

Appendix A – 2023 Sustainability Inventory

Executive Summary

This Appendix presents a detailed analysis of Sound Transit's 2023 Annual Sustainability Progress Report, offering key data snapshots and identifying resource use patterns compared to previous years. The report evaluates 2023 performance metrics in the context of multi-year trends, shedding light on the agency's progress toward sustainability goals.

Overall, the agency had a strong year of environmental sustainability performance. Sound Transit not used resources more efficiently per mile of service and per boarding but was also able to reduce its total (absolute, non-normalized) greenhouse gas emissions, energy use and water use.

Please note that any statements about resource use trends and metrics in this appendix are made in absolute terms unless explicitly stated otherwise; normalized trend analyses and metrics will be explicitly labeled as such (e.g., greenhouse gas emissions per PMT).

Service Levels and Ridership Trends:

- **Service Recovery and Ridership Dynamics:** While Sound Transit's service levels in 2023 approached pre-pandemic levels and Link light rail ridership exceeded pre-pandemic levels total passenger trips and passenger miles traveled (PMT) have yet to recover fully. In 2023, they remained nearly 40% below 2019 levels. The 22% increase in PMT from 2022, coupled with a 15% rise in unlinked passenger trips, reflects a positive trend but also underscores the lingering effects of the pandemic. As remote and hybrid work arrangements become entrenched, transit agencies like Sound Transit must adapt to new commuting patterns.
- **Mode-Specific Insights:** The recovery has been uneven across different modes of transport. Notably, Link light rail ridership has not only rebounded but surpassed pre-pandemic levels, indicating a shift in commuter preferences toward this mode. In contrast, ridership on ST Express and Sounder commuter rail services remains subdued, suggesting a potential longer-term shift away from traditional commuter rail in favor of modes that better align with the changing workforce landscape.

Energy Use and Efficiency:

- **Balancing Growth and Sustainability:** In 2023, Sound Transit achieved a slight overall reduction in energy consumption despite an increase in facility energy use, showcasing the agency's efforts to balance service expansion with energy efficiency. Total agency energy use—encompassing electricity, fleet fuel, and natural gas—decreased by 1% from 2022 and by 5% compared to 2018, marking steady progress toward sustainability goals.
- **Fleet Energy Reductions:** A notable 5% reduction in revenue fleet energy use from 2022 to 2023 was driven by efficiency improvements and service adjustments. The Sounder commuter rail service, for instance, reduced fuel consumption by 5% due to lower service levels, while the ST Express fleet achieved a 9% reduction, reflecting enhanced fleet efficiency. However, the expansion of Link light rail service led to a 6% increase in traction power consumption. And although electricity is the cleanest fuel used by the agency, the increase still highlights the trade-offs between service expansion and energy use.

Greenhouse Gas Emissions:

- **Operational Emissions Reduction:** Sound Transit continued to make strides in reducing its greenhouse gas (GHG) emissions, with total operational emissions decreasing by 5% from 2022 to 2023. The decrease is driven by Sounder and ST Express fuel use reductions. From 2022 to 2023, both services saw a 5% and 10% decrease in GHG emissions, contributing to the agency's broader efforts to minimize its carbon footprint in alignment with regional and global climate goals.

Water Use:

- **Water Conservation Success:** Despite a warmer year with increased cooling degree days, Sound Transit successfully reduced water consumption by 5% from 2022 to 2023. This achievement reflects the agency's ongoing commitment to resource efficiency and the effectiveness of its water conservation measures in the face of climate variability.

Waste Management:

- **Progress in Waste Diversion:** The agency made significant progress in waste management, with the amount of waste diverted from landfills increasing by 34% from 2022 to 2023. However, overall waste generation also rose by 21%, indicating both an increase in operational activity and a growing emphasis on waste management practices. The resulting waste diversion rate of 39%, up from 35% in 2022, demonstrates Sound Transit's enhanced focus on sustainability in its operational practices.

Notes on Appendix A: This document illustrates resource use trends over time from two baseline years: **2011**, when Sound Transit adopted its first Sustainability Plan, and **2018**, to reflect substantial system expansion and the baseline for key performance indicators established in the 2019 Sustainability Plan update. It also shows year-over-year changes from the preceding inventory year, 2022. In the following graphs, solid bars indicate total emissions, resource use, and resource costs. The trend lines show the normalized resources, either per PMT or per VRM, over time. Most graphs include seven years of data to illustrate trends.

Ridership and Level of Service

While Sound Transit’s service levels in 2023 approached pre-pandemic levels, total passenger trips and passenger miles traveled (PMT) have yet to recover fully, remaining nearly 40% below 2019 levels. The 22% increase in PMT from 2022, coupled with a 15% rise in unlinked passenger trips, reflects a positive trend but also underscores the lingering effects of the pandemic. As remote and hybrid work arrangements become entrenched, transit agencies like Sound Transit must adapt to new commuting patterns.

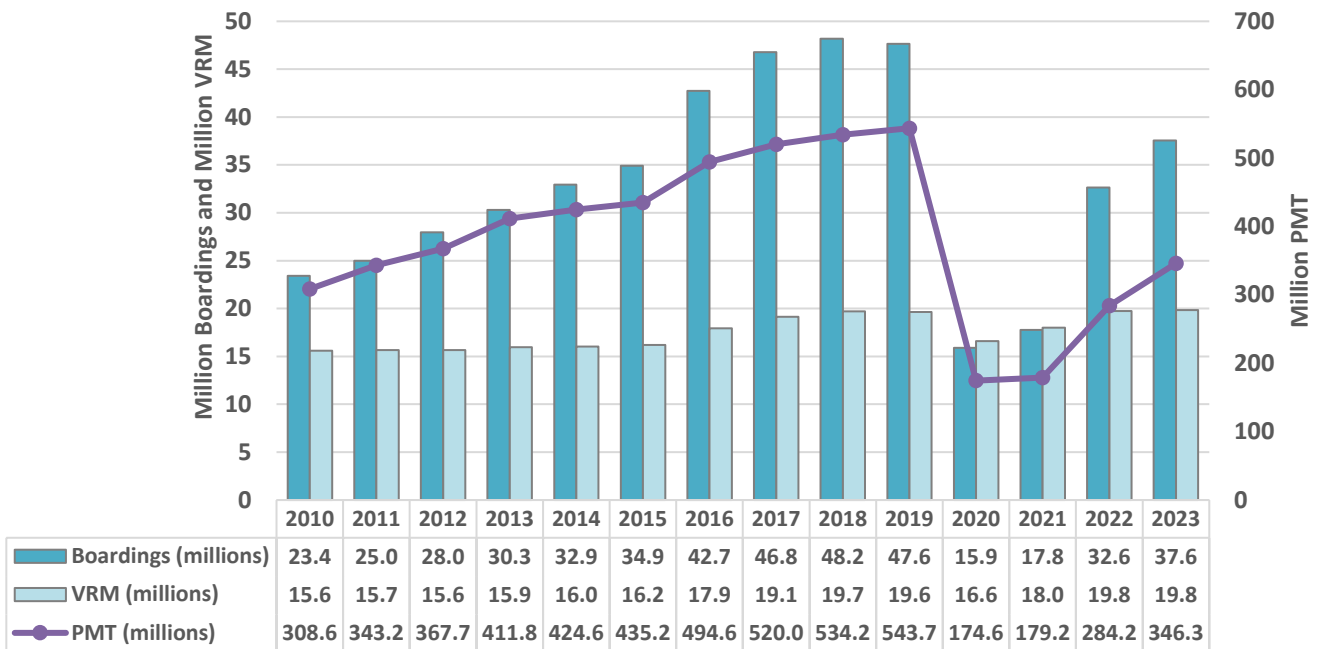
- Since the 2011 baseline, ridership measured in boardings has increased 50% and VRM increased 27%.
- Compared to 2018, boardings decreased by 22%, and ridership (PMT) decreased by 35%, while VRM remained relatively unchanged (+1%). From 2022 to 2023, boardings increased 15%, and VRM remained stable (+0.4%).
- While ST Express and Sounder ridership has decreased compared to pre-pandemic levels, Link light rail ridership in 2023 has now exceeded pre-pandemic levels.

Ridership has important implications for resource use. As Sound Transit’s network expands, the agency anticipates total resource use will increase. To account for the growth of Sound Transit’s service network while also interpreting resource efficiency trends over time, the Sustainability Inventory normalizes data by the level of service provided by the agency (VRM), the number of unlinked passenger trips (boardings or UPT) and the volume and distance of overall ridership (PMT).

Boardings and PMT have generally increased year-over-year throughout the agency’s history. However, 2020 saw the agency’s first steep decline in ridership due to the COVID-19 pandemic. Apart from Tacoma Link, VRM in 2020 fell significantly across all services, and boardings fell across all services. These levels increased only slightly in 2021, and more substantially in 2022.

In 2023, ridership rose compared to recent years but remains below pre-pandemic levels. Figure 1 below shows the trends of boardings, VRM, and PMT over time.

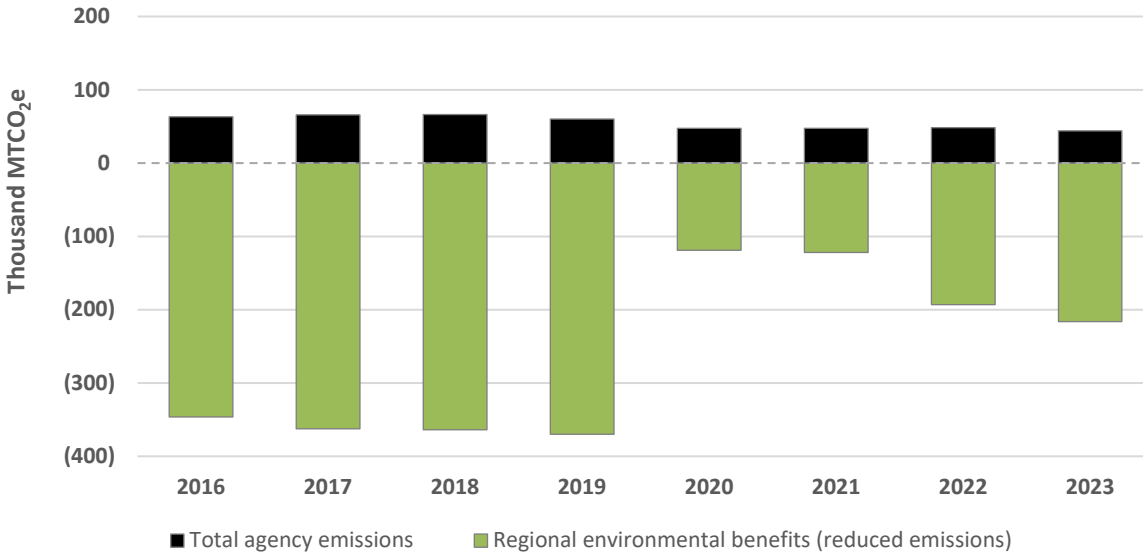
Figure 1. Boardings, VRM, and PMT by Year



Regional Environmental Benefit

Increased transit use reduces regional environmental impacts from passenger vehicles. As more people choose transit over driving, fuel consumption and GHG emissions are reduced. Avoided GHG emissions are a measure of the regional environmental benefit enabled by transit. Sound Transit uses a 2018 methodology developed by the American Public Transportation Association (APTA) to account for emissions avoided due to transit ridership, measured in metric tons of carbon dioxide equivalent (MTCO_{2e}), as shown in Figure 2 and Table 1.

Figure 2. Regional GHG Emissions (MTCO_{2e}) Avoided by Sound Transit Services



As seen in Figure 2 above, even though Sound Transit has had lower ridership since the start of the pandemic in 2020, its transit services still displace more GHG emissions than they emit from operations. For every ton of GHG emissions Sound Transit produced from operations in 2023, the region avoided 4.9 times the metric tons of emissions through the benefits of transit. The regional environmental benefits shown in green in Figure 2 include the benefits from people taking transit instead of driving (mode shift) and reduced emissions associated with denser land use patterns supported by transit. Prior to the pandemic-induced decline in ridership, these benefits were 5 to 6 times the agency’s operational emissions, in black.

Table 1. Regional GHG Emissions (MTCO_{2e}) Avoided by Sound Transit Services, 2023

Regional MTCO _{2e} Reduced		
Mode Shift Benefits	Land-Use Benefits	Total Benefits
40,654	175,462	216,116
Avoided Emission Ratios – CO _{2e} units reduced in the region per unit of CO _{2e} from Sound Transit operations		
Mode Shift Benefits	Land-Use Benefits	Total Benefits
0.89	3.82	4.71

The definitions for each of the identified types of benefits are below:

- **Mode shift benefits** measure the reduced GHG emissions (amount avoided) resulting from shifting from one mode of transportation (single occupancy vehicle) to another (transit), measured on a PMT basis.
- **Land use change benefits** measure the reduced carbon emissions due to the denser land use patterns supported by transit systems.

Resource Use

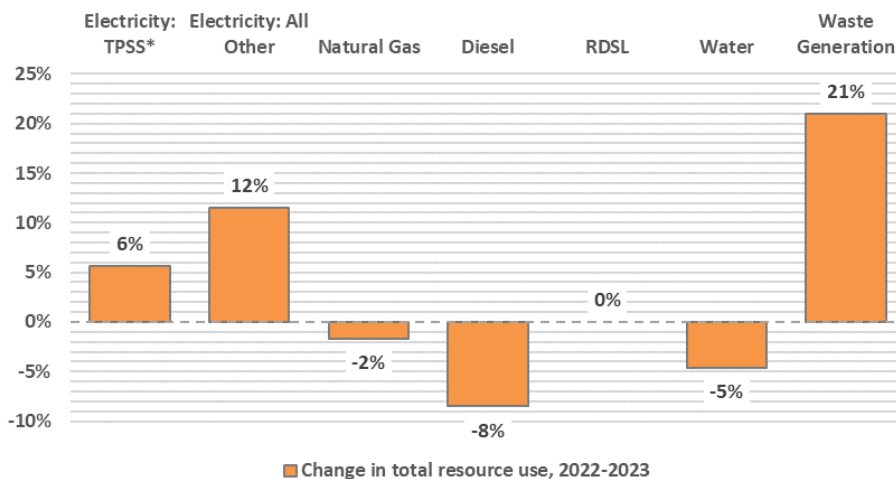
Total agency resource use has generally increased over time, reflecting the expansion of the Sound Transit system.

In 2023, Sound Transit achieved a slight overall reduction in energy consumption despite an increase in facility energy use, showcasing the agency's efforts to balance service expansion with energy efficiency. Total agency energy use—encompassing electricity, fleet fuel, and natural gas—decreased by 1% from 2022 and by 5% compared to 2018, marking steady progress toward sustainability goals.

Most increases in resource use have been directly in line with increased service levels and use of revenue fleet vehicles. In response to public health restrictions and diminished ridership during the COVID-19 pandemic, Sound Transit reduced service levels significantly in 2020, and resulting resource use declined across most metrics. As ridership and service levels rose from 2021 through 2023, resource use rebounded. Moreover, when standardized by PMT, Sounder, ST Express, and Link light rail resources uses have all decreased in recent years indicating that resource efficiency is also increasing. Figure 3 below shows the change in total resource use from 2022 to 2023.

- Total traction power electricity consumption (for Link light rail propulsion) remained relatively stable, increasing 6% from 2022 to 2023, while facility electricity consumption increased by 22%. Since 2018, traction power has increased 78% and facility electricity usage has increased 38%, reflecting increased service levels and the opening of Northgate Link in 2021. Traction power electricity consumption has increased 355% since 2011, while facility electricity has increased 60% during that time, reflective of increased service levels and opening of new light rail facilities. Increases in facility electricity consumption are driven by higher usage in administrative facilities (particularly 705), new customer facility accounts for Link's downtown tunnel stations, and the opening of the Tacoma Link Hilltop extension.
- Total agency diesel consumption declined by 8% from 2022 to 2023. Diesel consumption is down 29% from 2018 levels and down 39% relative to the 2011 baseline due to increased reliance on CNG and renewable diesel.
- Facility natural gas consumption decreased 2% from 2022 to 2023. This reduction is reflected in heating degree days. This measure of how cold it was during the heating season decreased 4% from the previous year. Facility natural gas consumption has increased 74% since 2018 and increased 189% since 2011, largely attributable to the openings of maintenance facilities such as the OMF East Link in 2021.
- Total water use decreased by 5% from 2022 to 2023, while cooling degree days (an indication of hot weather) increased by 2%. Water use has decreased by 16% since 2018 and decreased 11% relative to the 2011 baseline.
- Waste generation (recycling, compost, and waste to landfill) increased 21% from 2022 to 2023. Waste generation has increased 10% since 2018 and remained stable when compared to the 2011 baseline. The diversion rate (recycling and compost as a percentage of total waste generation) in 2023 was 39%, up from 35% in 2022. Diversion at office buildings, where the majority of agency staff work, was much higher than the agencywide rate, at 70% in 2023.

Figure 3. Change in Total Resource Use, 2022-2023



Fleet Energy Use

A notable 5% reduction in revenue fleet energy use from 2022 to 2023 was driven by efficiency improvements and service adjustments. The Sounder commuter rail service, for instance, reduced fuel consumption by 5% due to lower service levels, while the ST Express fleet achieved a 9% reduction, reflecting enhanced fleet efficiency. However, the expansion of Link light rail service led to a 6% increase in traction power consumption, highlighting the trade-offs between service expansion and energy use.

- Since the 2011 baseline, fleet energy use (including ST Express buses, Sounder commuter rail, Link light rail traction power, and non-revenue vehicles) has increased by 8%, with substantial expansions in overall service.
- Relative to 2018, fleet energy use has decreased by 11%, reflecting post-pandemic dip in overall ridership.
- From 2022 to 2023, total fleet energy use decreased by 4%, reflecting increases in fleet efficiency.
- Per VRM, fleet energy use has declined 4% since 2022 and 14% since 2011, largely due to service level increases.
- Also reflecting increases in efficiency, fleet energy use per PMT decreased 4% from 2022 to 2023, as ridership returned from pandemic lows, but was 31% higher than the 2011 baseline. In 2023, total fleet energy use decreased somewhat over 2022 levels, while energy use per PMT and per VMR decreased with similar trends, though they have not returned to pre-pandemic levels.

Prior to the COVID-19 pandemic, total fleet energy use (standardized in MMBTU) across Sound Transit's three modes—ST Express bus, Sounder commuter rail, and Link light rail—had been increasing slowly over time as more service was provided. Service became more efficient per PMT as system ridership grew faster than level of service (VRM). From 2021 to 2023, fleet energy use per PMT has trended downward, slowly returning towards pre-pandemic levels.

Fleet Energy Use by Mode. In 2023:

- Traction power electricity use for Link light rail increased 6% from 2022, increased 78% from 2018, and increased 355% since 2011.

Diesel fuel use for Sounder commuter rail was down 5% from 2022 and up 12% from 2011 levels (driven by a 10% increase in service levels since 2011). Sounder fuel use decreased 10% from 2018. Starting in March 2020, Sounder reduced service levels and suspended special event service (e.g., for sporting events). Service levels have increased since that time to nearly 90% of pre-pandemic levels.*

- Diesel fuel consumption for ST Express buses decreased 23% from 2022, decreased 42% from 2018, and decreased 41% from 2011 levels.
 - When normalized by Passenger Miles Traveled (PMT), ST Express diesel consumption decreased by 40% from 2022. However, when normalized by Vehicle Revenue Miles (VRM), ST Express diesel consumption increased by 30%. This indicates that efficiency improved when measured per PMT but declined when measured per VRM during this timeframe.
 - The composition of the ST Express fuel mix has changed over time. CNG used in ST Express buses has increased from 6% of total ST Express fleet energy consumption in 2011 to 18% in 2023, as the result of a growing prevalence of CNG buses in the Pierce Transit-operated portion of the ST Express fleet.
 - In 2023, diesel buses reduced energy consumption 23% from 2022 levels, while CNG buses increased energy consumption by 29%, due to increases in usage. Using CNG instead of diesel fuel reduces total GHG emissions and most criteria air pollutant (CAP) emissions, including particulate matter (PM) and NOx. Alternatively, CNG use does increase carbon monoxide (CO) emissions. (Air pollutants are discussed in more detail starting on page A11.)
 - In 2023, renewable diesel (R99) was introduced into the Pierce Transit operated portion of the ST Express fleet and accounted for 8% of ST Express fleet energy consumption.

* Note that replacement "bus bridge" service is now categorized with ST Express (including for previous years), rather than Sounder, per updated guidance.

Figure 4 and Figure 5 below show the trends in fleet energy use over time. Table 2 below shows the change in energy use by mode, as well as the change in efficiency (fuel use normalized by PMT and VRM for each mode).

Figure 4. Revenue Fleet Energy Use (Normalized by PMT)

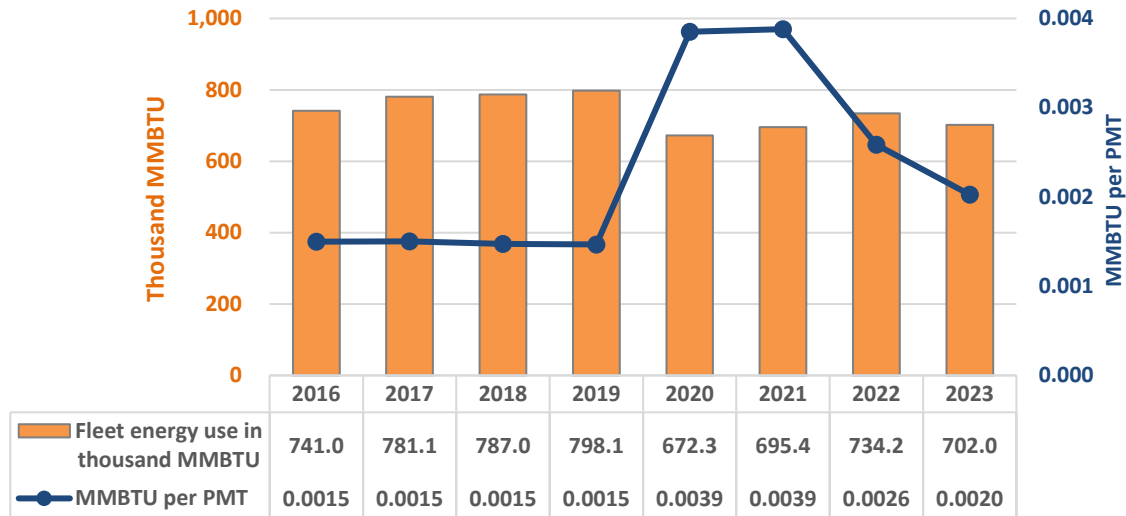


Figure 5. Revenue Fleet Energy Use (Normalized by VRM)

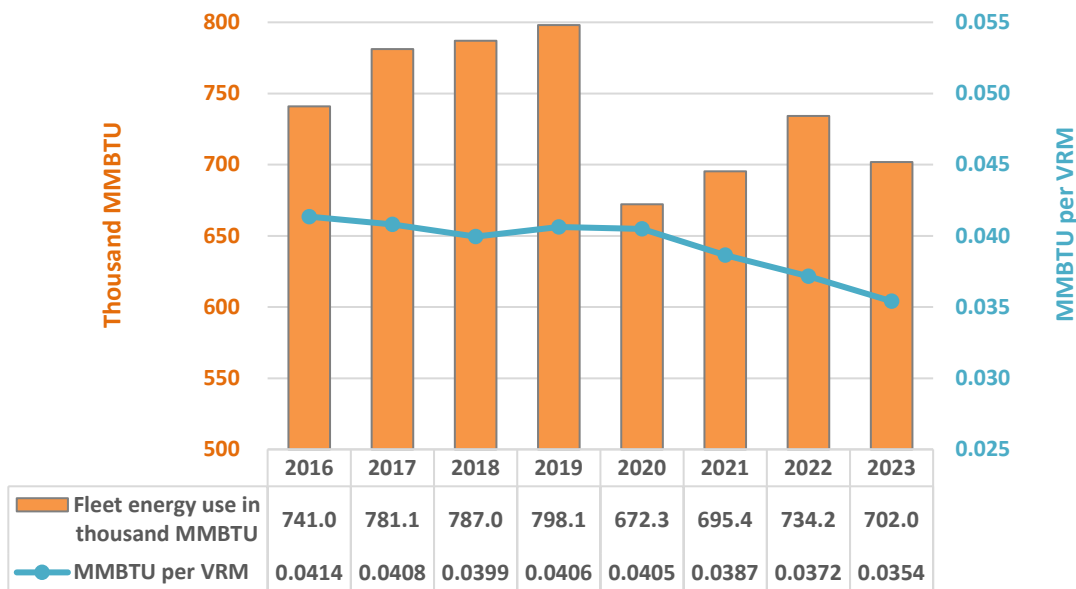


Table 2. Change in Energy Use by Mode, 2022-2023

Mode	% Change in Total Energy Use	% Change in Energy Use per PMT	% Change in Energy Use per VRM
Sounder Commuter Rail (diesel)	-5%	-31%	5%
ST Express Buses (diesel, R99, and CNG)	-9%	-29%	-9%
Link light rail traction power (electricity)	6%	-9%	1%

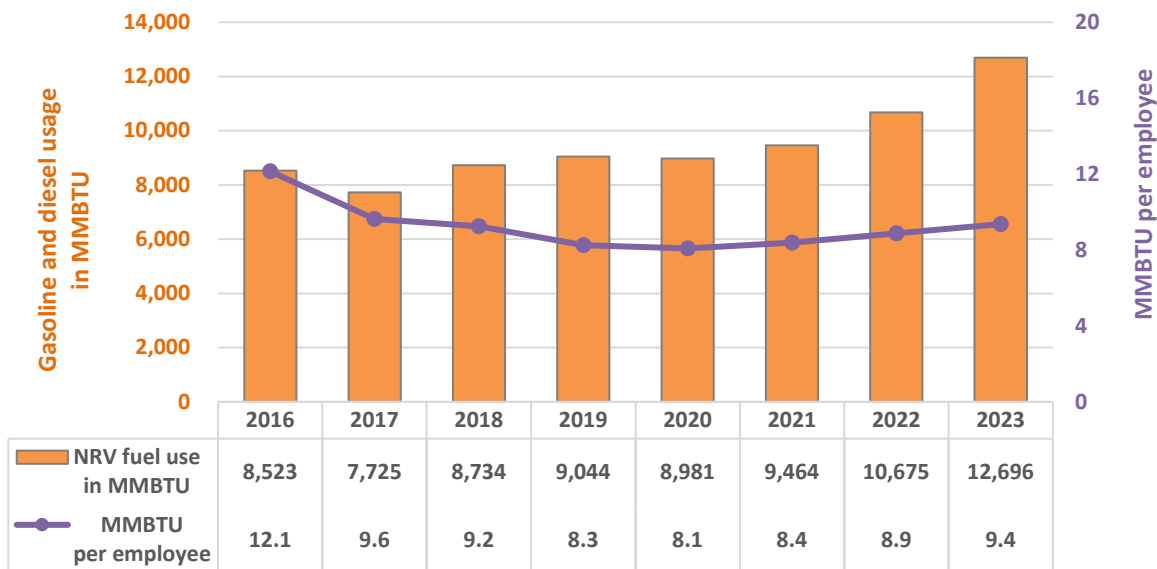
Note: Mode energy use is normalized by PMT and VRM specific to each mode.

Non-Revenue Vehicle (NRV) Fleet Energy Use

- From the 2011 baseline, NRV fleet energy use has increased by 60% overall but decreased by 38% per employee, as staff size has significantly grown.
- Since 2018, NRV energy use has increased 45% and increased 1% per employee.
- From 2022 to 2023, NRV energy use increased by 19% overall, while increasing by 6% per employee. This is due to more employees resuming office use and increased NRV fleet use in advance of two new major projects opening in 2024.

Energy use for the agency’s NRV fleet has grown moderately over time, as the NRV fleet and employee headcount has grown, as shown in Figure 6. While the agency’s headcount has increased every year, contributing to more driving of NRV fleet vehicles, Sound Transit has also purchased more hybrid and electric vehicles, helping to reduce per-mile and per-employee energy use and air pollutant emissions. The agency encourages employee carpooling or transit whenever feasible.

Figure 6. NRV Fleet Energy Use (in MMBTUs)



Facility Energy Use

- Total facility energy use increased by 71% in 2023 compared to the 2011 baseline and rose 43% since 2018.
- From 2022 to 2023, total facility energy use rose 18%, primarily due to increased electricity consumption in administrative buildings, new accounts for the downtown tunnel stations, and customer facilities openings such as the Lynnwood City Center Garage and Hilltop District Station.
- Facilities built before 2018 decreased energy consumption by 0.2% in 2023 relative to a 2018 baseline, though usage varied substantially among individual facilities, with some showing large increases (e.g., Kirkland Transit Center, Auburn Warehouse) and others showing decreases (e.g., Tukwila Sounder Station, Mercer Island Park and Ride).*

Although many Sound Transit facilities remained operational throughout the pandemic, many of Sound Transit’s office staff worked remotely starting in March 2020. Some staff returned to the office in 2021 and more in 2022, though overall office

* 2019 Sustainability Plan Key Performance Indicator

utility consumption has remained lower than pre-pandemic levels. Sound Transit is continuing the process of downsizing and consolidating its office space use.

From 2022 to 2023, total facility electricity increased by 22%, but varied substantially by line of business, with decreases in ST Express facilities and increases in Link light rail facilities. Electricity consumption is also subject to external factors like weather. In 2023, heating degree days decreased 4% from 2022, and cooling degree days increased by 2%.

Changes in electricity by facility type include:

- Link light rail facilities increased electricity consumption by 6% from 2022 to 2023.
- Sounder facilities' electricity consumption remained stable from 2022 to 2023.
- Across owned and leased properties, Sound Transit administrative facilities increased electricity consumption in 2023 by 81%, driven by an increase in usage at 705 Union Station.
- ST Express facilities' electricity consumption decreased by 4% from 2022 to 2023 but still exceeded pre-pandemic levels.

Figure 7. Facility Energy Use (Normalized by PMT)

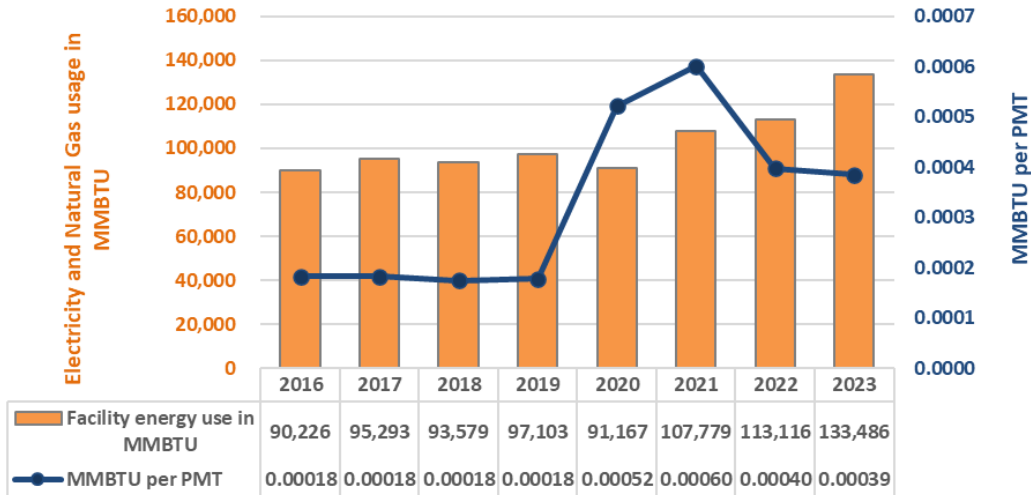
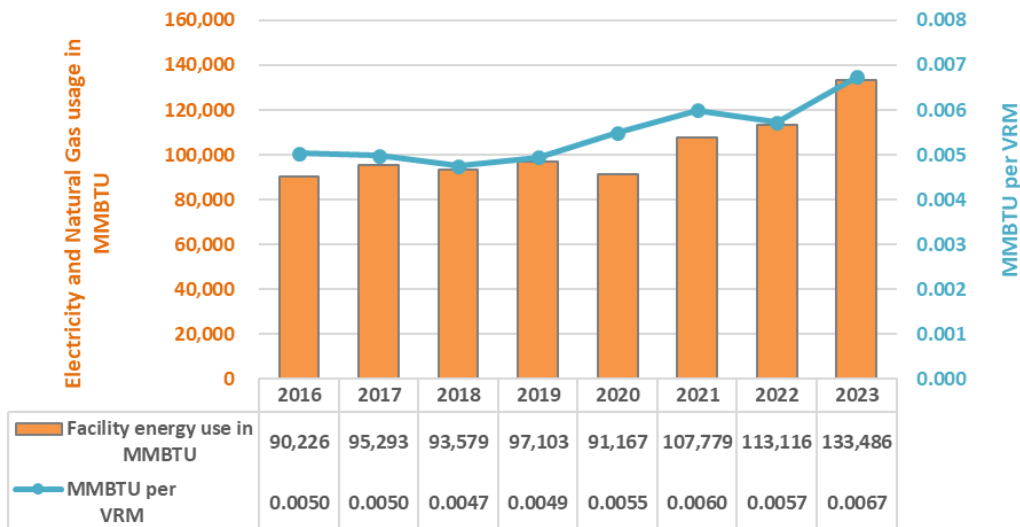


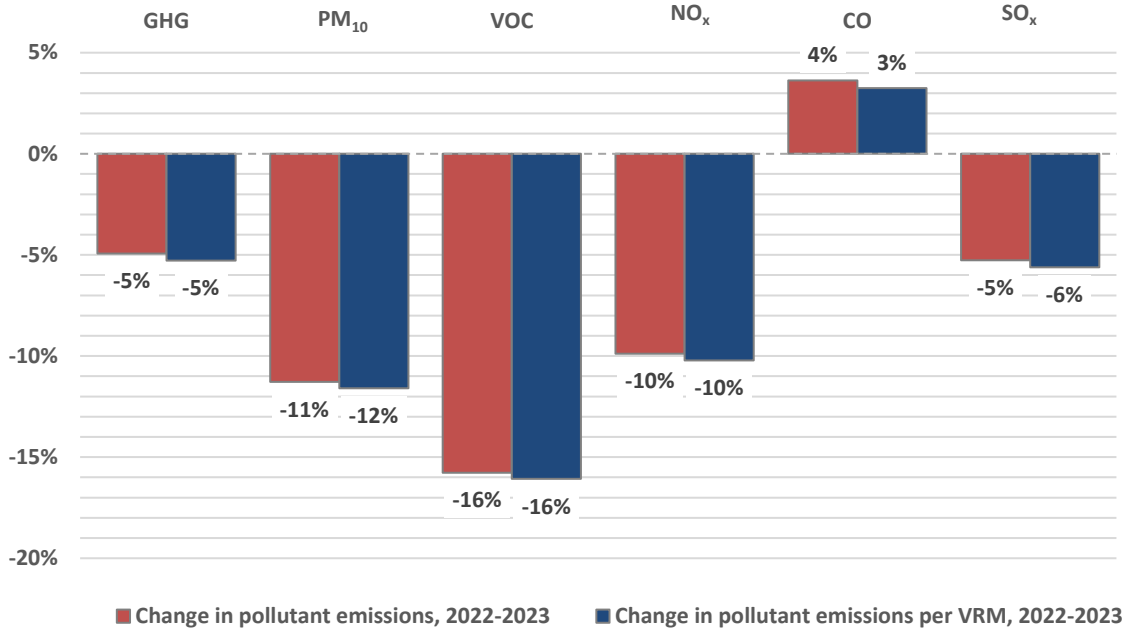
Figure 8. Facility Energy Use (Normalized by VRM)



Air Pollutant Emissions

The sections below illustrate the trends in GHG emissions and Criteria Air Pollutant (CAP) emissions from Sound Transit vehicle and facility operations. Figure 10 below shows the total percentage change and the change normalized per VRM by pollutant type from 2022 to 2023. As noted above, agency VRM increased by 0.4% from 2022 to 2023.

Figure 10. Changes in Pollutant Emissions, 2022-2023; Change in Pollutant Emissions per VRM, 2022-2023



GHG Emissions

Sound Transit continued to make strides in reducing its greenhouse gas (GHG) emissions, with total operational emissions decreasing by 5% from 2022 to 2023. The decrease is driven by Sounder and ST Express fuel use reductions. From 2022 to 2023, both services saw a 5% and 10% decrease in GHG emissions, contributing to the agency’s broader efforts to minimize its carbon footprint in alignment with regional and global climate goals.

- Since the 2011 baseline, total agency GHG emissions have decreased by 24%, even with substantial growth in service over that time.
- Relative to 2018, agency GHG emissions have decreased 31%.*
- From 2022 to 2023, agency GHG emissions decreased 5%, even while service increased and ridership rebounded from pandemic declines.

As Sound Transit service and ridership increased from 2011 through 2019, total agency GHG emissions in MTCO_{2e} remained relatively stable overall, and normalized emissions were declining as ridership and service increased. In 2020, multiple factors caused a drop in absolute agency GHG emissions and an increase in GHG emissions per PMT as ridership levels dropped, pictured in Figure 10. Decreased service levels led to reduced fuel consumption, while the substantial drop in ridership drove normalized metrics upward. In 2023, total emissions decreased by 5%, while emissions normalized per PMT decreased by 22% relative to the prior year and emissions per VRM decreased by 5%.

* 2019 Sustainability Plan Key Performance Indicator

Figure 11. Agency GHG Emissions (Normalized by PMT)

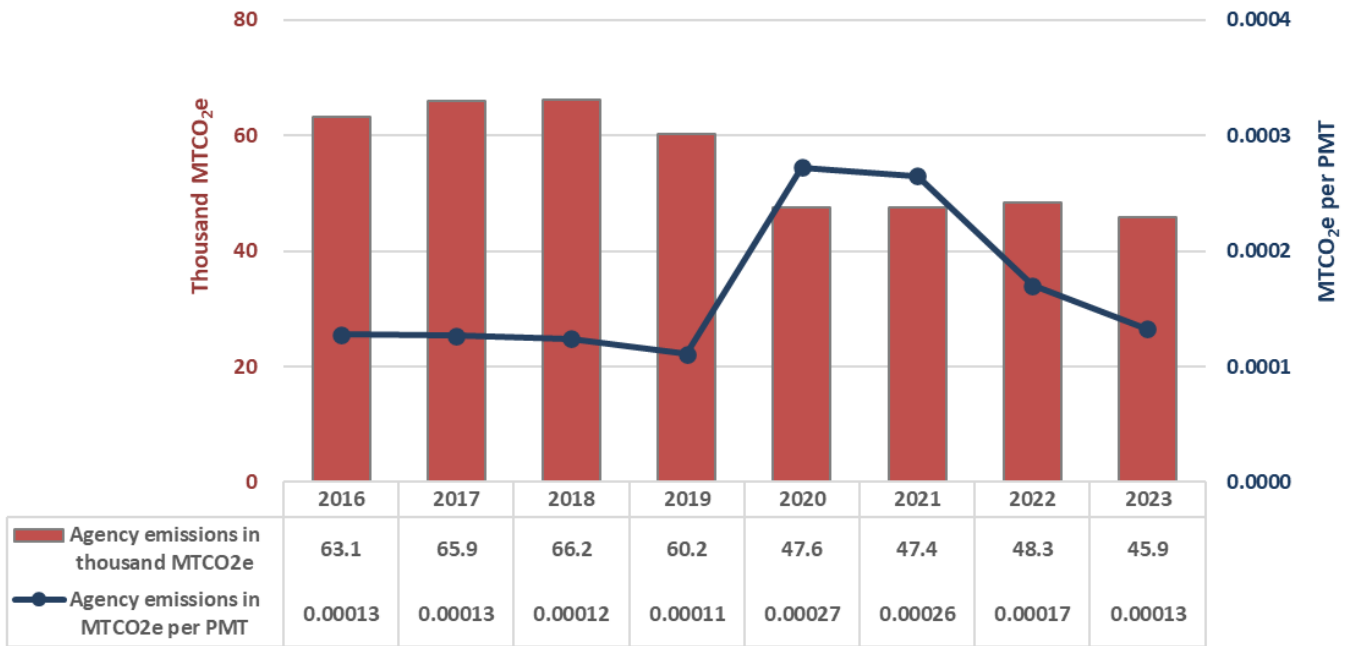


Figure 12. Agency GHG Emissions (Normalized by VRM)

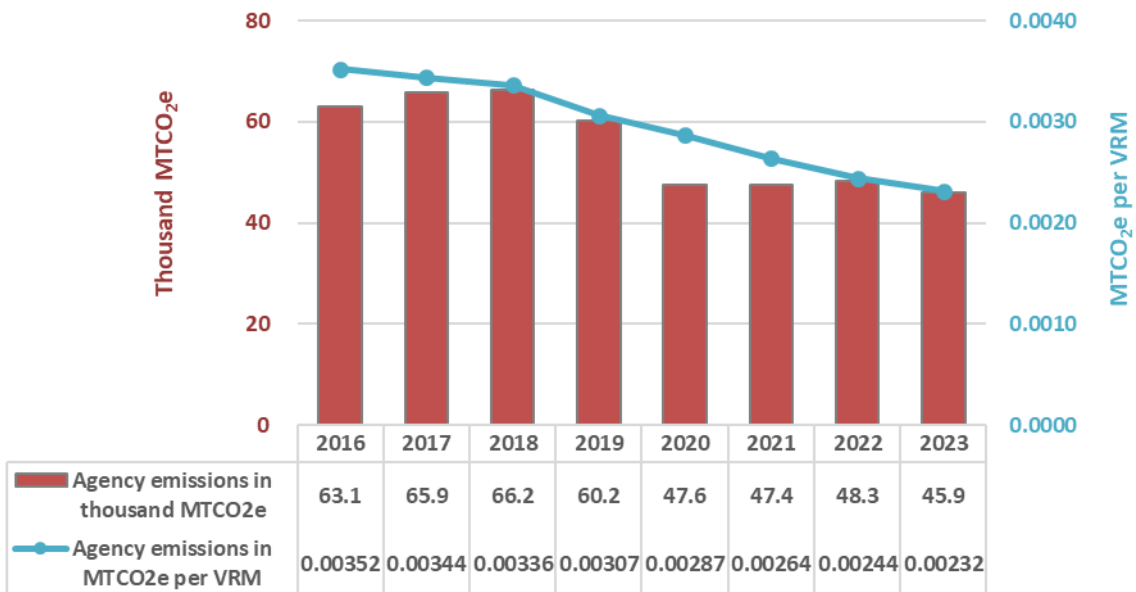
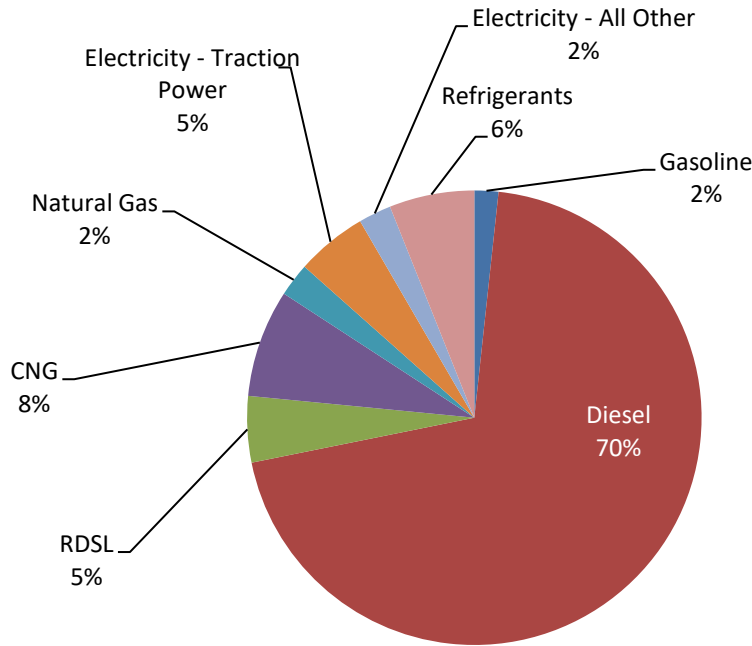


Figure 13. GHG Emissions (Scope 1 and 2) by Source, 2023



Criteria Air Pollutants (CAPs)

- From the 2011 baseline, total combined CAPs have decreased by 65%.
- From the 2011 baseline, all individual CAP emissions have decreased substantially (with decreases ranging from 51% to 79%), apart from SO_x, which has increased by 5% and shown greater inter-annual variability.
- Since 2018, total CAPs have decreased by 7%.*
- From 2022 to 2023, total CAPs have decreased by 6%.
- Contributions to CAPs varied by mode of transit, and service levels varied from 2022 to 2023.
 - VRM for ST Express Bus service decreased by 1% and Sounder Commuter Rail decreased by 10%, while Tacoma Link increased 88% and Central Link light rail increased 3%.
 - The associated changes in CAP emissions were also mixed.
 - Particulate matter (PM₁₀) decreased 11% and volatile organic compounds (VOCs) decreased 16%, nitrogen oxides decreased 10%, and sulfur oxides (SO_x) decreased 5%, while carbon monoxide (CO) increased 4%.

Table 3. Change in CAP Emissions

Pollutant	Change 2011–2023 (Absolute)	Change 2018–2023 (Absolute)	Change 2022–2023 (Absolute)
PM ₁₀	-72%	-30%	-11%
VOCs	-79%	-28%	-16%
NO _x	-51%	-11%	-10%
CO	-77%	5%	+4%
SO _x	+5%	-15%	-5%
Total Combined CAPs	-65%	-7%	-6%

* 2019 Sustainability Plan Key Performance Indicator
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Sound Transit’s long-term reduction in CAP emissions has been driven by ST Express’s shift from reliance on diesel buses to diesel-electric hybrids, CNG, and renewable diesel buses, as well as toward clean electrically powered light rail and general improvements in emission controls. The agency has also upgraded all Sounder commuter rail engines to reduce air pollution.

The figures below show the absolute and normalized change in PM₁₀ and CO emissions over time. These CAPs are down 72% and 77% since 2011, respectively.

Figure 14. Particulate Matter (PM₁₀) Emissions (Normalized by PMT)

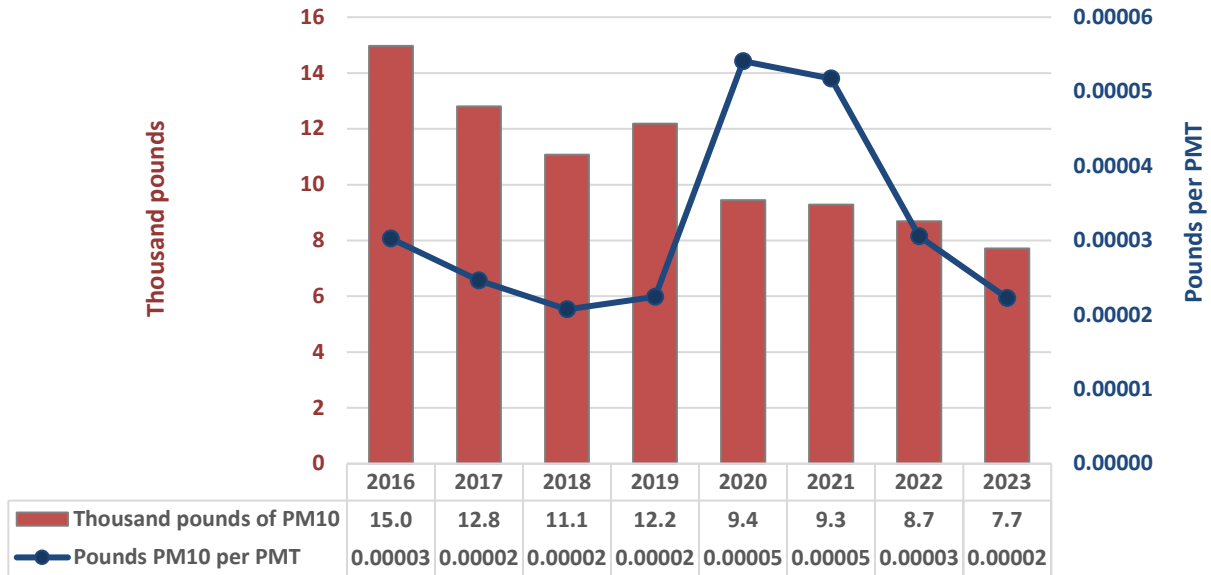


Figure 15. Particulate Matter (PM₁₀) Emissions (Normalized by VRM)

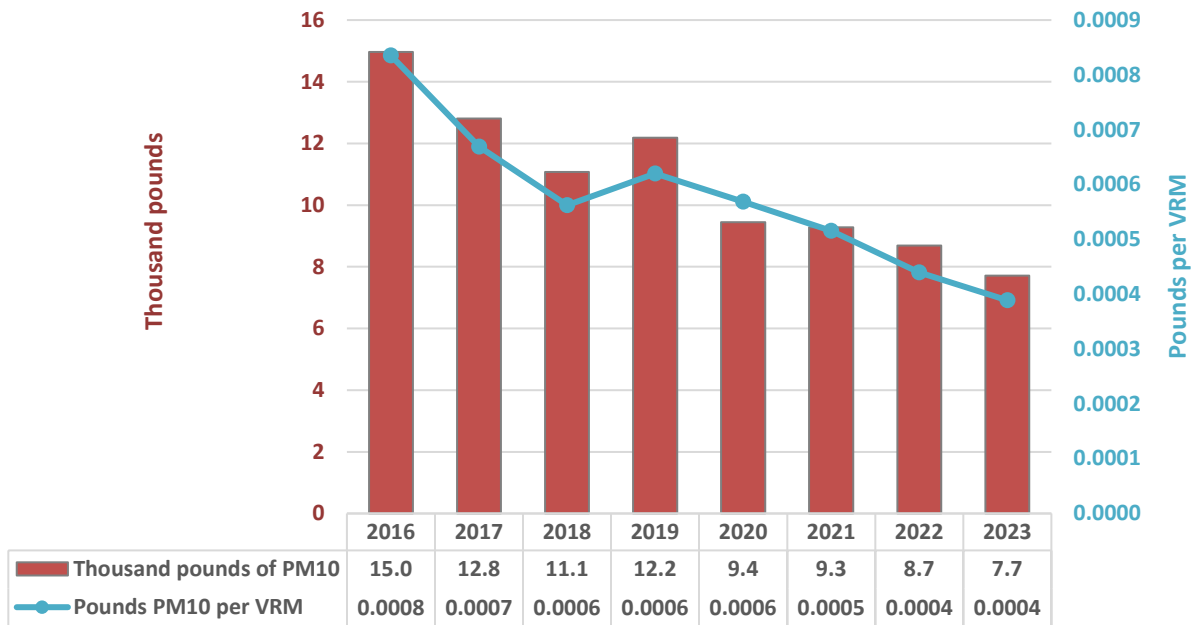


Figure 16. Carbon Monoxide (CO) Emissions (Normalized by PMT)

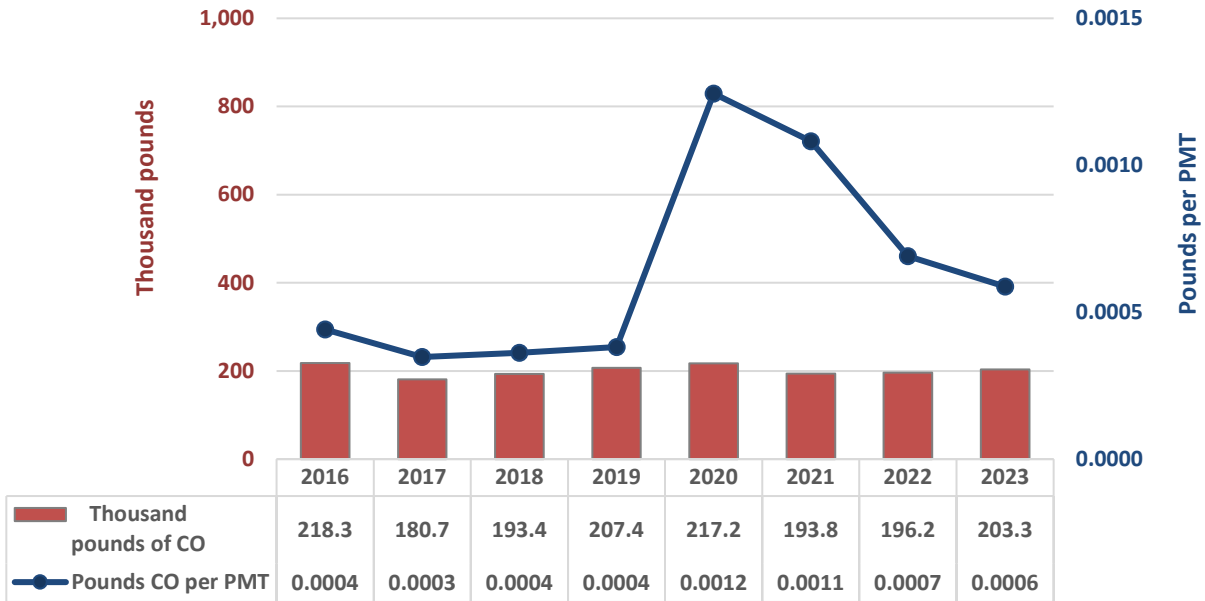
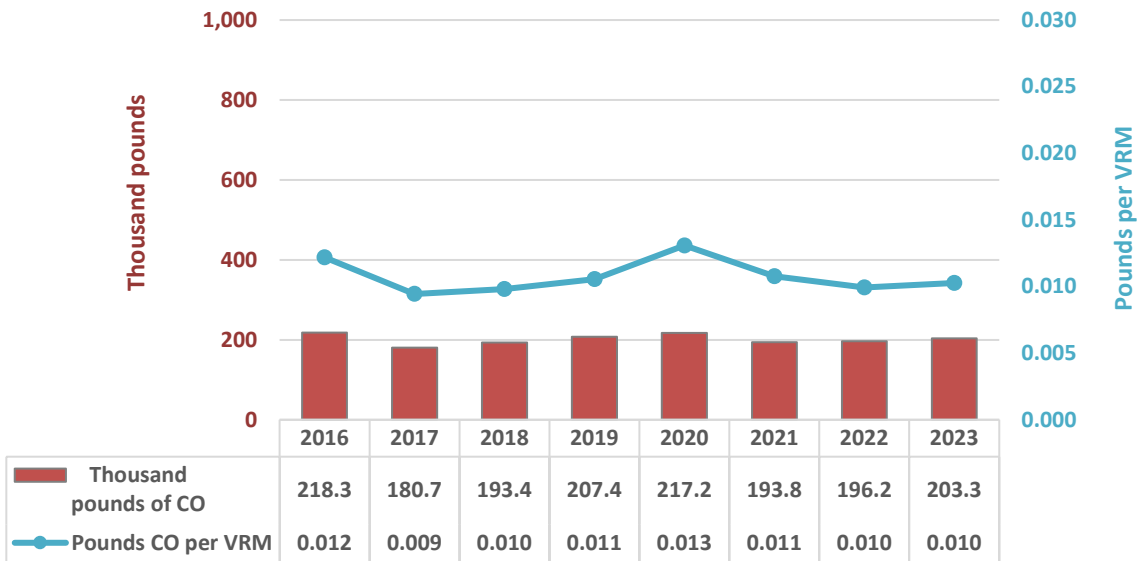


Figure 17. Carbon Monoxide (CO) Emissions (Normalized by VRM)

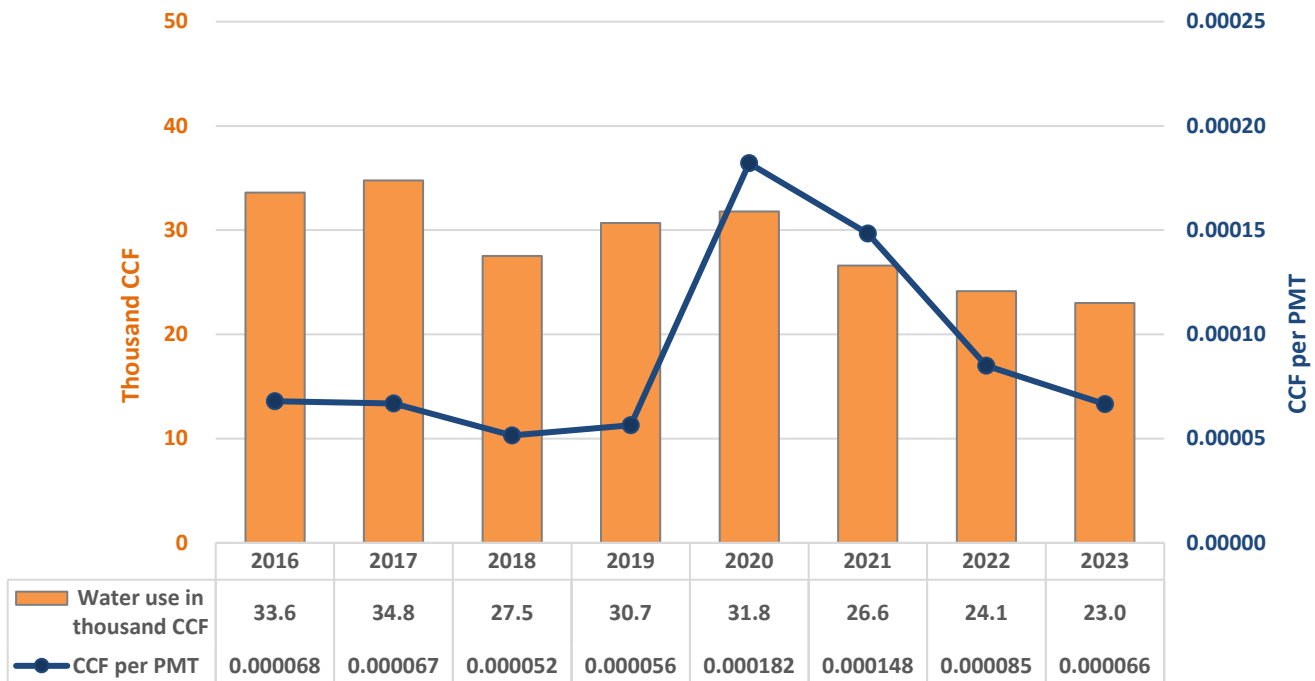


Water Use

Despite a warmer year with increased cooling degree days, Sound Transit successfully reduced water consumption by 5% from 2022 to 2023. This achievement reflects the agency's ongoing commitment to resource efficiency and the effectiveness of its water conservation measures in the face of climate variability.

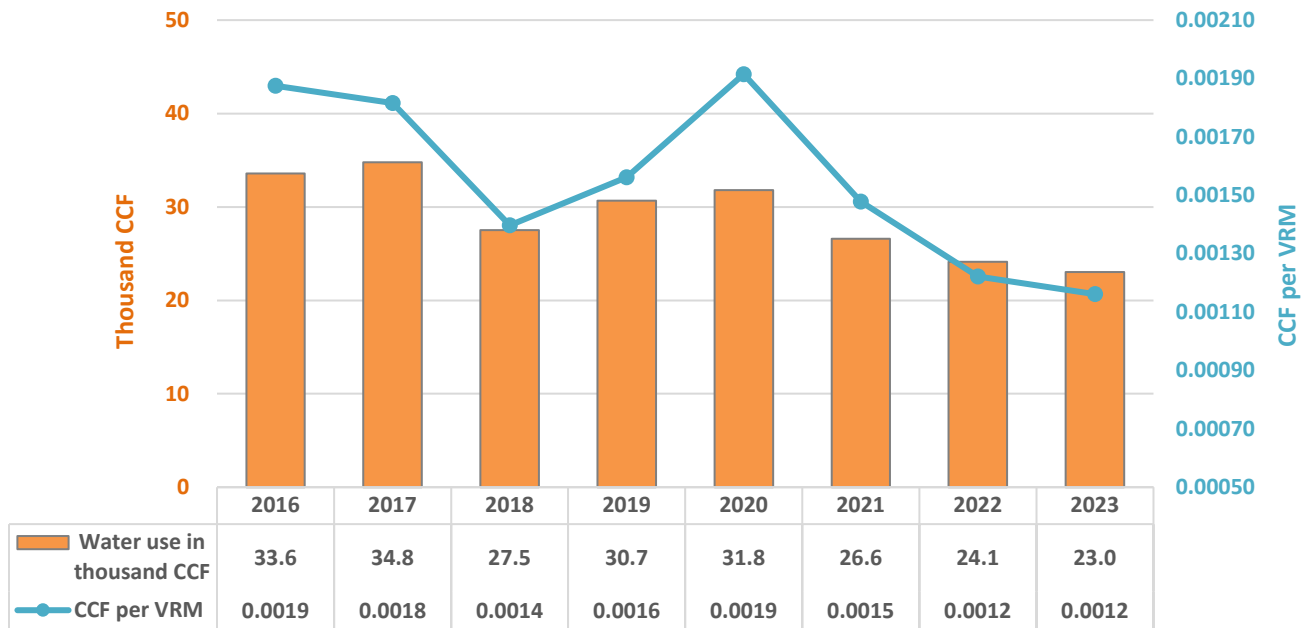
- Since 2011, total water use has decreased by 11% and decreased by 16% since 2018.*
- From 2022 to 2023, water use decreased by 5%. (Some data quality corrections were made to 2021 data.)
- Total agency water use is primarily driven by landscape irrigation and is therefore variable from year to year, with weather and landscape planting cycles.
- Changes in agency water consumption from the prior year varied across agency functions in 2023. Maintenance facilities decreased water consumption by 25% from the prior year. Customer facilities increased consumption by 3%, and administrative facilities increased water consumption by 10%.

Figure 18. Water Use (Normalized by PMT)



Note: 1 CCF equals 100 cubic feet, or 748 gallons

Figure 19. Water Use (Normalized by VRM)



Waste Generation

The agency made significant progress in waste management, with the amount of waste diverted from landfills increasing by 34% from 2022 to 2023. However, overall waste generation also rose by 21%, indicating both an increase in operational activity and a growing emphasis on waste management practices. The resulting waste diversion rate of 39%, up from 35% in 2022, demonstrates Sound Transit’s enhanced focus on sustainability in its operational practices.

- Since 2011, total waste generation (including recycling, compost, and waste to landfill) is generally trending downward, but when compared directly to the 2011 baseline, the 2023 total is nearly the same.
- Relative to 2018, waste generation has increased by 10%.
- From 2022 to 2023, waste generation increased 21%.
- The diversion rate in 2023 was 39%, up from 35% in 2022. Diversion at office buildings, where the majority of agency staff work, was much higher than the agencywide rate, at 70% in 2023.*

Inter-annual variability is evident in Sound Transit’s waste generation trend, with 2023 seeing the highest waste generation in Sound Transit facilities since 2014. This increase is largely due to higher service levels and an increase in agency staff. Despite this, the total amount of garbage sent to landfill has decreased by 8% over the same period. The portion of recyclables and compost diverted from the landfill (diversion rate) has fluctuated, reaching a low of 31% in 2012 and a high of 39% in 2021. The diversion rate in 2023 matched the 2021 high of 39%.

Sound Transit has worked to improve solid waste diversion from landfill, including enhancing employee recycling education and implementing paper towel composting in the restrooms at agency offices. The shift of administrative staff to remote work in 2020 decreased office recycling and composting volumes as a component of the total agency waste stream. However, in 2023, recycling and composting quantities reached back to pre-pandemic levels.

* 2019 Sustainability Plan Key Performance Indicator
Sound Transit 2023 Sustainability Trends Memo—Appendix A

- Composting quantities in 2023 increased 33% from the prior year, and recycling quantities increased 35%, while the agency's total diversion rate during that period increased from 35% to 39%.
- Waste diversion rates for central office facilities are substantially higher than for other facilities. As depicted in Table 4 below, the diversion rate for central office facilities remained in the 70-73% range prior to the pandemic but sank to 51% in 2020 with the move of the administrative staff to remote work. In 2021 and 2022, the central office diversion rate rose to 73% as staff returned to office.

Figure 20. Waste Generation and Diversion, Tons and Diversion Rate (Percentage)

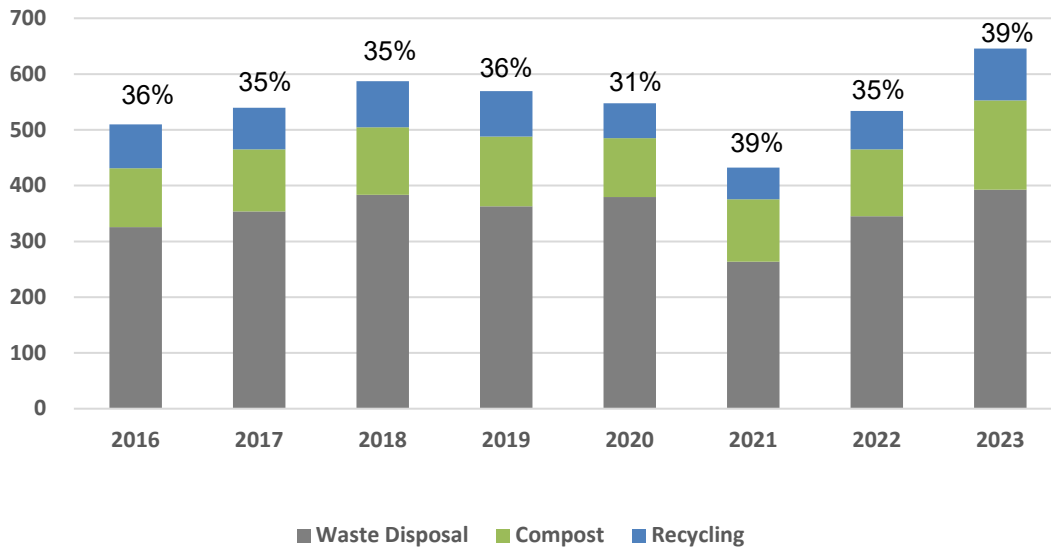


Table 4. Waste Diversion Rates by Facility Type

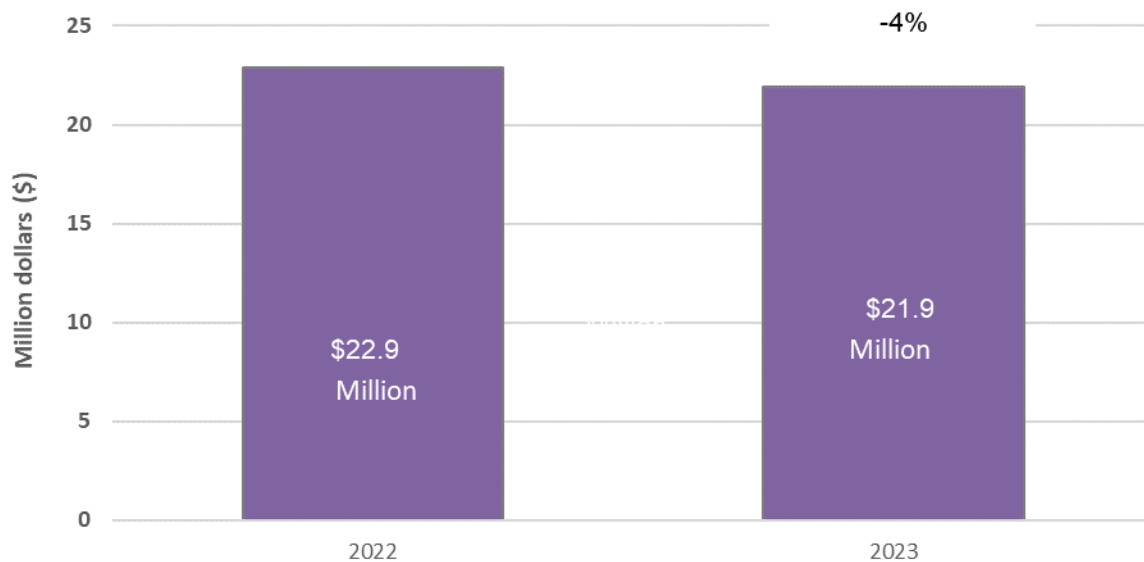
Year	Central Office	Other Facilities	Total
2015	64%	25%	35%
2016	67%	24%	36%
2017	60%	24%	35%
2018	64%	24%	35%
2019	64%	24%	36%
2020	51%	23%	31%
2021	73%	29%	39%
2022	73%	29%	35%
2023	70%	23%	39%

Fuel and Utility Expenses

- Since the 2011 baseline, combined agency utility and fuel costs (operating expenses) have increased by 36%.
- Relative to 2018, operating expenses have increased by 44%.
- From 2022 to 2023, operating expenses decrease by 4%.

Resource costs across categories have generally trended upward over time. However, the pandemic initially resulted in a substantial decrease in revenue vehicle fuel expenses in 2020. With rising consumption and fuel prices, agency fuel costs in 2021 rebounded from the 2020 lows, and then in 2022 agency fuel costs increased dramatically due to much higher fuel prices, before decreasing slightly in 2023. Figure 20 below shows the slight decrease in agency operating costs for fuel and utilities from 2022 to 2023. VRM remained about the same during this period.

Figure 21. Fuel and Utility Expenses, 2022-2023



Transit Fuel Costs (ST Express and Sounder)

- Compared to the 2011 baseline, transit vehicle fuel costs are down 3% in total (down 13% for ST Express buses and up 26% for Sounder commuter rail).
- Relative to 2018, transit fuel costs have increased 24% (up 18% for ST Express and up 39% for Sounder).
- From 2022 to 2023, transit fuel costs decreased by 12% (down 12% for ST Express and down 14% for Sounder).
- Transit vehicle fuel use accounted for 60% of Sound Transit's fuel and utility expenses in 2023, down from 66% in 2022.
- In 2023, transit vehicle fuel expenses accounted for roughly 3.5% of Sound Transit's operating budget, down from 4.0% the prior year.

Figure 22. Sounder and ST Express Fuel Costs (Normalized by PMT)

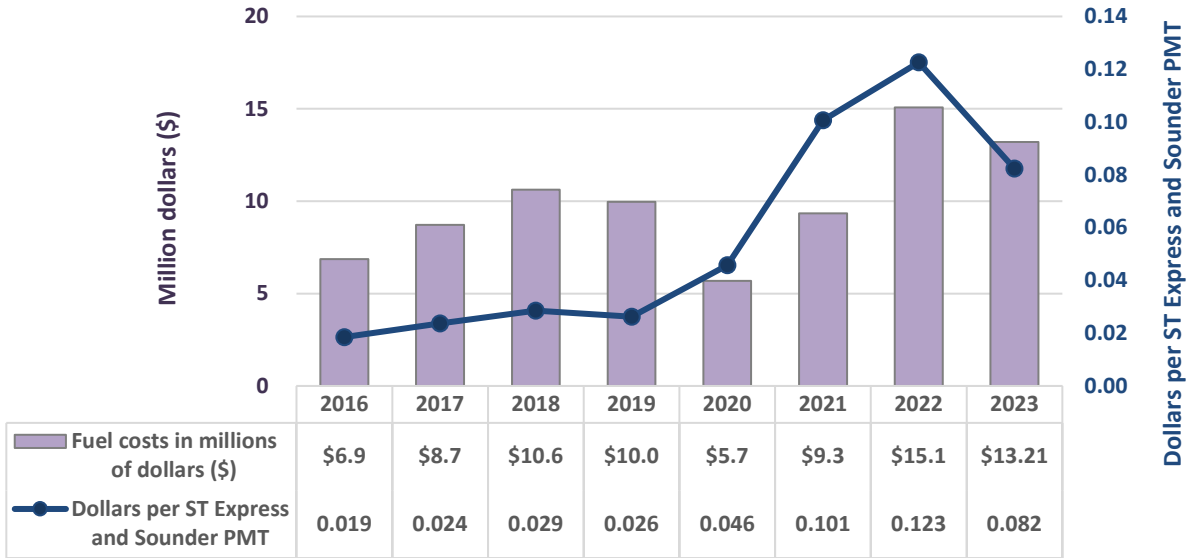
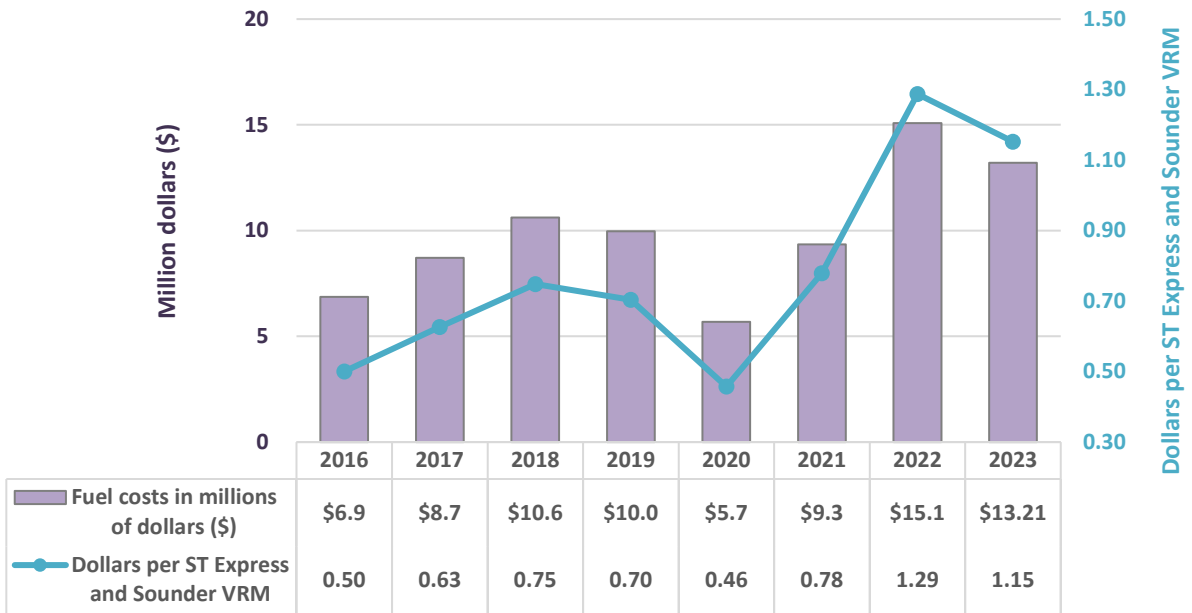


Figure 23. Sounder and ST Express Fuel Costs (Normalized by VRM)



Utility Expenses

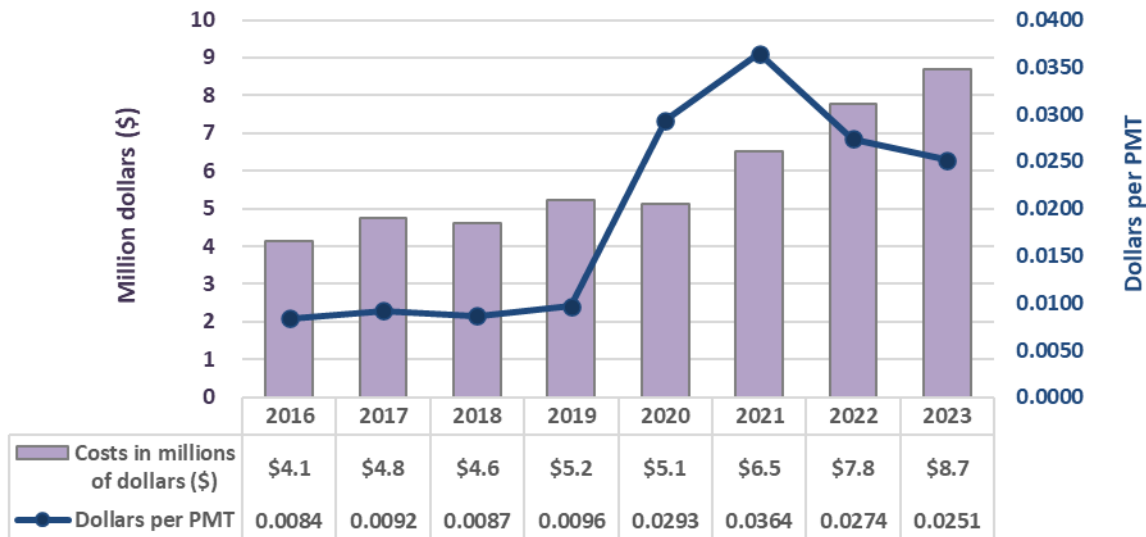
- Since the 2011 baseline, agency utility costs have increased by 250%.
- Relative to 2018, utility costs have increased by 88%.
- From 2022 to 2023, utility costs increased by 12%.

Table 5. Change in Utility Costs

	Change 2011-2023 (Absolute)	Change 2018-2023 (Absolute)	Change 2022-2023 (Absolute)
Traction power electricity costs	+567%	+120%	+11%
Facility electricity costs	+106%	+54%	+12%
Facility natural gas costs	+238%	+168%	+14%
Water costs	+20%	+20%	+6%
Waste, recycling, and compost costs	+77%	+16%	+63%
Combined Utility Costs	250%	88%	12%

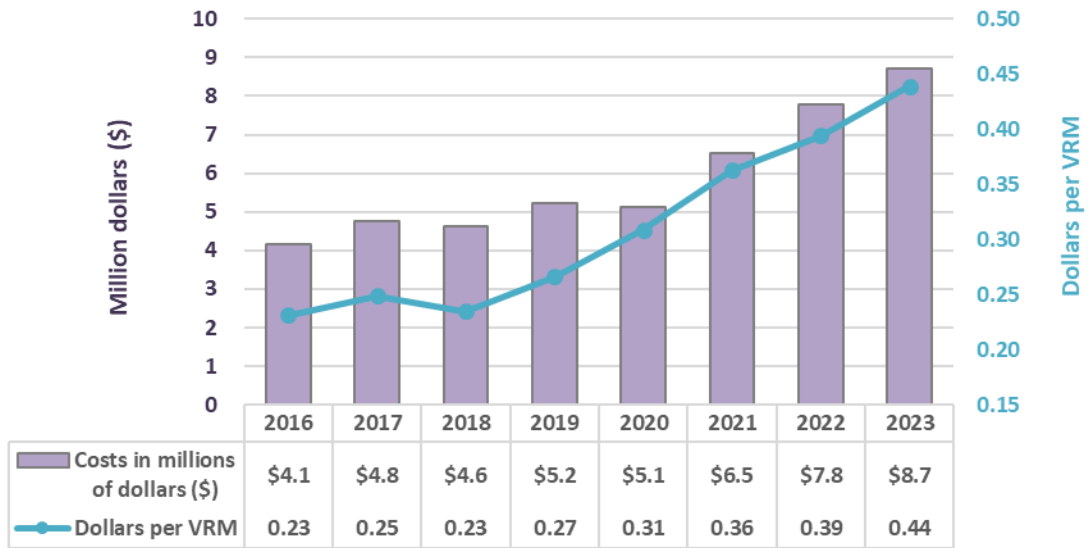
Utility expenses for electricity, water, and waste have increased over time in line with usage trends. Figure 23 below shows the change in resource costs over time. Total facility electricity costs since 2011 have increased by 106%, and waste costs have increased by 77%. Water costs have increased by 20% during that period but experience inter-annual variability. The agency’s fuel expenses have fluctuated with the volatility in petroleum prices, while other resource costs have increased more steadily.

Figure 24. Non-Vehicle Utility Costs (Normalized by PMT)



Note: Stormwater and sewer costs are not included.

Figure 25. Non-Vehicle Utility Costs (Normalized by VRM)



Appendix B – 2023 Sustainability costs and savings

The table below summarizes a sample of costs and savings from resource conservation projects completed as of the end of 2023. This data captures many significant monetary costs and savings. However, projects may have additional sustainability benefits that cannot be represented as financial savings – from reduced maintenance cycles to improved air quality.

Note that the savings figures below do not include labor and material cost savings related to improved operations and maintenance efficiency. Payback year estimates reflect applicable grants and or rebates. Many projects with long payback periods still incur significant labor and material cost savings and reduce the frequency of maintenance.

PROJECT	PROJECT FINISHED	CAPITAL COSTS	2023 SAVINGS	SAVINGS TO DATE, 2023	PAY-BACK YEAR	DESCRIPTION
ST Express mid-day bus storage	2008	\$0	\$237,720	\$2,611,055	2008	This program allows Pierce County buses to stay in Seattle until the afternoon commute to avoid driving back empty.
Sounder automatic engine start-stop system	2009	\$230,596	\$207,387	\$1,780,396	2013	This equipment was installed to shut down Sounder commuter rail engines when not in use and reduces engine idling time by about 34 percent and significantly reduces air pollution.
Sounder Lakewood-Seattle wayside power	2010	\$490,000	\$147,116	\$1,480,429	2015	Electric wayside power units are used instead of the commuter rail locomotives' diesel engines to heat and power coach cars during layovers, reducing diesel use and air pollutant emissions. Wayside units were installed in Tacoma in 2010 and were then moved to Lakewood in 2013, where more units were added.
Sounder Everett-Seattle wayside power	2011	\$315,000	\$12,835	\$289,886	2023	
Central Link OMF sewer deduct meter	2012	\$2,600	\$20,997	\$371,666	2012	This Central Link light rail Operations and Maintenance Facility meter reduces water costs by accounting for irrigation water that does not enter the wastewater stream.
Union Station HVAC controls upgrade*	2013	\$405,778	\$25,581	\$255,955	2022	The agency upgraded the controls for the Union Station Heating, Ventilation and Cooling (HVAC) system.
Federal Way Transit Center garage lighting upgrades*	2013	\$579,334	\$32,436	\$324,533	2023	Three transit facility garages were retrofitted for LED lighting. These locations included Federal Way Transit Center, Kent Sounder station and Auburn Sounder station.
Kent Station garage lighting upgrades*	2013	\$99,773	\$10,210	\$69,307	2022	
Auburn Station garage lighting upgrades*	2013	\$208,985	\$11,533	\$115,390	2023	

PROJECT	PROJECT FINISHED	CAPITAL COSTS	2023 SAVINGS	SAVINGS TO DATE, 2023	PAY-BACK YEAR	DESCRIPTION
Angle Lake Station solar power	2016	N/A – Installed as part of Design Build project	\$1,664	\$10,973	N/A	14 KW solar array system on the Angle Lake Station platform canopy and 50 KW solar array system on the Angle Lake Garage pedestrian walkway. These solar panels were installed in the original design build contract for the facility.
Angle Lake Garage solar power	2016		\$3,989	\$25,861	N/A	
Kent Station lighting upgrades*	2017	\$169,849	\$10,210	\$69,036	2030	Kent, Sumner and Puyallup Stations were upgraded with LED lighting.
Sumner Station lighting upgrades*	2017	\$138,967	\$10,250	\$69,307	2027	
Puyallup Station lighting upgrades*	2017	\$169,849	\$10,622	\$71,822	2029	
OMF interior and exterior LED lighting and EMS controls upgrade*	2018	\$1,065,415	\$70,944	\$411,475	2027	The building control system was upgraded at the Operations and Maintenance Facility, which allows for improved building mechanical operations. The inefficient lighting was replaced with LED in the maintenance shop and exterior parking areas.
Mukilteo Parking Lot lighting upgrades	2018	\$13,150	\$3,558	\$19,886	2021	Parking lot lighting was retrofitted with LED lights near Mukilteo Station.
Issaquah Transit Center lighting upgrades*	2018	\$161,514	\$8,921	\$49,762	2035	Lighting was upgraded to LEDs at the Issaquah Transit Center, Mercer Island Park & Ride, and King St. Stations from parking garages and station platforms to area lighting.
Mercer Island Park and Ride lighting upgrades*	2018	\$191,424	\$8,402	\$46,614	2039	
King St. Station lighting upgrades*	2018	\$245,262	\$4,966	\$24,844	2066	
Sounder Yard solar power	2018	N/A - Installed as part of Design Build project	\$215	\$1,203	N/A	2.1 KW solar array system on the Sounder Yard facility. These solar panels were installed in the original design build contract for the facility.
Light Rail vehicles lighting upgrades	2019	\$137,022	\$16,837	\$81,463	2025	Interior lighting and headlights on Link Light Rail were upgraded to LED, which reduced lighting energy use by 45%. The project also improved visibility and reduced maintenance requirements for the lighting system.
Light Rail vehicles oil-less compressors	2019	\$650,100	\$32,034	\$147,005	2040	Compressors on 62 Link Light Rail vehicles were upgraded with oil-less compressors as part of their lifecycle replacement. The new compressors do not use any oil, reduce maintenance costs and improve reliability.

PROJECT	PROJECT FINISHED	CAPITAL COSTS	2023 SAVINGS	SAVINGS TO DATE, 2023	PAY-BACK YEAR	DESCRIPTION
Edmonds Station Parking Lot lighting upgrades	2019	\$7,620	\$1,577	\$7,366	2024	Facilities retrofitted (24) 250 watt metal halide parking lot lights with 100 watt LED lights. The new lights use 60% less energy and require significantly less maintenance.
Angle Lake Garage irrigation controls	2020	\$1,903	\$214	\$803	2029	Installed smart irrigation controls at four locations.
Everett Sounder Station irrigation controls	2020	\$2,562	\$403	\$1,513	2027	
Issaquah Transit Center irrigation controls	2020	\$2,642	\$1,307	\$4,354	2022	
Mercer Island Park and Ride irrigation controls	2020	\$7,363	\$1,301	\$4,227	2026	
Lynnwood Warehouse lighting upgrades	2020	\$52,606	\$4,489	\$13,627	2028	
Beacon Hill Station deduct meter	2020	\$533	\$547	\$1,937	2021	This meter reduces water costs by accounting for irrigation water that does not enter the wastewater stream.
OMF East solar power	2021	N/A - Installed as part of Design Build project	\$2,903	\$25,947	N/A	100 KW solar array system on the OMF East roof. These solar panels were installed in the original design build contract for the facility.
Union Station Security Operations Center rooftop HVAC unit	2021	\$390,329	\$22,344	\$47,504	2036	Added a dedicated rooftop HVAC unit to the security operations center at Union Station, which operates 24/7. This part of Union Station was previously served by the main building's HVAC, which can now be placed on a more efficient schedule.
Angle Lake Garage irrigation controls - phase 2	2021	\$5,160	\$1,187	\$3,067	2025	Installed flow sensor and master valve. Upgraded irrigation controller.
Bonney Lake Park and Ride irrigation controls	2021	\$5,926	\$617	\$1,595	2031	Upgraded master valves, flow sensors and controllers at four locations.
Kent Garage irrigation controls	2021	\$4,346	\$435	\$1,014	2031	

PROJECT	PROJECT FINISHED	CAPITAL COSTS	2023 SAVINGS	SAVINGS TO DATE, 2023	PAY-BACK YEAR	DESCRIPTION
Union Station irrigation controls	2021	\$3,006	\$608	\$1,418	2026	
Central OMF irrigation controls	2021	\$11,000	\$2,204	\$4,957	2026	
Mt Baker Station deduct meter	2021	\$533	\$3,173	\$7,693	2021	This meter reduces water costs by accounting for irrigation water that does not enter the wastewater stream.
Airport Station LED lighting	2022	\$95,189	\$8,666	\$17,332	2033	Retrofit existing lighting with LED lighting.
Tukwila International Blvd Station LED lighting	2022	\$182,260	\$8,066	\$12,099	2045	
OMFE irrigation controls	2022	\$1,929	\$4,234	\$5,293	2022	Completed a central control upgrade.
Tacoma Link OMF irrigation controls	2022	\$1,929	\$176	\$220	2033	
Othello Station irrigation controls	2022	\$4,125	\$740	\$801	2028	Installed smart controller and completed a central control upgrade.
Puyallup Station irrigation controls	2022	\$2,434	\$976	\$1,546	2025	
Mukilteo Station irrigation controls	2022	\$2,434	\$179	\$209	2036	
Federal Way Transit Center irrigation controls	2022	\$2,434	\$579	\$676	2027	
Roosevelt Station deduct meter	2022	\$533	\$688	\$1,045	2023	These meters reduce costs by accounting for irrigation water that does not enter the wastewater stream.
University District Station deduct meter	2022	\$533	\$35	\$529	2024	
Mt. Baker Station LED Lighting	2023	\$358,914	\$9,451	\$9,451	2060	Retrofit existing lighting with LED lighting at 5 stations.
SoDo Station LED Lighting	2023	\$74,075	\$3,383	\$3,383	2044	
Columbia City Station LED Lighting	2023	\$59,195	\$5,159	\$5,159	2034	

PROJECT	PROJECT FINISHED	CAPITAL COSTS	2023 SAVINGS	SAVINGS TO DATE, 2023	PAY-BACK YEAR	DESCRIPTION
Rainier Beach Station LED Lighting	2023	\$37,865	\$3,405	\$3,405	2033	
Othello Station LED Lighting	2023	\$47,999	\$4,432	\$4,432	2033	
Kent Garage Turf Removal	2023	\$19,900	\$853	\$853	2047	Removed 2,000 sq. Ft. of grass turf and replaced with shrubs and ground cover
Central OMF Turf Removal	2023	\$55,460	\$2,675	\$2,675	2044	Removed 5,000 sq. Ft. Of grass turf and replaced with shrubs and ground cover

* Cost savings figures for projects implemented through an Energy Performance Contract (denoted with an *) represent average, annualized savings based on the project's projected lifetime savings. These projects may ultimately achieve more energy and cost savings than the guaranteed amount.

Appendix C – 2023 Key Performance Indicators

The table below presents the Key Performance Indicators (KPIs), as defined in the 2019 Sustainability Plan. The table also shows the KPIs in relation to their associated Priorities, Long-term goals and Short-term goals, per the Sustainability Plan. The KPIs reflect current progress compared to the 2019 Sustainability Plan’s baseline year of 2018. Note that the KPIs below are a subset of the 2019 Sustainability Plan’s metrics.

PRIORITY	LONG-TERM GOALS	SHORT-TERM GOALS	KEY PERFORMANCE INDICATOR	2018 BASELINE VALUE	2023 VALUE AND/OR PERCENT CHANGE
People	Social equity addressed and implemented as an agency value	Contribute to a revolving loan fund for affordable housing revolving loan fund	# of dollars contributed to affordable housing revolving loan fund	Contributions began in 2019	\$4 million
		Build staff awareness and capacity to integrate equity into all business lines	% of staff trained in equity and inclusion	37% of staff trained	<ul style="list-style-type: none"> • 97% of staff completed Equal Employment Opportunity Training • 74% of staff completed Implicit Bias Training • 51% of staff completed Inclusion Training • 14% of staff completed Microaggressions in the workplace training
		Meet or exceed workforce diversity goals for construction contractors Goals: <ul style="list-style-type: none"> • 21% people of color • 12% women • 20% apprentices 	% of hours worked by diverse communities on ST job sites	<ul style="list-style-type: none"> • 29% by people of color • 7% by women • 20% by apprentices 	<ul style="list-style-type: none"> • 40% by people of color • 8% by women • 16% by apprentices
All staff champion sustainability	Certify key staff to green design and building management professional accreditations	# of staff trained to sustainable professional accreditations	<ul style="list-style-type: none"> • 22 new Envision Sustainability Professionals • 17 new LEED Accredited Professionals • 5 other new sustainability certifications 	<ul style="list-style-type: none"> • 48 Envision Sustainability Professionals • 12 LEED Accredited Professionals • 12 other sustainability certifications 	

PRIORITY	LONG-TERM GOALS	SHORT-TERM GOALS	KEY PERFORMANCE INDICATOR	2018 BASELINE VALUE	2023 VALUE AND/OR PERCENT CHANGE
Planet	Achieve carbon free operations	Reduce greenhouse gas emissions by 10 percent	% change in greenhouse gas emissions	66,230 tonnes of CO ₂ e	45,899 tonnes of CO ₂ e; 31% reduction since 2018
			% change in criteria air pollutants	<ul style="list-style-type: none"> • Particulate Matter: 11,078 lbs • Volatile Organic Compounds: 15,485 lbs • NO_x: 399,828 lbs • CO: 193,411 lbs • SO_x: 9,986 lbs 	<ul style="list-style-type: none"> • Particulate Matter: 7,709 lbs; 30% decrease since 2018 • Volatile Organic Compounds: 11,137 lbs; 28% decrease since 2018 • NO_x: 355,076 lbs; 11% decrease since 2018 • CO: 203,287 lbs; 5% increase since 2018 • SO_x: 8,484 lbs; 15% decrease since 2018
		Increase production from solar panels to 750 KW	# of kW of renewable energy production	<ul style="list-style-type: none"> • 76,257 kWh produced • 66.1 KW installed total 	<ul style="list-style-type: none"> • 172,730 kWh produced in 2023 • 231 KW installed total
		Purchase available cost-effective, carbon-free electricity	% change in renewable electricity procurement	85% electricity from clean and renewable sources	88% electricity from clean and renewable sources in 2023; 4% increase since 2018
	Decrease total energy use 5 percent for all facilities built before 2018	% of facility energy reduced	26,910,384 kBtu	26,953,938 kBtu; 0% reduction since 2018	
	Enhance ecosystem functions	Achieve 100 percent environmental compliance (zero fineable violations)	# of fineable environmental compliance violations	Four	Zero
		Reduce total water use by 10 percent at all existing facilities and sites established before 2018	% change in agency water use	27,521 CCF used	23,023 CCF used; 16% decrease since 2018

PRIORITY	LONG-TERM GOALS	SHORT-TERM GOALS	KEY PERFORMANCE INDICATOR	2018 BASELINE VALUE	2023 VALUE AND/OR PERCENT CHANGE
Prosperity	Build resilience to climate change and natural or manmade disasters	Develop staff awareness of individual roles in emergency prepared	% of staff trained in emergency preparedness	Training began in 2019	<ul style="list-style-type: none"> • 254 staff trained in core safety training • 62 staff attended safety lunch and learns • 127 staff trained in a non-revenue vehicle safe driving course • 116 staff certified in First Aid/CPR/AED • 44 staff trained in Stop The Bleed • 45 staff trained in De-Escalation/Personal Safety • 1,263 staff trained in Safety Management Systems
		Conduct a Climate Vulnerability Assessment as part of each major system capital expansion project	% of projects that include Climate Change Vulnerability Assessments	Assessments began in 2019	100% of eligible projects
	Maximize operational efficiency	Divert 50 percent of office waste to recycling or compost	% of waste diverted	35%	39%
		Include green methods or features in at least 75 percent of all new agency procurements	% increase in # of and dollar value of procurements	<ul style="list-style-type: none"> • 19% of new procurements • \$299M in value 	<ul style="list-style-type: none"> • 65 procurements; 19% of procurements – 0% increase in number of procurements since 2018 • \$472M in value – 58% increase since 2018