American Samoa

Priority Climate Action Plan

Prepared by:
American Samoa Environmental Protection Agency

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Abbreviations

ASCA	American Samoa Code Annotated
AS-EPA	American Samoa Environmental Protection Agency
ASPA	American Samoa Power Authority
ASG	American Samoa Government
ASTCA	American Samoa Telecommunications Authority
BESS	Battery Energy Storage System
CAA	Clean Air Act
CAP	Criteria air pollutant
CFR	Code of Federal Regulations
CPRG	Climate Pollution Reduction Grant
EPA	U.S. Environmental Protection Agency
EV	Electric vehicle
GHG	Greenhouse Gas
GHGRP	Greenhouse Gas Reporting Program (40 CFR Part 98)
IRA	Inflation Reduction Act
MT CO_2e	Metric Tons of carbon dioxide equivalent
NREL	National Renewable Energy Laboratory
OAR	EPA Office of Air and Radiation
PM	Project Manager
PO	EPA Project Officer for Grant
POP	Period of Performance
POR	EPA Project Officer's Representative
PWP	Project Work Plan
PV	Photovoltaic
QA	Quality Assurance
QAM	Quality Assurance Manager
QAPP	Quality Assurance Project Plan
QC	Quality Control
TL	Task Leader
USPHS	U.S. Public Health Service

Introduction

American Samoa, an unincorporated and unorganized territory of the United States administered by the U.S. Department of the Interior, comprises five volcanic islands and two coral atolls situated south of the equator. Its closest neighbor is the independent country of Western Samoa, accessible by a short 25-minute flight [1]. The principal islands include Tutuila, Aunu'u, and the Manu'a islands, consisting of Ta'u, Ofu, and Olosega, located approximately 65 miles east of Tutuila. Swains Island, with a population of less than 25, and Rose Atoll, an uninhabited atoll about 120 miles east of Tutuila, complete the territory [1]. As of April 1, 2020, the population of American Samoa stood at 49,710 [2], with the majority residing on the island of Tutuila.

American Samoa and the other US Pacific Island territories are historically underserved communities compared to the US mainland. These territories are among the most economically distressed communities in the US, with rates of people living under the poverty level nearly four times the rate of the rest of the nation [3]. American Samoa in particular has the lowest per capita income of any state, territory, or county, more comparable to Botswana or Panama than anywhere in the nation[3].

Climate change is already harming American Samoa. Its communities, particularly the most vulnerable are the least resourced to adapt or relocate and are most impacted by rising sea levels, stronger hurricanes, floods, drought, and extreme heat that are degrading the health and livelihoods of American Samoans[4].

In 2010, the American Samoa Renewable Energy Committee (ASREC) was established to coordinate efforts with federal experts. Its mission is to reduce the territory's reliance on petroleum, increase energy efficiency, and increase renewable energy use on the islands. In 2016, ASREC adopted a goal to meet 50% of American Samoa's energy needs from renewable resources by 2025 and 100% by 2040. However, as of 2023, only around 3% of American Samoa's energy needs are being met by renewable resources. The other 97% of American Samoa's energy needs are provided for via imported diesel fuel that is used to power generators.

American Samoa requires immediate and sustained investments to reduce greenhouse gas emissions and address climate change. Climate Pollution Reduction Grants are a transformational opportunity to fund pathways to clean technologies and invest in critical infrastructure to improve the quality of life for those who live, work, and play in American Samoa.

Climate Pollution Reduction Grants (CPRG) Overview

Section 60114 of the Inflation Reduction Act (IRA) appropriates $5 billion to EPA to develop and implement plans to reduce greenhouse gas (GHG) emissions. Through the CPRG program, EPA is seeking to achieve three broad objectives:

1. Tackle damaging climate pollution while supporting the creation of good jobs and lowering energy costs for families.
2. Accelerate work to address environmental injustice and empower community-driven solutions in overburdened neighborhoods; and
3. Deliver cleaner air by reducing harmful air pollution in places where people live, work, play, and go to school.

CPRG includes two phases. Phase 1 provides grants to develop plans to reduce GHGs, while Phase 2 provides funding to implement measures from the GHG reduction plans.

PCAP Overview

Through the Inflation Reduction Act of 2022, the U.S. Environmental Protection Agency (EPA) administers the Climate Pollution Reduction Grants (CPRG) program. This initiative equips stakeholders with resources to combat greenhouse gas (GHG) emissions by facilitating the formulation of regional climate action plans. Moreover, it fosters the execution of policies, programs, and projects geared towards sustainable investment. The CPRG program aims to mitigate climate pollution, foster job creation, and decrease energy expenditures for households. CPRG strives to advance initiatives aimed at tackling environmental disparities, champion grassroots-driven solutions, and enhance air quality by reducing harmful pollutants across residential, occupational, recreational, and educational settings.

The first deliverable of the CPRG planning grant is the PCAP. The primary objective of the PCAP is to identify near-term, high-priority, implementation-ready measures to reduce GHG emissions, which can be submitted as projects under the implementation phase of CPRG.

The American Samoa PCAP is organized into the following sections to conform to the requirements and guidelines outlined by EPA:

- GHG inventory of American Samoa's priority sectors
- Quantified GHG reduction measures
- A benefits analysis of GHG reduction measures
- A review of authority to implement GHG measures

A Comprehensive Climate Action Plan (CCAP) will be completed following the PCAP. The CCAP provides the scope for more detailed modeling, technical analysis, and community engagement, and will represent a detailed roadmap for decarbonizing American Samoa.

Eligible entities, whether they received planning grants in phase 1 or not, can apply to implement measures outlined in their Priority Climate Action Plans (PCAPs). Individual grants will range between $2 million and $500 million.

Approach to Developing the PCAP

The CPRG Leadership Team's approach to developing this PCAP includes:

- Identifying and involving important stakeholders
- Comprehending the greenhouse gas (GHG) emissions inventory
- Identifying strategies to diminish GHG emissions
- Prioritizing and choosing GHG reduction strategies
- Assessing the potential impacts of GHG reduction measures

Scope of the PCAP

American Samoa is an unincorporated territory of the United States and is the only U.S. territory located in the Southern Hemisphere. American Samoa's five volcanic islands are situated in the South Pacific Ocean (14° N and 170° W) approximately halfway between Hawaii and New Zealand. The total land area of the territory is 199 kilometers squared (km), or 76 square miles with 116 km (72 miles) of coastline, little of which is accessible to ships. Natural hazards include susceptibility to typhoons between December and March. American Samoa has a tropical marine climate that is warm and humid with little seasonal temperature variation. The typical dry season occurs between May and October, and the rainy season is between November and April.

American Samoa has a culturally diverse population. Ethnic groups include Pacific Islander (88.7%), Asian (5.8%), Caucasian (0.8%), mixed ethnicities (4.4%), and other ethnic origins (0.3%). In addition to English, languages spoken include Samoa (90.6%), Tongan (2.4%), and others.

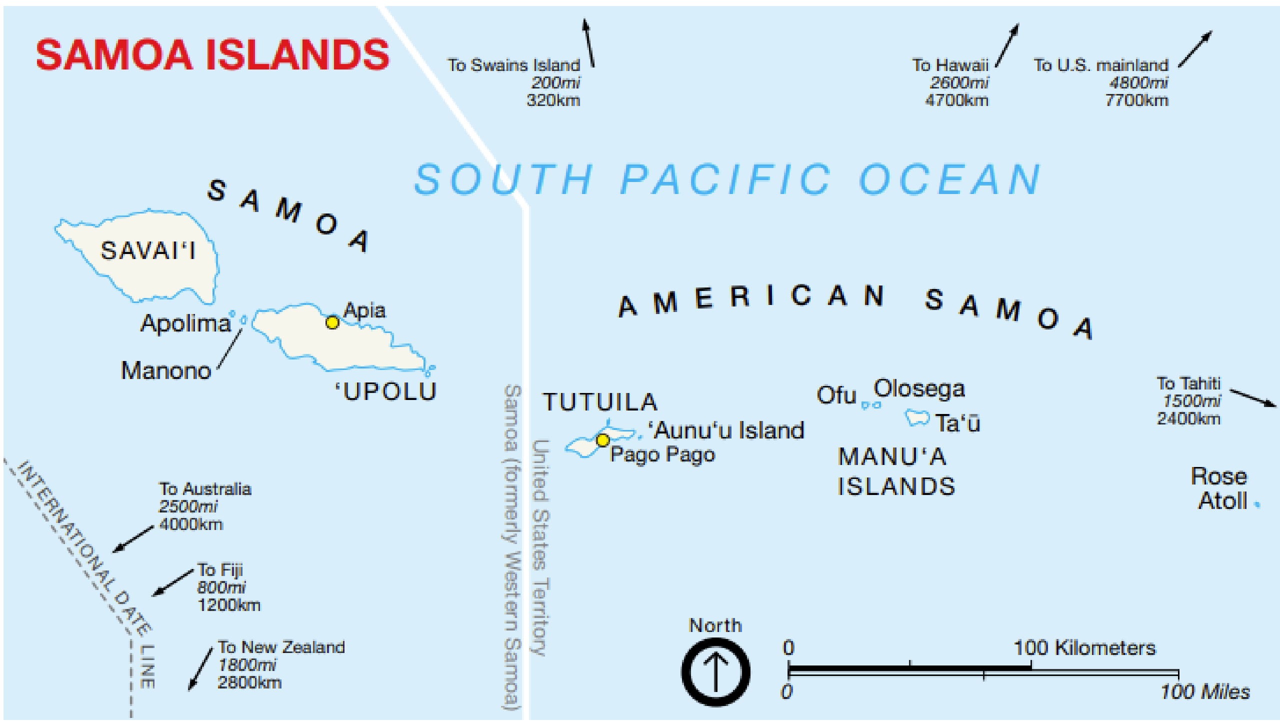


Figure 1. Map of American Samoa, Source: U.S. National Park Service [5]

This PCAP outlines GHG reduction measures slated for implementation on Tutuila, the largest island in American Samoa, comprising 69% (55 square miles) of the territory's land area and housing 97% of its population [1]. Tutuila's rugged, volcanic terrain defines its topography [5].

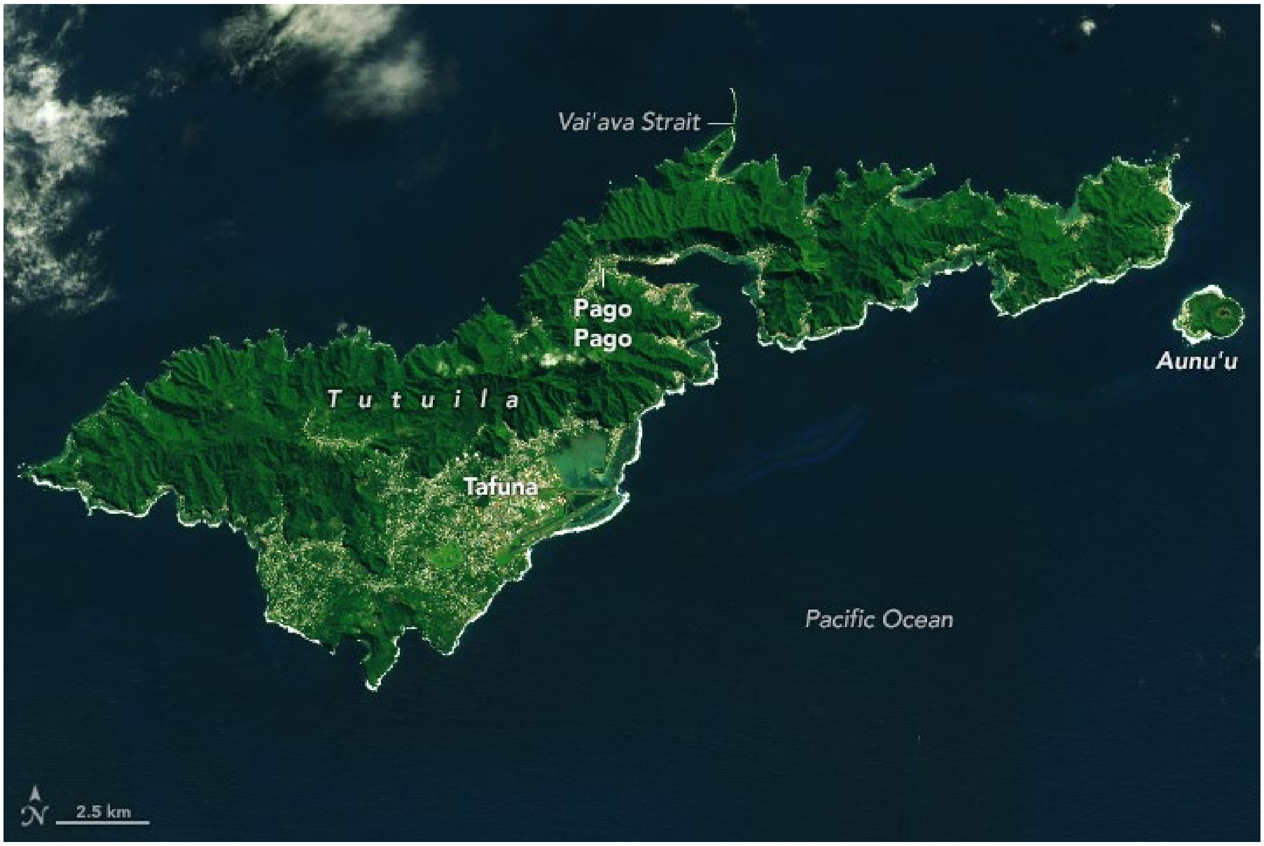


Figure 2. NASA Earth Observatory Image of Tutuila Island, American Samoa [11]

Territorial Organization and Considerations

Territorial PCAP Management and Development Team

American Samoa Environmental Protection Agency (AS-EPA)

Alice Franco, CPRG Program Manager
Alma Seu, Air Quality Branch Manager

Main Grant Recipient

American Samoa Power Authority (ASPA)

Wallon Young, Executive Director
Brian Thompson, ASPA Business & Finance Grants Division

Subgrant Recipient

American Samoa Telecommunications Authority (ASTCA)

Chuck Leota, Chief Executive Officer
Tofiga Liaiga, Grants & Compliance Division
Edna Noga, Special Projects & Grants Specialist

Collaborations

National Renewable Energy Laboratory (NREL)

Phillip Voss, Senior Project Leader
Alicen Kandt, Senior Research Engineer
Michael Young, Technical Project Manager

PCAP Coordination and Engagement

Interagency and Intergovernmental Coordination

Through a blend of in-person and virtual meetings, we engaged with various agencies such as the American Samoa Power Authority, American Samoa Telecommunications Authority, and the American Samoa Department of Port Administration to gather input on preliminary drafts of this document. These collaborative discussions facilitated the identification of the innovative measures listed within this PCAP, aimed at achieving effective and significant reductions in greenhouse gas emissions.

Public and Stakeholder Engagement

Gathering information is a crucial step in ensuring transparency and inclusivity in decision-making processes. As part of the stakeholder engagement strategy, preliminary PCAP plans were shared with the public through various channels, public websites, and social media platforms such as Facebook. Given its widespread usage and accessibility, Facebook plays a vital role in reaching a broad audience within the territory. By posting the PCAP publicly on the ASPA and ASTCA's web page and sharing it on Facebook, we invited diverse perspectives and encouraged community members to provide valuable feedback, suggestions, and concerns. Through online accessibility, stakeholders were able to easily participate, fostering collaboration in shaping this PCAP.

PCAP Elements

Greenhouse Gas (GHG) Inventory

This greenhouse gas inventory provides a narrative of methods used for the calculation of emissions within the territory. The greenhouse gas inventory details the methodologies employed to calculate emissions within the territory. It is structured according to priority sectors, namely Electricity Generation and Transportation. American Samoa's GHG Emissions Inventory was developed in partnership with the National Renewable Energy Laboratory (NREL), which offered technical support for this endeavor. The EPA's Local GHG Inventory Tool: Community Module facilitated the computation of emissions from various sectors using collected data and estimates for the selected inventory year of 2022.

Scope 1: Emissions from Electricity Generation
Scope 2: Emissions from Transportation

The specific calculation methodology for each of these sectors can be found in the GHG Emissions Inventory Calculation section of Appendix A-C.

Summary of Priority GHG Emissions Inventory

Priority sectors identified by American Samoa include Electricity Generation and Transportation, which align with American Samoa's priority actions for emissions reduction. Together, the territory's 2022 stationary and mobile combustion gross emissions consisted of 287,125 MT CO_2e (table 1). The GHG emissions estimated for these priority sectors are:

Table 1. Priority GHG Emissions

Emissions Source Category	Metric Tons of Carbon Dioxide Equivalent (MT CO_2e)	Percent of Total
Stationary Combustion (from ASPA Electricity Generation)	116,555	41%
Mobile Combustion (from road vehicles, marine transport, and aviation)	170,569	59%
Subtotal Gross Emissions of Priority Sectors for PCAP	**287,125**	

Scope 1: Emissions From Electricity Generation

Stationary Combustion

American Samoa is a remote island territory located in the South Pacific Ocean; this poses logistical challenges for accessing alternative energy sources. Currently, the territory depends on imported petroleum for nearly all its energy needs. In 2022 a total of 11,300,000 gallons of distillate fuel oil was used solely for energy generation, producing 116,555 MT CO_2e of greenhouse gas (table 2).

Table 2. Stationary Combustion and Energy Fuel Use for 2022

Stationary Combustion Emissions (MT CO_2e)				
Sector	**CO_2**	**CH_4**	**N_2O**	**Total**
Energy Generation	116,175	132	249	116,555
Fuel and Energy (MMBtu) Use				
	mcf	**gal**	**tons**	**Energy Use**
Total Stationary Combustion Energy Use	-	11,300,000	-	**1,567,202**

Stationary Combustion emissions from American Samoa Power Authority (ASPA) electricity generation can be disaggregated by customer class (i.e., consuming sector) as follows:

- Residential: **43,125 MT CO_2e**
- Commercial: **54,781 MT CO_2e**
- Industrial: **18,649 MT CO_2e**

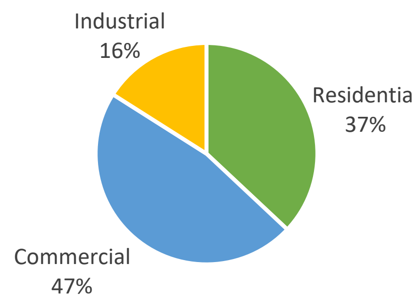


Figure 3. Energy Use by Consumer Sector

The percentages above represent ASPA-supplied electricity sales by end-use sector in 2022.

Combining the emissions estimates above with electricity sales data from ASPA, a grid average emissions factor can be derived as follows:

American Samoa Annual Average Grid Emissions Factor (2022)

- 116,555 MT CO_2e / 176,356 MWh = **0.66 MT CO_2e/MWh (1,457 lbs. CO_2e/MWh)**

For comparison and benchmarking, the American Samoa emissions factor is shown below with other comparable data points:

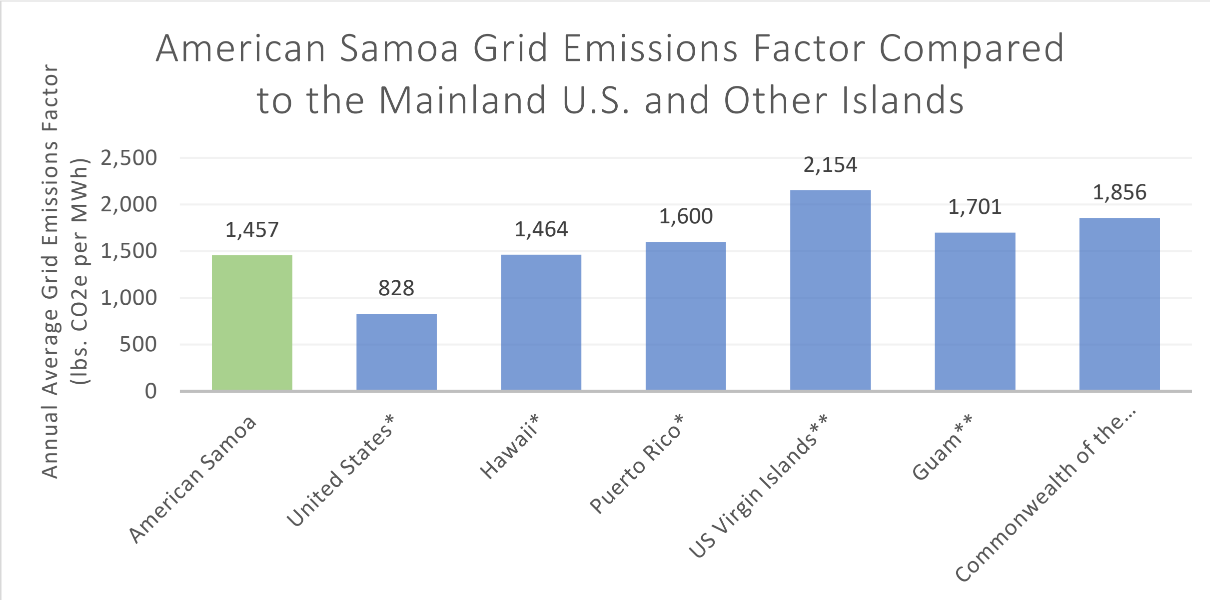


Figure 4. American Samoa Grid Emissions Factor Compared to the Mainland U.S. and Other Islands.

**Source: EPA eGRID 2022, **Preliminary estimate calculated by NREL for EPA CPRG PCAP*

Stationary Combustion emissions have been determined based on the following:

Activity Data

Fuel consumed by American Samoa Power Authority (ASPA) for power generation, averaged over FY2021 – FY2023 was calculated to be 11,300,000 gallons of Distillate Fuel Oil. This data is derived from the NREL American Samoa Energy Baseline Report.

Other notes/considerations

GHG emissions calculated from this activity data may not represent all electricity consumption in the territory. Only ASPA power generation is represented. Additional sources of emissions from electricity generation may include private/independent generators supplying electricity locally to homes, businesses, industry, hotels/resorts, etc. These other sources of electricity-based emissions data were not collected for the PCAP but should be quantified for more comprehensive GHG inventories in the future.

Scope 2: Emissions From Transportation

Mobile Combustion

Commercial transportation plays a pivotal role in GHG emissions. Its scale and potential for impactful interventions make it a key focus for these proposed emissions reduction efforts. By targeting this sector, we can achieve substantial emissions reductions while leveraging resources for innovation. Addressing GHG emissions in commercial transportation aligns with sustainability goals embraced by the territory and institutions globally.

Table 3 includes an inventory of American Samoa's net mobile emissions, gross mobile emissions, and energy use by fuel type, each offering valuable insights into the environmental impact of transportation activities. These metrics offer a comprehensive account of the environmental footprint associated with transportation and fuel choices within the territory.

Table 3. Commercial/Institutional Mobile Emissions and Fuel Use for 2022

Net Mobile Emissions (CO_2e)			
CO_2	**CH_4**	**N_2O**	**TOTAL**
168,319.41	519.73	1,730.13	**170,569**
Gross Mobile CO_2 Emissions*			
Gasoline	**Diesel**	**Jet Fuel**	**TOTAL**
55,101	98,605	14,613	**168,319**
Mobile Energy Use by Fuel Type (MMBtu)			
Gasoline	**Diesel**	**Jet Fuel**	**TOTAL**
784,470	1,333,678	206,146	**2,324,294**

***** *CO_2 Emissions (MT) = Fuel use × kg CO_2/unit of fuel × MT/kg*

Quantifying Mobile Combustion emissions from road transportation ideally requires data representing the fuel consumption and vehicle miles traveled (VMT) for each type of vehicle operating on the roads within the geographic area of a community GHG inventory. However, this level of detail is typically difficult to obtain, and assumptions are needed to fill in the blanks. In the case of this GHG inventory for American Samoa, the estimates for road transportation emissions were based on actual fuel use data. The following assumptions were then made to support the quantification of GHG emissions estimates:

- Licensed Motor Vehicle data were reviewed and assumed to be primarily aligned with the EPA vehicle category “Light Truck (vans, pickup trucks, SUVs)” (average fuel efficiency of 18.5 MPG for gasoline, and 22.1 MPG for diesel)
- Gasoline and Diesel fuel use values were entered into the EPA Community Greenhouse Gas Inventory Tool
- VMT values were estimated by multiplying each fuel consumption value by the EPA-default fuel economy (miles per gallon) for the Light Truck vehicle type.

These assumptions may result in overcounting the VMT, which would cause methane (CH_4) and nitrous oxide (N_2O) emissions estimates to be abnormally high. However, carbon dioxide (CO_2) emissions – the primary greenhouse gas – are influenced only by the volume of fuel combusted. Therefore, the overall GHG emissions for the Mobile Combustion category are most sensitive to the fuel consumption data (i.e., gallons of gasoline, gallons of diesel).

Mobile Combustion emissions have been determined based on the following:

Data sources

- Fuel consumption:
  - NREL American Samoa Energy Baseline Report
- Vehicle registration:
  - American Samoa Statistical Yearbook 2022

Other notes/considerations

> Several assumptions were made to quantify an estimate of GHG emissions from road transportation in American Samoa. More accurate estimates of emissions from road transportation could be achieved with actual vehicle mileage data (i.e., odometer readings).

GHG inventories usually cover both sources and sinks, which are processes that trap or absorb greenhouse gases (GHGs) for long periods, often thousands of years. Examples of GHG sinks may involve changes in land use, such as significant forest expansion. Additionally, human interventions like managing captured GHGs through geologic storage or redirecting them for industrial purposes can act as sinks. However, in American Samoa, neither of these activities nor any other active GHG sequestration methods are present, so there's no analysis of GHG sinks in this inventory.

GHG Reduction Measures

The following Priority GHG Reduction Measures are the focus of the American Samoa PCAP.

As indicated by the GHG inventory, power generation, and commercial/institutional transportation are significant contributors to greenhouse gas emissions in the territory, making them key areas for emission reduction efforts.

To address emissions from power generation, the focus will primarily be on transitioning from diesel generation to renewable energy sources. Due to its remote location, American Samoa must generate all its electricity locally. Currently, Tutuila Island relies entirely on diesel generators for power, leading to heavy dependence on petroleum imports and significant pollution. Fortunately, American Samoa's proximity to the equator provides abundant solar resources suitable for both photovoltaic (PV) and solar thermal applications. Additionally, the region boasts ample wind resources, offering another promising renewable energy option for electricity generation. These newly established renewable energy sources can also power vehicles. In the transportation sector, the GHG inventory revealed that diesel fuel serves as the primary contributor to mobile CO_2 emissions, given its predominant usage in transportation within the territory. American Samoa's GHG reduction efforts will focus on replacing diesel and gasoline combustion vehicles with cleaner and more efficient alternatives, including electric and hybrid vehicles. These strategies aim to mitigate emissions and promote sustainable practices in both sectors.

In the fight against climate change, American Samoa governmental agencies are stepping up to reduce their carbon footprint. This document outlines measures aimed at reducing GHGs that have been identified as crucial steps in combating environmental degradation in the territory. While all American Samoa government agencies can apply for the measures outlined in this document, the agencies identified for each measure have already expressed interest in these actions. These proactive steps pave the way for a greener, more efficient future for the territory. By embracing sustainable practices and reducing greenhouse gas emissions, governmental agencies are not only protecting the environment but also laying the groundwork for a thriving, resilient community.

American Samoa Renewable Energy Priority Action

Amidst the pressing need for sustainable solutions, renewable energy projects hold the key to transforming the territory's energy landscape. These initiatives encompass the widespread adoption of renewable sources such as solar and wind power, catalyzing a shift towards a cleaner, more resilient energy infrastructure. By harnessing the limitless potential of nature's resources, the territory gains energy independence from its current almost 100% reliance on imported petroleum.

In a bid to empower all American Samoa government agencies to take decisive action, this measure is designed for implementation with no specific GHG emission reduction targets. Agencies will be granted the flexibility to tailor their efforts according to their unique circumstances. This approach places trust in agencies to determine and specify their individual GHG reduction goals within their applications for this measure.

American Samoa Power Authority (ASPA) Priority Actions

The American Samoa Power Authority (ASPA) identified 2 priority GHG emission reduction measures within the Electricity Generation and Transportation sectors for this PCAP.

1. Electricity Generation: Build a new electrical grid control center, 12MWh BESS and 34.5KV Solar PV transmission line
2. Transportation: Replace work vehicle fleet with electric vehicles

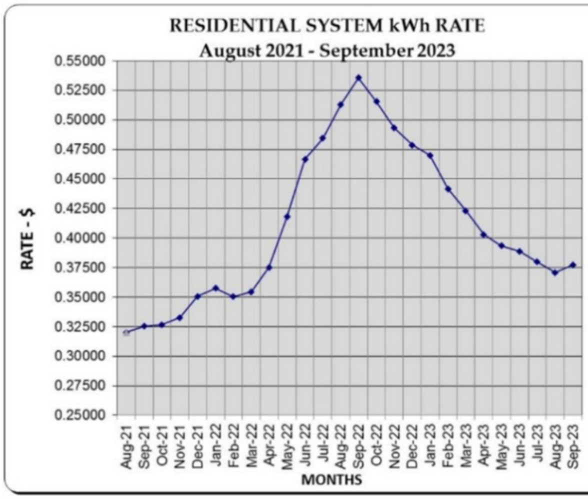
ASPA Priority Action 1: New Electrical Grid Control Center (NCC)

The unique position of American Samoa near the equator offers many natural advantages, as the territory is endowed with great potential for solar energy generation. ASPA is currently undertaking a significant transition on Tutuila, its largest and most populous island, aiming to reduce its nearly 100% reliance on fossil fuels by establishing a wind farm and solar plant.

As the only electric utility serving the territory, ASPA has been working within the community of American Samoa to establish renewable energy projects that will lower energy costs while contributing to a greener future for the territory. ASPA has Power Purchase Agreements (PPAs) in place with private renewable energy companies that allow the companies to sell renewable energy to the utility at a discount. The idea of the ASPA Solar Project bringing lower electric prices has had a positive connotation throughout the communities of American Samoa.

Due to their geographical isolation, Pacific Island nations face some of the highest global electricity costs with average electricity prices in American Samoa three times more than the U.S. average.[6] Currently, American Samoa depends on imported fossil fuels for almost all of the territory's energy needs – including transportation, drinking and wastewater treatment – and most (about 97% in 2020) of its electric power generation[6]. This leaves the territory especially vulnerable to global oil price fluctuations that directly impact the cost of electricity. This results in abnormally high energy costs which are then passed on to the residential customers, creating burdensome utility rates for consumers in an already economically disadvantaged area.

Figure 5 displays the Residential System kWh Rate for American Samoa. Over the course of the most recent full year for which data is available (2022), the average monthly System Rate in American Samoa was $0.44522 kilowatts per hour, which is greater than the established benchmark of $0.4318 kilowatts per hour.



Fuel Surcharge		Base R	System
Month	Rate $	Rate $	Rate $
Aug-21	0.22287	0.0974	0.32027
Sep-21	0.22795	0.0974	0.32535
Oct-21	0.22928	0.0974	0.32668
Nov-21	0.23538	0.0974	0.33278
Dec-21	0.25336	0.0974	0.35076
Jan-22	0.26012	0.0974	0.35752
Feb-22	0.25289	0.0974	0.35029
Mar-22	0.25700	0.0974	0.35440
Apr-22	0.27774	0.0974	0.37514
May-22	0.32049	0.0974	0.41789
Jun-22	0.36941	0.0974	0.46681
Jul-22	0.38715	0.0974	0.48455
Aug-22	0.41557	0.0974	0.51297
Sep-22	0.43822	0.0974	0.53562
Oct-22	0.41812	0.0974	0.51552
Nov-22	0.39576	0.0974	0.49316
Dec-22	0.38137	0.0974	0.47877
Jan-23	0.37254	0.0974	0.46994
Feb-23	0.34440	0.0974	0.44180
Mar-23	0.32569	0.0974	0.42309
Apr-23	0.30558	0.0974	0.40298
May-23	0.29603	0.0974	0.39343
Jun-23	0.29141	0.0974	0.38881
Jul-23	0.28235	0.0974	0.37975
Aug-23	0.27335	0.0974	0.37075
Sep-23	0.27992	0.0974	0.37732

Figure 5. Residential System kWh Rates

Energy efficiency will play a critical role in addressing energy consumption and costs across American Samoa since the costs for diesel-derived commercial and residential power generation are a drain on the American Samoan economy. The incorporation of renewable energy technologies, initially at lower levels, but increasing in overall contribution over time, is a critical part of reducing the amount of fuel imported for power generation. Further, access to cleaner electrical power creates the potential for transitioning parts of the transportation sector to electric technologies, further reducing the impacts of fossil fuel imports.

National Control Center (NCC)

Due to the increasing use of renewable energy, the growth in electricity demand, and the challenges in managing power plants on Tutuila Island, ASPA is planning to build a National Control Center (NCC). The Center will control the new 20MW Solar PV Plant, 42MW Wind Farm, Waste-to-energy gasification plant, and the two existing diesel plants located at Satala and Tafuna.

The electricity grid needs to be carefully controlled to ensure a balance between power generation and demand and to keep the network stable. The NCC will serve as a centralized hub for coordinating and managing grid operations. It will improve efficiency and ensure the reliable control of the electric grid. As a Load Dispatch Center (LDC), the NCC will be responsible for predicting electricity demand, controlling power generation, and managing the flow of electricity from various sources to meet the demand. In addition to overseeing the operations of the Wind Farm, Solar PV Plant, waste-to-energy gasification plant, and two diesel plants, the NCC will also house the remote control and monitoring systems for ASPA's Water and Wastewater plants.

Load dispatch is currently done manually by power plant operators at the two diesel plants at Tafuna and Satala. Load dispatch will be automated in the NCC due to challenges posed by highly intermittent renewable energy sources and the increased complexity of operating five (5) power plants simultaneously. The new LDC will improve the automation, necessary to enhance the reliability, stability, security, and efficiency of the power system.

12MWh BESS
While funding for the solar and wind components has been secured, the effectiveness of this transition hinges on the implementation of a battery storage system. Such a system is crucial for storing excess energy generated during peak hours and ensuring a continuous power supply during off-peak periods like cloudy days or nights. This capability is essential for addressing the intermittency of renewable energy sources and maximizing their impact on the island's energy landscape.

Construction of the 20MW Solar PV farm and 1.0MW Waste to Energy plant are in progress. The new peak load on the main island of Tutuila in 29MW and due to the high level of penetration of renewal energy, additional Battery Storage is needed to stabilize the grid. ASPA plans to install an additional 12MWh BESS due to the intermittency of Solar PV.

20MW Solar PV 34.5KV Interconnection (Transmission) Line
A new 34.5KV interconnection or transmission line is needed to connect the 20MW Solar PV Farm to six distribution feeders that serve the western half of the main island of Tutuila. ASPA plans to construct a four mile 34.5KV line for this purpose.

Description

ASPA is requesting funding for the following three projects under this measure:

- Priority Action 1.A- Construction of an electrical grid control center, National Control Center (NCC), an energy management facility to support the addition of their new 42MW wind and 20MW Solar PV solar projects.
- Priority Action 1.B- Installation of a 12MWh of battery storage (BESS) to support the 20MW Solar PV Farm.
- Priority Action 1.C- Installation of a new grid 34.5kv transmission line to transmit 20MW Solar Power to 13.2KV Distribution Feeders at the Tafuna Plant.

Table 4. ASPA Priority Action 1

ASPA Priority Action 1	
Implementing agency	American Samoa Power Authority (ASPA)
Geographic location	Tafuna, on the island of Tutuila in American Samoa
Applicable Sector	Electricity Generation
Annual *estimated* GHG and criteria air pollutant emission reductions	100,583 CO_2 tons per year

Implementation Schedule and Milestones: **Priority Action 1.A- NCC Design and Construction**

Jan 2025- Apr 2025
Feasibilty Assessment
Track progress and report back to EPA

May 2025-Sept 2025 ***System Design***
Track progress and report back to EPA

Oct. 2025 - Sept. 2026
Procurement & Construction
Track progress and report back to EPA

Oct. 2026 - Dec. 2026
Systems Commissioning
Track progress and report back to EPA]

Metrics Tracking Progress:

- Acquisition of building and permit approval; number of jobs created/redefined; project weekly reports, monthly reports, and quarterly reports.
- Interconnected to the existing grid infrastructure through inverters to convert direct current (DC) electricity generated by the panels into alternating current (AC) for distribution.

Implementation Schedule and Milestones: **Priority Action 1.B- 12MWh BESS**

Oct.2024 -Dec.2024	→	Jan. 2025 - Dec. 2025	→	Jan. 2026 - Mar. 2026	→	Apr. 2026 +
Feasibilty Assessment		***Procurement & Construction***		***Systems Commissioning***		***Operations & Optimization***
Track progress and report back to EPA		*Track progress and report back to EPA*		*Track progress and report back to EPA*		*Track progress and report back to EPA*

Metrics Tracking Progress:

- Number of battery systems acquired and installed; commissioning of the system; number of jobs created/redefined; divisional weekly reports, monthly reports, and quarterly reports.
- Measuring data of Energy storage systems integrated into the existing grid, capable of supplying power instantaneously in case of grid disturbances and sudden drop in Solar PV production.

Implementation Schedule and Milestones: **Priority Action 1.C- Grid transmission line installation**

Jan 2025- June 2025	→	Jan 2026 - Dec 2026	→	Jan 2027 - March 2027	→	March 2027 +
Feasibilty Assessment		***Procurement & Construction***		***Systems Commissioning***		***Operations & Optimization***
Track progress and report back to EPA		*Track progress and report back to EPA*		*Track progress and report back to EPA]*		*Track progress and report back to EPA*

Metrics Tracking Progress:

- Acquisition of distribution line; Installation; line commissioning; divisional weekly reports, monthly reports, and quarterly reports.
- The measure of stability of the grid by providing essential services like frequency regulation and voltage support.

ASPA Priority Action 2: Replace work vehicle fleet with electric vehicles (EVs)

Switching to cleaner electric alternatives for work fleet vehicles in the territory brings substantial benefits, particularly in reducing greenhouse gas emissions. Electric vehicles significantly cut down on carbon emissions, promoting environmental sustainability, and combating climate change. This transition also contributes to energy independence and resilience, reducing reliance on imported fossil fuels. Embracing electric mobility is a pivotal step toward achieving GHG reduction targets and securing a greener, more sustainable future for American Samoa.

ASPA's fleet includes numerous vehicles equipped with older, outdated, and fuel inefficient engines, which significantly contribute to pollution and greenhouse gas emissions. Given the remote location of the territory, acquiring newer vehicles, with advanced technology, is challenging, leading to a prevalence of older, less efficient ones. Replacing these vehicles with cleaner electric alternatives would greatly reduce current emission levels. The adoption of electric vehicles in the territory has been minimal, ASPA aims to normalize the use of electric vehicles (EVs) in the territory. Transitioning to EVs leads to savings of up to 40% compared to gasoline vehicles. Further, EVs produce no tailpipe pollutants, and the electricity supplied by the new solar and wind-powered plants will be free of air pollutants.

Electric vehicle (EV) charging stations play a crucial role in reducing the dependency on diesel generators for power generation. By facilitating the adoption of EVs, these charging stations contribute to a significant decrease in the consumption of fossil fuels for transportation purposes. One of the primary advantages of EVs is their ability to utilize electricity from renewable sources, such as solar and wind power. When EVs charge at dedicated stations powered by renewable energy, they effectively eliminate the need to draw electricity from diesel generators, thus reducing greenhouse gas emissions and air pollution associated with diesel combustion. As American Samoa embraces electric mobility and invests in EV charging infrastructure, the territory makes significant steps towards achieving cleaner, more sustainable transportation systems while simultaneously reducing reliance on environmentally harmful diesel generators.

Description

ASPA is requesting funding for the following two projects under this measure:

- Priority Action 2.A- ASPA plans to replace its fleet of gasoline and diesel heavy equipment with electrically powered vehicles.

  ASPA aims to substitute or integrate electric heavy equipment into its operations, including the following vehicles:

  - 7 EV Bucket Trucks
  - 2 EV Digger Derrik
  - 2 EV Backhoes

  Priority Action 2.B- ASPA will install 5 EV charging stations at each of the 4 ASPA locations including some for public use.

Table 5. ASPA Priority Action 2

ASPA Priority Action 2	
Implementing agency	American Samoa Power Authority (ASPA)
Geographic location	Government facilities on the island of Tutuila
Applicable Sector	Transportation
Annual estimated GHG and criteria air pollutant emission reductions	CO_2 by 427.5 tons annually

Implementation Schedule and Milestones: 2.A Fleet Vehicle Replacements

Jan 2025-Dec 2025	→	Jan 2025-Dec 2025	→	Jan 2026 - Dec 2026
Procurement		***Decommission Vehichles***		***Operations & Optimization***
Track progress and report back to EPA		*Track progress and report back to EPA*		*Track progress and report back to EPA*

Metrics Tracking Progress:

- Number of diesel vehicles disposed of; number of vehicles acquired;
- Number of jobs created/redefined; number of people trained;
- Regularly scheduled maintenance performed, monthly reports and quarterly reports.

Implementation Schedule and Milestones: 2.B Installation of EV charging infrastructure.

Jan 2025- June 2025	→	June 2025	→	June 2025 - Dec 2025
NEPA		**Procurement & Construction**		***Operations & Optimization***
Track progress and report back to EPA		Track progress and report back to EPA		*Track progress and report back to EPA*

Metrics Tracking Progress:

- Number of diesel vehicles disposed of; number of vehicles acquired;
- Number of jobs created/redefined; number of people trained;
- Regularly scheduled maintenance performed, monthly reports and quarterly reports.

American Samoa Telecommunication Authority (ASTCA) Priority Actions

Subgranting funds to continue GHG emission reduction measures is an important strategy in encouraging environmental sustainability. ASPA will be allocating a portion of its resources to the American Samoa Telecommunication Authority (ASTCA), this approach will foster collaboration among government entities and innovation in combating climate change. Through this subgrant, the territory can implement tailored renewable energy projects that will ultimately contribute to a greener and more sustainable future for American Samoa.

ASTCA has identified 3 priority GHG reduction measures within the Electricity Generation and Transportation sectors for this PCAP.

1. Electricity Generation: Telecommunications Generator Replacement
2. Transportation: Replace work vehicle fleet with more efficient vehicles
3. Transportation: Establish a van-pool

ASTCA Priority Action 1: Telecommunications Generator Replacement

Replacing old diesel generators with newer, more efficient models presents a significant opportunity for reducing GHG emissions and improving environmental sustainability. Older diesel generators often operate less efficiently, emitting higher levels of pollutants such as carbon dioxide (CO2), nitrogen oxides (NOx), and particulate matter (PM). Upgrading to newer, more efficient generators can significantly lower ASTCA's carbon footprint and contribute to cleaner air quality. Modern generators incorporate advanced technologies, such as cleaner combustion processes and emissions control systems, resulting in reduced emissions and higher energy efficiency.

Description

ASTCA is considering the replacement of nine older generators located at the central office locations. These generators currently play a crucial role in supporting the telecommunications infrastructure during power outages. However, they are aging and becoming less reliable. With the projected rise in climate-related storms, these grid failures are anticipated to become more frequent and prolonged. The territory aims to replace them with newer, more efficient generators to ensure the continuous operation of their telecommunications services, particularly during power losses. This initiative aims to mitigate the impact of greenhouse gas emissions while ensuring affordable and dependable power supply for their operational requirements.

Table 6. ASTCA Priority Action 1

ASTCA Priority Action 1	
Implementing agency	American Samoa Telecommunications Authority (ASTCA)
Geographic location	*Central offices*
Applicable Sector	Electricity Generation
Annual estimated GHG and criteria air pollutant emission reductions	CO_2 by 2.6 tons annually

Implementation Schedule and Milestones:

Oct2024
Project Apprival

→

Nov2024
Work with AS/US EPA to ensure compliance

→

Jan2025
Work with vendors to procure and finalize fleet

→

Feb2025-Sep2025
Begin procurement process (including replacement process)

Metrics Tracking Progress:

- Number of generators acquired; number of generators installed;
- Number of jobs created/redefined; number of people trained;
- Amount of regularly scheduled maintenance performed; monthly reports, and quarterly reports.

ASTCA Priority Action 2: Replace Work Fleet Vehicles with Newer Cleaner Diesel, Hybrid, and/or Electric Vehicles

ASTCA's work fleet comprises many vehicles with older, outdated, and inefficient engines, contributing significantly to pollution and greenhouse gas emissions. Upgrading work fleet vehicles from older, outdated models to cleaner electric, hybrid, or newer low-emission alternatives presents a significant opportunity for reducing greenhouse gas (GHG) emissions. By adopting lower/zero-emission vehicles and electric vehicles (EVs), ASTCA can combat climate change, enhance air quality, and align with sustainability goals while reducing its fleet's carbon footprint. Further, investing in cleaner transportation options not only reduces GHG emissions directly but also sets a positive example for other businesses and individuals, fostering broader adoption of environmentally friendly practices. Ultimately, replacing older fleet vehicles with cleaner alternatives is a crucial step toward achieving GHG reduction goals and increasing territory sustainability.

Electric vehicle (EV) charging stations are pivotal in diminishing reliance on diesel generators for power production. By promoting the adoption of EVs, these stations significantly curb the use of fossil fuels for transportation needs. Installing dedicated EV stations powered by renewable energy, effectively eliminates the need to draw electricity from diesel generators, thus reducing greenhouse gas emissions and air pollution associated with diesel combustion.

Description

ASTCA is requesting funding for the following two projects under this measure:

- Priority Action 2.A- ASTCA plans to replace 15 of their older, less efficient vehicles with newer, more efficient options.
- Priority Action 2.B- ASTCA will add electrical charging infrastructure at their public buildings to support the adoption of electrical vehicles.

Table 7. ASTCA Priority Action 2

ASTCA Priority Action 2	
Implementing agency	American Samoa Telecommunications Authority (ASTCA) and American Samoa Power Authority (ASPA)
Geographic location	Tafuna, on Tutuila Island in American Samoa
Applicable Sector	Transportation
Annual estimated GHG and criteria air pollutant emission reductions	Diesel vehicle replacement -CO_2 by 61.9 tons annually Gasoline vehicle replacement - CO_2e by 7.59 tons annually

Implementation Schedule and Milestones: 2.A New fleet vehicles

Oct2024
Project Apprival

→

Nov2024
Work with AS/US EPA to ensure compliance

→

Jan2025
Work with vendors to procure and finalize fleet

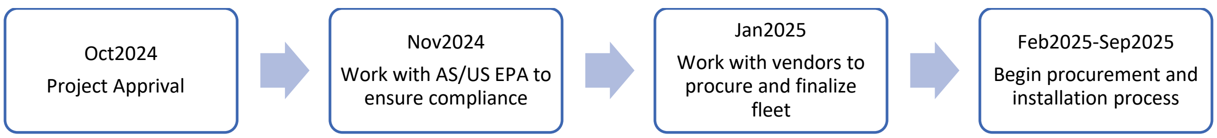
→

Feb2025-Sep2025
Begin procurement process (including replacement process)

Metrics Tracking Progress:

- Number of vehicles disposed of; number of vehicles acquired;
- Number of jobs created/redefined; number of people trained;
- Amount of regularly scheduled maintenance performed, monthly reports and quarterly reports.

Implementation Schedule and Milestones: 2.B Installation of EV charging infrastructure.



Metrics Tracking Progress:

- Number of charging stations acquired; number of charging stations installed;
- Number of jobs created/redefined; number of people trained;
- Amount of regularly scheduled maintenance performed, monthly reports and quarterly reports.

Priority Action 3: Establish a Vanpool Program

Initiating a vanpool system is a pivotal strategy in reducing greenhouse gas (GHG) emissions and fostering sustainability for American Samoa. In the territory, residents often rely on older, less efficient vehicles due to limited access to newer models and the challenges of importing vehicles to remote locations. These older cars tend to have higher emissions and lower fuel efficiency, exacerbating environmental concerns in these already vulnerable ecosystems. Introducing a van pool system offers a sustainable solution to mitigate these issues. By consolidating transportation needs and promoting carpooling, a van pool can reduce the number of individual vehicles on the road, leading to significant reductions in greenhouse gas emissions and air pollution. Additionally, the van pool system provides a cost-effective and convenient alternative for island residents, addressing transportation challenges while contributing to a cleaner and more sustainable environment.

Description

ASTCA's aims to establish a vanpool for their employees. With the purchase of three minibuses, each serving the main regions of Tutuila, the largest and most populous island, ASTCA is expanding environmentally friendly transportation options.

Table 8. ASTCA Priority Action 3

ASTCA Priority Action 3	
Implementing agency	American Samoa Telecommunications Authority (ASTCA)
Geographic location	Tutuila island, American Samoa
Applicable Sector	Transportation
Annual estimated GHG and criteria air pollutant emission reductions	57.033 CO_2e MT, 0.35 metric tons of carbon monoxide, 0.56 metric ton of $PM_{2.5}$

Implementation Schedule and Milestones:

Oct2024
Project Apprival

→

Nov2024
Work with AS/US EPA to ensure compliance

→

Jan2025
Work with vendors to procure and finalize fleet

→

Feb2025-Sep2025
Begin procurement process

Metrics Tracking Progress:

- Number of vans acquired; number of vehicle miles traveled; number of rides given;
- Number of drivers hired; number of drivers trained.

Benefits Analysis

In our pursuit of combatting climate change, it's crucial to acknowledge the interconnected impact of greenhouse gas (GHG) emissions and co-pollutants like particulate matter (PM) and nitrogen oxides (NOx). This benefits analysis aims to assess the multifaceted benefits derived from reducing both GHGs and co-pollutants. By evaluating improvements in air quality, public health, and economic savings, we aim to provide a comprehensive understanding of the societal value of integrated mitigation efforts. This analysis underscores the importance of considering co-pollutants alongside GHGs in crafting effective and sustainable strategies for a healthier, more resilient future for the territory.

American Samoa Co-Pollutant Emissions Inventory

The entire territory of American Samoa is considered a Low-Income & Disadvantaged Community (LIDAC) by EPA. Much of the land area of the American Samoa Islands (approximately 75%) is uninhabitable due to extremely steep terrain with heavy vegetation growth. All population, and all industrial and commercial areas, are located along the coastal fringe and the small Tafuna-Leone plain. Population density and the density of structures are extremely high in all territorial areas. Crowding leads to poor air quality in most areas. Air quality is affected by vehicles, utility engine generators, and engine generators used to support businesses due to the lack of reliability of the power grid.

Diesel engines have long been integral to powering everything from trucks and buses to generators in American Samoa. These engines play a central role in the territory's essential transportation and commercial activities, yet their emissions pose significant challenges to public health and environmental sustainability. Within these emissions lie a complex mixture of hazardous air pollutants (HAPs), including volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), acetaldehyde, and 1,3-butadiene, known for their adverse health effects and environmental impacts such as contributing to the formation of ground-level ozone and smog. The combustion of diesel fuel releases a cocktail of criteria air pollutants (CAPs), including nitrogen oxides (NOx), sulfur dioxide (SO2), nitrogen dioxide (NO2), and carbon monoxide (CO). These emissions pose significant health risks, contributing to respiratory ailments, cardiovascular diseases, and even premature death. Further, diesel emissions are a major source of fine particulate matter (PM) pollution, which can penetrate deep into the lungs and enter the bloodstream, exacerbating health issues and impairing air quality.

*Table 9. American Samoa Co-Pollutants**

Pollutant	**Tons/year emissions (uncontrolled)**
Nitrogen Oxides (NO_x)	1,251.8
Carbon Monoxide (CO)	4.7
Sulfur Dioxide (SO_2)	2.2
Particulate Matter (PM)	17.1
Volatile Organic Compounds (VOC/TOC)	0.6

**The analysis encompasses estimations of co-pollutants from 2022*

The specific calculation methodology for co-pollutants can be found in the Co-Pollutant Calculation section of Appendix D.

Prevalent co-pollutants in American Samoa include volatile organic compounds (VOCs), carbon monoxide (CO), particulate matter (PM10 and PM2.5), nitrogen oxides (NOx), and sulfur dioxide (SO2) (table 11). These substances accompany greenhouse gas emissions when fossil fuels are burned, or industrial processes occur. Co-pollutants pose risks to air quality, public health, and the environment, further highlighting the need for the mitigation efforts proposed in this PCAP.

Our proposal seeks to address this pressing issue through a comprehensive strategy aimed at reducing CAP and HAP emissions from diesel engines by replacing them with more efficient technologies and renewable sources of energy. This proposal represents a targeted approach to addressing diesel emissions, with the ultimate goal of fostering healthier communities and a more sustainable environment. Through strategic investments and collaborative efforts, these reduction measures will make significant strides toward mitigating the adverse impacts of diesel pollution and promoting a cleaner, healthier future for those in the territory.

ASPA Priority Action Benefits Analysis

ASPA Priority Action 1: New Wind and Solar National Control Center (NCC)

Direct benefits:

- Improved Grid Management: A control center enables real-time monitoring and control of the electrical grid, allowing operators to optimize grid performance, balance supply and demand, and maintain system stability.
- Enhanced Reliability: With advanced monitoring and predictive analytics capabilities, a control center can detect and mitigate potential grid disturbances or equipment failures proactively, minimizing downtime and enhancing grid reliability.
- Increased Efficiency: By optimizing grid operations, reducing transmission losses, and facilitating demand response programs, a control center improves overall energy efficiency and reduces energy waste.
- Grid Security: Enhances grid security by detecting and responding to cybersecurity threats, or natural disasters, ensuring the integrity and resilience of the electrical grid.
- Enhanced Integration of Renewable Energy: Facilitates the integration of renewable energy sources such as solar and wind power, optimizing their utilization while maintaining grid stability.

Indirect benefits:

- Economic Growth: Provides a stable and affordable energy supply and supporting business operations and industrial development.
- Job Creation: Creates job opportunities in areas such as grid management, data analytics, and software development, contributing to employment growth and skills development.
- Environmental Sustainability: The integration of renewable energy sources and facilitation of energy efficiency measures supports environmental sustainability goals by reducing greenhouse gas emissions and mitigating climate change.
- Grid Modernization: Fosters technological innovation through the adoption of smart grid technologies, which enhances grid resilience and prepares it for future challenges.
- Resilience and Disaster Preparedness: Enables rapid response and recovery efforts in the event of grid disruptions, natural disasters, or emergencies, ensuring continuity of essential services and protecting public safety.

ASPA Priority Action 2: Replace work vehicle fleet with electric vehicles (EVs)

Direct benefits:

- Cost Savings: Lower fuel and maintenance expenses.
- Fuel Savings: EVs will be largely powered by renewable electricity, this is less expensive than gasoline or diesel fuel.
- Environmental Impact: Reduces air pollution and greenhouse gas emissions, thus contributing to improved air quality, and mitigating climate change.
- Energy Efficiency: EVs are more energy-efficient than traditional vehicles, converting a higher percentage of energy from the grid into motion, resulting in lower energy consumption per mile traveled.

Indirect benefits:

- Climate-Friendly Promotion: Encourage EV use by demonstrating their viability.
- Increased EV Adoption: Installing charging stations can encourage greater adoption of EVs by alleviating concerns about charging infrastructure availability.
- Energy Security: Reducing dependence on fossil fuels for transportation, adoption of EVs enhances energy security by reducing reliance on imported oil.
- Technological Innovation: Adoption of EVs encourages innovation in battery technology.
- Economic Growth: Investing in EV manufacturing and charging infrastructure can stimulate economic growth, create jobs in manufacturing, installation, maintenance, and operation of charging infrastructure. It also fosters innovation in the clean energy sector, contributing to long-term economic prosperity.
- Public Health: Reducing air pollution and greenhouse gas emissions associated with transportation, the adoption of electric vehicles facilitated by charging infrastructure installation improves public health outcomes and reduces healthcare costs.

ASTCA Priority Action Benefits Analysis

ASTCA Priority Action 1: Telecommunications Generator Replacement

Direct benefits:

- Increased Reliability: Modern generators are designed to be more reliable and durable than older models, reducing the risk of breakdowns and downtime. This results in improved productivity and operational continuity for businesses and organizations.
- Improved Energy Efficiency: Newer generator models typically incorporate advanced technology and design features that enhance energy efficiency, leading to reduced fuel consumption and lower operating costs.
- Lower Maintenance Costs: Newer generators require less frequent maintenance and repairs compared to older, inefficient models.
- Reduced Emissions: Newer generator models often feature cleaner combustion technologies and emissions control systems, resulting in lower emissions of pollutants such as nitrogen oxides (NO_x), particulate matter (PM), and carbon monoxide (CO), thus contributing to improved air quality and environmental sustainability.

Indirect benefits:

- Enhanced Safety Features: Newer generator models incorporate advanced safety features such as automatic shutdown systems, overload protection, and fault diagnostics, improving overall safety for operators and maintenance personnel.

- Improved Resilience: Upgrading to newer generator models enhances the resilience of critical infrastructure and facilities, ensuring reliable power supply during emergencies, blackouts, or natural disasters.
- Public Health: Reducing air pollution and greenhouse gas emissions associated with diesel emissions improves public health outcomes and reduces healthcare costs.

ASTCA Priority Action 2: Replace Territory Owned Fleet Vehicles with Newer Cleaner Diesel, Hybrid, and/or Electric Vehicles

Direct benefits:

- Fuel Efficiency: Hybrid vehicles combine a traditional internal combustion engine with an electric motor and battery, resulting in improved fuel efficiency compared to conventional vehicles. This leads to direct cost savings on fuel expenses for fleet operators.
- Emissions Reduction: Hybrid vehicles and EVs produce fewer emissions than traditional vehicles, resulting in reduced air pollution and greenhouse gas emissions. This contributes to improved air quality and environmental sustainability.
- Maintenance Cost Reduction: Hybrid and EVs often require less frequent maintenance compared to conventional vehicles.

Indirect benefits:

- Workforce development: Provide more diverse skillset/training for fleet vehicle mechanics and maintenance staff.
- Health Benefits: Reduction of tailpipe emissions from hybrid and EVs leads to improved air quality.
- Energy Security: Reducing dependence on fossil fuels and improving fuel efficiency, the widespread adoption of hybrid vehicles enhances energy security and reduces reliance on imported oil, contributing to a more sustainable and resilient transportation sector.

Priority Action 3: Establish a Vanpool Program

Direct benefits:

- Cost Savings: Participants share transportation costs, resulting in significant savings compared to individual commuting expenses. These savings can include fuel, maintenance, insurance, and parking fees.
- Reduced Wear and Tear: Sharing the commute distributes the wear and tear on vehicles, potentially extending their lifespan and reducing maintenance costs.
- Environmental Impact: Consolidating trips and reducing the number of single-occupancy vehicles on the road contributes to lower fuel consumption and emissions, thus reducing environmental pollution and mitigating climate change.

Indirect benefits:

- Traffic Congestion Mitigation: Reducing the number of vehicles on the road helps alleviate traffic congestion, benefiting not only participants but also the broader community by improving overall traffic flow.
- Public Health: Reducing air pollution and greenhouse gas emissions associated with transportation improves public health outcomes and reduces healthcare costs.

Qualitative Benefits

This section further explains direct and indirect benefits from the GHG reduction measures proposed in this PCAP.

Air Quality and Public Health Improvements

Major improvements to air quality and public health can be realized in the territory by cutting emissions from electrical generation and transportation. Diesel Power generators and Diesel trucks and cars are routinely identified as main contributors to fine particulate NOx, black carbon, and VOC emissions. Diesel particulate is a main toxic risk in American Samoa with associated respiratory diseases such as chronic obstructive pulmonary disease (COPD), asthma, and lung cancer are linked to breathing in diesel exhaust[7]. Diesel exhaust also causes airway inflammation, allergies, and increases the risk of chronic bronchitis[8]. The particles and gases in diesel exhaust enter the circulatory system where the bloodstream sends the molecules throughout the body causing systemic health effects such as cardiovascular diseases, stroke, thrombosis, accelerated aging, and cancer[7].

Energy Cost Savings

Renewable and clean energy is cheaper than it has ever been and the construction of solar at community or utility scale makes it even more affordable. American Samoans face high electricity prices and frequent blackouts due to struggles to maintain the grid with aging generators and more frequent and stronger storms. The priority actions in this plan are designed to address both the reliability and the cost of energy.

Increased Climate Resilience

In American Samoa, climate mitigation and adaptation go hand in hand. Improving the reliability of energy, especially after disasters is a key priority. American Samoa has unreliable electric power, particularly after storms which are increasing in frequency and intensity due to climate change. The emission reduction efforts outlined in this proposal will increase the territory's resiliency with the support to anticipate, prepare for, adapt to, or recover from the effects of climate change through principles of smart, safe, and sustainable growth.

Jobs and Workforce Development

Increasing the number of training opportunities, jobs, and small business growth opportunities is a key goal of the PCAP. A selection of these jobs include:

- Driving and maintaining electric vehicles, vans, heavy-duty trucks, and EV charging stations.
- Planning, constructing, and operating increased electricity transmission and battery storage systems.
- Designing, planning, constructing, installing, and maintaining solar and wind farms.

Review of Authority to Implement

The recipients of the funding for the GHG reduction measures outlined in this PCAP are American Samoa government agencies. ASPA is a government-owned utility company in American Samoa that provides electricity to the residents and businesses in the territory. ASPA manages power generation, distribution, and maintenance of the electrical grid. Subgrant funding will be allocated to ASTCA, the government's telecommunications company who manages phone, internet, and other communication services within territory.

The American Samoa Power Authority (ASPA) Authority to Implement

American Samoa Power Authority, as a development-oriented public utility, possesses the power and authority to undertake GHG reduction-related actions due to its mandated role in serving the residents of American Samoa with essential services such as electricity, water, wastewater, and solid waste management. Operating under the legal framework established by the American Samoa Government, ASPA is driven by community service ideals and operates as a viable business entity. This legal mandate empowers ASPA to install, operate, and maintain the territory's utility infrastructure, which is essential for addressing climate-related challenges. Additionally, ASPA's governance structure, including its five-member board nominated by the Governor and confirmed by the Legislature, provides oversight and accountability, ensuring that climate-related actions align with the territory's priorities and needs. By striving to deliver high-quality services at affordable rates, ASPA contributes to the overall resilience and sustainability of American Samoa, making it well-positioned to undertake climate-related actions in collaboration with other stakeholders and government agencies.

American Samoa Telecommunications Authority (ASTCA) Authority to Implement

The American Samoa Telecommunications Authority possesses the power and authority to undertake GHG reduction actions due to its mandate established by the government of American Samoa. ASTCA's authority is rooted in legislation, regulations, and executive orders enacted by the American Samoa government, as outlined in the American Samoa Code Annotated (ASCA). This legal framework defines ASTCA's responsibilities, powers, and obligations in providing telecommunication services to the territory, including facilitating climate-related initiatives. Additionally, ASTCA's mission and goals focus on improving and maintaining telecommunication services, promoting economic development, and ensuring reliable communication, all of which are crucial for addressing climate challenges and enhancing resilience. ASTCA is also mandated to provide essential telecommunication services to the public, ensuring accessibility, affordability, and quality of service, which are essential components of any climate action plan. Further, ASTCA collaborates with various stakeholders, including government agencies and international partners, to achieve its goals, including those related to climate adaptation and mitigation. Under the oversight of the American Samoa government, ASTCA is held accountable through regular reporting, audits, and compliance assessments, ensuring that its activities align with its mandate, including climate-related initiatives.

Conclusion and Next Steps

American Samoa's Priority Climate Action Plan outlines urgently needed climate investments across the economy to benefit our most vulnerable communities. By pinpointing near-term climate implementation priorities and giving these the option to compete for federal implementation funding, this plan puts the Territory on a stronger footing to achieve a science-based carbon neutrality target and will help the U.S. meet its commitments under the Paris Agreement. It will also help meet the nation's Justice40 initiative goals by providing a range of benefits to American Samoa's low-income and disadvantaged communities that have historically had to shoulder the negative impacts of fossil fuel-powered transportation and industry. Importantly, American Samoa's statutory, regulatory, and policy framework supports a broad authority to take decisive and quick action to utilize federal funding received by the Territory.

American Samoa's next deliverable under the CPRG Program, the Comprehensive Climate Action Plan will build off the processes and ideas that underpin the PCAP, expanding on its stakeholder engagement and the scope of climate actions included. This holistic approach will be the Territory's next step under CPRG to address the global climate crisis.

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Appendix A: GHG Emissions Inventory Calculations

This GHG inventory was calculated by National Renewable Energy Laboratory (NREL). Greenhouse gas (GHG) emissions estimates were calculated for American Samoa in the Local GHG Inventory Tool: Community Module ("CPRG PCAP GHG Inventory – American Samoa.xlsx").

Inventory Emissions Summary

Total American Samoa Emissions (MT CO2e)								
	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	Total MT CO_2e	Percent of Total
Scope 1	284,493.94	651.37	1,979.32	-	-	-	287,124.62	100%
Scope 2 - Location Based	-	-	-	-	-	-	-	0%
Scope 2 - Market Based (for informational purposes only)	-	-	-				-	
Scope 3	-	-	-	-	-	-	-	0%
Total Gross Emissions	**284,493.94**	**651.37**	**1,979.32**	**-**	**-**	**-**	**287,124.62**	**100%**
Total Net Emissions	**284,493.94**	**651.37**	**1,979.32**	**-**	**-**	**-**	**287,124.62**	**100%**

Emissions by Source (MT CO_2e)								
Source	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	Total	Total
Stationary Combustion	116,174.53	131.65	249.19	-	-	-	116,555.36	41%
Mobile Combustion	168,319.41	519.73	1,730.13	-	-	-	170,569.27	59%
Solid Waste	-	-	-	-	-	-	-	0%
Wastewater Treatment	-	-	-	-	-	-	-	0%
Electricity - Location Based	-	-	-	-	-	-	-	0%
Electricity - Market Based (for informational purposes only)	-	-	-				-	
Water	-	-	-	-	-	-	-	0%
Ag & Land Management	-	-	-				-	0%
Urban Forestry	-	-	-				-	0%
Waste Generation	-	-	-				-	0%
Total (Gross Emissions)	**284,493.94**	**651.37**	**1,979.32**	**-**	**-**	**-**	**287,124.62**	**100%**
Total (Net Emissions)	**284,493.94**	**651.37**	**1,979.32**	**-**	**-**	**-**	**287,124.62**	**100%**

Local GHG Inventory Tool: Community Module

Appendix B: Stationary Combustion Calculations

Stationary combustion GHG emission were calculated by National Renewable Energy Laboratory (NREL). GHG emissions estimates were calculated for American Samoa in the Local GHG Inventory Tool: Community Module ("CPRG PCAP GHG Inventory – American Samoa.xlsx").

Sector Summary

Emissions by Sector (MT CO_2e)				
Sector	CO_2	CH_4	N_2O	Total
Residential	-	-	-	-
Commercial/Institutional	-	-	-	-
Industrial	-	-	-	-
Energy Generation	116,175	132	249	116,555
Total Stationary Combustion Emissions	**116,175**	**132**	**249**	**####**

Fuel and Energy (MMBtu) Use by Sector				
Sector	mcf	gal	tons	Energy Use
Residential	-	-	-	-
Commercial/Institutional	-	-	-	-
Industrial	-	-	-	-
Energy Generation	-	11,300,000	-	1,567,202
Total Stationary Combustion Energy Use	-	11,300,000	-	**1,567,202**

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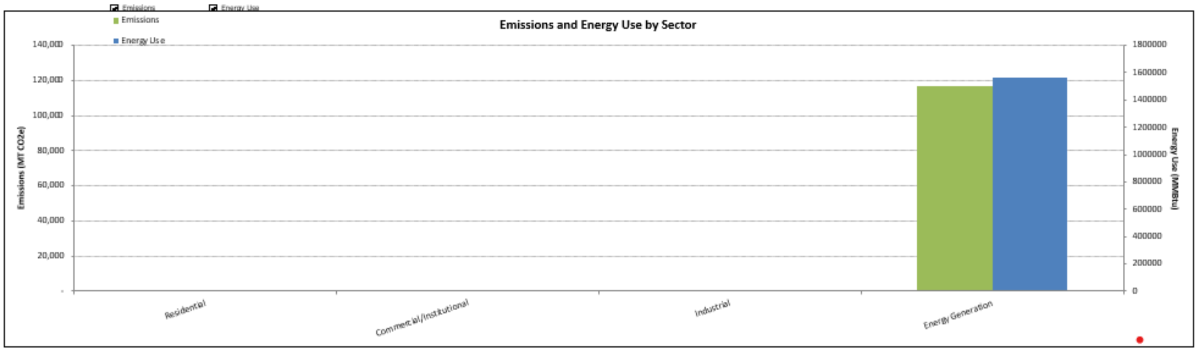


Fuel Summary

Emissions by Fuel Type				
Fuel Type	CO_2	CH_4	N_2O	TOTAL
Natural Gas	-	-	-	-
Diesel	-	-	-	-
Gasoline	-	-	-	-
LPG	-	-	-	-
Propane	-	-	-	-
Butane	-	-	-	-
Residual Fuel Oil No. 5	-	-	-	-
Residual Fuel Oil No. 6	-	-	-	-
Jet Fuel	-	-	-	-
Residential Coal	-	-	-	-
Commercial Coal	-	-	-	-
Industrial Coal	-	-	-	-
Electric Power Coal	-	-	-	-
Digester Gas	-	-	-	-
Distillate Fuel Oil	116,175	132	249	116,555
Kerosene	-	-	-	-
Stationary Fuel Combustion	**116,175**	**132**	**249**	**####**

Fuel and Energy Use by Type			
Fuel Type	Consumed		Use (MMBtu
Natural Gas	0	mcf	-
Diesel	0	gal	-
Gasoline	0	gal	-
LPG	0	gal	-
Propane	0	gal	-
Butane	0	gal	-
Residual Fuel Oil No. 5	0	gal	-
Residual Fuel Oil No. 6	0	gal	-
Jet Fuel	0	gal	-
Residential Coal	0	tons	-
Commercial Coal	0	tons	-
Industrial Coal	0	tons	-
Electric Power Coal	0	tons	-
Digester Gas	0	tons	-
Distillate Fuel Oil	11,300,000	gal	######
Kerosene	0	gal	-
Total Stationary Fuel Consumed			**#####**

Background Calculations

CO_2 Emissions by Fuel Type

CO_2 Emissions = Fuel use × CO_2 Emission Factor (kg CO_2/unit of fuel) × MT/kg

	Fuel Use	Unit	kg CO_2/unit	MT/kg	MT CO_2	× GWP =	MT CO_2e
Natural Gas	0	mcf	54.86	0.001	0.00	1	-
Diesel	0	gal	10.21	0.001	0.00	1	-
Gasoline	0	gal	8.50	0.001	0.00	1	-
LPG	0	gal	6.02	0.001	0.00	1	-
Propane	0	gal	5.72	0.001	0.00	1	-
Butane	0	gal	6.67	0.001	0.00	1	-
Residual Fuel Oil No. 5	0	gal	10.21	0.001	0.00	1	-
Residual Fuel Oil No. 6	0	gal	11.27	0.001	0.00	1	-
Jet Fuel	0	gal	9.75	0.001	0.00	1	-
Residential Coal	0	tons	2390.90	0.001	0.00	1	-
Commercial Coal	0	tons	2051.40	0.001	0.00	1	-
Industrial Coal	0	tons	2138.58	0.001	0.00	1	-
Electric Power Coal	0	tons	1890.52	0.001	0.00	1	-
Digester Gas	0	mcf	34.11	0.001	0.00	1	-
Distillate Fuel Oil	11300000	gal	10.28	0.001	116174.53	1	116,174.53
Kerosene	0	gal	10.15	0.001	0.00	1	-

CH_4 Emissions by Fuel Type

CH_4 Emissions = Fuel use × CH_4 Emission Factor (kg CH_4/unit of fuel) × MT/kg; CO_2 equivalent emissions = MT CH_4 × Global Warming Potential of CH_4

	Fuel Use	Unit	kg CH_4/unit	MT/kg	MT CH_4	× GWP =	MT CO_2e
Natural Gas	0	mcf	0.00487	0.001	0.00E+00	28	-
Diesel	0	gal	0.00041	0.001	0.00E+00	28	-
Gasoline	0	gal	0.00036	0.001	0.00E+00	28	-
LPG	0	gal	0.00028	0.001	0.00E+00	28	-
Propane	0	gal	0.00027	0.001	0.00E+00	28	-
Butane	0	gal	0.00031	0.001	0.00E+00	28	-
Residual Fuel Oil No. 5	0	gal	0.00042	0.001	0.00E+00	28	-
Residual Fuel Oil No. 6	0	gal	0.00045	0.001	0.00E+00	28	-
Jet Fuel	0	gal	0.00041	0.001	0.00E+00	28	-
Residential Coal	0	tons	0.27423	0.001	0.00E+00	28	-
Commercial Coal	0	tons	0.23529	0.001	0.00E+00	28	-
Industrial Coal	0	tons	0.24585	0.001	0.00E+00	28	-
Electric Power Coal	0	tons	0.21703	0.001	0.00E+00	28	-
Digester Gas	0	mcf	0.00210	0.001	0.00E+00	28	-
Distillate Fuel Oil	11300000	gal	0.00042	0.001	4.70E+00	28	131.65
Kerosene	0	gal	0.00041	0.001	0.00E+00	28	-

N_2O Emissions by Fuel Type

N_2O Emissions = Fuel use × N_2O Emission Factor (kg N_2O/unit of fuel) × MT/kg; CO_2 equivalent emissions = MT N_2O × Global Warming Potential of N_2O

	Fuel Use	Unit	kg N_2O/unit	MT/kg	MT N_2O	× GWP =	MT CO_2e
Natural Gas	0	mcf	0.00010	0.001	0.0000	265	-
Diesel	0	gal	0.00008	0.001	0	265	-
Gasoline	0	gal	0.00007	0.001	0	265	-
LPG	0	gal	0.00006	0.001	0	265	-
Propane	0	gal	0.00005	0.001	0	265	-
Butane	0	gal	0.00006	0.001	0	265	-
Residual Fuel Oil No. 5	0	gal	0.00008	0.001	0	265	-
Residual Fuel Oil No. 6	0	gal	0.00009	0.001	0	265	-
Jet Fuel	0	gal	0.00008	0.001	0	265	-
Residential Coal	0	tons	0.03989	0.001	0	265	-
Commercial Coal	0	tons	0.03422	0.001	0	265	-
Industrial Coal	0	tons	0.03576	0.001	0	265	-
Electric Power Coal	0	tons	0.03157	0.001	0	265	-
Digester Gas	0	mcf	0.00041	0.001	0	265	-
Distillate Fuel Oil	11300000	gal	0.00008	0.001	0.9403214	265	249.19
Kerosene	0	gal	0.00008	0.001	0	265	-

Activity Data by Sector and Fuel Type

Fuel use data by sector and fuel type. Units: Natural Gas and Digester Gas (mcf), Bituminous Coal (short tons), all other (gallons)

	Natural Gas	Diesel	Gasoline	LPG	Propane	Butane	Residual Fuel Oil No. 5	Residual Fuel Oil No. 6	Jet Fuel	Residential Coal	Commercial Coal	Industrial Coal	Electric Power Coal	Digester Gas	Distillate Fuel Oil	Kerosene	Gas Products (mcf)	Petroleum Products (gal)	Coal (tons)
Residential	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Commercial/Institutional	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Industrial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11,300,000	-	-	11,300,000	-
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11,300,000	-	-	11,300,000	-

Emissions by Sector and Fuel Type

CO_2 *Emissions = Units of Fuel Consumed × kg CO2 / unit × MT/kg*

CO_2	Natural Gas	Diesel	Gasoline	LPG	Propane	Butane	Residual Fuel Oil No. 5	Residual Fu	Jet Fuel	Residential (	Commercial Coal	Industrial Coal	Electric Power Coa	Digester Gas	Distillate Fuel Oil	Kerosene	TOTAL
Residential	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Commercial/Institutional	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Industrial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	116,175	-	116,175
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	116,175	-	**116,175**

CH_4 *Emissions = Units of Fuel Consumed × kg* CH_4 */ unit × MT/kg × GWP* CH_4

CH_4	Natural Gas	Diesel	Gasoline	LPG	Propane	Butane	Residual Fuel Oil No. 5	Residual Fu	Jet Fuel	Residential (	Commercial Coal	Industrial Coal	Electric Power Coa	Digester Gas	Distillate Fuel Oil	Kerosene	TOTAL
Residential	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Commercial/Institutional	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Industrial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	131.65	-	131.65
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	131.65	-	**131.65**

N_2O *Emissions = Units of Fuel Consumed × kg* N_2O */ unit × MT/kg × GWP* N_2O

N_2O	Natural Gas	Diesel	Gasoline	LPG	Propane	Butane	Residual Fuel Oil No. 5	Residual Fu	Jet Fuel	Residential (	Commercial Coal	Industrial Coal	Electric Power Coa	Digester Gas	Distillate Fuel Oil	Kerosene	TOTAL
Residential	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Commercial/Institutional	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Industrial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	249.185	-	249.185
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	249.185	-	**249.185**

Energy Use by Sector and Fuel Type

Energy Consumed (MMbtu) = Units of Fuel Consumed × Heat Content of Fuel (MMBtu/unit)

	Natural Gas	Diesel	Gasoline	LPG	Propane	Butane	Residual Fuel Oil No. 5	Residual Fu	Jet Fuel	Residential (	Commercial Coal	Industrial Coal	Electric Power Coa	Digester Gas	Distillate Fuel Oil	Kerosene	TOTAL
Residential	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Commercial/Institutional	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Industrial	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,567,202	-	1,567,202
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,567,202	-	**1,567,202**

State and Local Climate and Energy Program — ICF — Local GHG Inventory Tool: Community Module

Notes on Sources of Activity Data and Assumptions

Stationary Combustion emissions have been determined based on the following:

- Activity Data
    - Fuel consumed by American Samoa Power Authority (ASPA) for power generation, averaged over FY2021 – FY2023:
        - 11,300,000 gallons of Distillate Fuel Oil
- Data Source: NREL American Samoa Energy Baseline Report, Table 4 (via Pacific Energy)
- Other notes/considerations:
    - GHG emissions calculated from this activity data may not represent all electricity consumption in the territory. Only ASPA power generation is represented. Additional sources of emissions from electricity generation may include private/independent generators supplying electricity locally to homes, businesses, industry, hotels/resorts, etc. These other sources of electricity-based emissions data were not collected for the PCAP, but should be quantified for more comprehensive GHG inventories in the future.

Appendix C: Mobile Combustion Calculations

Mobile combustion GHG emission calculations were calculated by National Renewable Energy Laboratory (NREL). GHG emissions estimates were calculated for American Samoa in the Local GHG Inventory Tool: Community Module ("CPRG PCAP GHG Inventory – American Samoa.xlsx").

Quantifying Mobile Combustion emissions from road transportation ideally requires data representing the fuel consumption and vehicle miles traveled (VMT) for each type of vehicle operating on the roads within the geographic area of a community GHG inventory. However, this level of detail is typically difficult to obtain, and assumptions are needed to fill in the blanks. In the case of this GHG inventory for American Samoa, the estimates for road transportation emissions were based on actual fuel use data. The following assumptions were then made to support the quantification of GHG emissions estimates:

- Licensed Motor Vehicle data were reviewed and assumed to be primarily aligned with the EPA vehicle category "Light Truck (vans, pickup trucks, SUVs)" (average fuel efficiency of 18.5 MPG for gasoline, and 22.1 MPG for diesel)
- Gasoline and Diesel fuel use values were entered into the EPA Community Greenhouse Gas Inventory Tool
- VMT values were estimated by multiplying each fuel consumption value by the EPA-default fuel economy (miles per gallon) for the Light Truck vehicle type.

These assumptions may result in overcounting the VMT, which would cause methane (CH4) and nitrous oxide (N2O) emissions estimates to be abnormally high. However, carbon dioxide (CO2) emissions – the primary greenhouse gas – are influenced only by the volume of fuel combusted. Therefore, the overall GHG emissions for the Mobile Combustion category are most sensitive to the fuel consumption data (i.e., gallons of gasoline, gallons of diesel).

GHG Summary

Net Emissions by Sector (CO_2e)				
	CO_2	CH_4	N_2O	TOTAL
Residential	-	-	-	-
Commercial/Institutional	168,319.41	519.73	1,730.13	170,569
Industrial	-	-	-	-
Energy Generation	-	-	-	-
Total Mobile Emissions	168,319.41	519.73	1,730.13	**170,569**

CO_2 Detail Emissions		
Gross CO_2	- Biogenic =	Net CO_2
-	-	-
168,319	-	168,319
-	-	-
-	-	-
168,319	-	168,319

Fuel Use by Sector and Fuel Type

This table summarizes fuel consumption by sector. These are the activity data used to calculate CO_2 emissions.

	Gasoline	Diesel	Biodiesel (B5)	Biodiesel (B20)	Ethanol (E85)	CNG	LNG	LPG	Residual Fuel	Jet Fuel	Aviation Gasoline
Units	Gallons	Gallons	Gallons	Gallons	Gallons	G.G.E.	Gallons	Gallons	Gallons	Gallons	Gallons
Residential	-	-	-	-	-	-	-	-	-	-	-
Commercial/Institutional	6,275,761	9,657,666	-	-	-	-	-	-	-	1,527,007	-
Industrial	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-
Total	**6,275,761**	**9,657,666**	-	-	-	-	-	-	-	**1,527,007**	-

Energy Use by Sector and Fuel Type

This table summarizes energy use by sector (MMBtu).

	Gasoline	Diesel	Biodiesel (B5)	Biodiesel (B20)	Ethanol (E85)	CNG	LNG	LPG	Residual Fuel	Jet Fuel	Aviation Gasoline	TOTAL
Residential	-	-	-	-	-	-	-	-	-	-	-	-
Commercial/Institutional	784,470	1,333,678	-	-	-	-	-	-	-	206,146	-	2,324,294
Industrial	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-
Total	784,470	1,333,678	-	-	-	-	-	-	-	206,146	-	**2,324,294**

CO_2 Calculations

Gross CO_2 Emissions

CO_2 Emissions (MT) = Fuel use × kg CO_2/unit of fuel × MT/kg

	Gasoline	Diesel	Biodiesel (B5)	Biodiesel (B20)	Ethanol (E85)	CNG	LNG	LPG	Residual Fuel	Jet Fuel	Aviation Gasoline	TOTAL
EF: kg CO_2/gal (or g.g.e.)	8.78	10.21	10.17	10.06	6.20	6.84	4.46	5.79	11.80	9.57	8.31	
Residential	-	-	-	-	-	-	-	-	-	-	-	-
Commercial/Institutional	55,101	98,605	-	-	-	-	-	-	-	14,613	-	168,319
Industrial	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-
Total	55,101	98,605	-	-	-	-	-	-	-	14,613	-	**168,319**

Biogenic CO_2 Emissions

Biogenic CO_2 (MT) = Fuel use × Biogenic kg CO_2/unit of fuel × MT/kg

	Gasoline	Diesel	Biodiesel (B5)	Biodiesel (B20)	Ethanol (E85)	CNG	LNG	LPG	Residual Fuel	Jet Fuel	Aviation Gasoline	TOTAL
EF: kg CO_2/gal (or g.g.e.)	-	-	0.47	1.89	4.89	-	-	-	-	-	-	
Residential	-	-	-	-	-	-	-	-	-	-	-	-
Commercial/Institutional	-	-	-	-	-	-	-	-	-	-	-	-
Industrial	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	-	-	-	-	-

Net CO_2 Emissions

Net CO_2 Emissions (MT) = Gross CO_2 Emissions - Biogenic CO_2 Emissions

	Gasoline	Diesel	Biodiesel (B5)	Biodiesel (B20)	Ethanol (E85)	CNG	LNG	LPG	Residual Fuel	Jet Fuel	Aviation Gasoline	TOTAL
Residential	-	-	-	-	-	-	-	-	-	-	-	-
Commercial/Institutional	55,101	98,605	-	-	-	-	-	-	-	14,613	-	168,319
Industrial	-	-	-	-	-	-	-	-	-	-	-	-
Energy Generation	-	-	-	-	-	-	-	-	-	-	-	-
Total	55,101	98,605	-	-	-	-	-	-	-	14,613	-	**168,319**

Local GHG Inventory Tool: Community Module

Notes on Sources of Activity Data and Assumptions

Mobile Combustion emissions have been determined based on the following:

- Data sources:
    - Fuel consumption:
        - NREL American Samoa Energy Baseline Report, Table 4 (via Pacific Energy)
    - Vehicle registration:
        - American Samoa Statistical Yearbook 2022
- Other notes/considerations:
    - Several assumptions were made to quantify an estimate of GHG emissions from road transportation in American Samoa. More accurate estimates of emissions from road transportation could be achieved with actual vehicle mileage data (i.e., odometer readings).

Appendix D: Co-Pollutant Calculations

	AP-42 Chapter 3.3		AP-42 Chapter 3.4		AP-42 Chapter 3.1		South Coast AQMD	AP-42 Chapter 3.1	
	<600 hp, diesel ind. Engine		> 600 hp, diesel ind. Engine		diesel turbine		LPG turbine/engine	natural gas turbine	
	PTE	controlled	PTE	controlled	PTE	controlled		PTE	controlled
	lb/MMBtu		lb/MMBtu		lb/MMBtu		lb/1000 gal	lb/MMBtu	
NOx	4.41		3.2	1.9	0.88	0.24	139	0.32	0.13
CO	0.95		0.85		0.0033	0.076	129	0.082	0.03
SO2	0.29		0.002		0.00152		0.35	0.0034	
PM*	0.31		0.062		0.012		5	0.0066	
PM10	--		0.050						
PM2.5	--		0.048						
VOC/TOC	0.36		0.082		0.00041		83	0.0021	
	N/A		lb/1000 gal		lb/1000 gal		lb/1000 gal	lb/1000 gal	
NOx			448	266	123.2	33.6	139	44.38	18.03
CO			119		0.46	10.64	129	11.37	4.16
SO2			0.21		0.21		0.35	0.47	
PM*			8.68		1.68		5	0.92	
PM10			6.94		0.00		0	0.00	
PM2.5			6.71		0.00		0	0.00	
VOC/TOC			11.47		0.06		83	0.29	

Notes:

Potential alternate EF for propane/LPG engine or turbine, diesel (micro?) turbine

https://www.aqmd.gov/docs/default-source/planning/annual-emission-reporting/combustion-emission-factors-2021.pdf

https://www.aqmd.gov/docs/default-source/planning/annual-emission-reporting/default-combustion-emission-factors.pdf?sfvrsn=12

https://www.epa.gov/natural-gas-star-program/engine-exhaust

turbines have lower emissions than engines for same fuel - natural gas may be needed to represent propane turbines

emission factors for propane are on same scale as diesel engine - higher than turbine. Close to scale for engines, too high for turbines

3%	of VOC are crankcase/slip emissions		
0.0015	% ULSD sulfur content (maximum)		

*PM=PM10=PM2.5 for several sets of emission factors

600	hp	0.44742	MW
	All engines are larger than 600 hp = 0.45 MW		
1	MW =	3.412	MMBtu/hr

convert from lb/MMBtu to lb/1000 gal -> multiply by fuel heat content

Unit Details			Fuel Use			NOx	CO	SO2	PM*	PM10	PM2.5	VOC/TOC	
MW			turbine		engine generator								
45	diesel	turbine	20,322,195	gallons ULSD		1,251.85	4.69	2.16	17.07	17.07	17.07	0.58	
5	PV												
						1,251.85	4.69	2.16	17.07	17.07	17.07	0.58	**Total**

Fuel calculation assumptions = "most recent fuel" worksheet

Emission factors and emission assumptions = "emissions" worksheet

Appendix E: ASPA GHG Emission Reduction Methodology

ASPA Priority Action

The National Control Center (NCC) will control ASPA's three Renewable Energy projects under construction, namely the 20MW Solar PV Farm, 1.0 MW Waste to Energy plant and 42MW Wind farm.

The 12MWh BESS and 34KV Interconnection or Transmission line is necessary for the 20MW Solar PV farm.

GHG Emission Reduction - 20MW Solar PV Farm

Annual KWh production	- 28,032,000 KWh per year.
Diesel reduction per year	- 1,785,478 gallons
GHG Emission Reduction per year	**- 20,033 tons per year**

Calculation is based on 10,180 grams (22.44 lbs.) of CO_2 per gallon of diesel.

Source - Joint EPA/Department of Transportation rulemaking on May 7, 2010

- Federal Register (2010). Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule, page 25,330 (PDF) (407 pp, 5.7MB, About PDF).
- IPCC (2006). 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 2 (Energy). Intergovernmental Panel on Climate Change, Geneva, Switzerland.

Combined GHG Emission Reduction - 20MW Solar PV, 42MW Wind Farms and WtE plant

20MW Solar PV Farm production	- 28,032,000 KWh per year
42MW Wind Farm production	- 110,376,000 KWh per year
MW Waste to Energy production	- 2,336,000 KWh per year
Total RE KWh production	- 140,744,000 KWh per year
Diesel Reduction	- 8,964,586 gallon per year
Total GHG Reduction	- **100,583 tons per year**.

Calculation is based on 10,180 grams (22.44 lbs.) of CO_2 per gallon of diesel.

Source - Joint EPA/Department of Transportation rulemaking on May 7, 2010

- Federal Register (2010). Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule, page 25,330 (PDF) (407 pp, 5.7MB, About PDF).
- IPCC (2006). 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 2 (Energy). Intergovernmental Panel on Climate Change, Geneva, Switzerland

ASPA Priority Action 2

These calculations were derived from the EPA's Diesel Emissions Quantifier (DEQ), an interactive, web-based tool that evaluates clean diesel projects and upgrade options for medium-heavy and heavy-heavy duty diesel engines. The DEQ estimates baseline emissions, reduced emissions, cost effectiveness for NOx, PM2.5, HC, CO and CO2, and PM-related health benefits.

All estimates were based on engine and vehicle replacements, the DEQ estimated emissions from both the old and new engines. The difference is the estimated emission reduction resulting from the replacement.

Annual Results (short tons)[2]	NO_x	PM2.5	HC	CO	CO_2	Fuel[3]
Baseline for Upgraded Vehicles/Engines	8.314	0.506	0.514	2.261	427.5	38,000
Amount Reduced After Upgrades	8.314	0.506	0.514	2.261	427.5	38,000
Percent Reduced After Upgrades	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lifetime Results (short tons)[2]						
Baseline for Upgraded Vehicles/Engines	41.761	2.532	2.582	11.480	2,475.0	220,000
Amount Reduced After Upgrades	41.761	2.532	2.582	11.480	2,475.0	220,000
Percent Reduced After Upgrades	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lifetime Cost Effectiveness ($/short ton reduced)						
Capital Cost Effectiveness[4] (unit & labor costs only)	$100,573	$1,658,597	$1,626,839	$365,859	$1,697	
Total Cost Effectiveness[4] (includes all project costs)	$598,649	$9,872,602	$9,683,563	$2,177,732	$10,101	

[1] Emissions from the electrical grid are not included in the results.

[2] 1 short ton = 2000 lbs.

[3] In gallons; fuels other than ULSD have been converted to ULSD-equivalent gallons.

[4] Cost effectiveness estimates include only the costs which you have entered.

Assumptions in DEQ [9]

• CNG, LNG and LPG engine/vehicle replacements use diesel criteria pollutant factors as a surrogates. – No good data source for alternative fuel & engine factors – Alternative fuel engines must meet diesel standards – Converts alternate fuel to diesel-equivalent gallons for CO2
• Median life is used in estimating lifetime reductions; this may be edited, but the value is capped.
• For nonroad, locomotive and marine, assigns baseline engine year or tier when only one of these is entered.

Data sources for DEQ [9]

• Onroad – MOVES2014a (in-use data)
• Emission reductions from EPA and CARB verification and certification programs

Appendix D: ASTCA GHG Emission Reduction Methodology

ASTCA Priority Action 1

Diesel generator engine replacement GHG emission reductions

These calculations were derived from the EPA's Diesel Emissions Quantifier (DEQ), an interactive, web-based tool that evaluates clean diesel projects and upgrade options for medium-heavy and heavy-heavy duty diesel engines. The DEQ estimates baseline emissions, reduced emissions, cost effectiveness for NOx, PM2.5, HC, CO and CO2, and PM-related health benefits. All estimates were based on engine and vehicle replacements, the DEQ estimated emissions from both the old and new engines. The difference is the estimated emission reduction resulting from the replacement.

Annual Results (short tons)[2]	NO_x	PM2.5	HC	CO	CO_2	Fuel[3]
Baseline for Upgraded Vehicles/Engines	0.076	0.003	0.007	0.025	11.9	1,060
Amount Reduced After Upgrades	0.064	0.003	0.006	0.024	2.6	233
Percent Reduced After Upgrades	84.3%	96.7%	97.0%	95.5%	22.0%	22.0%
Lifetime Results (short tons)[2]						
Baseline for Upgraded Vehicles/Engines	0.076	0.003	0.007	0.025	11.9	1,060
Amount Reduced After Upgrades	0.064	0.003	0.006	0.024	2.6	233
Percent Reduced After Upgrades	84.3%	96.7%	97.0%	95.5%	22.0%	22.0%
Lifetime Cost Effectiveness ($/short ton reduced)						
Capital Cost Effectiveness[4] (unit & labor costs only)	$28,900,959	$561,979,291	$289,620,663	$77,534,067	$701,031	
Total Cost Effectiveness[4] (includes all project costs)	$392,676,067	$7,635,588,195	$3,935,063,353	$1,053,451,996	$9,524,884	

[1] Emissions from the electrical grid are not included in the results.

[2] 1 short ton = 2000 lbs.

[3] In gallons; fuels other than ULSD have been converted to ULSD-equivalent gallons.

[4] Cost effectiveness estimates include only the costs which you have entered.

Assumptions in DEQ[9]

• CNG, LNG and LPG engine/vehicle replacements use diesel criteria pollutant factors as a surrogate.
 – No good data source for alternative fuel & engine factors
– Alternative fuel engines must meet diesel standards
– Converts alternate fuel to diesel-equivalent gallons for CO2
• Median life is used in estimating lifetime reductions; this may be edited, but the value is capped.
• For nonroad, locomotive and marine, assigns baseline engine year or tier when only one of these is entered.

Assumptions with the generators
•Gathering specific information about ASTCA's generators slated for replacement proved challenging due to their deteriorated exteriors. For those generators where information was indiscernible, we input their data with the average values of the others earmarked for replacement.

Data sources for DEQ [9]
• Nonroad – Factors & formulas from the NONROAD model – EPA regulatory documents
• Emission reductions from EPA and CARB verification and certification programs

ASTCA Priority Action 2

Diesel vehicle replacement GHG emission reductions

These calculations were derived from the EPA's Diesel Emissions Quantifier (DEQ), an interactive, web-based tool that evaluates clean diesel projects and upgrade options for medium-heavy and heavy-heavy duty diesel engines. The DEQ estimates baseline emissions, reduced emissions, cost effectiveness for NOx, PM2.5, HC, CO and CO2, and PM-related health benefits.

All estimates were based on engine and vehicle replacements, the DEQ estimated emissions from both the old and new engines. The difference is the estimated emission reduction resulting from the replacement.

Annual Results (short tons)[2]	NO_x	PM2.5	HC	CO	CO_2	Fuel[3]
Baseline for Upgraded Vehicles/Engines	0.245	0.027	0.047	0.259	61.9	5,500
Amount Reduced After Upgrades	0.245	0.027	0.047	0.259	61.9	5,500
Percent Reduced After Upgrades	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lifetime Results (short tons)[2]						
Baseline for Upgraded Vehicles/Engines	0.357	0.039	0.065	0.401	90.0	8,000
Amount Reduced After Upgrades	0.357	0.039	0.065	0.401	90.0	8,000
Percent Reduced After Upgrades	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Lifetime Cost Effectiveness ($/short ton reduced)						
Capital Cost Effectiveness[4] (unit & labor costs only)	$1,678,603	$15,414,336	$9,165,266	$1,497,668	$6,667	
Total Cost Effectiveness[4] (includes all project costs)	$69,941,786	$642,263,988	$381,886,082	$62,402,822	$277,778	

[1] Emissions from the electrical grid are not included in the results.
[2] 1 short ton = 2000 lbs.
[3] In gallons; fuels other than ULSD have been converted to ULSD-equivalent gallons.
[4] Cost effectiveness estimates include only the costs which you have entered.

Assumptions in DEQ [9]

• CNG, LNG and LPG engine/vehicle replacements use diesel criteria pollutant factors as a surrogates.
– No good data source for alternative fuel & engine factors
– Alternative fuel engines must meet diesel standards
– Converts alternate fuel to diesel-equivalent gallons for CO2
• Median life is used in estimating lifetime reductions; this may be edited, but the value is capped.

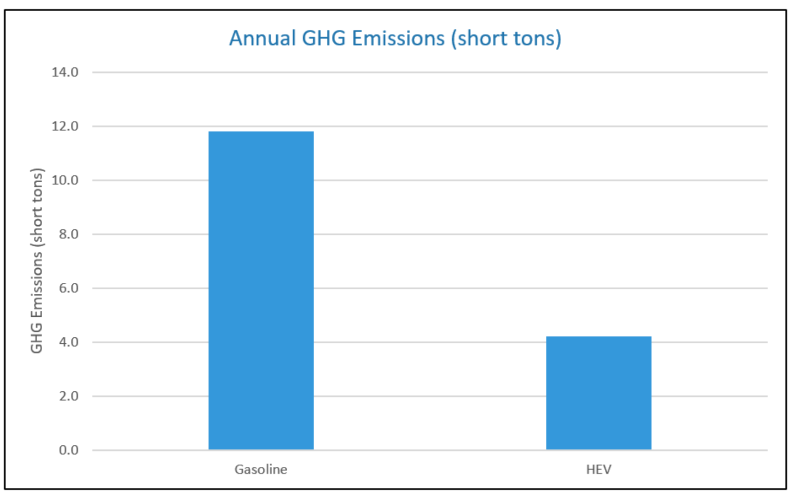
Data sources for DEQ [9]

- Onroad – MOVES2014a (in-use data)
- Emission reductions from EPA and CARB verification and certification programs

Gasoline vehicle replacement GHG emission reductions

The Department of Energy's Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) online tool (https://afleet.es.anl.gov/afleet) was used to compute GHG emission reductions. AFLEET examines both the environmental and economic costs and benefits of alternative fuel and advanced vehicles. Argonne national laboratory developed the Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool for Clean Cities stakeholders to estimate petroleum use, greenhouse gas emissions, air pollutant emissions, and cost of ownership of light-duty and heavy-duty vehicles using simple spreadsheet inputs.

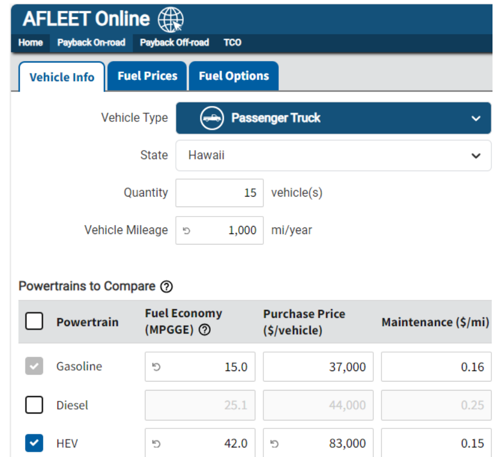
The tool uses data from Argonne's R&D Greenhouse gases, Regulated Emissions, and Energy use in Technologies (GREET) fuel-cycle model to generate necessary well-to-wheels petroleum use and GHG emission co-efficient for key fuel production pathways and vehicle types. In addition, Environmental Protection Agency's Motor Vehicle Emission Simulator (MOVES) and certification data are used to estimate tailpipe air pollutant emissions. Various sources are used to provide default cost data, including the Clean Cities Alternative Fuel Price Report and American Recovery and Reinvestment Act awards.



Powertrain	Annual GHG Emissions
Gasoline	11.8
HEV	4.2

AFLEET Assumptions

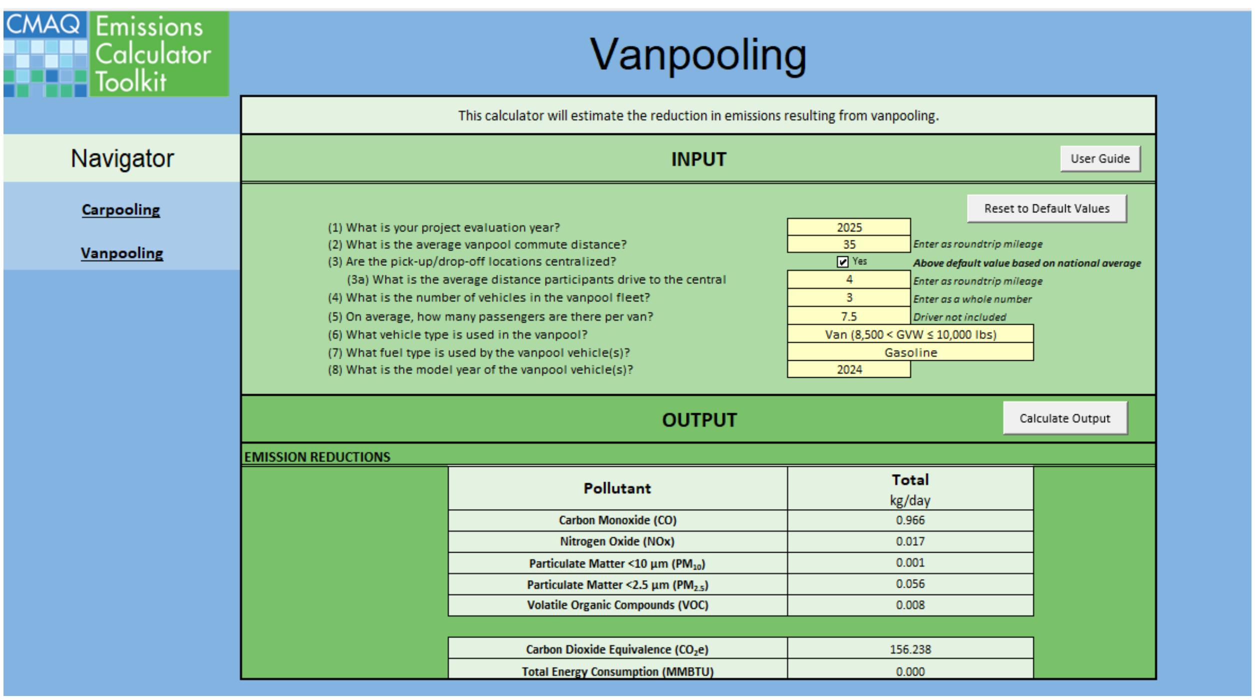
This tool was not available for the geographical location of the American Samoa territory. The recommended solution for this was to use Hawaii as a proxy to estimate reductions as it is the closest available location and most comparable state to American Samoa.



ASTCA is replacing 15 passenger trucks and SUVs, the average miles per year for each of their vehicles was around 1,000 miles. Driving conditions in American Samoa are akin to city rather than freeway driving as the speed limit is never more than 25 mph per year. Because of this and the age of the vehicles being replaced, the MPG were averaged out to 15. The hybrid electric replacement vehicles had an average city MPG of 42.

ASTCA Priority Action 3

GHG emission reductions were calculated with the U.S. Department of Transportation Federal Highway Administration CMAQ Emissions Calculator Toolkit for Carpooling and Vanpooling. This tool calculates emission reductions from projects that start carpool and vanpool programs, increase ridership in existing programs, or purchase vehicles for vanpool programs.



Vanpool Calculations[10]

The emission reductions calculators for the Carpooling and Vanpooling tool rely on running, start, evaporative, and crankcase exhaust emission rates as well as national-scale activity rates within MOVES. The rates were obtained with a set of MOVES runs in which all evaluation years were combined together into a single MOVES run and were generated on the national scale. MOVES3 (version from January 2022) was used to obtain the emission rates used in the tool. Compressed natural gas (CNG) factors from AFLEET 20205 were applied to default conventional fuel emission rates depending on vehicle source, use type, and pollutant in the Vanpooling module. A more detailed description of applying AFLEET factors for CNG vans can be found in the "Fuel Type" discussion in the Vanpooling module documentation.

Tool Methodology [10]

Emission reductions, reported in kilograms per day of the vanpool program, are calculated for a given pollutant as follows:

$$daily\ reduced\ emissions = \left(e_{running\ car} \cdot VMT\ reduced + e_{starts\ car} \cdot starts\ reduced\right) - \left(e_{running\ van} \cdot VMT\ added + e_{starts\ van} \cdot starts\ added\right)$$

where the starts and VMT reduced from the passenger vehicles displaced by the vanpool,

$$VMT\ reduced_{non\ central} = displaced\ vehicle\ pop \cdot commute\ distance$$

$$VMT\ reduced_{central} = displaced\ vehicle\ pop \cdot (commute\ distance - distance\ to\ central\ location)$$

$$starts\ reduced_{non\ central} = displaced\ vehicle\ pop \cdot starts$$

and where the starts and VMT added for the vans in the vanpool,

$$VMT\ added = van\ fleet\ size \cdot commute\ distance$$

$$starts\ added = van\ fleet\ size \cdot starts_{van}$$

The variables for the equations are defined as:

$erunning$ = running emission rate11 for a pollutant based on the given evaluation year
$estarts$ = starting emission rate12 for a pollutant based on the given evaluation year
$van\ fleet\ size$ = the number of vehicles included in the van fleet
$commute\ distance$ = average roundtrip distance the active vanpool vehicle will travel to and from the common workplace

The Carpooling and Vanpooling tool yielded Kg/per day results that were converted to MT/year with the following calculation:
Metric Tons/Year=((Kilograms/Day×365)/1000)