

Technical Appendix – Mashantucket Pequot Tribal Nation

This Technical Appendix applies to two projects:

- 1) Lighting Efficiency Upgrades – Government Facilities
- 2) Tribal Household Energy Audits and Household Efficiency Upgrades – Voucher Program

GHG REDUCTION ESTIMATE METHOD & MODELS/TOOLS USED

Project: Lighting Efficiency Upgrades – Government Facilities

1. Public Works
2. Mashantucket Pequot Museum & Research Center
3. Community Center
4. Public Safety
5. Post Office
6. Daggett Utility Building
7. Child Development Center

The lighting inventory for the above tribal government buildings was utilized to determine the expected annual energy savings (kWh) if all fixtures/bulbs were upgraded. We then calculated emissions that would result from that amount of electricity use.

Emission factors utilized, for both GHG (CO₂e) and criteria pollutants, were obtained from EPA's Emissions & Generation Resource Integrated Database (eGRID). In addition to the typical GHG pollutants, eGRID provides factors (lb/MWh) for NO_x & SO_x. EPA had also posted PM_{2.5} data to eGRID, however only for year 2020.4 Please refer to detailed methodology write-up for MPTN's inventory provided within Appendix I of this document.

Project: Tribal Household Energy Audits and Household Efficiency Upgrades – Voucher Program

To calculate the estimated pollutant reductions for this, measure The Costs of Home Decarbonization in the US was used to provide baseline data for project cost expectations and carbon reduction expectations related to home improvements through electrification.

Cumulative project period emissions, determined assuming that the utilization of the voucher program would occur equally throughout the project period, are estimated as 1,311.75 MTCO₂e based on 159 homes on the Reservation (provided by the MPTN Department of Housing).

MEASURE IMPLEMENTATION ASSUMPTIONS

Project: Lighting Efficiency Upgrades – Government Facilities

All existing fluorescent troffer fixtures were assumed to currently use T8 bulbs (32 W/bulb). Existing wattage information for other fixtures that will require replacement was provided by Building Management. Other lights, where it was assumed that only simple bulb replacement will be required, were assumed to have previously been updated from incandescent to fluorescent bulbs. Troffer replacement wattage was assumed to be equivalent to percent efficiency improvement noted for the NRP project, on a bulb-to-bulb basis.

Project: Tribal Household Energy Audits and Household Efficiency Upgrades – Voucher Program

- A majority of the voucher program projects will be home energy electrification projects
- All homeowners on the reservation will take advantage of the program

GHG REDUCTION ESTIMATE ASSUMPTIONS

Project: Lighting Efficiency Upgrades – Government Facilities

For this project, there is no real assumption to the reduction estimate. There was no estimate in the number of incandescent/fluorescent lighting fixtures because an actual inventory was done for each building. Additionally, there is no estimate on the wattage for the lighting fixtures because it was accounted for in the inventory. Similar LED wattage is expected based on LED replacements that have already been installed in other MPTN buildings.

Project: Tribal Household Energy Audits and Household Efficiency Upgrades – Voucher Program

The project cost and carbon pollution reductions are scalable in the way the calculations were made. The assumption is that each household participating in the voucher program will result in median project carbon emissions reduction at a level of 2.75 MTCO_{2e} per year.

REFERENCE CASE SCENARIO (GHG EMISSIONS OR ACTIVITY LEVEL)

Project: Lighting Efficiency Upgrades – Government Facilities

For this project the reference case scenario was comparing existing, inefficient lighting fixtures to more energy efficient LED lighting fixtures.

Project: Tribal Household Energy Audits and Household Efficiency Upgrades – Voucher Program

For this project the reference case scenario is comparison of a home with some or no energy efficiency or weatherization upgrade(s) compared to a home that has implemented an energy efficiency and/or a weatherization upgrade(s).

MEASURE-SPECIFIC ACTIVITY DATA

Project: Lighting Efficiency Upgrades – Government Facilities

This measure focuses on reducing GHG emissions through lighting upgrades. The specific intent is to replace less efficient lighting fixtures with more efficient LED lighting fixtures.

For a number of years MPTN Building Management has reduced electrical usage within government buildings by, where possible, simple bulb replacement (e.g. incandescent to LED or T12 fluorescent to T8). However, fixture upgrades, particularly for standard office troffer lighting, has been beyond the scope of their services/budget. Recently, during a renovation of the Tribe's Natural Resources Protection office, troffer fixtures were replaced. We calculate this single project will reduce cumulative CO₂e emissions by over eleven (11) metric tons (MT) by 2030.

Consulted with Building Management staff to identify government buildings where similar lighting upgrades would lead to improved energy efficiency and thus reduced emissions of GHGs.

Lighting Inventory
Fixture Count

	Troffer Lights					Other Fixture Replacement				Other Assumed Bulb Only Replacement			
	2x2	4' 2-bulb	4' 3-bulb	4' 6-bulb Gym Lights	8' 2-bulb	Double tube downlight	Low V. downlight 50W	Misc. forms 13 to 70 watt	4" vanity lights	6" Pot Lights	6" Round 2-Bulb	4" Round Pot Light	4" Direct Beam Spot
Public Works	68												
MPMRC	185	526		21						72	128	88	12
Community Center	485		116						74				
Public Safety	198	63	192		58	38	44	159					
Post Office		42											
Daggett Building			52		8					4	3	20	
Child Devel. Center	48	109	103										

Project: Tribal Household Energy Audits and Household Efficiency Upgrades – Voucher Program

Data: Number of Homes on the Reservation provided by the MPTN Department of Housing and the median project cost and carbon emissions reduction sourced by “The Costs of Home Decarbonization in the US” report.

GHG EMISSIONS REDUCED

Project: Lighting Efficiency Upgrades – Government Facilities

The intent is to replace all applicable lights with LED lights at a number of MPTN government buildings. If fully implemented, this reduction measure would reduce roughly 315.8 MTCO_{2e} for 2025 through 2030; and 2,526.4 MTCO_{2e} for 2025 through 2050.

Project: Tribal Household Energy Audits and Household Efficiency Upgrades – Voucher Program

This pollution reduction measure intends to provide each qualified MPTN household with \$15,000 in funding to upgrade building energy efficiency. Examples include, but are not limited to, the installation of heat pumps, installation of renewable energy technology, improving home appliances, and weatherization upgrades.

This pollution reduction measure would include an educational component for the Mashantucket Tribal community. The workshops would serve two purposes: advertise the funding opportunity and educate potential participants.

This pollution reduction measure includes an educational component for membership, revolving around explanation of the details on the voucher program as well as energy efficiency upgrades.

If fully implemented, this reduction measure would reduce roughly 1,311.75 MTCO_{2e} for 2025 through 2030; and 6,558.75 MTCO_{2e} for 2025 through 2050.

GHG EMISSION REDUCTION CALCULATIONS

Project: Lighting Efficiency Upgrades – Government Facilities

Reduction Calculations: 1) Inventory of existing incandescent/fluorescent lighting fixtures in specific tribal government buildings including type and quantity. 2) Determine wattage for each inventories lighting fixture to arrive at a sum wattage. 3) Determine 1:1 LED replacement lighting fixtures at same quantity. 4) Take the sum of the reduced wattage in comparison to the old wattage. Show MTCO_{2e} reduced after completion.

Project: Tribal Household Energy Audits and Household Efficiency Upgrades – Voucher Program

To calculate the estimated pollutant reductions for this, measure The Costs of Home Decarbonization in the US was used to provide baseline data for project cost expectations and carbon reduction expectations related to home improvements through electrification. Based on 1,739 energy upgrade projects across the country (410 [~25%] in Northeastern U.S.), the median project carbon emissions reduction was 1.6 MTCO_{2e} per year and the median project cost was \$8,740. From there, the extrapolation was made to achieve a project cost of \$15,000 and subsequent carbon emission reduction of 2.75 MTCO_{2e} per project per year. Applying this calculation to the 159 households in Mashantucket in 2022, the total carbon emission reduction for this measure is estimated to be 437.25 MTCO_{2e} per year. ($\$15,000/\$8,740 = 1.72 \rightarrow 1.72 * 1.6 \text{ MTCO}_2\text{e per year} = 2.75 \text{ MTCO}_2\text{e reduced per project per year} \rightarrow 2.75 \text{ MTCO}_2\text{e reduced per project per year} * 159 = 437.25 \text{ MTCO}_2\text{e reduced per year}$).

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