emissions Calculations Spreadsheet). August 2023 is representative of the 7 months that the Sports Complex is in operation per year. Hourly consumption estimates of the complex in kWh is applied to a corresponding hourly emission factor, representing the most accurate estimate of the carbon intensity of the grid in that moment, to estimate hourly associated GHG emission reductions. These estimates are provided by nZero's Carbon Emissions Tracking Platform.

Total GHG emissions from August 2023 were multiplied by 7 to estimate annual baseline GHG emissions, totaling 40 mt CO2e. A 30% estimated energy savings, or emission reduction, was assumed to represent lighting replacement with LED, and was used to determine the 5-year and 25-year reduction potential.

Implementation of this measure is anticipated to reduce 12mt CO_2 e per year with 60 cumulative $mtCO_2e$ for the period between 2025 – 2030, and 300 cumulative $mtCO_2e$ for the period between 2025 – 2050. Although not quantitatively provided, CAP emission

[10] *Nevada Contractor Association 5.12.22 percentage change in producer price indexes (PPIs) and Employment Cost Indexes (ECIs) for Construction, 2017-2022* https://www.nvcontractors.org/constructioninflation-175532.html

reductions are expected, as the avoided energy consumption from a carbon-intensive grid will lead to a decrease in CAP emissions at fossil-fueled power plants.

xx. CAP Reductions Estimated for Solar Generation and Energy Efficiency Measures using AVERT

Methodology: The total PV solar capacity, in MW, for projects ix, x, xi, and xiv, and the total avoided generation for projects xvi, xvii, xviii, and xix, in gWh were used as an input for EPA's Avoided Emissions and Generation Tool (AVERT) Web Edition. Nevada - All Counties was selected for the geographic region. Energy efficiency measures were applied as reductions to total generation, PV solar capacity was applied as distributed rooftop solar. Since AVERT does not directly estimate PM_{10} reductions, it is assumed that PM_{10} reductions are equal to that of $PM_{2.5}$. Estimated CAP reductions (kg/year) are provided below by project:

Project	Project Description	NO_x	$PM_{2.5}$	PM_{10}	VOC	SO_2
ix	GOE solar	231	27	27	9	127
x	UNR solar	844	91	91	27	463
xi	Washoe County Solar	145	14	14	5	77
xiv	NCEF Solar	3778	413	413	122	2064
xvi	GOE Preweatherization	1969	218	218	68	1061
xvii	UNR LED Retrofit	218	23	23	9	118
xviii	UNR SEM	4813	526	526	159	2590