TECHNICAL APPENDIX

Methodology and assumptions used to estimate GHG reductions for each proposed measure are detailed below. See GHGcalcs_Metroplan.xlsx for additional assumption details, calculations, inputs, and outputs.

GREEN NETWORKS

Land Restoration, Stream Restoration, Land Preservation, and Trail Construction

a. Method: Literature-based spreadsheet model + local input

b. Models/Tools Used: The following sources were used to develop GHG emissions reductions calculators for carbon sequestration and transportation mode shift: Greenhouse Gases Equivalencies Calculator - Calculations and References for Number of urban tree seedlings grown for 10 years, ICLEI LEARN (Land Emissions And Removals Navigator) Tool, and California Air Resources Board, Climate Investments Quantification Methods Assessments - Quantifying Reductions in Vehicle Miles Traveled from New Bike Paths, Lanes, and Cycle Tracks. The calculators developed are included in the GHGcalcs_Metroplan.xlsx with a sample project (River Commons, NWA) to show the calculators' functions and outputs. Summaries shown of regional outputs and outcomes reference project-specific activities and calculations (see also Project List). CA emissions reductions were modeled on 4 example projects that are representative of the projects to be targeted for pass-through grants. Estimated cost ranges for land and stream restoration work were established using actual incurred costs for recently implemented projects of similar scope in CA and NWA. The estimated cost ranges include all associated costs with planning, design, permissions, implementation, and maintenance for three years.

c. Measure Implementation Assumptions: Key project implementation assumptions include:

- Implementation milestones:
  - Initial land restoration work is complete: 2026 for CA, 2027 for NWA
  - Stream restoration complete: 2026 for CA, 2028 for NWA
  - Land preservation complete: 2029 for CA, 2028 for NWA
  - Trail construction complete: 2029 for CA, 2028 for NWA
  - Inspection and maintenance continue for three years
  - Measure lifetime: More than 25 years
- Stream restoration costs depend on scale (watershed size); length of river; civil infrastructure, use of repurposed materials; and restoration approach
  - Sites with severe, accelerated streambank erosion: $500 to $800/feet
  - Sites with minor erosion and low-gradient: $100 to $150/feet
  - Additional riparian restoration: $3,900 to $6,000/acre
- Land restoration costs:
  - Wetlands: $3,000 to $7,000/acre
  - Prairie: $3,000 to $10,000/acre
  - Forest restoration: $3,900 to $6,000/acre
- Land preservation costs: $52,000 to $125,000/acre. Three scenarios exist:
  - A utility easement is purchased at 40% land value
  - Owner agrees to a conservation easement being placed on a property
  - Land is purchased and a conservation easement is placed on land
- Trail Cost: $200 to $400/ft
- Trail Uptake: 0.25% increase in bicycle/pedestrian commuters due to newly constructed trails and bike lanes based on local government bike and pedestrian counts on the Razorback Greenway Trail

d. GHG Reduction Estimate Assumptions:

Land restoration factors depend upon whether the area to be restored is fully degraded (paved or choked with invasive plants) or partially degraded. Sequestration from land and stream restoration is assumed to remain at an average steady rate for the first 15 years with sequestration slowing to 60% of the original rate in years 15 to 25. Emission factors used for land and stream restoration include:

- Trees planted: 0.06 mt CO_2e reduced per urban tree planted
- Floodplain/wetland restoration sequestration: 7.35 mt CO_2e/acre/year for fully degraded and 3.68 mt CO_2e/acre/year for partially degraded
- Prairie restoration sequestration: 5.79 mt CO_2e/acre/year for fully degraded and 2.23 mt CO_2e/acre/year for partially degraded
- Forest restoration sequestration: 2.78 mt CO_2e/acre/year for fully degraded and 1.39 mt CO_2e/acre/year for partially degraded
- Stream restoration sequestration: 12.25 mt CO_2e/acre/year

Land preservation emission reduction factors are applied one time rather than as an annual factor. Once preservation is initiated, the total emission reduction factor is applied. By putting land into a conservation easement, the avoidable flux of carbon content is maintained in the land and GHGs are not released by development disturbances. Emission factors used for land preservation include:

- Wetland/floodplain preservation sequestration: 35.47 mt CO_2e/acre
- Prairie preservation sequestration: 16.4 mt CO_2e/acre
- Forest preservation sequestration: 97.65 mt CO_2e/acre

Trail construction emission reductions were calculated from avoided gasoline vehicle miles traveled (VMT) using trails to commute instead of internal combustion engine vehicles.

- Average passenger vehicle emission factor: 400 grams of CO_2 per mile or 0.000400 MTC0_2/mile[1]
- Emission reductions are anticipated to remain at an average steady state year over year.

e. Reference Case Scenario: Without CPRG funding, these land and stream restoration and preservation projects due not occur. Lands identified for conservation easements are assumed to be developed unless conservation occurs. 250 commuting days by vehicle are assumed per year absent implementation of the trail projects with an average commute of 33.44 miles per person per day.[2]

f. Measure-Specific Activity Data and Implementation Tracking Metrics: Subrecipients and their contractors will track and report actual acres of floodplain, wetland, prairie, and streams restored; acres of each placed in conservation easements; and trees planted. Subrecipients will perform trail use counts.

g. GHG Emissions Reduced: Annual and cumulative GHG emission reductions in mt CO_2e for these projects are listed in the tables below.

Year	NWA	CA
2025		
2026	15,433	
2027	21,780	17,337
2028	16,657	18,972
2029	17,460	20,061
2030	17,460	53,185
2031	17,460	20,196

Year(s)	NWA	CA
2032	17,460	20,196
2033	17,460	20,196
2034	17,460	20,196
2035	17,460	20,196
Annually 2036 - 2050	10,595	12,171.6

[1] Questions and Answers: Tailpipe Greenhouse Gas Emissions from a Typical Passenger Vehicle (2023). United States Environmental Protection Agency Office of Transportation and Air Quality. EPA-420-F-23-014 <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1017FP5.pdf>

[2] <https://www.bts.gov/statistical-products/surveys/vehicle-miles-traveled-and-vehicle-trips>

Pollutant	CA	NWA
2025 – 2030 Cumulative GHG reductions	109,552	88,512
2025 – 2030 Cumulative GHG reductions	393,097	335,037

City of Fort Smith Alleyways Rehabilitation

a. Method – Literature-based spreadsheet model + local input

b. Models/Tools Used: Spreadsheet developed by the McClelland and City of Fort Smith (COFS)

c. Measure Implementation Assumptions: Key assumptions related to project implementation include:

- Construction of alleyways completed by August 2026
- Measure lifetime: 25 years
- Initial capital cost to complete all alleyway rehabilitation projects: $5,100,000
- Operation and maintenance cost not included in CPRG proposal; these costs will be paid by City of Fort Smith
- Uptake: An initial 15% reduction in VMT on road segments with rehabilitated alleyways is assumed in the first 5 years after construction with diminishing additional uptake each year through 2050; for 2026, this reduction is prorated to 10% because completion of the alleyways is anticipated in August 2026 prior to the start of the fall semester

d. GHG Reduction Estimates Assumptions: Key GHG reduction assumptions estimates include:

- CO_2e emission factor (average passenger vehicle): 400 grams of CO_2 per mile[3]
- VMT along each segment were reduced based on the measure uptake assumptions
- Annual GHG emissions reductions were calculated from the Annual GHG emissions with measure-based VMT reductions from the reference case scenario

e. Reference Case Scenario: Arkansas Department of Transportation (ARDOT) 2023 Average Daily Volume Count and segment length for the nearest Average Daily Traffic station to each rehabilitated alleyway were used to calculate passenger car miles driven absent measure implementation at the targeted locations.[4] Daily passenger car miles were multiplied by 400 grams of CO2e per mile to obtain baseline daily CO2e emissions. Daily counts were multiplied by 365 to calculate the baseline annual CO_2 emissions for these road segments.

f. Measure-Specific Activity Data and Implementation Tracking Metrics: The coalition will use ARDOT Average Daily Volume Count and other government data to track changes in VMT for the identified road segments for each year of this grant to evaluate assumed uptake and determine whether targeted messaging is needed to encourage residents to use these revitalized bicycle and pedestrian modes

g. GHG Emissions Reduced:

546 mt CO_2e in 2026, 712 mt CO_2e in 2027, 619 mt CO_2e in 2028, 539 mt CO_2e in 2029, 326 mt CO_2e in 2030, 297 mt CO_2e in 2031, 270 mt CO_2e in 2032, 245 mt CO_2e in 2033, 223 mt CO_2e in 2034, 106 mt CO_2e in 2035, 101 mt CO_2e in 2036, 96 mt CO_2e in 2037, 92 mt CO_2e in 2038, 87 mt CO_2e in 2039, 51 mt CO_2e in 2040, 49 mt CO_2e in 2041, 48 mt CO_2e in 2042, 47 mt CO_2e in 2043, 45 mt CO_2e in 2044, and 14 mt CO_2e in each year thereafter.

2025 – 2030 Cumulative GHG reductions: 3,884 mt CO_2e
2025 – 2050 Cumulative GHG reductions: 4,588 mt CO_2e

[3] Questions and Answers: Tailpipe Greenhouse Gas Emissions from a Typical Passenger Vehicle (2023). United States Environmental Protection Agency Office of Transportation and Air Quality. EPA-420-F-23-014 <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1017FP5.pdf>

[4] ARDOT Daily Traffic web portal: <https://addt-ardot.hub.arcgis.com>

E-Bike Voucher Program

a. Method: Local Input + Spreadsheet-based calculator

b. Models/Tools Used: E-Bike Environment and Economics Impact Assessment Calculator for Cities created by RMI in 2023 was used to estimate the impact of the e-bike program in Arkansas

c. Measure Implementation Assumptions: Key project implementation assumptions include:

- Implementation milestones/measure uptake: 1948 e-bike vouchers per year in 2025, 2026, and 2027 (total 5844 vouchers); 75% of vouchers are claimed by income-qualified program participants
- Measure lifetime: 25 years
- Model Inputs:

Model Parameter	Model Value	Description
State	AR	State where program will occur
City	Bentonville	Placeholder city as the city does not impact model outputs under this scenario
Scenario Input	E-Bike Incentive Program	Models an e-bike incentive program rather than a city-wide scenario
Population	1,294,752	2020 census for Central AR and Northwest AR
Population Growth Projection (Annual)	1%	Projected population for Central Arkansas and Northwest Arkansas MSAs from 2020 federal census to 2022 ACS
Percent EVs registered to residents in the city	0.50%	U.S. Light-Duty Electric Vehicle Market Share by State (2013-2022); (AAI 2023)
EV Policy Scenario	BAU	Business-As-Usual. Projects 15% of vehicles will be EVs by 2035
Annual e-bike incentive program budget	$1,075,000	Annual funding allocation to vouchers
Timeline of e-bike incentive program (years)	3	
Market-rate cargo e-bike incentive	$1,000	$500 base incentive + $400 cargo bike incentive + $100 safety/security incentive
Market-rate commuting e-bike incentive	$600	$500 incentive + $100 safety/security incentive
Income-qualified cargo e-bike incentive	$1,400	$900 base incentive + $400 additional for cargo bike incentive + $100 safety/security incentive
Income-qualified commuting e-bike incentive	$1,000	$900 base incentive + $100 safety/security incentive
Percent of incentives for income-qualified program participants	75%	This percent of vouchers will be allocated to income-qualified participants
Percent of income-qualified incentives for commuting e-bikes	50%	Default value from Denver E-bike Program; Bicycle Colorado et al. (n.d.)
Percent of incentives for market-rate commuting e-bikes	50%	Default value from Denver E-bike Program; Bicycle Colorado et al. (n.d.)
Estimate of average miles biked per week - income-qualified program participants	32	Supported by Denver E-bike Program; Bicycle Colorado et al. (n.d.)

Estimate of average miles biked per week - market-rate program participants	22	Supported by Denver E-bike Program; Bicycle Colorado et al. (n.d.)

d. GHG Reduction Estimate Assumptions: The RMI calculator estimates GHG emissions of ICE vehicles using emissions rates from USDOT,[5] average VMT by state,[6] and the state share of vehicle types.[7] A baseline scenario and an e-bike scenario were run to calculate corresponding GHG emissions over ten years. The mathematical difference in emissions between the two scenarios yielded the estimated GHG reduction for the e-bike program.

e. Reference Case Scenario: The RMI model produced outputs over a 10-year timeline and was assumed to run from 2025 to 2035. The business-as-usual (BAU) scenario was used to estimate emissions reductions, which relied on the percent of electric vehicles (EVs) as a share in a state using AAI (2023). The increase in EV adoption under the BAU scenario corresponds to the scenario created as part of the Inflation Reduction Act (IRA) passed in August 2022 and estimates 9% EV adoption in 2030 and extrapolates 15% EV adoption in 2035. The RMI calculator estimated environmental and economic impact through 2035. The percent share of EV vehicles was held constant at 15% from 2035 to 2050 due to increased levels of uncertainty in the forecast and due to strong support from the forecasted EV adoption range reported by the U.S. Energy Information Administration Annual Energy Outlook 2023.

f. Measure-Specific Activity Data and Implementation Tracking Metrics:

The calculator estimates that an e-bike incentive program designed using the model values described above will result in the following activity data:

- 1,050 e-bikes provided to community residents annually over three years
- Average reduction of 156,560 gallons of gasoline used annually
- Average reduction of 4,694,425 VMT annually

Trailblazers will track and report on changes in VMT annually in locations where the e-bike voucher program is implemented.

g. GHG and Criteria Co-Pollutant Emissions Reduced:

Implementation of these projects is anticipated to reduce 1032 mt CO_2e in 2026, 2046 mt CO_2e in 2027, 3040 mt CO_2e in 2028, 3006 mt CO_2e in 2029, 2963 mt CO_2e in 2030, 2913 mt CO_2e in 2031, 2853 mt CO_2e in 2032, 2785 mt CO_2e in 2033, 2708 mt CO_2e in 2034, and 2626 mt CO_2e in each year thereafter.

2025 – 2030 Cumulative GHG reductions: 6,515 mt CO_2e

2025 – 2050 Cumulative GHG reductions: 35,231 mt CO_2e

Average annual reductions of CAPs: 0.43 tons NO_x, 12.3 tons CO, and 0.036 tons $PM_{2.5}$.

TRANSPORTATION EFFICIENCY

EV Light-Duty Fleet Replacement and EV Supply Equipment (EVSE) Installation

a. Method: Spreadsheet-based models

[5] USDOT Bureau of Transportation Statistics (2023). Estimated U.S. average vehicle emissions rates per vehicle-by-vehicle type using gasoline and diesel. <https://www.bts.gov/content/estimated-national-average-vehicle-emissions-rates-vehicle-vehicle-type-using-gasoline-and>.

[6] USDOT Federal Highway Administration (2022). Highway statistics 2022. <https://www.fhwa.dot.gov/policyinformation/statistics/2022/>.

[7] AAI (2023). U.S. light-duty electric vehicle market share by state (2013-2022). <https://www.autosinnovate.org/EVDashboard>.
Blackley, J. (2023). Which vehicle type is the most popular in each state? <https://www.iseecars.com/popular-vehicle-type-by-state-study>.

b. Models/Tools Used: AFLEET CFI was used to quantify GHG emission reductions from EVSE installation and AFLEET 2023 background data was used to obtain emission factors, gasoline gallon equivalents, and fuel economy data for estimating GHG reductions from replacement of light-duty gasoline cars and trucks with all-electric equivalents. Both tools were developed by Argonne National Laboratory.[8]

c. Measure Implementation Assumptions: Key assumptions related to project implementation include:

- Implementation milestones/uptake:
    - 30 light-duty gasoline trucks (engine model year 2018) and 10 light-duty gasoline cars (engine model year 2018) replaced with all-electric equivalents with 50% of replacements occurring in 2025 and the other 50% occurring in 2026
    - 40 level 2 EVSE deployed in Central Arkansas (CA) in 2026, 60 in 2027, and 36 in 2028
    - 12 level 2 EVSE and 14 direct current fast charging (DSFC) EVSE deployed in the Fort Smith MSA by the end of 2025
    - Measure lifetime: all-electric light-duty cars and trucks are assumed to operate for 16 years consistent with AFLEET 2023 background data; EVSEs are assumed to operate for at least 25 years.
- Costs:
    - The maximum incentive values for vehicle replacement projects were calculated based on the remaining cost differential between an all-electric and internal combustion engine (ICE) equivalent purchase prices after tax credit. AFLEET 2023 background data was used for price estimates.

Vehicle Type	ICE	EV Price	Tax Credit	Max. CPRG Incentive
Light-duty truck	$37,000	$77,000	$7,500	$30,000
Light-duty car	$20,000	$37,000	$7,500	$7,500

    - For CA, level 2 public charging stations were assumed to cost $9,500 to install and $637/year to maintain and operate. CPRG funding is assumed to cover up to 70% of the costs for equipment and installation and project participants are expected to use the federal tax credit or pay a cost share for the other 30% of initial costs.
    - COFS costs of $2.5 million were based on a quote for specific equipment and sites.

d. GHG Reduction Estimates Assumptions: Key GHG reduction assumptions estimates include:

- CO_2e intensity of the electric grid for the SERC Mississippi Valley region: 803.7 lbs/MWh
- Light-duty gasoline vehicle emission factor: 0.00887 metric tons per gallon gasoline

e. Reference Case Scenario: The scope of EVSE infrastructure projects and light-duty vehicle transitions included in the proposal are not anticipated to occur without CPRG funding. The projects are anticipated to displace gasoline-powered light-duty cars and trucks.

f. Measure-Specific Activity Data and Implementation Tracking Metrics: The coalition members will track EVSE equipment deployed and vehicles replaced with CPRG dollars. Project participants will track and report annual kWh usage of EV charging stations and annual mileage of electric fleet vehicles for the grant period. Reported usage data will be used to calculate GHG and CAP emission reductions.

g. GHG Emissions Reduced:

Implementation of the CA fleet replacement competition is anticipated to reduce 69.55 mt CO_2e in 2025 and 139.11 CO_2e each year thereafter through 2040. Implementation of the CA EVSE incentive is anticipated to reduce 116.76 mt CO_2e in 2025, 291.9 mt CO_2e in 2026, and 396.98 mt CO_2e each year thereafter. Implementation of the COFS incentive is anticipated to reduce 235 mt CO_2e annually beginning in 2026. Cumulative GHG reductions and annual CAP emission reductions are summarized below.

Pollutant	CA Fleet	CA EVSE	COFS EVSE
2025 – 2030 Cumulative GHG reductions (mt CO2e)	765.08	1599.61	1173.48

[8] <https://afleet.es.anl.gov/home>

2025 – 2050 Cumulative GHG reductions (mt CO2e)	2156.14	9142.31	5867.40
CO tons reduced	0.75	3.14	1.79
NOx tons reduced	0.025	0.076	0.043
PM10 tons reduced	0.0023	0.0080	0.0045
PM2.5 tons reduced	0.0019	0.007	0.004
VOC tons reduced	0.020	0.31	0.18
SO2 tons reduced		0.0014	0.00080

Streetlight Conversion to LED Incentive Program

a. Method: Spreadsheet model tool developed with literature-based emission factors and local input.

b. Models/Tools Used: A model was developed by Conway Corp, in association with consultants Fisher Arnold, based on actual streetlights in need of conversion to LED. The original model used a national average CO_2 metric, but the EPA's specific sub-region figure and the non-baseload figure were used to refine the numbers. Data from Conway Corps' plan to replace non-LED light fixtures were extrapolated to calculate anticipated GHG reductions for the Central Arkansas (CA) streetlight conversion incentive program. AVERT was used to quantify annual criteria pollutant emission reductions.

c. Measure Implementation Assumptions: Key assumptions related to project implementation include:

- Implementation milestones/uptake: streetlight replacement projects complete by 10/2025.
- Measure lifetime: 20 to 25 years
- Light fixture replacement costs are summarized below.

Light Type	Price per Fixture Replacement
Nightwatcher	$ 990.35
Flood Light	$1,407.57
Cobrahead - small	$1,072.37
Cobrahead - large	$1,438.83

Light Type	Price per Fixture Replacement
Post Top - neighborhood	$1,267.93
Post Top - downtown	$3,131.27
Hang Down	$4,352.64

d. GHG Reduction Estimates Assumptions: Key GHG reduction assumptions estimates include:

- Annual operating hours assumed are based on 4,313 hours of darkness
- The Conway Corp project was used to quantify the percent reduction from replacing traditional streetlights with LED equivalents; the energy savings were scaled by the total program budget to calculate total CA streetlight replacement program GHG reductions
- 2025 reductions were reduced by 50%, assuming the project may take a few months to install

e. Reference Case Scenario: Conway Corp non-LED kWh annual usage data of 2,651,836 kWh was used as the reference case.

f. Measure-Specific Activity Data and Implementation Tracking Metrics:

- 4,033 streetlights will be replaced with the following breakdown by light type: 26% Nightwatcher, 22% Flood Light, 22% Cobrahead-small, 3% Cobrahead-large, 25% Post Top – neighborhood, 1% Post Top – downtown, 1% Hang Down
- Project participants will track streetlights replaced and energy usage before and after project implementation and report such data to the coalition

g. GHG Emissions Reduced:

Implementation of this measure is anticipated to reduce 433 mt CO_2e in 2025 and 866 mt CO_2e each year thereafter.

2025 – 2030 Cumulative GHG reductions: 4,762 mt CO_2e

2025 – 2050 Cumulative GHG reductions: 19,482 mt CO_2e

Energy savings will result in an annual reduction of 0.57 tons NO_x, 0.55 tons PM2.5, 0.02 tons VOC, and 0.725 tons SO2.

BUILDING EFFICIENCY

Commercial Property Assessed Clean Energy (CPACE) Revolving Loan Fund, Energy Savings Performance Contracting (ESPC), COFS Solar

a. Method: Spreadsheet model tool developed with literature-based emission factors, AVERT, and local input

b. Models/Tools Used: Helioscope was used to design the solar array for the COFS Nelson Hall project. EPA eGRID 2022 non-baseload output emission rates data for the SMRV and SPSO subregions was used to quantify the electric intensity of the electric grid in CA and COFS, respectively. EPA Greenhouse Gas Equivalency Calculator data was used to calculate emissions reduced from natural gas energy savings. AVERT was used to estimate annual CAP emissions from reduced electricity use by Nelson Hall in 2030.

c. Measure Implementation Assumptions: Key assumptions related to project implementation include:

- Implementation milestones/uptake:
  - CPACE: assumes 38 projects are completed in the first 4 years with 10% of projects complete in 2025, 50% in 2026, 75% in 2027, 100% in 2028 and that RLF repayments begin to fund 2 – 5 additional projects per year through 2050
  - EPSC: assumes projects are completed with 10% of projects complete in 2025, 50% in 2026, 75% in 2027, 100% in 2028
  - Nelson Hall solar project is complete by January 2026
- Measure lifetime: Energy savings from CPACE and EPSC anticipated to last 22 years from project completion and energy generation from the Nelson Hall solar project is anticipated to continue beyond 25 years with a 0.5% annual degradation rate after the first year.
- Costs:
  - CPACE: $75,000 per each loan anticipated on average
  - ESPC: Grants up to $500,000 per project
  - Nelson Hall Solar Project: $2.1 million based on Helioscope outputs with 30% covered by the federal investment tax credit

d. GHG Reduction Estimates Assumptions: Key GHG reduction assumptions estimates include:

- Energy savings from CPACE and ESPC and energy generation from the Nelson Solar Project are expected to displace electricity generation from the grid
  - Non-baseload output emission rate for SMRV (CPACE and ESPC): 1,226 lbs CO_2e/MWh
  - Non-baseload output emission rate for SPSO (Nelson Hall): 1,535 lbs CO_2e/MWh
  - Natural Gas: 0.05502 mt CO_2/MCF[9]

e. Reference Case Scenario: EGRID 2022 emissions rates for SMRV and SPSO were used as a reference for the GHG intensity of electricity displaced by the proposed projects

f. Measure-Specific Activity Data and Implementation Tracking Metrics:

- The Nelson Hall 850 kW solar array is anticipated to produce 1,476,900 kWh in Year 1 of operation with a 0.5% annual degradation.
- For CPACE and ESPC savings were calculated using a savings per investment metric derived from EIA average dollars per kWh and dollars per MCF averages from the United States Energy Information Administration and projected kWh savings per year for 100% implementation. Savings were then prorated based on the percent investment per year from CPRG programs.

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[9] <https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references>

g. GHG Emissions Reduced:

Annual and cumulative GHG emission reductions in mt CO_2e for CPACE, EPSC and Nelson Hall Solar projects are listed in the tables below.

Year	CPACE	EPSC	Nelson Hall
2025	332	387	0
2026	1,577	1,937	720
2027	2,407	2,905	716
2028	3,154	3,874	713
2029	3,320	3,874	709
2030	3,486	3,874	706
2031	3,652	3,874	702
2032	3,818	3,874	699
2033	3,984	3,874	695
2034	4,150	3,874	692
2035	4,316	3,874	688
2036	4,565	3,874	685
2037	4,814	3,874	681

Year	CPACE	EPSC	Nelson Hall
2038	5,063	3,874	678
2039	5,312	3,874	674
2040	5,561	3,874	671
2041	5,810	3,874	668
2042	6,059	3,874	664
2043	6,308	3,874	661
2044	6,557	3,874	658
2045	6,806	3,874	654
2046	7,138	3,486	651
2047	7,138	1,573	648
2048	5,893	787	645
2049	3,901	0	641
2050	1,162	0	638

Pollutant	CPACE	ESPC	Nelson Hall
2025 – 2030 Cumulative GHG reductions	14,277	16,850	3,563
2025 – 2030 Cumulative GHG reductions	116,289	80,799	16,956
NOx tons reduced annually			1.02
PM2.5 tons reduced annually			0.06
VOC tons reduced annually			0.025
SO2 tons reduced annually			0.96

Clinton National Airport (LIT) Geothermal Well Field

a. Method: Literature-based spreadsheet model, EPA's Avoided Emissions and Generation Tool (AVERT) + local input

b. Models/Tools Used: AVERT was used to calculate GHG and CAP emission reductions based on energy displaced from the electric grid through implementation of this project. Emission factors were used to estimate GHG emissions from displaced natural gas use.

c. Measure Implementation Assumptions: Key assumptions related to project implementation include:

- Implementation milestones/uptake: Completion anticipated by April 2026
- Measure lifetime: greater than 25 years
- Costs: The total project cost of the Geothermal Central Utility Plant is $24,374,000. This proposal would fund $7,750,000 of the project. The remaining funding for the project will come from other funding sources.

d. GHG Reduction Estimates Assumptions: Key GHG reduction assumptions estimates include:

- Fugitive GHG reductions from replacing three chillers with geothermal energy were estimated by comparing business as usual (BAU) to the geothermal implementation scenario. Leak rates of refrigerants for each equipment type were based on EPA percentages with the leak rate for each refrigerant multiplied by the global warming potential.
- Similarly, GHG reductions from displaced from fuel use and electricity use under the implementation scenario were compared to the BAU scenario. Implementing the CUP based on assuming the project will eliminate the terminal HVAC natural gas usage and reduce the terminal HVAC electricity consumption by 25%, as the system is more efficient than conventional HVAC systems. GHG emissions

reductions calculations also incorporate the anticipated change in HVAC energy usage over time due to changes in the terminal's square footage as well as changes with grid electricity GHG emission factors similar to the BAU scenario. Emission factors used for fuel use are listed below:

- Natural gas: 53.11 kg CO_2e/mmBtu
- Propane: 5.74 kg CO_2e/gallon
- Diesel: 10.24 kg CO_2e/gallon
- Gasoline: 8.81 kg CO_2e/gallon
- Electricity (MB): 0.3667 kg CO_2e/kWh
- Electricity (LB): 0.3659 kg CO_2e/kWh

e. Reference Case Scenario: The BAU scenario assumes HVAC energy usage (natural gas and electricity) at the airport terminal will increase proportional to the terminal's square footage as the terminal has planned expansion already approved. In addition, an increase in the percentage of renewable energy was assumed within the mix of electricity supply. We estimated greening of grid at 5% through 2035 and 7.5% through 2050 in the BAU scenario. The BAU scenario assumption is based on the mid-case current policy scenario as understood under *2023 Standard Scenarios from National Renewable Energy Laboratory*. The mid-case scenario serves as a baseline or middle-ground scenario to reflect what might happen if current trends and conditions continue.

f. Measure-Specific Activity Data and Implementation Tracking Metrics: Little Rock Airport will track fuel use, electricity use, and refrigerants to quantify GHG and criteria pollutant reductions from implementation of the geothermal project. Anticipated overall energy savings include 1,980,842 kWh electricity savings and 24,638 mmBtu natural gas energy savings.

g. GHG Emissions Reduced:

Annual GHG in mt CO_2e and CAP reductions and cumulative GHG emission reductions in mt CO_2e for the LIT CUP credited to this proposal are listed in the tables below.

Year	mt CO2e Reduced	Year	mt CO2e Reduced	Year	mt CO2e Reduced
2026	809.8367	2035	962.2118	2044	825.7102
2027	929.2335	2036	948.3068	2045	815.0904
2028	911.9221	2037	928.4922	2046	805.267
2029	1062.432	2038	910.1637	2047	796.1803
2030	1043.516	2039	893.2098	2048	787.7752
2031	1025.546	2040	877.5274	2049	780.0004
2032	1008.474	2041	863.0213	2050	772.8088
2033	992.2559	2042	849.603		
2034	976.8487	2043	837.1912		

Pollutant	Reduction
2025 – 2030 Cumulative GHG reductions (mt CO2e)	4756.94
2025 – 2050 Cumulative GHG reductions (mt CO2e)	22412.62
NOx tons reduced annually	0.985
PM2.5 tons reduced annually	0.1
VOC tons reduced annually	0.03
SO2 tons reduced annually	1.25