



Stark Area RTA Climate Action Plan 2027

A Commitment to a Greener Tomorrow

AIChE January 28 Akron & Cleveland Joint Meeting

Burntwood Tavern; Fairlawn, Ohio

Tuesday, January 28, 2025

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1. Introduction

The Stark Area Regional Transit Authority (SARTA) has compiled a Climate Action Plan to document past, current, and future initiatives to create a greener way of producing and delivering the service provided to the greater Stark County area. The purpose of this plan is to look back at what has already been accomplished, evaluate those undertakings, and look ahead to determine what else can be done with the vehicles and facilities operated by SARTA.

This plan looks primarily at what has been done to the fleet, which is just a scratch to the surface of making a transit agency more environmentally sustainable. It will also look at what can be done for service design and future capital projects. This plan evaluates the Greenhouse Gas (GHG) Emissions of the SARTA fleet by looking back at 2015 emissions and comparing them to 2021, creating a baseline of data for SARTA to move forward with. The plan will allow future organizational goals to be set that fall in line with current Federal goals for zero-emissions fleets.

The Climate Action Plan can be used to help SARTA evaluate current fleet consumptions of fuel and plan for future sustainable options to keep moving toward a zero-emissions fleet. It will also address ways that SARTA can improve their facilities to become more sustainable and what green methods can be utilized on future buildings or renovations. This document will be a working document that continues to track past and future initiatives that SARTA enacts to achieve net-zero emissions in all aspects of the agency's existence.



2. Agency Overview

SARTA began in 1997 as the newly funded county-wide public transit provider for Stark County based in Canton, Ohio. Through a dedicated 0.25% sales tax levy – last passed in 2016 for ten (10) years – SARTA was able to provide expanded fixed-route and demand response services to more than just the cities of Canton and Massillon. Other municipalities benefiting from this service are Hartville, Uniontown, Greentown, even Akron and Cleveland through express fixed routes. These routes help people move among four (4) counties in the region.

Most recently, SARTA entered a partnership with Community Action of Wayne & Medina Counties (CAW/M) establishing the Wayne County Transit (WCT) providing countywide demand response service to the residents of Wayne County, Ohio. This was achieved through the acquisition of \$1 million in 5311 funds. Moving people in the most efficient, affordable, and sustainable ways will continue to be the mission of SARTA.

According to the 2020 census, Stark County has a population of 374,853 people and covers 575.27 square miles. SARTA is funded through a local 0.25% 10-year sales tax passed in 2016 as well as state and federal grants and programs when applicable. SARTA runs on a \$15.9 million budget. With the introduction of WCT, SARTA added another county with a population of 116,710 people and an additional 554.93 square miles in coverage.

SARTA fully operates from its main facility located in Canton, Ohio with four transit centers located in Alliance, Canton, Plain Township, and Massillon. These facilities are also evaluated, along with the fleet, for how best to deliver the most environmentally friendly service possible to the residents of Stark County. Just having these facilities in place allows us to move residents about in an economical fashion where they can travel from community to community with ease.

SARTA runs a fleet of 113 vehicles comprised of a mixture of revenue and non-revenue vehicles. These vehicles run on a variety of fuels where low to no emissions has been an organizational goal since 2009 when the first electric hybrid bus arrived on-site. Along with the fleet, SARTA works to ensure its operations and administration facilities run as green as possible as well. This means that initiatives have been enacted from LED lighting to geo-thermal technology.

SARTA's fleet is one of the most recognizable in the region. Each bus has a unique livery that illustrates the commitment SARTA has put forth in ensuring service is delivered in the most environmentally friendly way. As of 2021, 58% of SARTA's fleet runs on an alternative fuel of hydrogen or CNG or is a hybrid combining an alternative fuel with a fossil fuel to power the propulsion system. SARTA has reduced its fossil fuel or diesel and gasoline fleet by 21% from 2015 to 2021 with diesel consumption down 45%. SARTA began running Hydrogen Fuel Cell buses in 2016 and now have 12 of these vehicles on the road with another 5 scheduled to go into service in 2022. This makes up 11% of the fleet currently running on Hydrogen Fuel Cell technology. See appendices A and B for more GHG and fleet information.

GHG emissions were calculated for years 2015 and 2021. The fuel categories operated by SARTA during those years were 1960-2006 Diesel, 2007-2018 Diesel, Gasoline, Compressed Natural Gas (CNG), and Hydrogen Fuel Cell. In 2015, SARTA operated 107 vehicles in both the revenue and non-revenue fleets. At that time, the fleet consisted of 57% strictly diesel and gasoline powered vehicles and only 43% were some sort of alternative fuel or hybrid technology. By 2021, those numbers began to flip in the other direction reducing the gasoline and diesel fleet by 21% and increasing the alternative – or hydrogen and CNG – fleet by 54%. This flip demonstrates SARTA's commitment to operating a completely green fleet.

SARTA has worked to build their facilities in the most environmentally friendly ways. Their main campus located in Canton, Ohio has gone through several upgrades over the years and most recently upgraded the lighting to LED. The current HVAC system has also been evaluated to ensure it runs as efficiently as possible and will be further evaluated to determine the need for upgrading to an even more efficient system. SARTA also installed LED lighting at all four transit centers too. This program was benchmarked as well by looking at electric costs in 2015 and again in 2021. This program saved SARTA \$32,819 and reduced their electric bill by 16%. Another way that SARTA remains environmentally sustainable is through its recycling efforts and monitoring paper consumption by encouraging all staff to eliminate unnecessary printing.

4. Past & Current Initiatives

SARTA has always made climate sustainability a priority when it comes to fleet operations. In the past, SARTA utilized electric hybrid technology starting in 2009, then moving toward Compressed Natural Gas in 2012, before finally investing heavily in Hydrogen Fuel Cell technology in 2016. Hydrogen is a way to run an electric fleet without having to worry about on-route charging and costly infrastructure.

This led to SARTA building the largest hydrogen fueling station in the country, at the time, where buses can be fueled on-site similar to how the traditional diesel fleet is fueled at the end of the service day. CNG is also fueled on-site. Both fuels are available to the public for other fleet operators wishing to use alternative fuels. This is all done at SARTA's main facility in Canton, Ohio.

At the time of the launch of the Hydrogen Fuel Cell fleet, SARTA placed the largest order for fixed route buses and ordered the first fleet of hydrogen demand response vans. The vans will hit the road in 2022. SARTA will continue to utilize the Hydrogen Fuel Cell technology as a way of powering their fleet. Funding for on-site hydrogen production is currently being searched for to carry this initiative into the future.

Other areas that SARTA has taken on to promote the reductions of GHG, has been in the field of electric vehicles. SARTA began placing EV charging stations at their transit facilities in 2020 promoting the use of this technology. SARTA's Belden Village Transit Center also makes use of geothermal technology for climate control purposes.

SARTA works to do more than just operate a green fleet. There are also administrative initiatives as well. The administrative offices have a recycling program. Paper consumption is also monitored to discourage unnecessary printing. SARTA has also begun researching ways of incorporating solar power for the administrative facility and utilizing fuel cells as a way to provide back-up power. In 2021, SARTA wrapped up an organizational-wide LED lighting conversion project where reducing electrical consumption was the goal and it was met with success.

While SARTA does maintain their own environmental goals and initiatives, they also will take note of local, state, and federal initiatives as well. SARTA works closely with their MPO, the Stark County Area Transportation Study (SCATS), to ensure local initiatives can be met for GHG emission reduction. Most notably would be those laid out in this plan as well as goals from SCATS plans too. Currently SARTA puts 73 vehicles on the road each day transporting approximately 4100 people which helps to reduce congestion within Stark County by reducing single-occupancy vehicles on the road. This is in addition to ensuring SARTA vehicles are environmentally friendly too.



5. Emissions Reduction Goals and Targets



SARTA began exploring greener service delivery options in 2009 when they introduced electric hybrid technology to the fleet. Since then, it has been a goal to continue moving SARTA in a more environmentally sustainable direction with the addition of CNG in 2012 and Hydrogen Fuel Cell in 2016. Three fueling stations were added to their main property in Canton, Ohio for not only their fleet, but for fueling other fleets that may wish to use this green technology. Other propulsion systems have been utilized as well in the non-revenue fleet such as CNG and CNG hybrids.

SARTA will continue its commitment to Hydrogen Fuel Cell through its contribution to the Hydrogen Hub Alliance. This alliance will help improve Hydrogen use and production by bringing on-site production to SARTA's main campus. This will strengthen industries in Northeast Ohio and the surrounding regions. It will also allow SARTA to continue to utilize Hydrogen as a fuel source and control how it is produced. Currently, it is trucked in and stored on-site with no ability to control how green the production and delivery system operates.

SARTA has demonstrated the steps they have taken to reduce GHG emissions since 2015. The overall annual metric tons of carbon dioxide (MTCO₂) have decreased by 37% annually and 27% per vehicle mile travelled as of 2021. See appendix A for more detail. SARTA will have no problem achieving new goals further reducing emissions and increasing the fleet to nearly zero-emissions by another 25% by 2027. Below are goals SARTA has set for the fleet and facilities.

- Add another 12 Hydrogen Fuel Cell buses to the fleet by 2027
- Continue to displace diesel Light Transit Vehicles with CNG until availability of Hydrogen Fuel Cell vans grow [?]
- Reduce our GHG emissions by another 37% by 2027
- Continue future service planning with GHG reduction goals in mind
- Continue facilities planning with zero-emissions goals in mind
- Add solar to main property to power not only the building, but the fueling stations as well allowing for a greener way to fuel the fleet
- Begin monitoring all energy consumption closely and creating new benchmarks by 2027



6. Strategies and Actions

Goal #1: By 2027, reduce fleet reliance on strictly diesel and gasoline by a further 15%

Strategy	Actions	Metric to track progress	Timeframe	Responsible Office
Convert fleet to all CNG and Hydrogen Fuel Cell	Develop Climate Action Plan	Y/N plan developed	April 2022	Development
	Develop Zero-Emissions Bus Transition Plan	Y/N plan developed	May 2022	Development
	Purchase of only CNG or Hydrogen fueled vehicles	Number of vehicles replaced	2021-2027	Transportation
	Purchase of only CNG or Hydrogen fueled non-revenue vehicles	Number of vehicles purchased	2022-2025	Transportation



6. Strategies and Actions

Goal #2: By 2030, begin producing Hydrogen on-site decreasing need for delivery of one fuel type

Strategy	Actions	Metric to track progress	Timeframe	Responsible Office
Construct an on-site hydrogen production facility	Acquire funding for hydrogen production station	Y/N funded	March 2022	Finance
	Select a design firm to develop hydrogen station	Y/N contract implemented	June 2022	Development
	Bid and Build HSR station	Y/N notice to proceed with construction	September 2022	Development
	Expand SARTA and public use of hydrogen station	Number of vehicles fueled	September 2023	Executive



6. Strategies and Actions

Goal #3: By 2030, begin introducing other sustainable energy sources to facilities

Strategy	Actions	Metric to track progress	Timeframe	Responsible Office
All future buildings to be at or approaching carbon net-neutral	Future buildings to be built to handle solar	Y/N for builds	July 2023	Development
	Current buildings to be evaluated for the use of solar	Y/N for current buildings	Ongoing	Development
	Incorporate solar into build of hydrogen station	Y/N	June 2023	Maintenance
	Monitor and evaluate current buildings for energy consumption	Cost	Ongoing	Finance
	Construction of a micro-grid for redundancy using fuel cells	Y/N	June 2023	Maintenance



7. Implementing and Monitoring

SARTA has already begun investing in Hydrogen Fuel Cell technology to create a more environmentally friendly fleet. This is in addition to the long-standing use of CNG. Both on-site stations will be undergoing renovations and expansions beginning in 2022. SARTA has even helped form the Midwest Hydrogen Center of Excellence. This is a hydrogen hub alliance for those looking to utilize this clean form of fueling, raising awareness, and providing outreach. SARTA's borrow a bus program has allowed for many transits across fifty (50) cities and two (2) countries test out a public transit vehicle powered on Hydrogen Fuel Cell technology.

The next step in utilizing Hydrogen Fuel Cell technology for the SARTA fleet will be to bring on-site production to SARTA. By producing the fuel on-site, SARTA will continue to reduce the amount of GHG emitted by fuel delivery vehicles delivering hydrogen and diesel. SARTA has even begun exploring streetcar service to be powered through Hydrogen Fuel Cell technology. Should on-site production be achieved, SARTA will have a second fuel source in addition to CNG provided without the use of a delivery service.

Hydrogen being made available through the hub in Ohio will allow other industries to take advantage of this clean fuel source. Everything from steel and glass production to Cummins entering a new era of powering vehicles can benefit through the use of hydrogen.



7. Implementing and Monitoring

The introduction of twelve large Hydrogen Fuel Cell buses to the SARTA fleet between 2016 and 2021 has enabled SARTA to greatly reduce GHG emissions. SARTA will further grow this fleet and continue monitoring the GHG emissions on a regular interval to determine the success of this climate challenge and zero-emission program. Furthermore, there will be another five demand response vans introduced to the fleet in 2022 displacing the diesel and gasoline vehicles. SARTA will also be utilizing CNG to propel the demand response fleet while the Hydrogen Fuel Cell technology catches up for the smaller vehicles.

Monitoring SARTA's GHG emissions will be done through future versions of this plan. In the attached appendices are the charts and calculations used based on the requirements of the FTA. Other calculations have been completed that will allow a tracking of the fleet by fuel type. While the fleet has grown from 2015 to 2021, SARTA has reduced the number of vehicles operating strictly on diesel and gasoline by 21% while increasing the hydrogen and CNG fleet by 54%. Their investment in Hydrogen and CNG is due to the ability to run a low and no-emissions fleet.

The facilities are always being evaluated on how they can be improved upon. Currently, the administration building is being evaluated for a heating and cooling upgrade that will help make climate control more energy efficient. The electrical capacity of the main campus is also being reviewed for future expansions which include the ability of being powered with solar technology. New buildings such as the new administration building and the Massillon Transit Center are being designed in a way that a solar array could be installed on the roof. The current garage facility was also evaluated and decided that it could support solar as well. Plans and funding searches are currently underway to get all or part of the main campus operating with solar powered technology.

Appendix A: Greenhouse Gas Inventory

Below is the SARTA Greenhouse Gas Emissions Inventory for years 2015 and 2021 with calculations for the change in GHG emissions. Calculations were also done for showing the reduction in fuel consumption for the two years. The increase in gasoline can be attributed to the increase in the non-revenue fleet where gasoline is more readily available for vehicles of this size.



2015 Annual Emissions					
2015	Diesel Bus MY1960-2006	Diesel Bus MY07-18	Gasoline Bus (MY18)*	CNG ICE Bus	Fleet Total
CH4 Emissions (grams)	1,659	21,003	2,073	14,830,670	14,855,405
N2O Emissions (grams)	1,561	95,288	2,073	1,483	100,405
CO2 (grams)	712,790,730	3,437,257,760	42,187,900	7,220,913	4,199,457,303
2015	Diesel Bus MY1960-2006	Diesel Bus MY07-18	Gasoline Bus (MY18)*	CNG ICE Bus	Fleet Total
CH4 Emissions (grams) to MTCO2e	0	0.59	0	415	416
N2O Emissions (grams) to MTCO2e	0	25.25	1	0	27
CO2 (grams) to MTCO2e	713	3,437.26	42	7	4,199
Annual MTCO2e	713	3,463.10	43	423	4,642
Annual MTCO2e per VMT	0	0.00156641	0.00067305	0.000285134	0.001136967

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2021 Annual Emissions

2021	Diesel Bus MY1960-2006	Diesel Bus MY07-18	Gasoline Bus (MY18)*	CNG ICE Bus	Fleet Total	Difference	Change
CH4 Emissions (grams)	11	14,260	5,630	18,354,860	18,374,762	3519356.89	23.69%
N20 Emissions (grams)	10	64,697	5,630	1,835	72,174	-28231.35	-28.12%
CO2 (grams)	5,564,450	2,272,123,190	96,896,080	9,148,459	2,383,732,179	-1815725123.74	-43.24%
2021	Diesel Bus MY1960-2006	Diesel Bus MY07-18	Gasoline Bus (MY18)*	CNG ICE Bus	Fleet Total	Difference	Change
CH4 Emissions (grams) to MTCO2e	0	0.40	0	514	514	98.54	23.69%
N20 Emissions (grams) to MTCO2e	0	17.14	1	0	19	-7.48	-28.12%
CO2 (grams) to MTCO2e	6	2,272.12	97	9	2,384	-1815.73	-43.24%
Annual MTCO2e	6	2,289.67	99	524	2,917	-1724.66	-37.15%
Annual MTCO2e per VMT	0	0.001525327	0.000570582	0.000285249	0.000830809	0.00	-26.93%

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Fleet Miles and Fuel Consumed											
Year	Diesel Bus MY1960-2006		Diesel Bus MY 2007-2018		Gasoline Bus		CNG Bus			Hydrogen	
	gallons	VMT	gallons	VMT	gallons	VMT	GGE	Cubic Feet	VMT	kg	VMT
2015	69,813	325,307	336,656	2,210,849	4,805	63,584	260,059	132,630	1,483,067	0	0
Year	Diesel Bus MY1960-2006		Diesel Bus MY 2007-2018		Gasoline Bus		CNG Bus			Hydrogen	
	gallons	VMT	gallons	VMT	gallons	VMT	GGE	Cubic Feet	VMT	kg	VMT
2021	545	2,164	222,539	1,501,099	11,036	172,711	329,479	168,034	1,835,486	40,761	230,261
	Diesel				Gasoline		CNG			Hydrogen	
Difference	-	-			6231	109,127	69,420	35,404	352,419	40,761	230,261
Change	-45.12%	-40.73%			129.68%	171.63%	26.69%	26.69%	23.76%	100.00%	100.00%

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	gallons	VMT	gallons	VMT	gallons	VMT	GGE	Cubic Feet	VMT	kg	VMT
2015	69,813	325,307	336,656	2,210,849	4,805	63,584	260,059	132,630	1,483,067	0	0
Year	Diesel Bus MY1960-2006		Diesel Bus MY 2007-2018		Gasoline Bus		CNG Bus			Hydrogen	
	gallons	VMT	gallons	VMT	gallons	VMT	GGE	Cubic Feet	VMT	kg	VMT
2021	545	2,164	222,539	1,501,099	11,036	172,711	329,479	168,034	1,835,486	40,761	230,261
	Diesel				Gasoline		CNG			Hydrogen	
Difference	-	-			6231	109,127	69,420	35,404	352,419	40,761	230,261
Change	-45.12%	-40.73%			129.68%	171.63%	26.69%	26.69%	23.76%	100.00%	100.00%

Appendix B: Vehicle Inventory By Fuel Type

Below are tables illustrating the SARTA fleet by fuel type then by fuel class where the fuel types were grouped together based on expected levels of emissions.



2015-2022 Vehicle Count by Fuel Type

	<u>2015</u>	<u>% Fleet</u>	<u>2021</u>	<u>% Fleet</u>	<u>Difference</u>	<u>% Change</u>
1960-2006 Diesel	8	7.48%	1	0.88%	-7	-87.50%
2007-2018 Diesel	46	42.99%	32	28.32%	-14	-30.43%
Gasoline	7	6.54%	15	13.27%	8	114.29%
CNG	39	36.45%	48	42.48%	9	23.08%
Hydrogen	0	0.00%	12	10.62%	12	
Diesel/Electric	4	3.74%	2	1.77%	-2	-50.00%
Gasoline/CNG	3	2.80%	3	2.65%	0	0.00%
Total	107		113		6	5.61%

2015-2022 Vehicle Count by Fuel Class

	<u>2015</u>	<u>% Fleet</u>	<u>2021</u>	<u>% Fleet</u>	<u>Difference</u>	<u>% Change</u>
Fossil	61	57.01%	48	42.48%	-13	-21.31%
Alternative	39	36.45%	60	53.10%	21	53.85%
Hybrid	7	6.54%	5	4.42%	-2	-28.57%
Total	107		113			

Questions ? & Answers !

