

UCUT CPRG Technical Appendix

UCUT-Wide Assumptions

- There were no emissions projections or forecasts done in the PCAP. Therefore, all GHG reduction estimates are directly from the 2022 GHG inventory baseline.
- The 2022 GHG inventory baseline was developed using the EPA's Tribal Greenhouse Gas Inventory Tool.
- GHG reduction projects will prioritize the known and tribally prioritized projects that can quickly accomplish CPRG program goals and result in the most immediate GHG reductions.
- All technologies included in these measures are widely used and market-available as UCUT is prioritizing implementation-ready GHG reduction measures.

Measure-Specific Assumptions

Tribal Home Decarbonization

- **GHG Reduction Estimate Method**
 - GHG Reduction Estimates for the residential decarbonization program were derived from several sources. GHG reductions from this program would come from two primary sources: wood stove upgrades or changeouts that would reduce harmful GHG's such as Methane and Nitrous Oxides, and efficiency projects centered around heat pump installations.
 - Estimates on the efficiency of new heat pump installations compared to existing electrical baseboard heating systems come multiple government sources including the DoE¹.
- **Models/Tools Used**
 - California Air Resource Board Wood Stove Changeout Calculator Tool² was used to calculate the GHG reductions for a potential wood stove upgrade/changeout project.
 - EPA Tribal Greenhouse Inventory Tool is used to calculate GHG emissions from kWh savings in the NWPP grid subregion.
- **Measure Implementation Assumptions**
 - New equipment including EPA certified wood stoves and air sourced ductless heat pumps expected to have an average rated useful life of 15 years.
 - Operations and Maintenance (O&M) cost assumptions are assumed to be similar to current heating sources in the homes.
- **GHG Reduction Estimate Assumptions**
 - Emissions factors for electricity reductions were assumed to be the 2022 emissions factor for the EPA NWPP subregion.
- **Reference Case Scenario**

¹ <https://www.energy.gov/energysaver/air-source-heat-pumps>

² https://ww2.arb.ca.gov/sites/default/files/auction-proceeds/carb_wr_calc_21-22_final.xlsx

- GHG emissions reductions are quantified relative to the base year emissions and a percentage reduction in emissions from Scope 1 wood stove emissions and Scope 2 electricity emissions.
- **Measure-Specific Activity Data**
 - DoE estimates that air sourced heat pumps save an average of 3,600 kWh annually compared to electric baseboard heating. Assumptions for this measure were lower, as the heat pumps would also add air conditioning to many homes that have not had the ability to cool in the summer before.
 - An estimated 2000 tribal member homes could be affected by this measure. Program costs will cover the installation of an air source heat pump, an EPA certified wood stove, or both. There is an expected adoption curve for this measure, so GHG reductions ramp up slowly in the first few years of the program.
- **GHG Emissions Reduced**
 - Included in the GHG emission reduction calculations spreadsheet.

Commercial Building Decarbonization

- **GHG Reduction Estimate Method**
 - GHG emissions baseline was calculated using both estimates and primary data in the Tribal Greenhouse Gas Inventory Tool.
 - GHG reduction estimates were derived from industry standards for commercial energy efficiency and decarbonization projects including an assumed simple payback period of an average of four years.
- **Models/Tools Used**
 - Excel-based engineering estimates based on reasonable \$.10/kWh electricity rates and assumed simple payback period.
- **Measure Implementation Assumptions**
 - Measure lifetime is assumed to be 12 years.
 - Because there are not many material sources of emissions in the commercial buildings sector throughout UCUT due to the relatively low GHG emission factor of the EPA subregion, targeted implementation can result in rapid GHG reductions and achievement of project milestones.
 - Ongoing Operations and Maintenance (O&M) costs are assumed to not be additional to current O&M costs for the equipment. This is a conservative assumption in that many decarbonizing technologies often require less O&M expenses; for example, LED light fixtures have longer lifespans than more carbon intensive options and often are incorporated with the removal of the old ballast.
- **GHG Reduction Estimate Assumptions**
 - GHG reductions are assumed to come through a combination of electrification of fossil fuel use and energy efficiency projects resulting in reduced electricity use.
- **Reference Case Scenario**
 - GHG emissions reductions are quantified relative to the base year emissions and a percentage reduction in the commercial building emissions sector.
- **Measure-Specific Activity Data**

- Consumption data were obtained for a number of buildings for the 2022 GHG inventory base year. Where consumption data was not readily available, the EIA's Commercial Buildings Energy Consumption Survey³ (CBECS) was used with actual or estimated square footages to estimate total energy consumption for the commercial buildings.
- Some buildings, such as fish hatcheries, consume a very similar amount of electricity and their consumption is able to be extrapolated if there is no primary data for GHG calculations available.
- **GHG Emissions Reduced**
 - Included in the GHG emission reduction calculations spreadsheet.

Carbon Smart Transportation

- **GHG Reduction Estimate Method**
 - GHG emissions baseline was calculated using both estimates and primary data in the Tribal Greenhouse Gas Inventory Tool.
 - GHG reduction estimates were calculated based on the performance of similar programs run through California Climate Investments⁴ (CCI). Programs run through CCI have varying levels of cost effectiveness per CO₂e reduction, and the type of program seemed to be largest influence of that.
 - Consumer based incentive programs such as rebates or vouchers had a lower cost per GHG reduction with many performing at ~\$500/MT CO₂e.
 - Enhanced public transit programs ran in the \$100-\$300 /MT CO₂e range.
 - Capital intensive projects such as those that directly upgraded fleet vehicles or infrastructure performed closer to ~1,000/MT CO₂e.
 - GHG reductions were calculated based on a reasonable cost/GHG reduction sourced from CCI, recognizing that CPRG funding will go towards the programs that can be both cost effective and immediately prioritized by the implementing tribe.
- **Models/Tools Used**
 - Excel-based engineering calculations using the target cost effectiveness gathered from similar CA programs. In this case our portfolio of programs within this sector was assumed to be \$300//MT CO₂e_s over the lifetime of the program.
- **Measure Implementation Assumptions**
 - Measure lifetime is assumed to be 8 years.
 - Average assumed 'persistence of savings' useful life of purchased transportation technology (e.g., how long until such technology is the baseline) and how long until personnel commuting practices implemented should be considered standard operating procedure.
 - Implementation of each component of this measure will be prioritized by those with immediate GHG reductions and projects with the lowest barriers to implementation combined with the greatest GHG reduction potential.

³ <https://www.eia.gov/consumption/commercial/data/2018/>

⁴ <https://www.caclimateinvestments.ca.gov/all-programs>

- Measure implementation assumed to be a combination of low-cost enhanced public transit, combined with higher capital costs projects like vehicle electrification and complete streets infrastructure.
- **GHG Reduction Estimate Assumptions**
 - Emissions reductions were assumed to come from a combination of reduction in overall Vehicle Miles Traveled (VMT) well as reduction in gasoline and diesel use through vehicle electrification.
 - Employee commuting for non-tribal members was included in this GHG inventory effort and is included in as a GHG reduction source for this measure as well. This will likely include reduced emissions from enhanced public transit and workplace EV chargers.
- **Reference Case Scenario**
 - BAU assumed to have minimal adoption of electric vehicles in both tribal government and among tribal members unless CPRG funds would cover the premium associated with an EV upgrade relative to an internal combustion engine (ICE) counterpart, as well as the charging infrastructure necessary for their use.
- **Measure-Specific Activity Data**
 - We used the Employee Commuting estimates within the Tribal Greenhouse Gas Inventory Tool for the total number of non-tribal employees to calculate base year GHG emissions.
 - Residential annual VMT was estimated to be 10,000 miles with an assumed average of 1.5-2 vehicles per household.
- **GHG Emission Reduced**
 - Included in the GHG emission reduction calculations spreadsheet.

Waste Reduction Programs

- **GHG Reduction Estimate Method**
 - GHG reductions are estimated to be from the largest sources of food waste on the reservations: the restaurants within the casinos and hotels.
 - Estimates on reductions are derived from program performance with similar food waste diversion programs in northwest Tribal Casinos.
 - UCUT 2022 baseline Municipal Solid Waste (MSW): 17,018 MT going to landfill.
 - WA State MSW Composition 2020-2021⁵ consists of roughly 32% compostable materials.
 - Therefore, we estimate UCUT annual compostable material that is currently landfilled to be $.32 \times 17,018 = 5,445.8$ MT. This figure is inclusive of compostible papers.
 - 2,100 MT (38.6%) of the UCUT total mixed organics is estimated to be food waste from casinos.
- **Models/Tools Used**
 - Using the EPA's WARM tool, we calculated existing baseline emissions from food waste as well as the GHG reduction potential of a mitigation program.
- **Measure Implementation Assumptions**

⁵ <https://apps.ecology.wa.gov/publications/documents/2107026.pdf>

- This measure is assumed to have a useful life of 15 years.
- This measure is assumed to scale quickly and can achieve rapid GHG reductions and program success due to the few sites contributing so significantly to the overall GHG emissions.
- **GHG Reduction Estimate Assumptions**
 - We estimate that the source reduction and the complimentary composting infrastructure in this measure will result in a 35% source reduction , 35% diversion to composting, and 30% remaining still going to the landfill. Those inputs, when put into the WARM tool for the 2100 tonnes of food waste in casinos, and 2,745 MT of mixed organic waste elsewhere on the reservations, will result in:
 - 3,506.2 MT CO₂e reduced in casinos, annually.
 - 439.3 Mt CO₂e reduced from access to composting infrastructure elsewhere, annually.
 - For a total of 3,945.5 MT CO₂e reduced annually.
- **Reference Case Scenario**
 - GHG emissions reductions are quantified relative to the base year emissions and a percentage reduction in emissions from Scopes 1 and 3 waste.
- **Measure-Specific Activity Data**
 - Included in GHG reduction estimate assumptions.
- **GHG Emission Reduced**
 - Included in the GHG emission reduction calculations spreadsheet.