

Moving Towards Sustainability:

2012 Metro Sustainability Report Using Operational Metrics



Metro®

Acknowledgement

This document was prepared by ICF International under contract through Los Angeles County Metropolitan Transportation Authority (Metro) Sustainability Program administered by Metro's Environmental Compliance and Services Department. Technical input was provided by staff in the following Metro departments: Contract Services, New Business Development, Systems Engineering, Rail MOW Engineering, Resource Management, Environmental Compliance and Services Department, ECSD, Maintenance Administration, Facilities and Property Maintenance, Governmental Accounts, Quality Assurance, Long Range Planning, Operations Systems Integration, Purchasing, Vehicle Technology and Support, Building Services, and General Services Administration.

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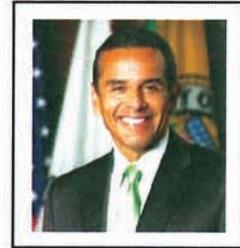
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2012 Sustainability Report Message from the Chairman

As Mayor of the City of Los Angeles, sustainability has long been one of my key initiatives and I commend Metro for including sustainability in its mission to be “responsible for the continuous improvement of an efficient and effective transportation system for Los Angeles County.” As Chair of Metro’s Board of Directors, I applaud the agency’s commitment to implement planning, construction, operations, and procurement activities to reduce our climate change impacts and work to increase our ability to control costs, expanding the transit system, and efficiently managing resources.



Our transit operation helps improve the region’s mobility by removing vehicles from roadways, reducing congestion, and creating conditions for transit oriented developments, which brings jobs, services, and housing together. To illustrate, in 2011 Metro’s transit system removed over one billion vehicle miles from the roadway; saving almost 51 million gallons of gasoline and displacing almost 450,000 metric tons of greenhouse gas (GHG) emissions (based on a mode shift factor developed as part of the American Public Transportation Association’s (APTA) draft “Quantifying and Reporting Transit Sustainability Metrics”). To enhance transit’s positive climate benefits, Metro is aggressively pursuing new projects and expanding transportation choices, such as vanpools, bikes, ridesharing, etc., for commuters. Other initiatives, such as transit demand management and congestion pricing, increase the capacity of the region’s transportation system, while reducing the impacts of climate change.

Metro has also taken the lead to address emissions from sources beyond the operation of our transit system. In the midst of an aggressive Measure R program to expand Metro’s transit system, Metro’s Board adopted a Green Construction Equipment Policy that mandates the use of low emission construction vehicles on Metro construction projects, adopted a Renewable Energy Policy to establish targets for renewable energy use and development, and continues to reduce electricity consumption through energy efficiency retrofits.

Since its inception, Metro’s sustainability program has achieved significant reductions in resource usage, reduced the agency’s carbon footprint, and saved money; over \$2 million per year with additional savings coming in the future. I commend our staff for their dedication and on-going efforts to reduce operations costs, while simultaneously enhancing and expanding the county’s transit system.

Very truly yours,

Antonio R. Villaraigosa
Chairman, Board of Directors



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2012 Sustainability Report Message from the CEO

Los Angeles Metro is committed to building a world-class transportation system; one that is safe, clean, reliable, on-time, and courteous. While doing this, we are also working to ensure that every step forward is as environmentally aware and sustainable as possible.



When we talk about sustainability at Metro, our core concern is managing environmental effects. Air quality, water management, energy usage, emissions, recycling and waste management are some elements that characterize Metro's sustainability efforts.

Metro's commitment to sustainability can be seen in recent successes:

- Metro has become the first transit property in America to adopt a Green Construction Policy to reduce air emission impacts from construction equipment and related activities with the goal of improving the region's air quality.
- Metro has a large renewable energy portfolio; generating two megawatts of clean renewable energy with an additional half megawatt ready to come on-line in 2012.
- In February 2011, Metro retired its last diesel bus; an initiative that started in 1990. Through this transformation of its bus fleet into the largest clean fuel bus fleet in the nation, Metro has reduced criteria air pollutant emissions by 95% as compared to the 1990 bus fleet.
- Metro's Division 20 (Red Line Yard) was the first major rail maintenance facility in the nation to earn an ISO 14001 certification for its environmental management system (EMS); a similar effort was initiated at Division 10.

Metro is on the forefront of transportation innovation in all of our planning, construction, operations, and procurement; exploring the best ways to maintain a high level of service while reducing environmental impacts. Metro's sustainability efforts have increased environmental safety, jobs, cleanliness, efficiency, and cost-savings agency-wide.

Metro serves as a national example for this region and the nation. With targeted management of our environmental impacts, we make the most of the resources we have; enabling us to keep fares low and passenger loads high.

I congratulate our staff and our partners in leading the way towards a more sustainable Los Angeles.

Sincerely,

Arthur T. Leahy
Chief Executive Officer



Company Profile

Los Angeles County Metropolitan Transportation Authority's (Metro) mission is to be responsible for the continual improvement of an efficient and effective transportation system in Los Angeles County, and Metro's role is unique among the nation's transportation agencies. Metro serves as transportation planner and coordinator, designer, builder, and operator for one of the country's largest, most populous counties. More than 9.6 million people — nearly one-third of California's residents — live, work, and play within Metro's 1,433-square-mile service area.

In the last 25 years, Metro has developed an extensive mass rapid transit system consisting of almost 80 miles of urban rail, a very successful Bus Rapid Transit (BRT) route, and the nation's largest fleet of very low emissions buses (2,500+ buses; Metro's last diesel bus was retired in February 2011). Metro operates 180 bus routes, servicing almost 16,000 bus stops to accommodate over 1.1 million average weekday boardings for a total of 365.9 million annual boardings.



Metro also operates the region's fixed guideway system, which includes a heavy rail subway (Red Line) and three light rail lines (Blue, Gold, and Green Lines). The first segment of the Metro Red Line was opened in 1993 and the final segment to North Hollywood was opened in 2000. The Red Line is 17 miles in length, includes 16 stations, and averages 148,000 weekday boardings for a 2011 total of 47.2 million boardings. Combined, the three light rail lines (Metro Blue Line – 1990; Metro Gold Line – 2003; and Metro Green Line – 1995) are 61.7 miles long, include 57 stations, and average 148,000 weekday boardings for a 2011 total of 47.8 million boardings. All rail boardings combined in the calendar year 2011 are estimated at 95 million boardings.

As the region's transportation planner, Metro has developed a Long Range Transportation Plan. The Plan calls for investments to expand the region's rail system by another 105 miles and build 170 more miles of carpool lanes. The Gold Line Eastside Extension started revenue service in 2009; the Expo Line, Phase 1, started revenue service on April 30, 2012; the Orange Line Extension is scheduled to start revenue service in June 2012; and planning work continues on several corridors to develop light rail transit. In addition, projected benefits from Measure R projects include the creation of 160,000 new jobs, and annual reductions in vehicle miles traveled (VMT) (208 million miles) and gallons of gasoline used (10.3 million gallons), and increases in transit boardings (77 million boardings). These investments, in combination with a statewide mandate to better coordinate land use planning with the transportation system, will transform LA's urban landscape over the next 30 years, reduce demand for single-occupancy travel, reduce per capita greenhouse gas (GHG) emissions, and improve air quality.

Metro also encourages transit-oriented developments (TOD) on Metro-controlled property near transit facilities to create walking and bicycle improvements and better connectivity to the transit system.

Planning, developing, and operating the region's transportation system is an energy-intensive endeavor. To reduce the consumption of natural

resources and the associated emission of pollutants and GHGs, Metro has implemented several initiatives and policies to operate more efficiently and to be better stewards of the environment. Specifically, Metro has committed to:

1. Constructing all new facilities to Leadership in Energy and Environmental Design (LEED) Silver standards; three buildings have received a LEED Gold rating and one building is under construction and on track to receive a Gold rating.
2. Assessing its existing facilities to determine the feasibility of achieving a LEED – Existing Building Operations and Maintenance (EBOM) certification; Metro's Gateway headquarters building has received a LEED-EBOM Gold rating, LEED-EBOM efforts are underway on two facilities, and 15 other facilities are currently being assessed.
3. Adopting Metro's Renewable Energy Policy to incorporate renewable energy into Metro facilities; solar panels have been installed at four Metro facilities for a combined 2 megawatts of energy and solar is planned for new facilities currently in design.
4. Adopting Metro's Green Construction Equipment Policy to reduce emissions from construction activities by requiring the use of clean, green construction equipment on all Metro construction projects.

These policies and activities tie back to Metro's mission — responsibility for an efficient and effective transportation system — and its effort to do so in a sustainable manner with minimal impacts on the environment.



Introduction

The 2012 Metro Sustainability Report Using Operational Metrics ("2012 Sustainability Report") provides an update on Metro's resource use and contribution to the reduction of pollutant emissions and greenhouse gases for calendar year 2011. The purpose of this report is to compare data with previous years in order to track our progress towards our goals for sustainability. Additionally, this report is intended to provide Metro's decision makers with information they can use to improve Metro's sustainability performance.

This report discusses the methodology used to obtain and analyze the data, including how the different indicators were chosen, how efficiency is measured within the specific indicators, and identifying potential weaknesses in the data. Accuracy within the data is essential; therefore, we used the best available data as of April 2012 and the most reliable sustainability guidelines to develop this report.



Data are organized according to indicator area, each area focusing on a resource or economic cost by which Metro can analyze the effectiveness of its sustainability strategies over time. The 2012 sustainability report has been revised to reflect the Recommended Practice of Quantifying and Reporting Transit Sustainability Metrics (Draft: November 30, 2011) as developed by American Public Transit Association (APTA). As part of this revision, indicator areas have been added and some have been modified. The indicator areas selected for historic and ongoing analysis are listed below. Indicator areas new to this 2012 report are noted.

- 1 Water Use
- 2 Criteria Air Pollutant Emissions
- 3 Greenhouse Gas Emissions
- 4 Greenhouse Gas Displacement **NEW**
- 5 Energy Use
 - Fuel Use
 - Rail Propulsion Power
 - Facility Electricity Use
- 6 Waste and Recycling
 - Solid Waste and Recycling
 - Used Oil Waste
 - Hazardous Liquid Waste
 - Non-Hazardous Liquid Waste
 - Anti-Freeze Waste
- 7 Operating Expenses **NEW**
- 8 Unlinked Passenger Trips per Capita
- 9 Vehicle Miles Traveled per Capita **NEW**

This report includes a detailed discussion of each indicator area according to the following structure:

- **Accomplishments** – Lists significant actions or programs that affected the indicator during the calendar year.
- **Data and Analysis** – Provides data graphs and analysis summaries.
- **Next Steps** – Discusses specific actions that Metro is considering for future implementation; these are specific to each indicator area and include a discussion of general next steps.

In addition to the specific issues discussed in the indicator sections, Metro has developed and implemented broad policies, goals, and standards in an effort to demonstrate our commitment to apply sustainable strategies throughout the planning, construction, and operation of various projects. Specifically, all Metro projects will comply with all local, state, and federal codes, ordinances, and regulations, and applicable Federal Transit Administration (FTA), Federal Highway Administration (FHWA), and APTA guidelines. Furthermore, we consider at a minimum the following strategies to achieve a sustainable approach to our projects:

- Reduce waste, reuse materials, recycle, and procure environmentally friendly products.
- Include “green” and sustainable features through planning, design, construction, and operation of facilities and services.
- Increase the use of alternative energy solutions such as renewable energy sources.

Using Environmental Management System (EMS) principles as a tool, Metro is further identifying environmental issues of significant concern, proactively addressing those issues, implementing specific solutions as issues are developed, and continuously engaging management to ensure continuous improvement. EMS is a tool identified in our Environmental Policy to ensure the implementation of sustainable principles in all our planning, construction, operations, and procurement activities.



Executive Summary

This sustainability report analyzes Metro's 2011 environmental performance and the economic cost of its core activities and presents historical performance data for the identification of significant trends and issues. The purpose of this report is to provide an update to the previous year's report by presenting sustainability data for calendar year 2011. The report compares trends, focusing on the previous year's report data (2010) and this year's report data (2011), to monitor and analyze the increases or decreases in environmental impacts and assess Metro's ongoing progress towards sustainability. This trend analysis can then be used to identify causes, set targets, direct resources, and improve performance and sustainability in a cost-effective way for future years.

The Metro Board adopted the Metro Sustainability Implementation Plan (MSIP) in June 2008. The MSIP contains short-term projects and general guidelines that serve as the basis for specific long-term sustainability project development. An ongoing task is the reporting of Metro's environmental sustainability performance. This report focuses on our activities for calendar year 2011, and meets



the requirement by comparing and analyzing trends over the course of previous years in environmental performance across five key areas: ridership, energy, emissions, water use, and waste. From these five key areas, nine indicators and eight sub-indicators are used to evaluate Metro’s sustainability progress. The indicators used in this report were derived using the Global Reporting Initiative (GRI) sustainability reporting framework. Indicators were chosen that are common to most organizations in relation to energy, water, materials, emissions, effluents, and waste, as well as impacts to biodiversity. In addition, the format and other aspects of the 2012 report were revised from previous sustainability reports to reflect the development of the *Recommended Practice for Quantifying and Reporting Transit Sustainability Metrics (Draft: November 30, 2011)* that has been prepared by the APTA Standards Sustainability Metrics Working Group.

The report has two goals: 1) to provide information that can be used to improve Metro’s sustainability going forward and 2) to inform the public on Metro’s sustainability performance. This report not only demonstrates Metro’s proactive approach

to meeting the sustainability goals of this region, but more importantly demonstrates Metro’s commitment to meeting social, financial, and environmental goals.

The three essential components of a sustainability program are:

- Performance goals
- Program implementation
- Performance monitoring

This report strengthens Metro’s sustainability program in all three areas. By providing annual information 1) enables our Board to adopt informed performance targets, 2) provides information necessary to implement plans to meet those targets, and 3) creates a structure that can be used to regularly monitor progress. A brief summary of performance in each of the nine indicator areas is presented in the following section.

Indicator Area Summary Table

The following table compares key indicator area data from 2010 and 2011.

Indicator	Unit	2010	2011	Progress
1 Water Use	Gallons of Water	243,000,000	238,000,000	I
2 Criteria Air Pollutant Emissions	Tons of Criteria Pollutants	1,783	1,420	I
3 Greenhouse Gas Emissions	Metric Tons of CO ₂ e	476,000	457,000	I
4 Greenhouse Gas Displacement	Metric Tons of CO ₂ e	410,776	419,344	I
5 Energy Use <ul style="list-style-type: none"> • Fuel Use • Rail Propulsion Power • Facility Electricity Use 	Gallons of Gas Equivalents	46,000,000	43,000,000	I
	Kilowatt Hours	244,000,000	261,000,000	R+
6 Waste and Recycling <ul style="list-style-type: none"> • Solid Waste and Recycling • Used Oil Waste • Hazardous Liquid Waste • Non-Hazardous Liquid Waste • Anti-Freeze Waste 	Tons of Solid Waste	11,000	8,600	I
	Recycling Percentage	44	41	R+
7 Operating Expenses	Combined Dollars per Boarding	\$8.08	\$8.19	R
8 Unlinked Passenger Trips per Capita	Boardings	460,000,000	457,000,000	R
9 Vehicles Miles Traveled per Capita*	Miles	N/A	7,869	NC

* According to the most recent Highway Performance Monitoring System report, Caltrans (2010).

I = Improved R = Regressed NC = No Change + = Co Benefit Achieved (benefits achieved other than the benefit intended)

1 Water Use

Metro's water use increased sharply between 2004 and 2008; however, through increased focus on water conservation and management, we have been able to produce slight but steady decreases from 2008 through 2011, at a time when transit service has been expanded. Water use in 2011 was approximately 5 million gallons less than in 2010. This reduction, combined with slight decreases in the purchase price of water, resulted in a reduction in Metro's overall cost for water in 2011 by approximately \$203,000. Transit service (measured in revenue hours) decreased from 2010 to 2011 at a faster rate than water use, causing our water efficiency (measured in gallons per revenue hour) to decrease.

From 2002 to 2011 our water costs per gallon increased nearly 44% (adjusted for inflation). In 2011, we spent more than \$1.3 million on water. Water shortages over the past 4 years caused water prices to increase, but increases in water resources from a larger Sierra snowpack in 2011 resulted in slight decreases in water cost during 2011, demonstrating that water costs are highly dependent on availability of water year-to-year. Despite this recent decrease in water prices, the long-term price of water is expected to increase as droughts are expected to become more common. Metro is taking action to continue to reduce water consumption, to stabilize the associated annual cost, and to contribute to region-wide water conservation.

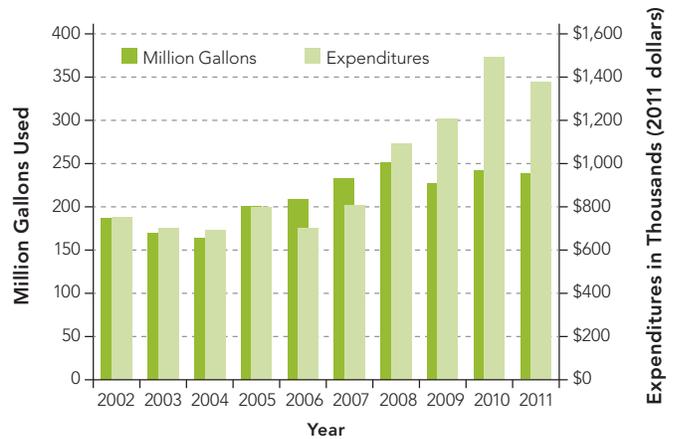


Figure 1. Historic Water Use and Cost

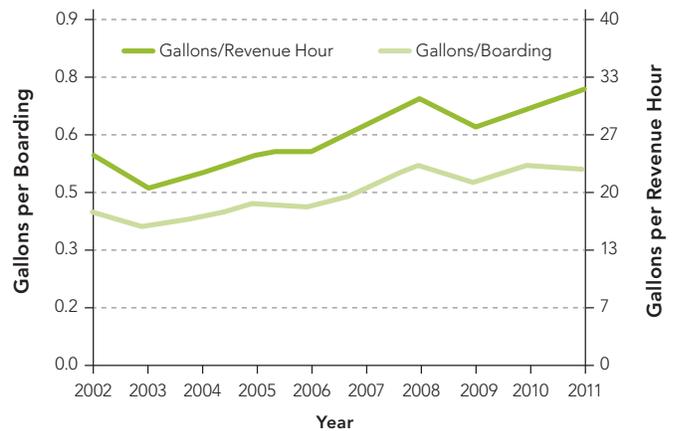


Figure 2. Historic Water Use and Efficiency



2 Criteria Air Pollutant Emissions

Metro bus and rail operations continue to achieve significant reductions in criteria air pollutants. In comparing 2011 fleet emission levels to those previously calculated for 2010, Metro’s overall fleet emission levels demonstrated substantial decreases. 2011 fleet emissions of reactive organic gases (ROG), carbon monoxide (CO), oxides of nitrogen (NOx), and particulate matter (PM) were reduced by 10.3%, 22.5%, 19.9%, and 23.1%, respectively, as compared to 2010 levels. Overall, total criteria pollutant emissions dropped approximately 362.6 tons, or 20.3%, from 2010 to 2011.

The emission reductions can be attributed to the following factors:

1. An overall reduction in transit bus miles traveled from 2010 to 2011. Total transit bus miles traveled for all Divisions in 2011 saw a reduction of approximately 8,489,491 miles as compared to 2010. This equates to an approximate 8.7% reduction in bus miles traveled .
2. Retirement of diesel-fueled buses from the Metro bus fleet and transition to low emissions natural gas buses.
3. Increased efficiency in Metro rail operations. Revenue hours increased approximately 4.5% from 2010 to 2011.

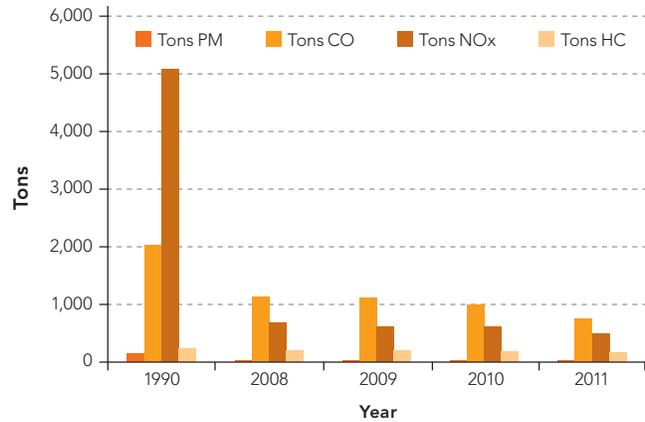


Figure 3. Historic Criteria Air Pollutant Emissions

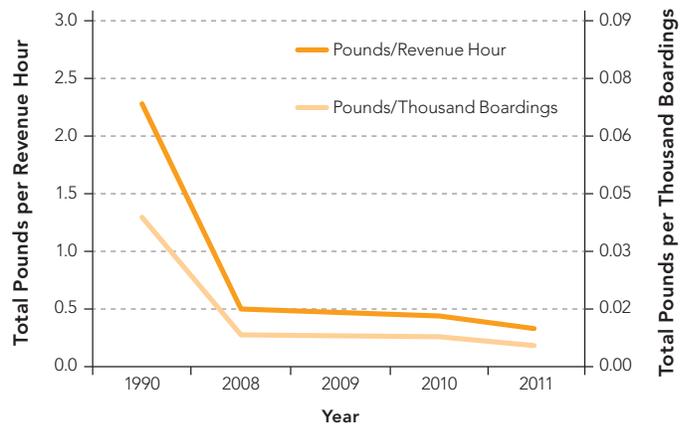


Figure 4. Criteria Air Pollutant Emission Efficiency

3 Greenhouse Gas Emissions

In 2011, Metro emitted 457,000 metric tons of carbon dioxide equivalents (CO₂e) (Figure 5), of which 386,000 metric tons were emitted by transit vehicles. GHG emissions in 2011 were nearly 3% less than in 2010 and 5% less than in 2007 (the first year that data was collected). Approximately 89% of Metro’s GHG emissions during 2011 were related to fuel from our transit system that moves passengers. While Metro’s operations create GHG emissions, the transit service helps to reduce regional emissions by reducing regional VMT and traffic congestion, and by contributing to denser, more pedestrian-friendly land use patterns. When the effects of Metro’s service on VMT, congestion, and land use are considered, Metro prevents more GHG emissions than it produces. This reduction in GHG emissions has been calculated with guidance from APTA using only the Mode Shift factor; methodologies to identify the emission reduction benefits from Congestion Relief and Land Use Impacts will be developed in the future and included in future reports.

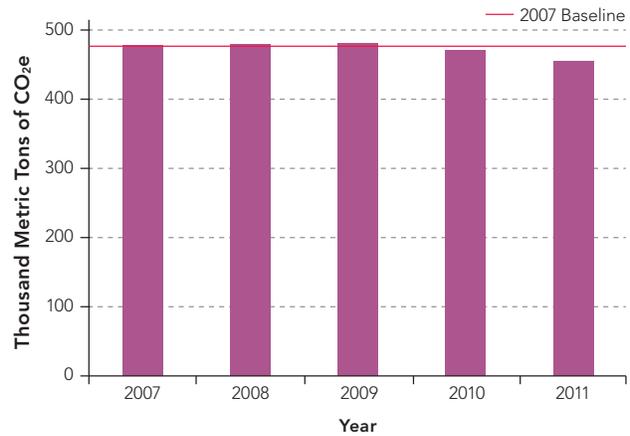


Figure 5. Historic Greenhouse Gas Emissions

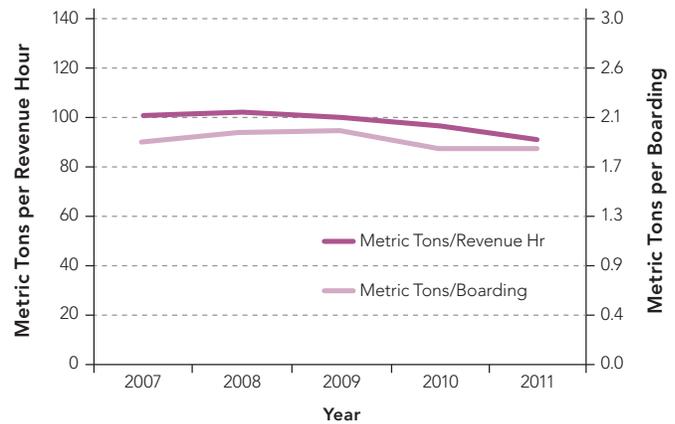


Figure 6. Greenhouse Gas Emissions Efficiency



4 Greenhouse Gas Displacement

By providing alternatives to vehicular travel, Metro's transit service displaced nearly 420,000 MT (metric tons) CO₂e of GHG emissions that would have been emitted by passenger cars. These emissions reduction result from Metro's transit service offsetting 1 billion vehicle-miles travelled by passenger cars in 2011. Without the transit service provided by Metro, many of the passengers would otherwise drive alone in personal vehicles, which are less efficient on a per-passenger-mile basis.

Source	Quantity of Emissions Displaced (MTCO ₂ e)
Total Emissions Displaced from Mode Shift	(419,344)
Emissions from Metro Operations	456,598
Net Emissions from Metro Operations	37,254

Figure 7. Net Emissions Displaced During 2011

5 Energy Use

As recommended in the APTA guidelines, the Energy Use indicator includes the sub-indicators Fuel Use, Rail Propulsion Power, and Facility Electricity Use.

Fuel Use

In 2011, Metro used three types of fuel to power its vehicles: Compressed Natural Gas (CNG), diesel, and gasoline. Total fuel use, measured in gasoline gallon equivalents (GGE), rose an average of 1% annually since 2002. By early 2011, diesel fuel was no longer used in the Metro fleet. The last diesel bus was officially retired in February 2011, completing Metro's goal of achieving a 100% alternatively fueled fleet, operating 2,221 CNG, one electric, and six gasoline-electric hybrid buses.

The fuel intensity of Metro's service, as measured in GGE per boarding, increased by 3% from 2002 to 2011, but decreased by 7% from 2010 to 2011.

After rising consistently from 2002 to 2008, prices of all fuels dropped sharply in 2009, rose modestly in 2010, and increased more sharply in 2011. After adjusting for inflation, diesel prices in 2011 were 207% higher than in 2002. Gasoline prices and CNG prices were 131% and 10% higher, respectively. In addition to its cleaner burning, CNG continues to be the lowest priced fuel per GGE.

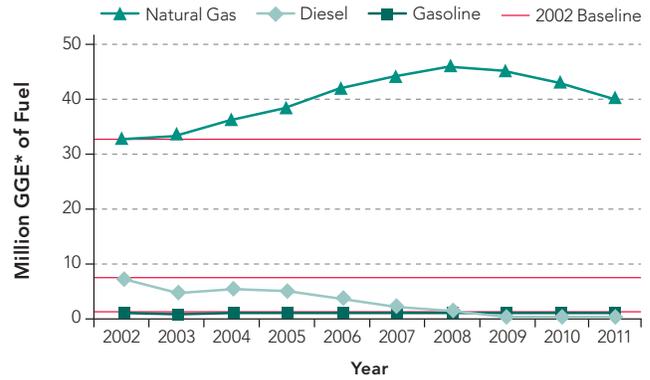


Figure 8. Historic Fuel Use

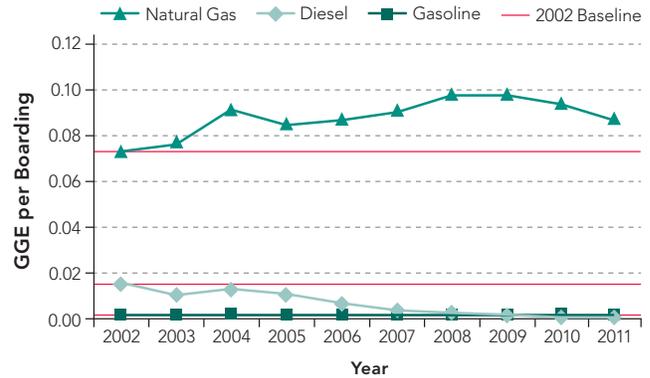


Figure 9. GGEs of Fuel per Boarding by Fuel Type

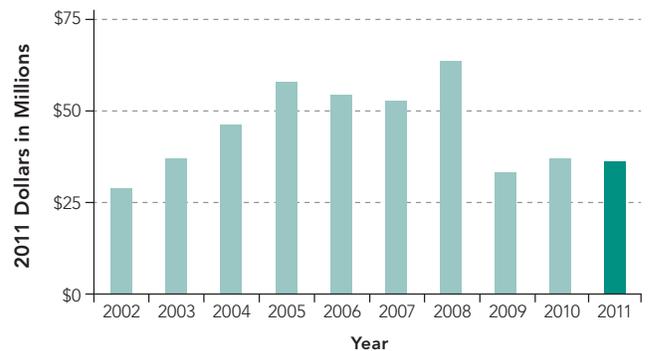


Figure 10. Historic Fuel Expenditures

* GGE = gallons of gasoline equivalent (the amount of fuel it takes to equal the energy content of one liquid gallon of gasoline)



Rail Propulsion Power

Metro’s rail lines consumed approximately 164 million kilowatt hours (kWh) of electricity in 2011, which represents a 3% decrease from 2005 and a 4.8% decrease from 2010. The cost of powering Metro’s trains increased by 5% during that period, from \$19.6 million to \$21.2 million. The Red Line consumes more power than any other Metro rail line, and the decrease in electricity consumption paired with a slight increase in the price of electricity caused the Red Line’s electricity costs to decrease by more than \$315,000 between 2010 and 2011. The decrease in rail propulsion power in 2010 and 2011 has been attributed to the (corrected*) electrical consumption differentiation between rail propulsion power and facility electricity use accounts.

In 2011, Metro used 1.93 kWh of electricity per rail boarding compared to 2.26 kWh per boarding in 2005—a 15% increase in efficiency since 2005 and a 1% increase in efficiency since 2010. Since 2005, the efficiency of rail car operations has fluctuated between 243 and 281 kWh per vehicle revenue hour, a difference of 14%.

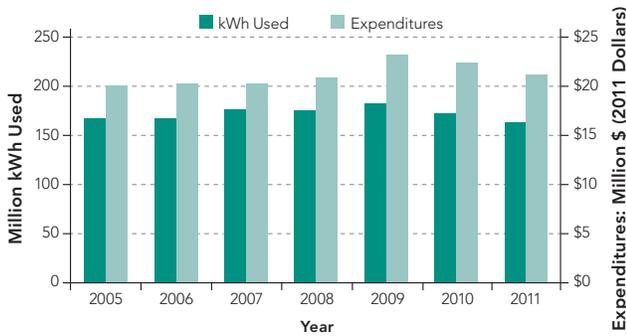


Figure 11. Changes in Rail Propulsion Power



Figure 12. Rail Propulsion Power Efficiency

Facility Electricity Use

The cost of electricity used to power Metro’s facilities is steadily increasing. In 2011, Metro spent \$12.2 million on facility electricity, which was 15% more than the amount spent in 2010 (adjusted for inflation). This increase in cost follows an increase in Metro electricity consumption of 20% in 2011 compared to 2010. The cost and consumption increases are in large part due to the switch from natural-gas powered to electrically-driven CNG compressors at bus facilities.

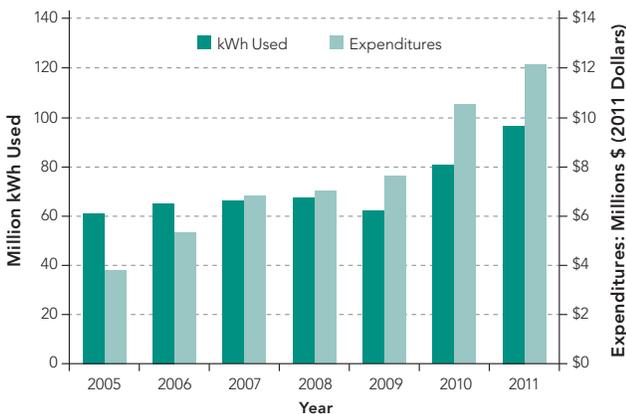


Figure 13. Facility Electricity Use

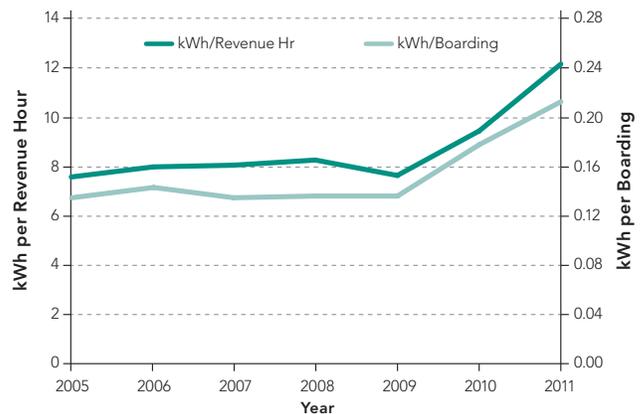


Figure 14. Facility Electricity Use Efficiency

* The assignment of meters to either Rail Propulsion Power or Facility Electrical use was revised during the development of the Energy Conservation and Management Plan (ECMP) in 2011. All future years use corrected values.

6 Waste and Recycling

Metro will continue to actively work on reducing waste. Metro has implemented several internal programs to divert waste from landfills. Among these programs are the bus battery, tire, construction, small battery, printer cartridge, and office recycling programs.

Overall solid waste output has decreased every year since 2008, however, recycling rates dropped from 44% in 2010 to 41% in 2011. From 2010 to 2011, total solid waste produced by Metro decreased from approximately 11,000 tons to approximately 9,000 tons.

Improvements to existing recycling programs are expected to further increase diversion rates* and waste reduction targets will be implemented to continue to reduce overall waste production.

Specific discussions regarding Used Oil Waste, Hazardous Liquid Waste, Non-Hazardous Liquid Waste, and Anti-Freeze Waste are included in the indicator area analysis section of this report.

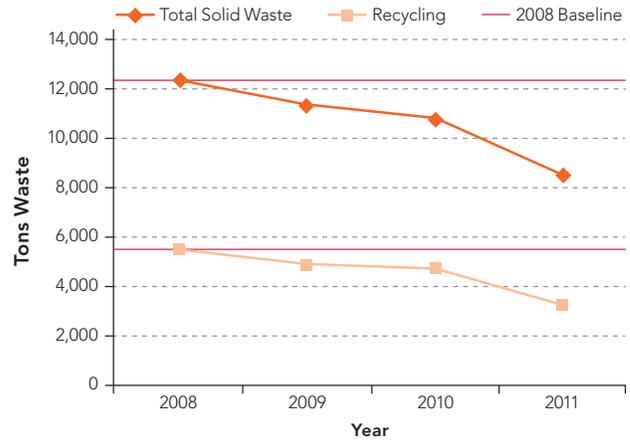


Figure 15. Historic Waste Production

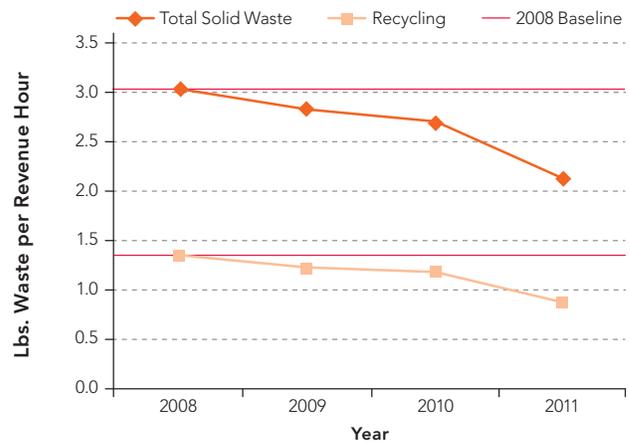


Figure 16. Waste and Recycling Efficiency (per Revenue Hour)

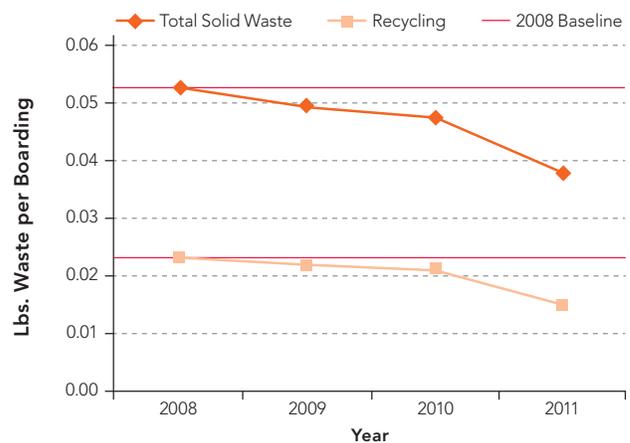


Figure 17. Waste and Recycling Efficiency (per Boarding)

* Waste diversion rates are the rates by which Metro prevents and reduces generated waste through source reduction, recycling, reuse or composting.



7 Operating Expenses

The overall cost of operating Metro’s transit service is improving with respect to the number of passengers it carries and the distance traveled by Metro’s transit vehicles. While passenger boardings and vehicle revenue miles have decreased in 2011, Metro’s costs rose less than in previous years. Reductions in transit service in 2011 contributed to improved cost efficiency in 2011, leading towards more streamlined business practices and operations.

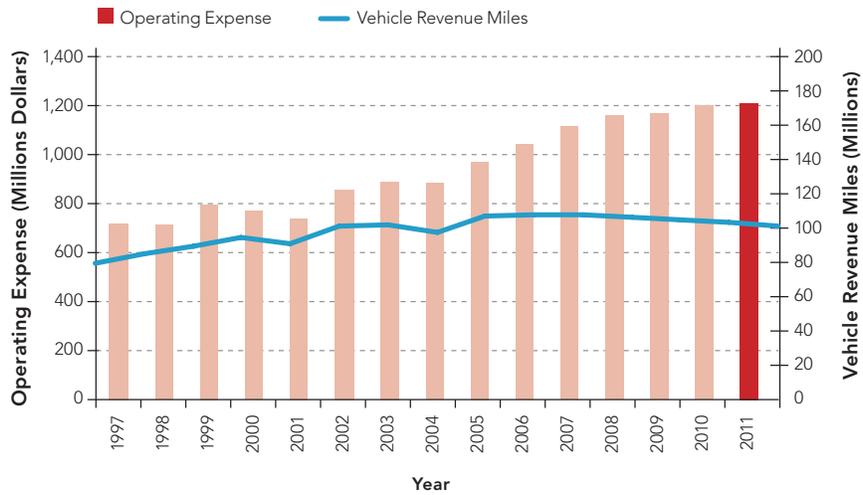


Figure 18. Historic Operating Expense

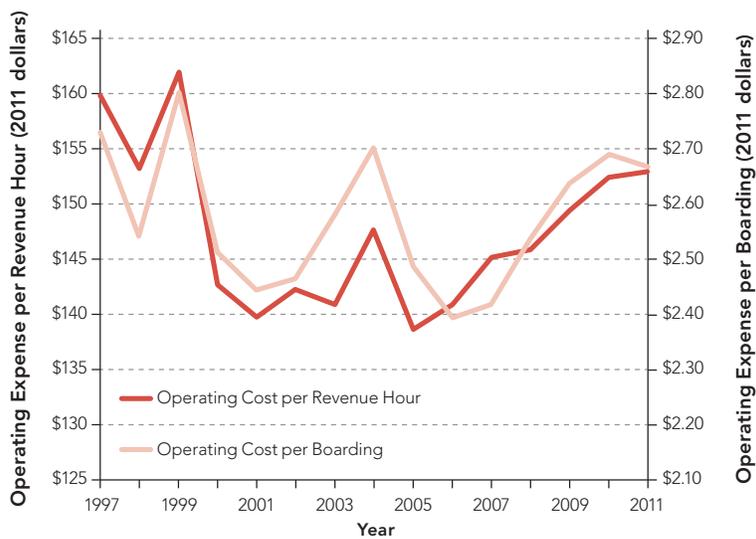


Figure 19. Operating Expense Efficiency

8 Unlinked Passenger Trips per Capita

This section analyzes transit ridership as a means to assess the environmental performance of our operations. Transit service is measured using ridership boardings and revenue hours. Ridership boardings are the total number of unlinked trips on our transit vehicles. Revenue hours are the sum total of hours that each bus and train carries passengers.

In 2011, bus boardings remained the majority of Metro boardings; their growth has been steady in the last 3 years. Rail boardings have also experienced the same steady trend. During the past 15 years, changes in bus boardings have been overshadowed by the growth in rail boardings. While the larger bus service area has continued to facilitate more than three and a half times as many trips by bus in 2010 as by rail, rail has seen the fastest ridership growth, more than doubling to 21% of Metro's total mode share from 9% in 1997. In addition to increased rail service, this increase in rail mode share is also attributable to the relatively small increases of bus boardings from 1997 to 2011. Bus ridership has increased by only 3% between 1997 and 2011, slowing to about 360 million boardings per year in recent years. The combination of increasing rail ridership and steady bus ridership has resulted in a decrease in bus mode share from 91% in 1997 to 79% in 2011. Despite the changes in mode share, overall transit ridership increased 18% since 1997, though evidence shows ridership has slightly decreased since a peak in 2007.

Increasing transit ridership can reduce regional VMT and the associated GHG emissions. Although this may increase Metro's transit GHG emissions, these emissions will be offset by an overall regional reduction of GHG from reduced personal vehicle travel.

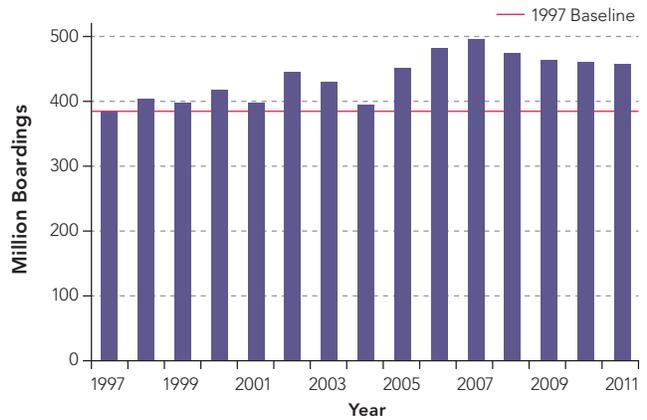


Figure 20. Total Boardings (1997-2011)

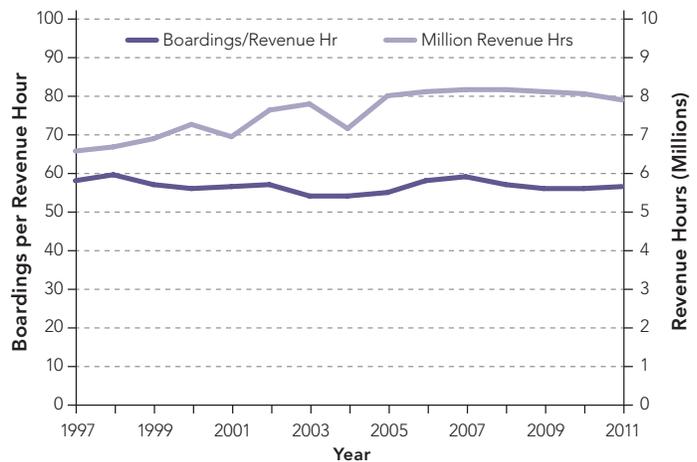


Figure 21. Boardings Efficiency

9 Vehicle Miles Traveled per Capita

Despite a gradual rise in population since the recession in 2007, Los Angeles County drivers drove less each year from 2007 to 2010. In 2010, Los Angeles County drivers drove 272 miles less per person per year than they did in 2007 and 374 miles less than in 1997. However, not all Los Angeles drivers are switching to transit from their personal vehicles, as Metro also experienced a decrease in ridership from 2007 to 2010. The recent economic hardships and historically high gas prices may have resulted in drivers choosing to travel less frequently and less far, carpool more often, or travel by biking or walking.

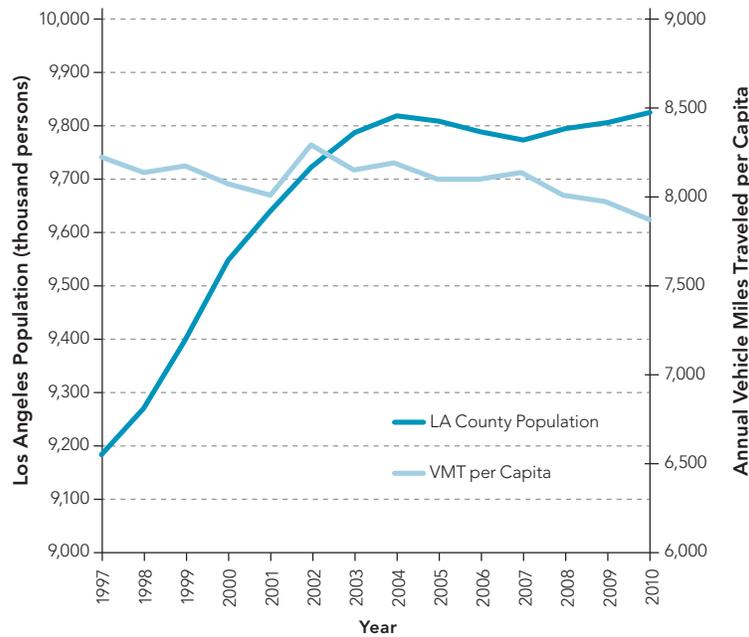


Figure 22. Los Angeles County Annual VMT per Capita and Population Trends



Reporting Methodology

How the Indicators Were Chosen

Metro was a founding member of the American Public Transportation Association (APTA) Sustainability Commitment. As a signatory to this commitment, Metro has agreed to quantify and annually report on a series of key performance indicators and to track performance against each metric over time. To provide technical assistance and guidance for transit agencies, APTA created a working group that created the *Recommended Practice for Quantifying and Reporting Transit Sustainability Metrics* that provides the framework and methodology for development of this annual report. The Recommended Practice was updated and a draft version was issued on November 30, 2011. This revised Recommended Practice identifies nine performance metrics to be reported on an annual basis. The nine performance metrics include the following: 1) Water Use, 2) Criteria Air Pollutant Emissions, 3) Greenhouse Gas Emissions, 4) Greenhouse Gas Displacement, 5) Energy Use, 6) Waste and Recycling, 7) Operating Expenses, 8) Unlinked Passenger Trips per Capita, and 9) Vehicle Miles Traveled per Capita.

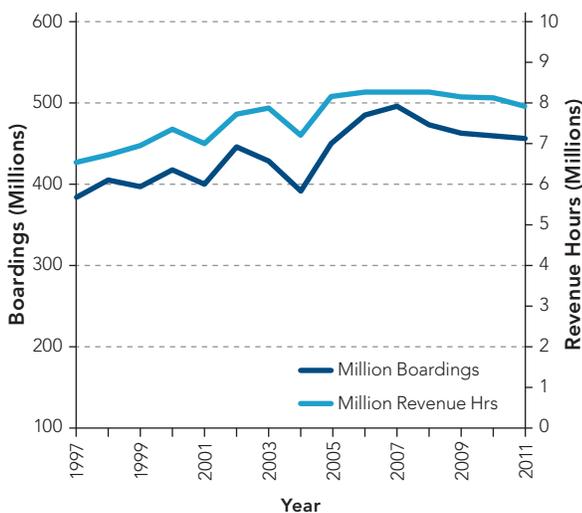


Measuring Efficiency: Comparing Changes in Ridership to Changes in Environmental Impacts

One of Metro’s principal roles is to provide efficient and effective transit service to the Los Angeles region. Metro’s transit service creates net sustainability benefits in the region through decreased congestion and VMT and increased mobility. As Metro increases our service capacity, the environmental impacts of our operations will grow. Efficient expansion of Metro’s services will ensure that environmental impacts do not outpace the benefits to the region. By comparing the change in environmental impacts to the changes in service (revenue hours) and ridership (boardings), the efficiency of growth can be assessed. While not a perfect science, the comparisons provide added depth for more informed decision-making.

Why We Measure Efficiency with Boardings and Revenue Hours

This report uses boardings and revenue hours to measure Metro’s transit ridership and transit service. These statistics are reported annually by all transit agencies to the National Transit Database (NTD) and thus enable cross-agency benchmarking.



Boardings

The purpose of transit is to move people from one place to another; in other words, to enable travel. This report measures ridership in boardings. “Boardings” are defined as persons getting on a bus or train. It is an unlinked trip versus a linked trip.

Revenue Hours

Revenue hours are the number of hours that all Metro revenue vehicles serve customers, but do not include the time that buses operate out of service. Measuring revenue hours enables us to see if increasing impacts are correlated to increased service. This is important because as a transit agency, Metro must both anticipate and induce travel demand. For this reason, the ridership benefits of transit projects might not be realized until several years after the projects are implemented. Measuring revenue hours can help to understand increased environmental impacts before they have translated into increased ridership.

Indicator Area Specific Methodology Deviations

Our calculations for operating expenses are consistent with APTA’s suggested methodology. Operating expense statistics by transit mode and operating statistics (vehicle revenue miles and boardings, or unlinked passenger trips) are taken from Metro’s NTD Agency Profile. APTA also suggests comparing Metro’s operating expenses performance metrics to that of the industry total. However, NTD only has industry data up through 2010, and does not have 2011 industry data. Thus, the comparisons in this report are made for 2009 and 2010, and not 2010 and 2011. Operating expense metrics are compared for all modes except vanpool, for which only 2011 data was available. As of May 2012, no vanpool operating expense data were available for years before 2011.

A comparison of the change in VMT per capita in Metro’s service area to the change in Metro’s total ridership can reflect the effectiveness of our ability to get people out of their cars and onto buses, rail, and vanpools. To calculate the VMT per capita for Metro’s service area, APTA suggests that the daily VMT per person be extracted from the FHWA’s “Highway Statistics” publication. However, as of

May 2012, this data was not available for 2010 from the FHWA website. Alternatively, as the federal data are built off of reports from the states themselves, we gathered daily VMT for Los Angeles County published in the California Highway Performance Monitoring System (HPMS) data. This data was available for each year from 1997 to 2010. To chart the historical trend in VMT per capita for Los Angeles County, daily VMT was converted to annual VMT and divided by the total population in Los Angeles County for each respective year, using historical population data from the California Department of Finance.

Weaknesses in the Data

Analyzing the environmental performance of an agency as large and complex as Metro involves large amounts of data from many sources. We used the best data available as of April 2012 for this report and determined that these data provide an accurate analysis of the agency's performance. There were a few shortcomings in the data, however, that should be addressed in future reports:

1. Lack of Sub-Meters: Because a few of Metro's current utility meters monitor several buildings within a division (for example), it is difficult to accurately identify the source of increasing or decreasing energy usage within a specific division.
2. Lack of Data:
 - Facility Electricity and Solid Waste and Recycling – Data were not available back to 2002. In these instances, all data that were available were used for analysis.
 - Rail Propulsion Electricity – Rail propulsion electricity data are not available before 2005.
 - Specific waste streams for waste and recycling not available.
3. Meter Issues: Water billing and electricity use were provided by meter address, which does not always match up to a specific location/division.



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Accomplishments

Throughout 2011, Metro actively pursued sustainable and efficient strategies in an effort to maximize transportation efficiency, access, safety, and performance while minimizing energy use, consumption, pollution, and the generation of waste. Those efforts and sustainable strategies that were suggested in the previous sustainability report and the accomplishments achieved throughout 2011 are provided and discussed by indicator area. Some sustainable strategies are considered essential and ongoing; therefore, they are carried forward on an annual basis. Each accomplishment is a confirmation that Metro is committed to increasing our sustainability, efficiency, and environmental performance.

In 2011, Metro adopted the Energy Conservation and Management Plan (ECMP) that included a holistic assessment of energy supply and demand. Also in 2011, Metro Environmental and Sustainability staff assisted APTA in the development of its sustainability metrics for transit agencies. In addition, an Environmental Management System (EMS) has been fully implemented at the Metro Red Line Yard (Division 20) and Division 10 is in the process of full implementation as well. Also as part of the accomplishments of 2011, Metro retired from service all remaining diesel fuel buses and now boasts a fleet of 2,221 buses that are all powered by CNG.

Case Study – CNG Bus Fleet Conversion

Challenge

More than 1 million trips are made each weekday on Metro's fleet of over 2,000 buses. These trips are made in the Southern California Air Basin – one of the most polluted in the country. Traditionally fueled buses that run on diesel are costly to operate and release harmful particulates into the air. Poor air quality is linked to a number of health issues such as pulmonary and respiratory problems, heart disease, and cancer. As an agency committed to improving air quality and environmental health in the region, Metro began planning a switch from diesel to alternatively fueled vehicles more than 18 years ago.



Action

Since 1993, Metro has only added buses to its fleet that run on alternative clean air fuels, phasing out the notoriously highly polluting diesel buses that are still prevalent throughout the nation. After experimenting, testing, tracking, analyzing, and evaluating various alternative-fuel technologies like methanol and ethanol vehicles, Metro decided to adopt CNG technology for its buses. Metro's CNG engines use the latest generation ISL-G natural gas engines from Cummins-Westport. These are among the cleanest engines available in the world and are fully compliant with current California Air Resources Board (CARB) and U.S. Environmental Protection Agency (EPA) emission standards. Internally, Metro continues to pilot cleaner bus technologies with the recent introduction of six gasoline-electric hybrid buses and one fully electric bus to further reduce Metro's fleet air quality impact and carbon footprint.

Though CNG buses are \$50,000 more expensive than diesel vehicles, over the life of the bus lower fuel costs make CNG buses very cost-effective in both improved air quality and operations cost (compared to diesel). CNG is significantly cleaner than diesel with regard to GHG and criteria pollutants, especially Diesel Particulate Matter.

Outcome

This CNG-phasing strategy led Metro to become the first and only major transit agency in the nation that directly operates a fleet running entirely on alternative fuel when the last diesel bus was retired from the fleet in 2011. Today, that fleet includes 2,221 CNG vehicles. At the official retirement of the Metro fleet's last remaining operational diesel bus in February, Los Angeles Mayor Antonio Villaraigosa and South Coast Air Quality Management District (SCAQMD) board member Mike Antonovich summarized Metro's achievement: "Along with eliminating the emission of 300,000 pounds of greenhouse gases daily – the equivalent of shutting down four oil refineries, we reduce our nation's dependence on foreign oil by utilizing clean burning natural gas of which 98% is produced in North America."

From 1990 to 2011, Metro reduced GHG emissions by 34%, and criteria pollutants by 95%, including a noteworthy 91% reduction in Diesel Particulate Matter, a likely carcinogen.

In 2011, Metro received a Clean Air Award from the SCAQMD for its achievement in building a clean bus fleet. Metro is further expanding its clean air initiative by replacing contract service diesel buses with CNG-fueled vehicles, working toward supporting a completely alternative-fuel bus service with both direct operation and contract service buses using alternative fuels.

Case Study – Green Construction Policy

Challenge

Expediting Metro's Measure R Initiative through the America Fast Forward Program will reduce overall emissions and get people out of their cars and onto transit sooner; however, the potential to create significant harmful emissions from traffic congestion and those associated with construction activities and existing non-mitigated legacy construction equipment usage remains high. The Los Angeles region ranks among the lowest in the nation for air quality. At the same time, Metro is working hard to provide high quality transit options in the Los Angeles region. Some of the most harmful environmental impacts that are caused by construction activities include the emission of airborne particulates from off-road equipment, engines, generators, and dust.

Action

In a proactive effort to prepare the agency and region for new restrictions under AB32 and SB375 and improve regional air quality, Metro passed the Green Construction Policy in 2011. This innovative policy commits Metro to reduce impacts of harmful emissions from construction equipment and traffic generated by construction activities. This policy requires that vehicles used during construction of Metro projects are equipped with technologies to reduce emissions and meet or exceed modern air quality standards.

After an extensive outreach effort with regional agencies, municipalities, and local communities, the Green Construction Policy was adopted in July 2011. Metro's Green Construction Policy is in line with the clean construction requirements already existing in New York, Illinois (Cook Co.), and Rhode Island (Providence), among others. Locally, the Port of Los Angeles, Port of Long Beach, and Los Angeles World Airports have already incorporated clean construction requirements into their specifications.

Outcome

From an informal survey of transit agencies nationwide (conducted through APTA), it appears that only a handful of our peers have considered clean/green construction equipment requirements. There appears to be no transit agency at this time that has adopted such a policy. With the adoption of this policy, we have become the industry leader in the APTA community for our proactive efforts in regulating construction equipment and activities.

The Green Construction Policy will apply to the majority of upcoming Measure R capital projects, and it includes aggressive restrictions for on- and off-road equipment emissions and operations for construction projects in an effort to lead the way in improving air quality in the Los Angeles region.



1 Water Use

In 2011, Metro initiated a recycled water project for landscape irrigation along the Metro Orange Line. Metro also initiated a water recycling system for the steam bays at Division 18.

Also in 2011, a reclaimed water connection was provided to the Division 3 bus wash by the Los Angeles Department of Water and Power (LADWP). This line provides recycled water for Division 3's bus wash.

Metro also continues to install conservation features as part of standard retrofits and has taken steps to proactively reduce water consumption throughout all operations.

2 Criteria Air Pollutant Emissions

Metro's overall fleet emissions levels saw a significant reduction from 2010 to 2011. 2011 fleet emissions of reactive organic gases (ROG), carbon monoxide (CO), oxides of nitrogen (NOx), and particulate matter (PM) were reduced by 10.3%, 22.5%, 19.9%, and 23.1%, respectively, as compared to 2010 levels. Overall, total criteria pollutant emissions were reduced by approximately 362.6 tons, or 20.3%, from 2010 to 2011. These improvements can be attributed to the following actions:

- An overall reduction in transit bus miles traveled in 2011 as compared to 2010.
- Retirement of diesel-fueled buses from the Metro bus fleet and transition to low emissions natural gas buses;
- Increased efficiency in Metro rail operations.

3 Greenhouse Gas Emissions

In 2011, both the Metro Gateway headquarters building and Division 3 maintenance obtained LEED-EBOM certifications. In addition to this, certifications are also being pursued in various other divisions.

Efforts made in Unlinked Passenger Trips per Capita, Fuel Usage, and Facility Electricity Use have

all resulted in GHG reductions. Growth in overall passenger trips over the last 14 years has reduced region-wide VMT and associated GHG emissions.

4 Greenhouse Gas Displacement

2011 saw an increase in GHG emissions displaced by Metro's operations. Displaced GHG emissions increased from 410,776 MTCO_{2e} in 2010 to 419,344 MTCO_{2e} in 2011. This increased displacement of emissions helps illustrate the key role that Metro's transit services have in reducing GHG emission throughout the region.

5 Energy Use

100% of Metro's bus fleet runs on CNG. As of 2011, the last remaining diesel fuel bus was retired. Metro's entire fleet has transitioned from diesel to CNG, making it the largest CNG bus fleet in North America.

Metro continues to pursue implementation of Wayside Energy Storage System (WESS) projects that use stationary electricity storage devices to capture energy generated when a rail car unit decelerates, releasing energy back into the system when required. A WESS for the Metro Gold Line is being funded by the SCAQMD Mitigation Fund Grant and was approved by the Board in April 2012. In addition, Metro continues development of the Metro Red Line WESS project at the Westlake/MacArthur Park station, which was awarded Federal Transit Administration grant funds.

Metro has implemented lighting retrofit plans that assist in the replacement of old, inefficient light fixtures throughout Metro facilities. These lighting retrofit projects are accomplished through the establishment of Life of Project (LOP) budgets using Sustainability Capital Project funds. In 2011, Metro completed lighting retrofits in the Division 20 shop area and procured new LED light fixtures for the Division 10 tire shop.

In 2011, a LEED-EBOM gold rating was awarded to the Metro Gateway headquarters building. LEED-EBOM certifications for Divisions 10 and 30 are currently being pursued.

6 Waste and Recycling

Metro continues to implement strategies that reduce its chemical, non-hazardous liquid, oil usage, and associated waste. Such strategies include desk-side recycling and the use of waste compactors. For 2011, Metro recycled solid waste at a rate of 41% while decreasing solid waste produced (in comparison to 2010). Total solid waste output decreased by 2,346 tons.

8 Unlinked Passenger Trips per Capita

Metro continues to provide resources to commuters throughout Los Angeles County in an effort to promote carpooling and the use of transit as transportation alternatives. As part of this effort, Metro continues to implement ridesharing and transit pass programs for Los Angeles employers and provides Metro employees with a transit subsidy program that provides additional incentives to take alternative commuting to and from Metro offices.



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How Did We Do?

Metro's environmental performance throughout 2011 is assessed by our performance in each indicator area. This analysis provides the data that Metro uses both to track progress from year to year, and to set new targets, strategies, and goals for future years. Each indicator section presents accomplishments achieved in 2011 followed by general indicator information. Annual performance data are also discussed and presented graphically. Finally, next steps suggested for future implementation are provided.

1 Water Use



Accomplishments

- Provided recycled water connection to the Division 3 bus wash facility; initiated recycled water project for landscape irrigation along the Metro Orange Line.
- LEED-EBOM effort identified the replacement of existing plumbing fixtures with more water-efficient fixtures.
- Initiated water recycling system for the steam bays at Divisions 9 and 18; project budget has been established and procurement is underway.

Data and Analysis

In 2011, Metro purchased 238 million gallons of water from LADWP, approximately 2% less than in 2010. We track our water use in two categories, Major Facilities and Other Facilities. Major Facilities generally include high volume water users like Divisions, ROC, CMF, and the Metro Gateway headquarters building. Other Facilities generally include low volume users like stations and landscape irrigation. As shown in Figure 24, from 2002 to 2008, Other Facilities water use experienced a significant yearly increase. During that same time period, Major Facilities water use experienced fluctuations but was relatively stable. The increase in Other Facilities water use is largely attributed to an increase in the number of facilities. Other Facilities totaled 76 in 2002 and grew to 106 in 2011. Major Facilities totaled 22 in 2002 and increased to 26 by 2011.

From 2010 to 2011, Major Facilities water use experienced a significant reduction while Other Facilities water use had a significant increase. 2011 was only the second year on record where Major Facilities water use was less than Other Facilities and can be attributed to the many water conservation actions being taken at the Division level and overall water use reductions associated with a decrease in ridership. Analysis of water use data shows that water use at bus yards experienced a net decrease of 17% from 2010, but water use at other Metro facilities increased by 19% in 2011.

After Consistent Increases, Water Consumption Is Steady

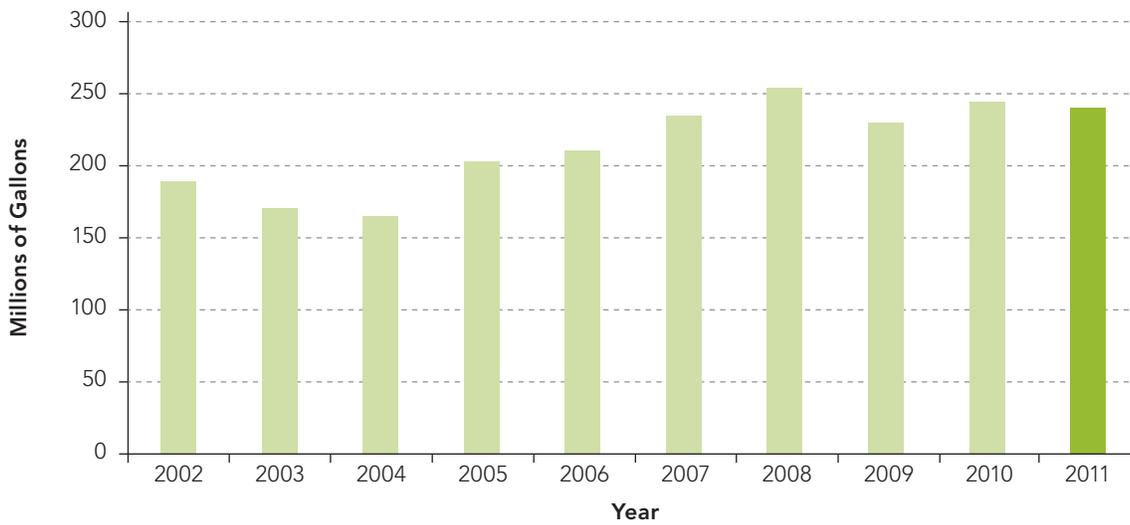


Figure 23. Historic Water Use (2002-2011)

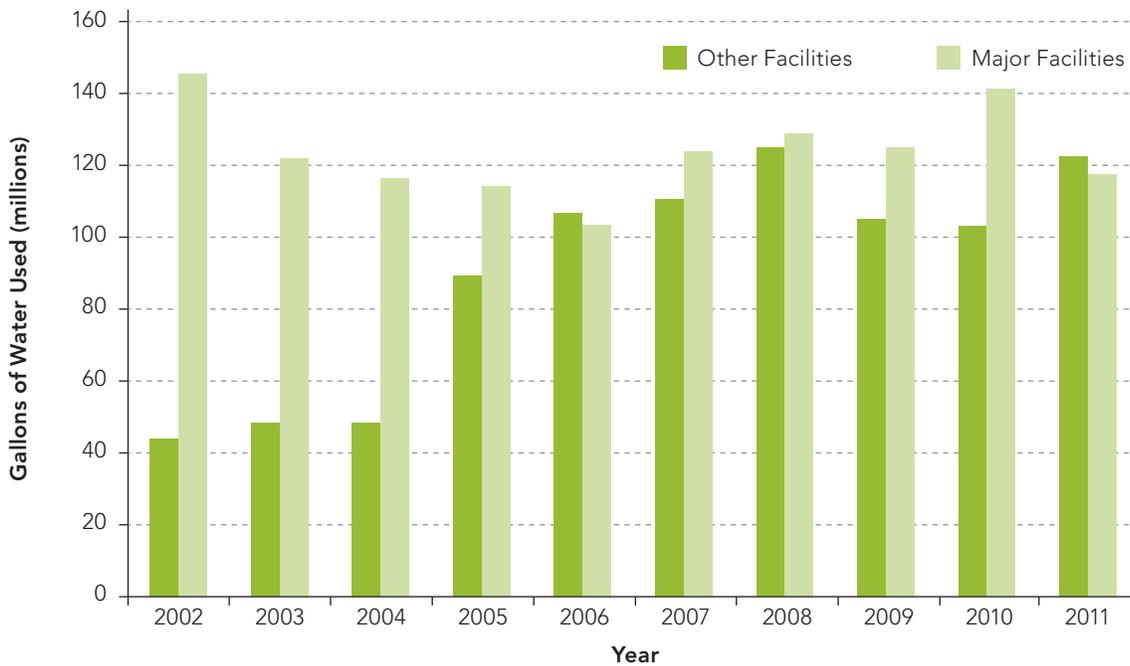


Figure 24. Major Facility and Other Facility Water Use (2002-2011)



Water Efficiency Decreased In 2011

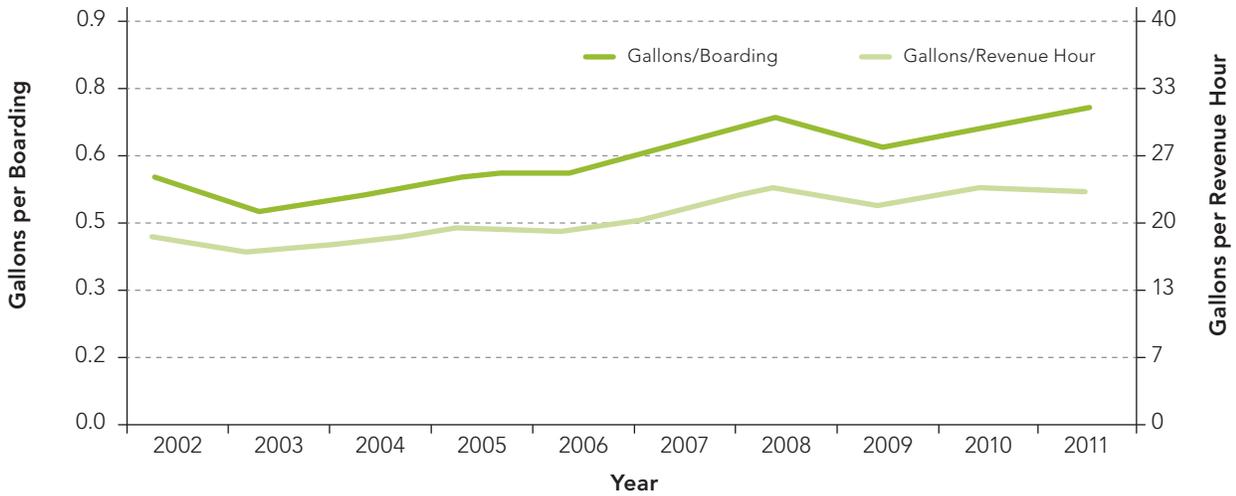


Figure 25. Historic Water Use Efficiency (2002-2011)

Transit service (measured in revenue hours) decreased from 2010 to 2011 at a faster rate than water use, causing our water efficiency (measured in gallons per revenue hour) to decrease. Water efficiency in 2010 was 29.87 gallons per revenue hour compared to 31.72 gallons per hour in 2011, a loss of efficiency of 1.85 gallons per revenue hour.

Water Consumption At Major Facilities

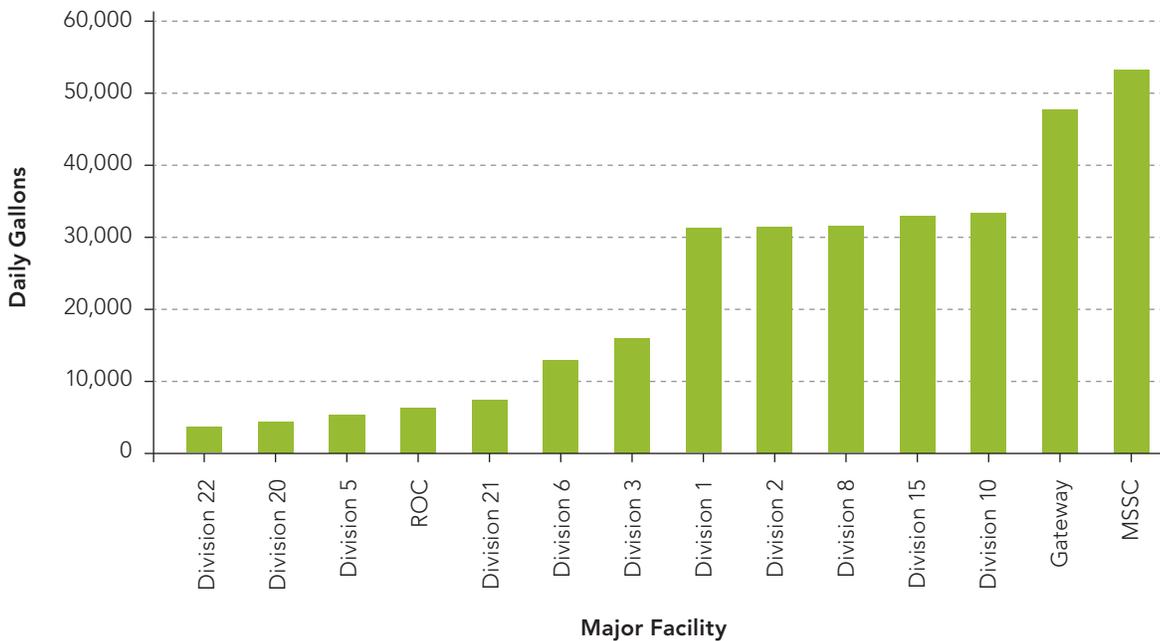


Figure 26. Average Daily Water Use in Gallons by Major Facility (2011)

Overall Cost For Water Has Decreased

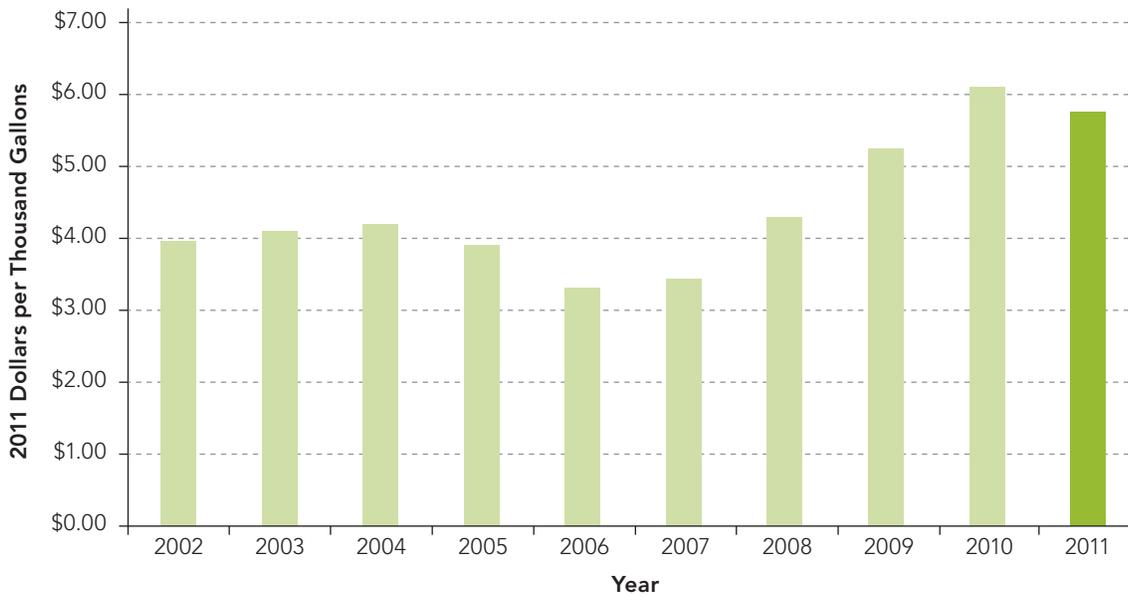


Figure 27. Average Water Cost per Thousand Gallons – 2011 Dollars (2002-2011)

Due to the reduction in water use and a decrease in the purchase price of water (due to the above-average snowpack in early 2011¹) our water costs were lower in 2011 than in 2010, declining to about \$5.78 per thousand gallons. Between 2002 and 2011, the average water cost per gallon grew nearly 44%. During that time period, sewer expenditures also rose but eventually returned to 2002 levels. Overall water use between 2002 and 2011 increased by 27%, resulting in an overall total water expenditure increase of 47%. In 2002, Metro spent \$740,000 on water and \$579,000 on sewer (adjusted for inflation). In 2011, Metro spent more than \$1.3 million on water and \$656,000 on sewer. This reflects a 2011 dollar increase of \$545,000 on water and an increase of \$77,000 on sewer from 2002.

¹ California Department of Water Resources. 2011. DWR Announces Results of Fourth Snow Survey of 2010-2011 Season. News Release. Available at <http://www.water.ca.gov/news/newsreleases/2011/033011snow.pdf>. Accessed: April 5, 2011.

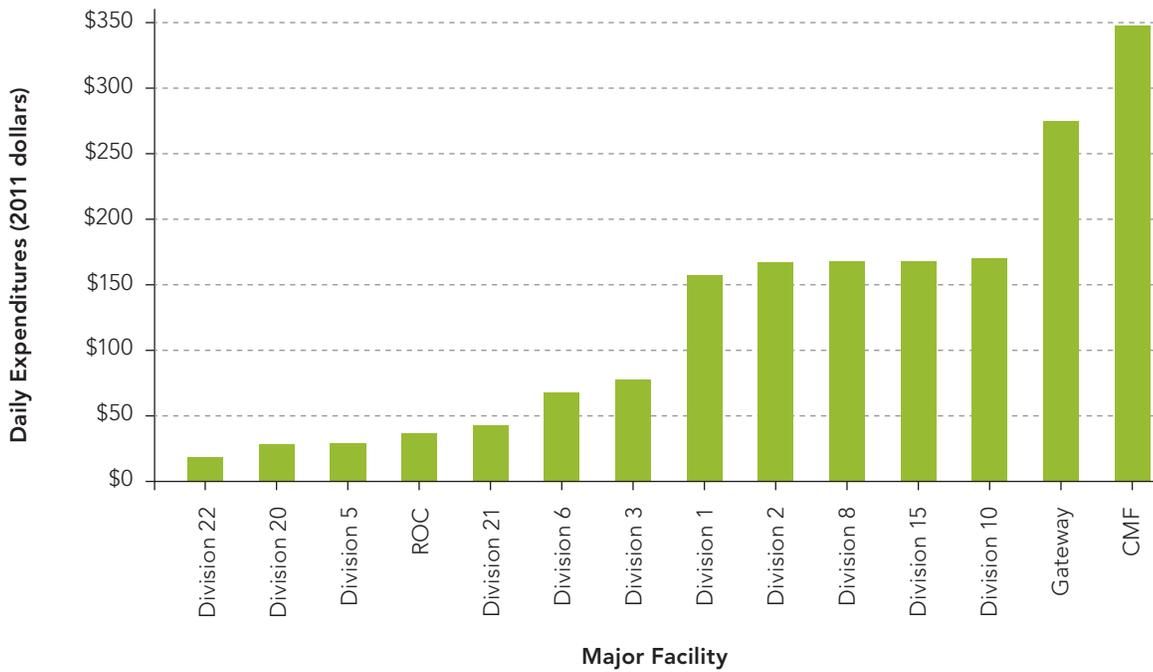


Figure 28. Average Daily Water Expenditures by Major Facility (2011)

In 2011, daily Major Facility water use varied from a low of 3,535 gallons at Division 22, to a high of 52,943 gallons at the Central Maintenance Facility (CMF) building. All but five divisions experienced a decrease in total water use from 2010 to 2011. In 2011, CMF remained the facility with the highest daily water usage, as was the case in 2010. Metro's Gateway headquarters has historically used the greatest amount of water out of all divisions from 2005 to 2009. Average daily water costs varied between \$19 (Division 22) and \$347 per day (CMF). The continued high water usage at CMF reflects the pressure washing of 6,000 solar panels on an as-needed basis that began in 2010.

Next Steps

- WU1 Substitute municipal recycled water for potable water when possible.
- WU2 Capture a higher percentage of runoff for recycling at washing bays.
- WU3 Use native plants for landscaping and implement rain water saving systems to reduce the use of municipal water for landscaping.
- WU4 Replace inefficient sanitary fixtures in bus and rail facilities with more efficient fixtures.
- WU5 Prioritize recycling and re-use of onsite grey water at bus and other facilities.
- WU6 Replace inefficient steamers with high efficiency models.
- WU7 Use water conservation and efficiency guidelines outlined in LEED reference books.
- WU8 Use recycled water for car washing throughout Metro's rail facilities.
- WU9 Add water recycling systems to maintenance facility steam bays.

Case Study – LEED-EBOM Certification

Challenge

A considerable portion of resources Metro uses is consumed by our facilities. All of our facilities serve vital functions, yet many were built without consideration of resource use or waste. We as an agency are conscious of how the design of buildings and facilities can affect energy, water, waste, and other resources, and strive to minimize waste with cost and resource saving solutions.

Action

In 2011, Metro received Leadership in Energy and Environmental Design (LEED), Existing Buildings Operations and Management (EBOM) Gold Certification from the U.S. Green Building Council for the Metro Gateway headquarters building. This certification recognizes the fact that Metro took steps to ensure that our 15-year-old, 27-story headquarters building employs energy and water conservation measures, and has improved indoor environmental quality.

Outcome

Actions taken to comply with LEED certification standards have resulted in a 48% decrease in water use, a 6% decrease in energy use, and a 13% decrease in natural gas use. Waterless urinals in the building save more than half a million gallons of water per year, and Metro implemented a green cleaning program to reduce exposure to harmful cleaning chemicals. Achieving LEED certification can also protect occupant health and improve employee productivity. Recently, Metro committed to constructing all new facilities over 10,000 square feet to LEED Silver standards. In total, five Metro buildings have received LEED certification.





② Criteria Air Pollutant Emissions

Accomplishments

- In 2011, Metro retired its last diesel-powered bus. Metro's fleet now includes 2,221 CNG-powered vehicles.
- Metro has not purchased a diesel-powered bus since 1993, and is continuing to pursue the use of cost-effective clean fuel vehicles.
- In 2011, the non-revenue department at Metro continued replacing unleaded fuel vehicles with hybrid vehicles.
- In 2011, the non-revenue department at Metro began replacing gas forklifts with battery operated forklifts.

Data and Analysis

For 2011, Metro was able to reduce overall air pollution emissions by approximately 20% from 2010. Also in 2011, Metro reduced emissions of harmful diesel particulate matter pollution by 23%. Reduction in diesel particulate matter is directly tied to Metro's continued efforts to modernize its bus fleet by converting over to the use of CNG.



Total Fleet Criteria Pollution Continues to Decrease.

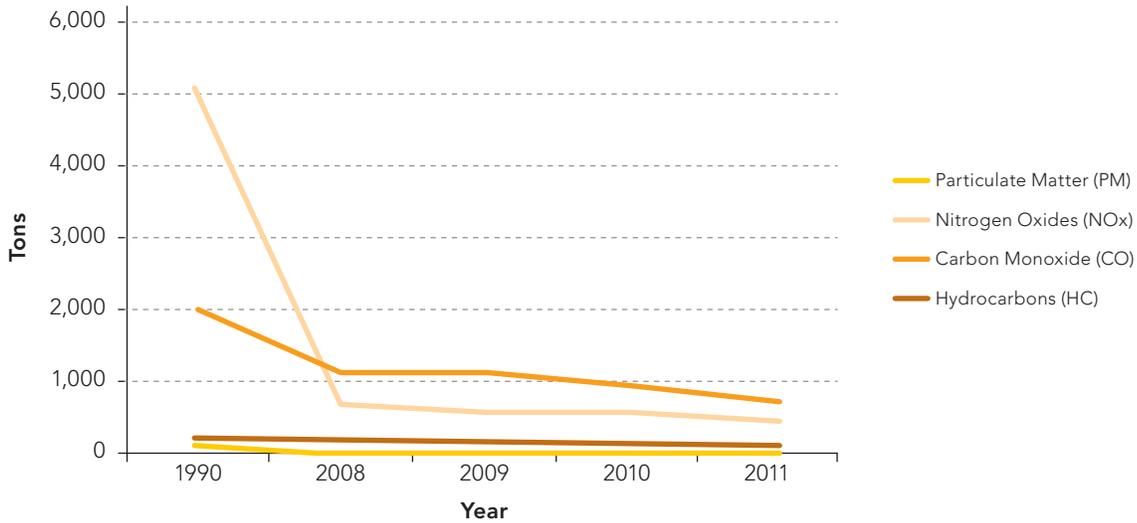


Figure 29. Historic Criteria Air Pollutant Emissions (1990, 2008-2011)

Efficiency Continues to Increase in 2011.

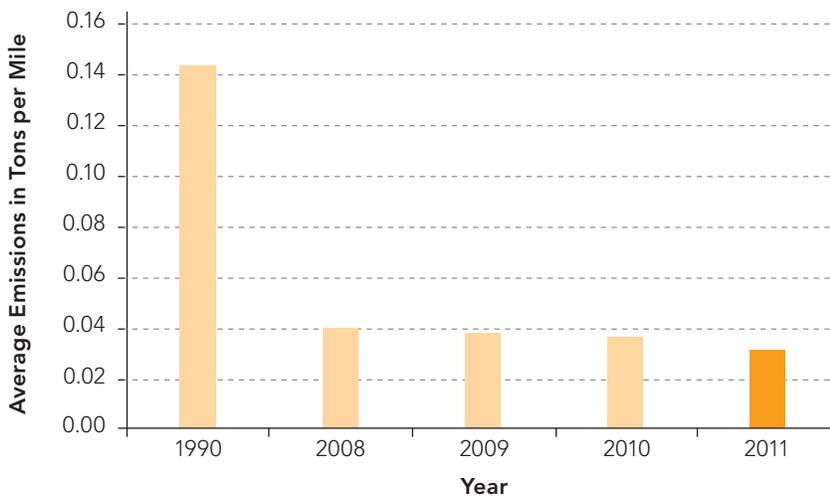


Figure 30. Average Criteria Pollutant Emissions per Mile (1990, 2008-2011)

In 2011, Metro’s overall criteria pollutant emissions efficiency increased by approximately 13% from 2010. The switch from diesel to CNG buses and increases in rail mileage meant that Metro was able to increase vehicle miles while simultaneously reducing total pollution emissions.

This reduction in criteria pollutants is a significant achievement – emissions of fine particulate matter in vehicle exhaust have serious health effects. Combustion particulates from diesel engines are known carcinogens.

2011 Bus is Less Polluting Than a 1990 Bus

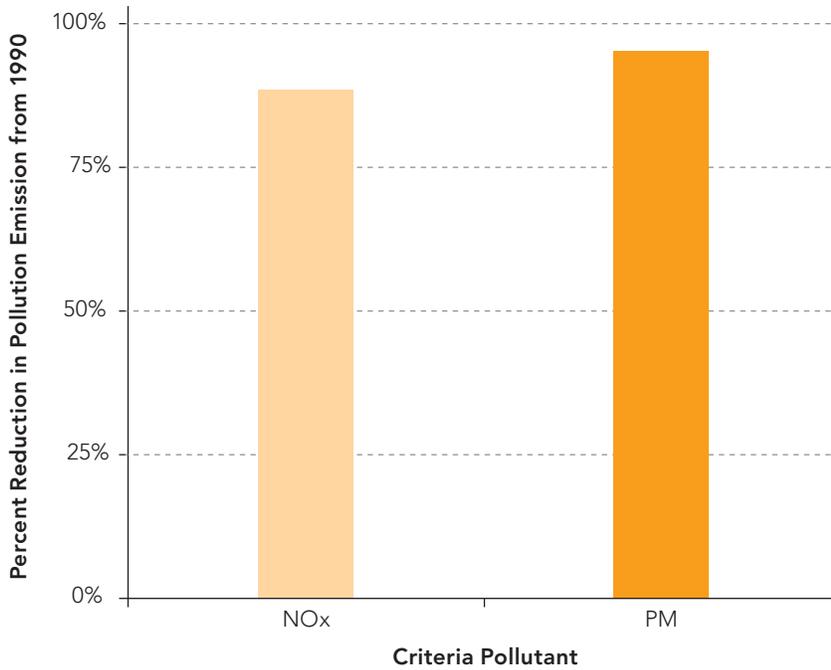


Figure 31. Reduction in Criteria Pollutants from the Average 2011 Bus

The average bus in 2011 emitted 89% less NOx and 95% less PM than in 1990. The most significant factor in the continued reduction in Metro fleet emissions is the transition of the Metro transit bus fleet to cleaner fuels and more modern technology. This trend is expected to continue as Metro continues to replace and re-power its buses with the newest technology engines.

Next Steps

AQ1 Continue to explore technological advancements in transit vehicles that decrease air pollution.



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3 Greenhouse Gas Emissions

Accomplishments

- Completed phase-out of diesel buses in Metro fleet.
- Streamlined and reduced Metro service by 13% to optimize and improve regional transit service.¹
- Began Live Help travel assistance for riders on Metro.net.²
- Began testing real time bus arrival system mobile application, Nextrip, to facilitate and encourage transit ridership.
- Offered incentives to employees who use their bikes as part of their commute and completed two bicycle studies.
- Continued and expanded Metro's vanpool program.
- Continued to plan and construct an additional 12 rail and bus lines to be added to the Metro transit service as a part of the 30/10 initiative. Construction on the Foothill Gold Line Extension continues to make progress. Current construction of the new Expo rail line is expected to be completed in 2012.
- Continued the use of renewable energy technologies on transportation infrastructure.
- Continued to provide a transit subsidy program to our employees.
- In FY2012, Metro plans to procure 92 hybrid sedans, 20 to 25 hybrid utility vehicles, and at least one electric truck, increasing the use of hybrid vehicles for non-revenue fleets.
- Continued to provide a variety of services and product offerings to employers and educational institutions in Los Angeles County to promote carpooling, vanpooling, and transit as alternatives to driving alone.
- Metro Environmental and Sustainability staff assisted APTA in the development of its sustainability metrics for transit agencies.

¹ <http://thesource.metro.net/2011/01/03/metro-proposes-bus-service-changes-in-june/>

² <http://thesource.metro.net/2011/01/07/need-assistance-live-help-beta-arrives-on-metro-net/>



- Metro's Environmental Management System (EMS) was fully employed at Division 20 and is in the process of full implementation at Division 10.
- Developed a Draft Climate Action and Adaptation Plan that includes GHG reduction, mitigation, and adaptation strategies. A Sustainable Rail Plan is also under development and includes resource conservation strategies directly linked to GHG reduction.
- Received a LEED-EBOM Gold Rating Certification for the Metro Gateway headquarters building and a LEED for New Construction Certified rating for the Division 3 Maintenance Building Renovation.
- In 2011, the non-revenue department at Metro continued replacing unleaded fuel vehicles with hybrid vehicles.
- In 2011, the non-revenue department at Metro began replacing gas forklifts with battery operated forklifts.

Data and Analysis

During 2011, we were able to achieve a nearly 4% reduction in the quantity of GHG emissions from 2010; since 2007, Metro has reduced its GHG emissions by 5%. The reduction in emissions from transit sources in 2011 was greater than the increase in emissions related to facility energy use, resulting in a net emissions reduction in 2011.

Since 2010, GHG Emissions Were Reduced by Nearly 4%



Figure 32. Historic Greenhouse Gas Emissions (2007-2011)

CNG bus activity was reduced by nearly 8 million miles from 2010 to 2011, resulting in a reduction of approximately 22,600 metric tons of CO₂ equivalents (MTCO₂e). Reductions in overall rail energy use, purchased transport emissions, and, to a lesser degree, the final phase-out of diesel buses further decreased emissions by 5,700 MTCO₂e from 2010. Increases in facility energy use and a slight increase in non-revenue emissions contributed an additional 8,300 MTCO₂e. The rise in vanpool service further emitted 1,300 MTCO₂e in 2011. Combined, these changes resulted in a net decrease of 14,000 MTCO₂e from the previous year. Emissions from water treatment and distribution were added to the inventory for 2010 and 2011 years but contributed to less than 1% of total emissions. Emissions related to water were 12% more in 2011 than in 2010.

Almost 90% of GHG Emissions Are From Direct Passenger Transit

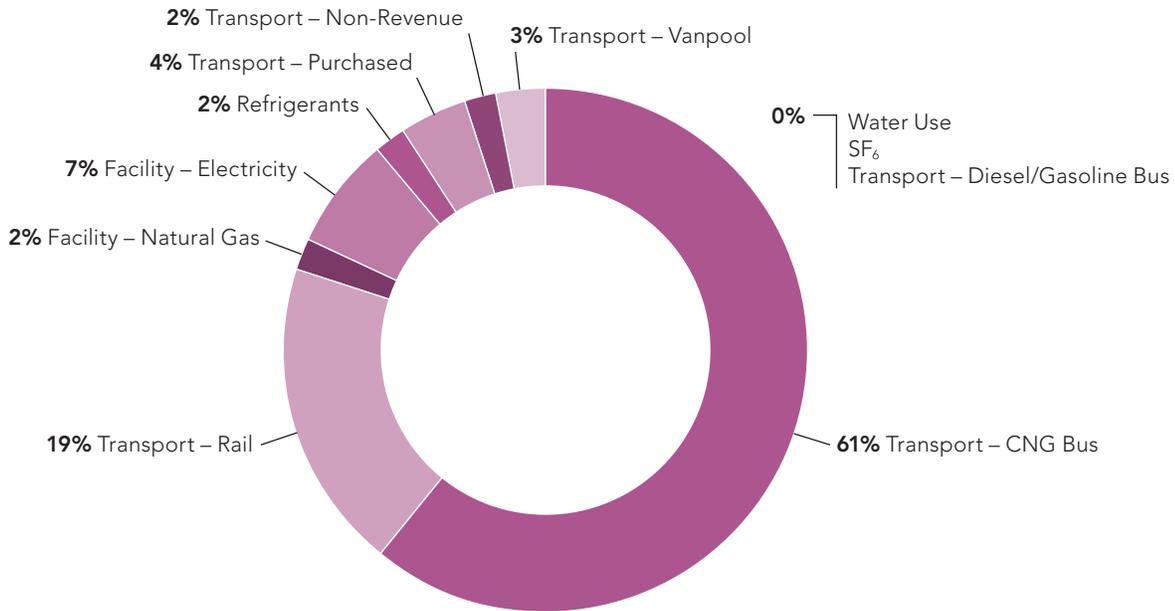


Figure 33. Percentage of Total CO₂e Emissions by Source (2011)

In 2011, 89% of Metro’s GHG emissions were generated by the direct operation of the transit system that moves Metro passengers. The majority of the remaining emissions resulted from the energy use (electricity and natural gas) at Metro facilities, which increased 25% from 2010. Emissions from vanpool gasoline usage were added for the first time in 2010 and accounted for 3% of total emissions in 2011. Refrigerant emissions of HFCs and PFCs, accounted for less than 1% of total emissions in 2011. SF₆ emissions, a high global warming potential gas used in electrical transformers, accounted for less than 1% of total emissions in 2011.



Directly Operated Buses and Light Rail, Most Carbon Efficient per Boarding

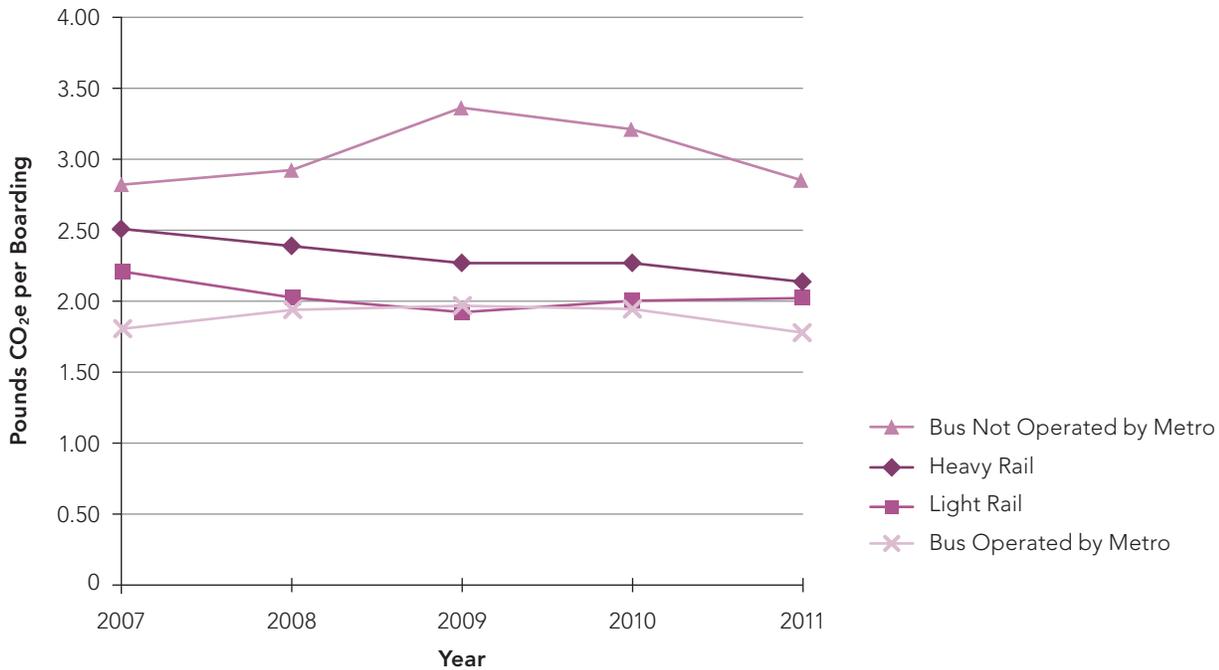


Figure 34. Greenhouse Gas Emissions Efficiency (2007-2011)

In 2011, Metro's directly operated buses were the most carbon-efficient transit mode emitting 1.77 lbs CO₂e per boarding, followed by light rail at 2.01 lbs CO₂e per boarding. The carbon efficiency of the directly operated buses reflects both an 8% reduction in total emissions and a 1% increase in ridership in this mode from 2010, reducing the emissions per boarding to just below 2007 levels. Purchased bus transport continues to be the least carbon-efficient mode per boarding, although an increase in efficiency between 2010 and 2011 was achieved. This efficiency was due to the greater shift toward the use of CNG from diesel as well as a slight increase in ridership.

Diesel consumption from purchased transport also decreased from 61% to 53% of total fuel use; CNG consumption increased from 36% to 43% of total fuel use with propane fueling the remainder. Increases in carbon efficiency have been made for both bus and rail transit modes. For both purchased and directly operated buses, the recent improvements in carbon efficiency reflect the shift away from diesel towards cleaner burning CNG and gains in ridership. For rail, reduced energy use and activity with only a minor decrease in ridership contributed to a continued increase in carbon efficiency.

The greatest gains in efficiency since 2007 remain from light rail and heavy rail, which have experienced significant growth in ridership since 2007. While not displayed in the figure, vanpool carbon efficiency was 9.4 lbs CO₂e per boarding. While this figure is significantly higher than all other modes shown here, the carbon efficiency by passenger mile is comparable to other transit modes as shown in Figure 35.

APTA Efficiency Statistics Reveal Variety of Carbon Efficiency

Mode	Lbs CO ₂ e / Veh Mile	Lbs CO ₂ e / Rev Hour	Lbs CO ₂ e / Pas. Mile
Heavy Rail	16.48	389.71	0.44
Light Rail	9.58	217.25	0.29
Bus Not Operated by Metro	4.82	76.41	0.81
Bus Operated by Metro	6.58	91.14	0.43
Vanpool	1.22	42.54	0.31
Total Lbs CO₂e/Metric (Total)	7.23	106.92	0.40

*Average passenger car emits about 1.1 pound of CO₂ per mile

Figure 35. APTA Suggested Statistics in Pounds* of CO₂e

APTA's climate change standard recommends reporting of the performance statistics outlined above³. Results from fuel use, travel, and ridership data indicate vanpools as having the best carbon-efficiency of all modes in terms of pounds of CO₂e emitted per VMT and revenue hour. The relatively high ridership of vanpools, combined with flexible travel routes and lighter weight vehicles, as compared to bus and rail modes, are likely to have contributed to the relatively high carbon efficiency of vanpools. In 2011, Metro's light rail system was the most carbon-efficient transit mode per passenger mile, emitting 0.29 pounds of CO₂e per passenger mile.

Although vanpools seem more efficient, unlike rail and Bus Rapid Transit-lane buses, their level of service is dependent on the level of congestion on publicly shared roads and freeway space. Bus and rail systems still provide an essential public service and both can improve their carbon efficiency through higher levels of ridership and improving the fuel efficiency of the vehicles.

³<http://www.apta.com/resources/hottopics/sustainability/Documents/Quantifying-Greenhouse-Gas-Emissions-APTA-Recommended-Practices.pdf>



Next Steps

- GG1 Establish a staff-level “Green Team” to inform, develop, and implement policies and procedures to meet the sustainability targets.
- GG2 Develop a metric to measure greenhouse gas emission reductions and the congestion relief benefits of Metro’s transit system.
- GG3 Continue to improve data collection capabilities through sub-metering and by aligning Metro’s address data with that of the utility companies.
- GG4 Improve the flow of information.
- GG5 Consider life-cycle costs for all projects.
- GG6 Continue to give preference to recyclable and recycled products during design and construction of Metro projects.
- GG7 Continue to review all licenses and permits for landfills, recycling facilities, and similar entities that will be used for the disposal or diversion of any waste or construction and demolition projects.
- GG8 Continue to develop and conduct Environmental Management System awareness training.
- GG9 Include sustainability principles on projects to be constructed under the new funding mechanisms such as Measure R and the American Recovery and Reinvestment Act.



4 Greenhouse Gas Displacement

In 2011, Metro emitted 456,598 metric tons CO₂e (MTCO₂e) associated with its buses, trains, non-revenue vehicles, and facilities. Our more than 2,200 CNG buses emit GHGs from their tailpipes, as do smaller numbers of gasoline and diesel buses¹. Light rail and heavy rail trains are responsible for GHGs emitted in their use of grid electricity. Metro's nonrevenue vehicles also emit GHGs from their tailpipes. Facilities use grid electricity and some natural gas, thereby contributing to GHG emissions.

Metro also keeps GHGs out of the atmosphere by allowing transit riders to leave their cars at home and by supporting other forms of low emission travel options. In 2011, Metro saved approximately 420,000 MTCO₂e from being emitted by displacing vehicle driving. As discussed in guidance from APTA, Mode Shift is used to quantify how Metro's service reduces GHG Emissions²:

- **Mode shift** – Metro reduces the amount of VMT on Los Angeles County's roads by getting people out of their cars and onto Metro buses, trains, and vanpools.

¹ Only purchased transport continues to use diesel buses in the fleet. Metro completely phased out diesel buses by early 2011.

² American Public Transportation Association 2011, "Recommended Practice to Quantify & Report Sustainability Metrics for Transit Agencies". APTA Standards Sustainability Metrics Working Group. November 30, 2011. TTI 2010, "Urban Mobility Report 2011". Available at <http://mobility.tamu.edu/ums/>, <http://mobility.tamu.edu/files/2012/01/complete-data.xls>. Accessed 4/17/12. NTD 2011. Service.xls in "RY 2010 Database". Available at <http://www.ntdprogram.gov/ntdprogram/data.htm>. Accessed April 17, 2012.



A summary of the GHG emissions that are displaced by Metro operations is presented in the following table:

Metro Prevents as Much GHG Emissions as It Produces

Source	Quantity of Emissions Displaced (MTCO ₂ e)
Total Emissions Displaced from Mode Shift	(419,344)
Emissions from Metro Operations	456,598
Net Emissions from Metro Operations	37,254

Figure 36. Net Emissions Displaced During 2011

Metro recently completed a study that tests the land-use co-benefit approach for quantifying the reduction in greenhouse gases (GHG) emissions from Metro's transit service. Metro supports one of the nation's highest and most uniform densities per capita in the nation; but this study suggests that the additional GHG savings from transit is difficult to isolate due to Los Angeles' unique land use patterns of development. While the results of this study also suggest that the GHG reduction impact of Metro's services may be up to three times greater than APTA's recommended value, further exploration of quantification techniques specifically for the Los Angeles region is necessary before Metro can account for this GHG credit. It is important to recognize that Metro's modern rail system has existed for only 20 years, a relatively short period of time compared to other transit agencies in New York, Chicago, and Philadelphia. Our near term capital projects are adding at least 236 miles of rail and Bus Rapid Transit lines to our system, as well as possible joint development projects. With the onset of these projects, the GHG reduction benefits from dense land use patterns are expected to grow. Valuation of these GHG credits is currently the subject of national discussion.



5 Energy Use

In accordance with the APTA guidance, Energy Use is divided into three sub-indicators. Each sub-indicator is discussed below.

Fuel Use

Accomplishments

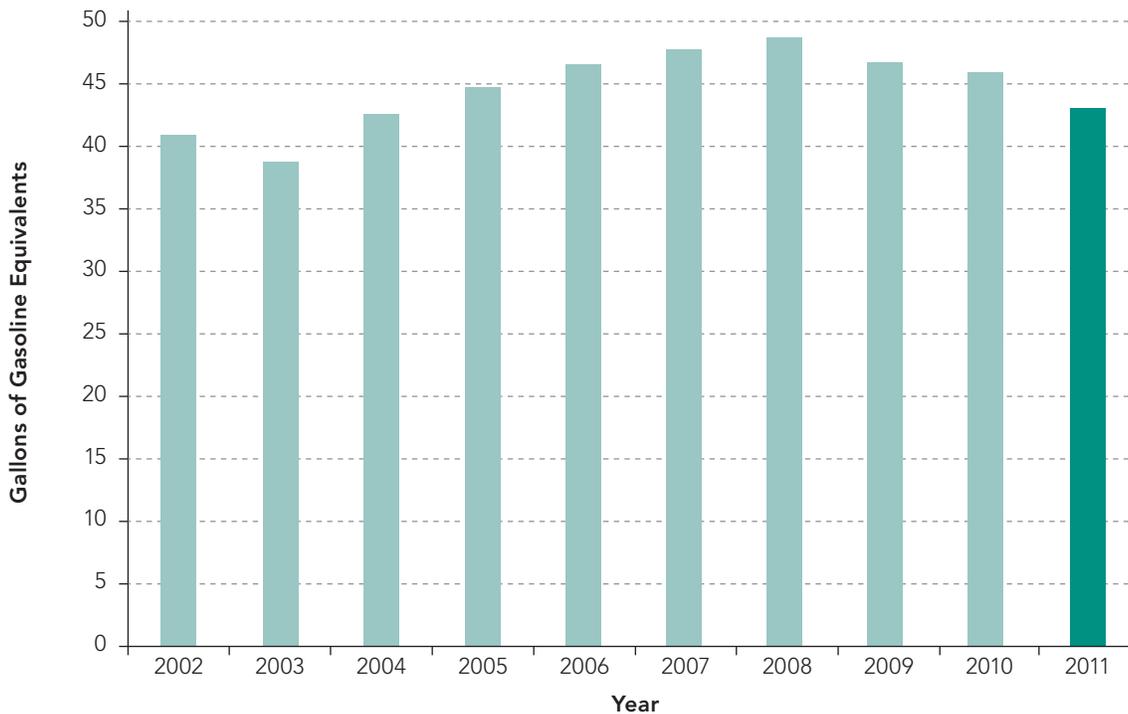
- In February 2011, Metro’s last diesel bus was retired from service, helping Metro to achieve our goal of a 100% alternatively fueled fleet, with 95% of the fleet powered by clean-burning CNG.
- SCAQMD awarded Metro with a “Promotion of Good Environmental Stewardship” award to honor the switch to 100% alternative fuels in 2011.¹
- In 2011, the non-revenue department at Metro began replacing gas forklifts with battery operated forklifts.

¹ <http://thesource.metro.net/2011/04/13/measure-r-road-project-breaks-ground-in-westlake-village/>



Data and Analysis

Overall Fuel Use Is at a 7-Year Low



Note: Vanpool fuel usage was added to the historical inventory in 2010; prior years do not include this data.

Figure 37. Total Fuel Used (2002-2011)

In 2011, Metro's fleet, excluding vanpool services, used over 41 million gallons of gasoline equivalent (GGE) fuel, 2 million more than was used in 2002 (the earliest year recorded), but nearly 5 million less than the peak usage in 2008. This usage in 2011 equates to an average annual 1% overall increase since 2002. Service cuts in 2009 caused fuel usage to decrease and additional planned service cuts in 2011 caused fuel usage to further decline.² Not included in this analysis is the impact of Metro's vanpool gasoline usage for 2011 of over 1.5 million gallons; vanpool fuel use accounts for 3.5% of total fuel usage in 2011.

² <http://thesource.metro.net/2011/01/03/metro-proposes-bus-service-changes-in-june/>

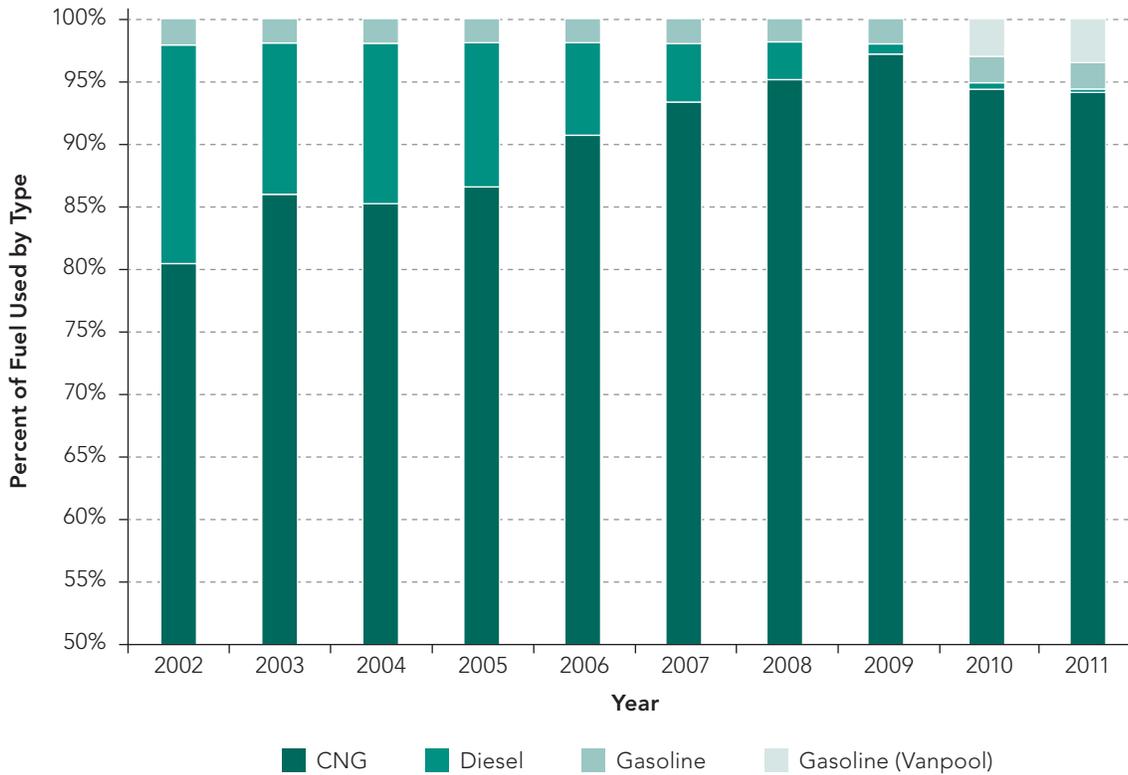


Figure 38. Percentage of Fuel Used by Fuel Type (2002-2011)

Due to Metro’s conversion from diesel to CNG, bus diesel consumption has decreased by 98% between 2002 and 2011, and by 54% from 2010 to 2011. While Metro’s bus fleet is 100% CNG fueled, six Gasoline-Electric Hybrid buses have been added to the fleet to demonstrate the viability of the technology (these buses were removed from service in December 2011). The operation of these six buses resulted in a 6% increase in gasoline consumption during the same time period. Metro’s fleet used 7.6 million more GGEs of CNG in 2011 than in 2002, a 23% increase. Also, accounting for gasoline used in vanpools, Metro’s gasoline use accounts for 6% of all fuel use, when compared on a GGE basis.



Fuel Use Efficiency Increases

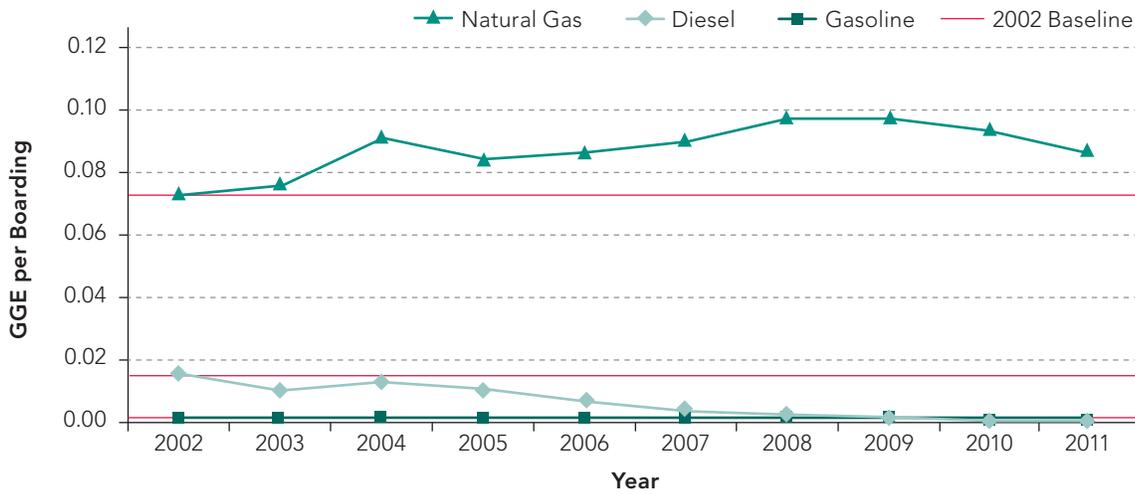


Figure 39. Total GGEs per Boarding (2002-2011)

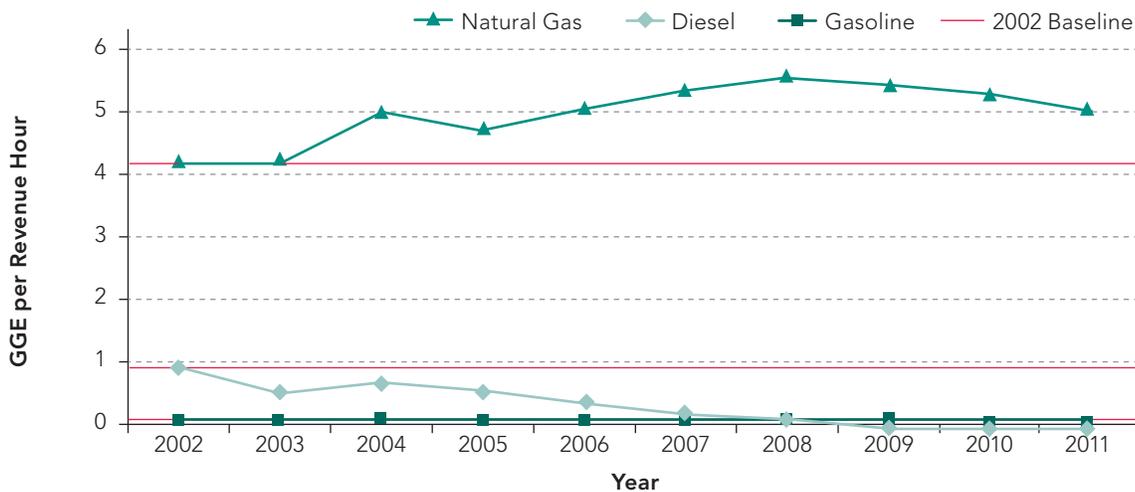


Figure 40. Total GGEs per Revenue Hour (2002-2011)

GGEs per Metro-operated bus boarding and system-wide boarding dropped just after 2004, increased again until 2008, and then decreased slightly each year through 2011. This decrease, starting in 2008, is at least partially due to the decline in ridership and service cuts from 2008 to 2011.

Overall Fuel Expenditures Are Constant

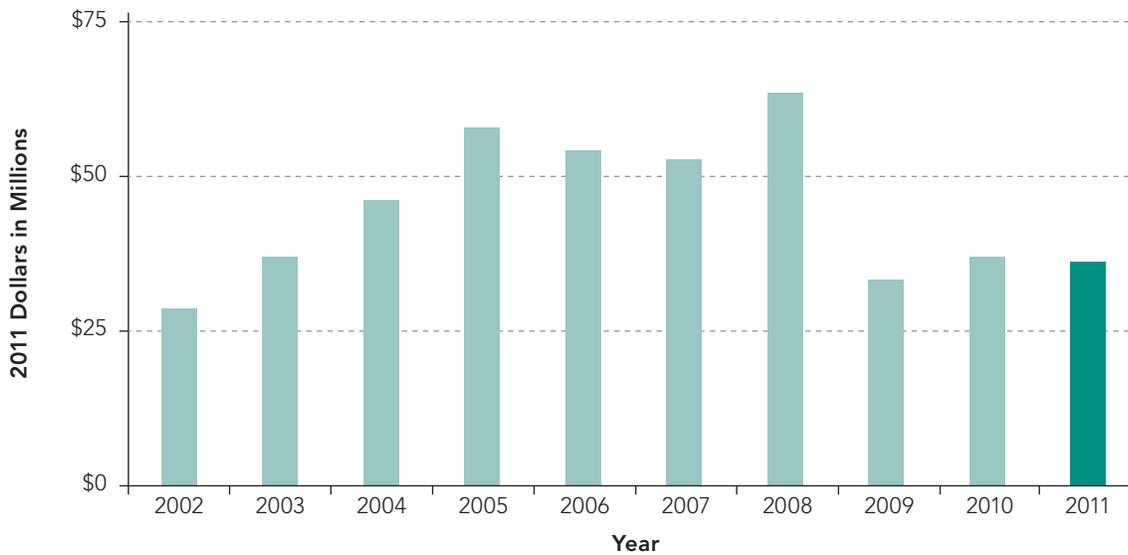


Figure 41. Historic Fuel Expenditures – 2011 Dollars (2002-2011)

Price of CNG Is Stable as Price of All Other Fuels Rise

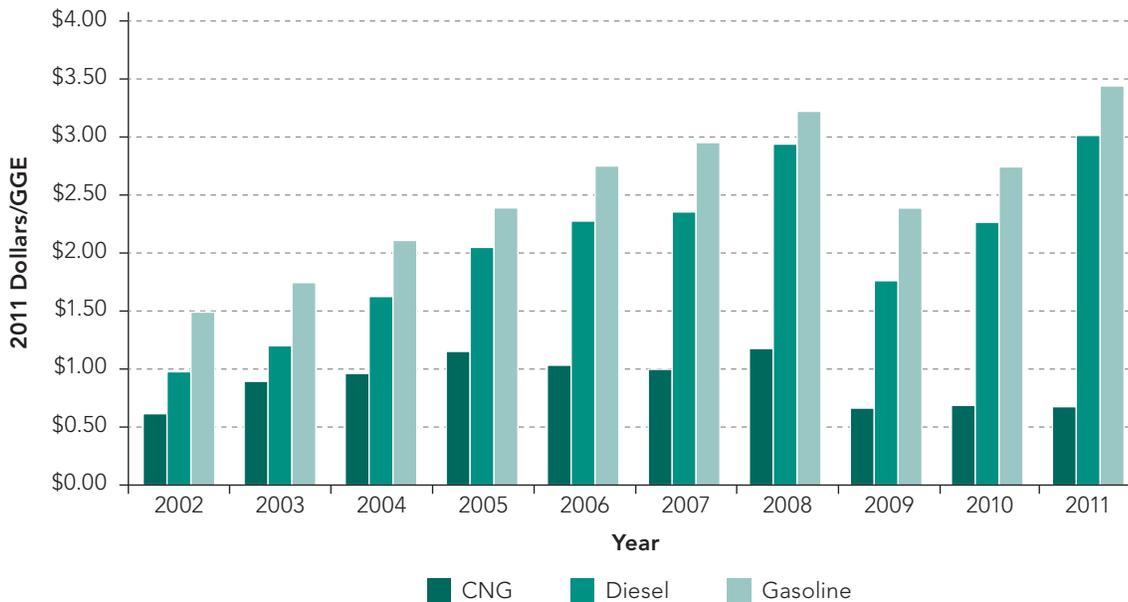


Figure 42. Average Cost per GGEs – 2011 Dollars (2002-2011)

In 2011, Metro spent \$36 million on fuel, including vanpool fuel, which is nearly half of the amount spent on fuel in 2008. This is a sharp reversal of the trend from 2002-2008, when fuel expenditures rose by 121% (after



adjusting for inflation). This decrease from the 2002-2008 trend is in large part due to Metro's transition to a 100% CNG-powered bus fleet, due to CNG's lower price per GGE. The addition of vanpool usage in the 2010 inventory shows that Metro spent \$5.2 million, or 14% of all fuel expenditures, on unleaded gasoline for this particular service.

2011 fuel expenditures on diesel decreased by 39% compared to 2010 due to Metro concluding dependence on diesel fuels. Decreases in GGEs of CNG also contribute to the overall slight dip in fuel expenditures compared to 2010. Prices of all three fuels fell dramatically from 2008 to 2009, an average of 45%, and increased varyingly in 2010 and 2011. Prices of diesel and gasoline then increased sharply from 2010 to 2011 by 33% and 25%, respectively, while the price of CNG decreased by 2%. This dramatic change in fuel prices coincided with nationwide fuel prices which spiked in 2008, when crude oil prices reached nearly \$140 a barrel in 2008, and dropped back down to 2005 levels at about \$50 a barrel in 2009. In 2011, crude oil prices increased to over \$100 a barrel. While not nearly as dramatic as crude oil based fuels, CNG also experienced a nationwide decrease in fuel prices between 2010 and 2011 from \$11.37 to \$10.79 (nominal dollars) per thousand cubic feet (EIA 2012).

Next Steps

- F1 Continue periodic division site visits to determine compliance with Metro's Executive Office directive on bus idling.
- F2 Bus divisions will be identified for replacement of conventional lead acid batteries to absorbed glass mat (AGM) batteries which will further reduce bus idling. AGM batteries have been installed in buses at Divisions 3 and 5 and delivered to Division 18. Future battery deliveries and installations will continue on a division by division basis.
- F3 Continue to seek ways to reduce non-revenue vehicle use.
- F4 Hybrid vehicles are to be purchased during upcoming vehicle procurements which will further reduce Metro's emissions.

Rail Propulsion Power

Accomplishments:

- A Wayside Energy Storage System (WESS) (funded by SCAQMD Mitigation Fund) for the Metro Gold Line was approved by the Board in April 2012.
- On-board storage of regenerative braking is being considered as one of several possible energy saving options currently being explored in a sustainable rail study.
- Installed 10 new Energy Efficient Traction Power Substations in the Metro Blue Line as replacements to older, less efficient energy traction power substations.
- Installed sub-meters at Division 10; prepared sub-metering plan for Division 7 and 30.

Data and Analysis

Propulsion Power Use Decreased

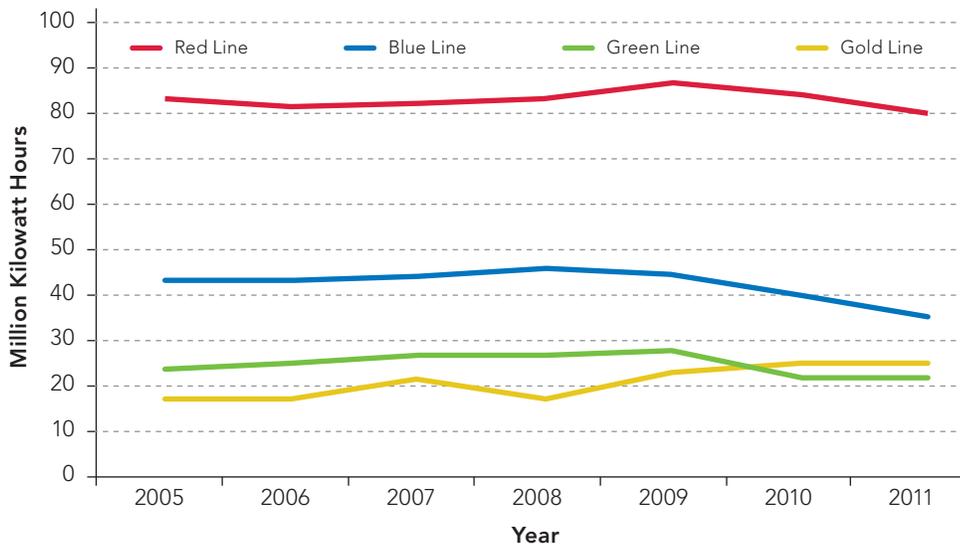


Figure 43. Rail Propulsion Power Use by Rail Line – 2011 Dollars (2005-2011)

Metro's rail lines consumed approximately 164 million kWh of electricity in 2011, which represents a 3% decrease from 2005 and a 4.8% decrease from 2010. The cost of powering Metro's trains increased by 5% during that period, from \$19.6 million to \$21.2 million. The Red Line consumes more power than any other Metro rail line, and the 4.8% decrease in electricity consumption paired with a slight increase in the price of electricity caused the Red Line's electricity costs to decrease by approximately \$315,000 (3.1%) between 2010 and 2011. The decreases in rail propulsion power in both 2010 and 2011 compared to previous years has been attributed to the (corrected) electrical consumption differentiation between rail propulsion power and facility electricity use accounts.



Rail Propulsion Power Efficiency Is Improving



Figure 44. Rail Propulsion Power Efficiency (2005-2011)

In 2011, Metro used 1.93 kWh of electricity per rail boarding compared to 2.26 kWh per boarding in 2005—a 15% increase in efficiency; this represents a 1% increase from 2010. Since 2005, the efficiency of rail car operations has fluctuated between 243 and 281 kWh per vehicle revenue hour, a difference of 14%.

LADWP Provides Majority of Rail Propulsion Power



Figure 45. Historic Rail Propulsion Power Use by Provider – 2011 dollars (2005-2011)

Historically, LADWP has provided more than 58% of Metro’s rail propulsion power. Electricity provided by LADWP is cheaper than that of Southern California Edison (SCE), but LADWP’s electrical power is also more carbon intensive than that of the private utility.³ Pasadena Water and Power (PWP) provided only a small fraction of Metro’s power each year.

³ Source: LADWP has plans to reduce the carbon intensity of their power generation in coming years.

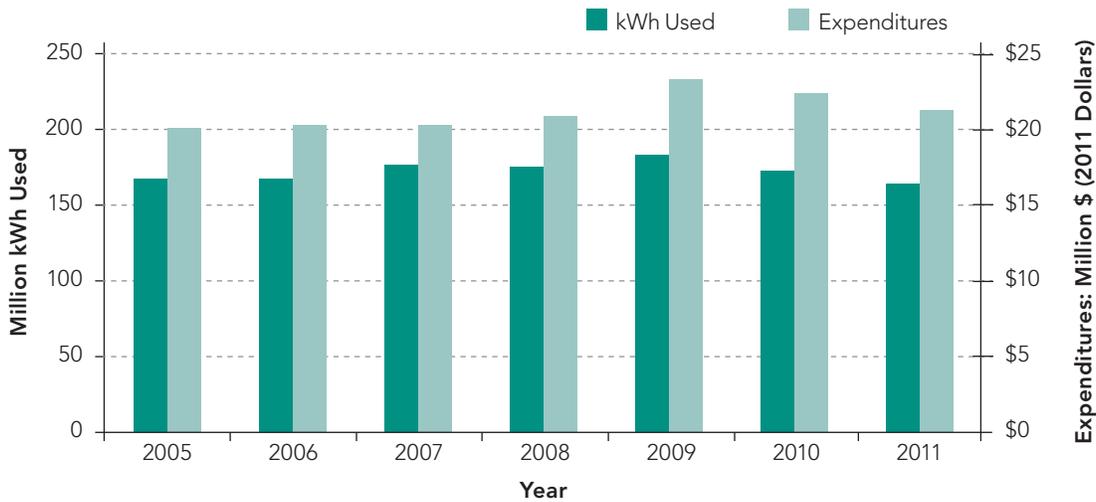


Figure 46. Changes in Rail Propulsion Power and Expenditures (2005-2011)

Dollars spent on rail propulsion saw a total decrease of approximately 5 percent, from \$22.4 million in 2010, to \$21.3 million in 2011. In 2011, the Red, Blue, Green and Gold Lines all saw a decrease in propulsion power consumed and a decrease in the amount of Metro dollars spent. The Blue Line saw the largest decrease, approximately 10%, from \$5.8 million in 2010 to \$5.2 million in 2011.

Next Steps

- RP1 Implement a Wayside Energy Storage System (WESS) and/or on-board storage technology to capture electricity and energy produced by dynamic braking.
- RP2 Research the on-board storage of regenerative braking energy strategy.
- RP3 Install sub-meters to measure electrical use specific to rail propulsion and facilities.
- RP4 Implement the recommendations contained within the completed 2011 Energy Conservation and Management Plan.
- RP5 Work with electric utility providers to accurately identify and label all rail propulsion accounts.

Facility Electricity Use

Accomplishments

- Adopted Energy Conservation and Management Plan.
- Adopted Renewable Energy Policy by Metro Board of Directors in 2011.
- In FY2011, fully implemented an Environmental Management System (EMS) at Division 20 (Metro Red Line Yard); EMS effort underway at Division 10.
- Completed energy efficiency audits at Divisions 7, 11, and 15.
- Initiated LEED-EBOM certification efforts at Divisions 10 and 30 and a LEED for New Construction Certified rating for the Division 3 Maintenance Building Renovation.
- Received LEED-EBOM Gold Certification for the Metro Gateway headquarters building.

Data and Analysis

Electricity Consumption by Major Facility (2011)

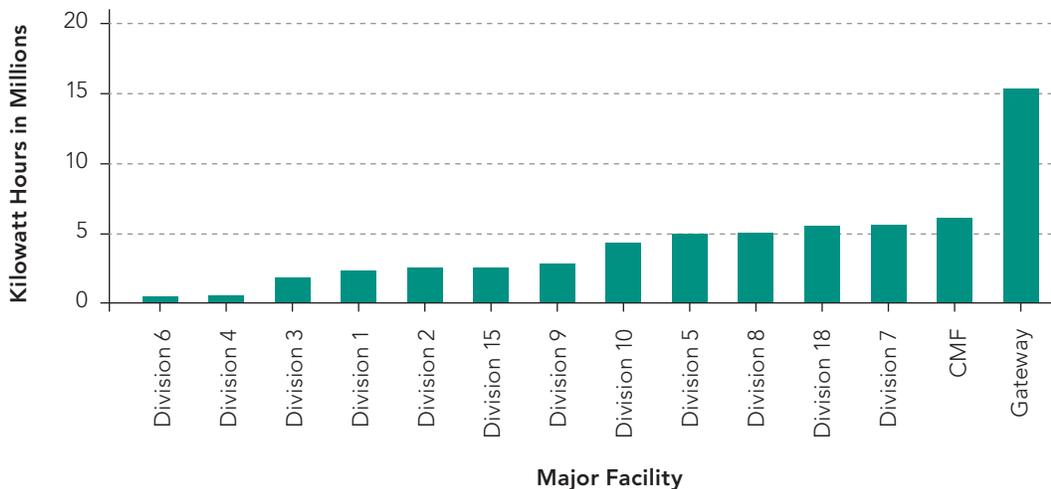


Figure 47. Facility Electricity Use by Major Facilities (2011)

In 2011, the Metro facilities that consumed the most electricity were the Metro Gateway headquarters (15.2 million kWh) and the CMF (6.1 million kWh). The combined electricity consumption at these two facilities accounted for 22% of Metro’s total facility electricity use in 2011.



Electricity Use Increased in 2011

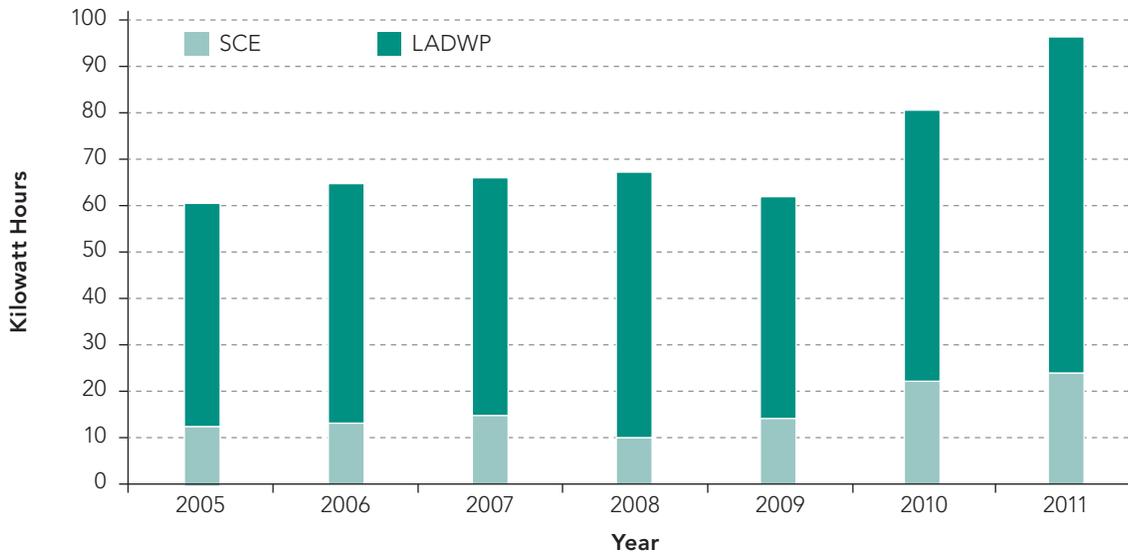


Figure 48. Facility Electricity Use in Kilowatt Hours (2005-2011)

In 2011, Metro facilities used 97 million kWh of electricity. Metro's electricity consumption increased between 2006 and 2008, dropped in 2009, had an artificial rise in 2010 due to changes in how facility versus propulsion electricity is apportioned, and rose in 2011 largely due to the switch from diesel-powered to electricity-driven CNG compressors at bus facilities. Of the additional 15.9 million kWh consumed by facilities in 2011, 11.0 million kWh (69%) is directly attributed to electricity-driven CNG conversions at Divisions 1, 5, 7, and 8. The overall facility increase can be attributed primarily to changes in consumption from Metro's facilities serviced by LADWP, for which consumption increased 24% (14.0 million kWh) compared to 2010. There was an additional increase of 9% (1.9 million kWh) in electricity consumption from Metro's facilities that are serviced by SCE. In contrast to a very slight decrease in Metro ridership (boardings), Metro facilities used 20% more kWh per boarding in 2011 than in 2010.

Efficiency of Facility Electricity Use Is Decreasing

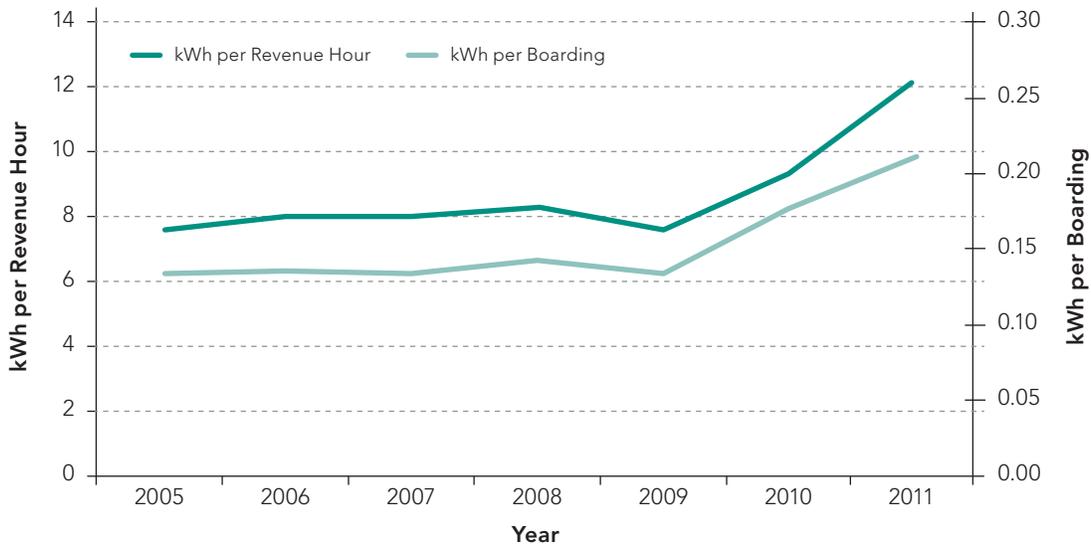


Figure 49. Facility Electricity Use Efficiency (2005-2011)

In 2011, Metro spent \$12.2 million on facility electricity, \$1.6 million more than in 2010. Facility electricity expenditures increased by 15% in real dollars, while electricity use increased by 20% compared to 2010. This was in part a result of an increase in Metro’s consumption of LADWP-supplied electricity, which cost an average of \$0.12/kWh, and an increase in consumption of SCE-supplied electricity, which cost Metro an average of \$0.14/kWh. The average cost per LADWP-supplied kWh increased 2% compared to 2010, while the average cost per SCE-supplied kWh decreased 3% during the same time period. In 2011, SCE charged an average of 12% more for facility electricity than LADWP. Efficiency projects in SCE territory thus experience quicker payback periods and higher returns on investment than similar projects in facilities that are supplied by LADWP.

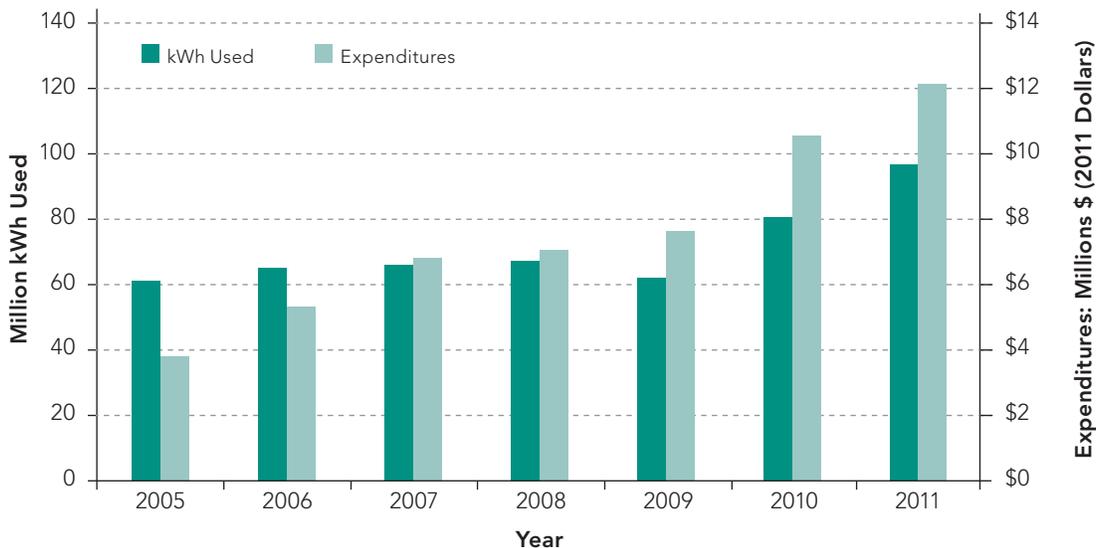


Figure 49. Facility Electricity Use and Expenditures (2005-2011)



Next Steps

- FE1 Develop a lighting retrofit plan to replace old, inefficient light fixtures at various Metro facilities.
- FE2 Establish a Life of Project budget to fund lighting retrofit projects.
- FE3 Provide sub-meters for appropriate funding for facilities and tracking of data.
- FE4 Invest in energy management systems.
- FE5 Track energy efficiency upgrades and measure their success.
- FE6 Implement the recommendations contained within the completed 2011 Energy Conservation and Management Plan.
- FE7 Aggressively pursue renewable energy sources.
- FE8 Construct new facilities and projects using energy efficiency and conservation strategies.
- FE9 Fully implement the Environmental Management System at the pilot sites.
- FE10 Complete additional energy audits.
- FE11 Develop additional renewable sources other than photovoltaics.
- FE12 Pursue LEED-EBOM certification at several sites to be assessed and evaluated

Case Study – Lighting Retrofitting

Challenge

A significant number of Metro buildings and facilities employ outdated lighting schemes, fixtures, and lamps. As an agency, we spent approximately \$12.2 million on electricity for facilities this year. Recent advancements in lighting technology and our commitment to conserving resources have led us to conduct activities to reduce the energy consumed by inefficient light fixtures at certain facilities.

Action

Recently, multiple lighting retrofit projects have been initiated at Metro to improve energy efficiency. In 2009, the Rail Operation Control Center (ROC) was remodeled and energy-efficient fixtures replaced older less efficient equipment. One year after the lighting retrofits were installed, energy savings totaled 29%. In a more recent project, Division 20 replaced 256 high pressure sodium (HPS) fixtures, which use 400W, each with 6-bulb T-5 fluorescent fixtures, which only use 324W each. This resulted in decreasing the wattage per hour from 102,400 W/hr to 82,944 W/hr, which produced a savings of 20%. This project was completed both effectively and efficiently. There was a net savings of 42% in the labor budget, and the materials costs savings totaled 13%. With all the realized savings, total project costs came in under 50% of the estimated budget.

Outcome

Beyond financial savings, the projects were successful in reshaping the institutional mentality toward environmental initiatives. Electricians at Division 20 went on to upgrade all of the office lighting with T-8 bulbs, helping them realize further energy savings from diminished electricity use.



6 Waste and Recycling

In accordance with the APTA guidance, Waste and Recycling is divided into five sub-indicators. Each sub-indicator is discussed below.

Solid Waste and Recycling

Accomplishments

- Increased desk-side recycling at the Metro Gateway headquarters building. Some facilities included bottles and cans in their desk-side recycling program, increasing the average reduction of solid waste created.
- Installed cardboard compactors in several locations, making cardboard box recycling more practical.



Data and Analysis

Metro Facilities Continue Decrease in Solid Waste Output

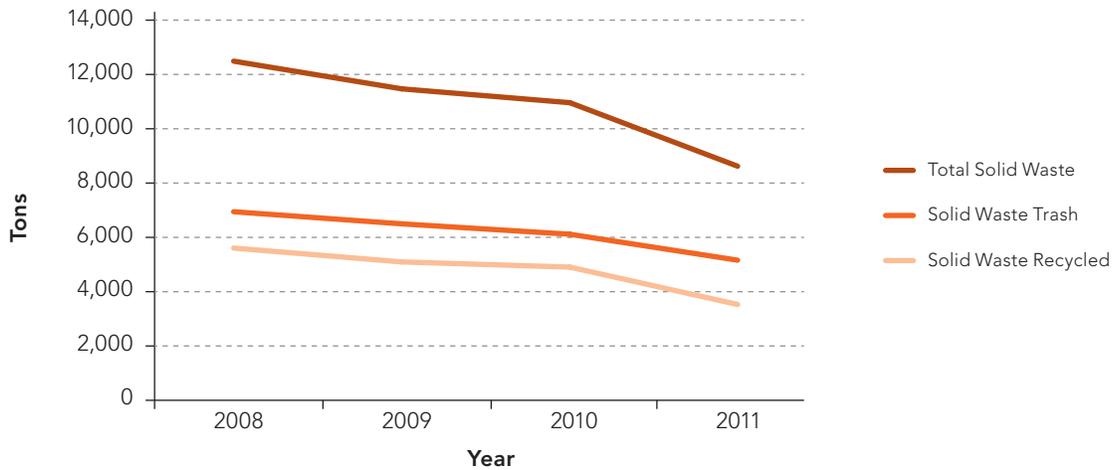


Figure 50. Solid Waste and Recycling (2011)

Metro uses a contractor to separate landfill waste from recyclable waste. Under this agreement, the contractor must separate all materials (paper, cardboard, cans, and bottles) that can be recycled. In 2011, 41% of waste was recycled. Total solid waste output decreased by 2,346 tons from 2010 to 2011. Due to changes in data collection techniques, recycling data are only available as recent as 2008.

Waste Efficiency Continues to Increase

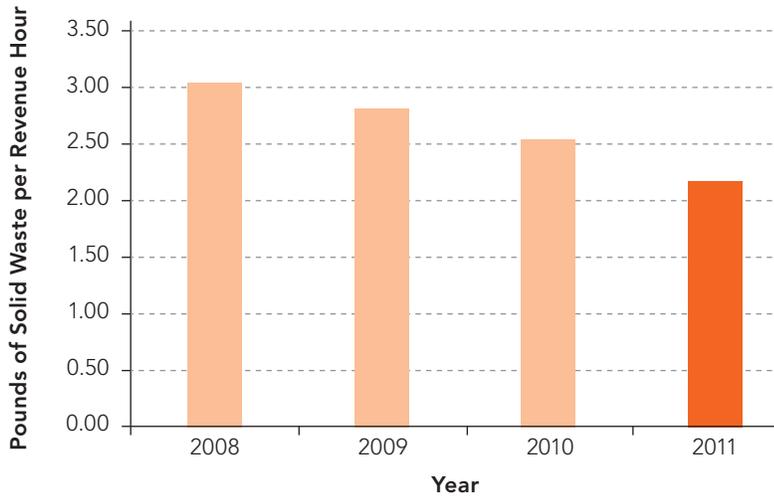


Figure 51. Solid Waste Production Efficiency (2008-2011)

Solid waste production efficiency has increased every year since 2008. Solid waste production per revenue hour decreased from 2.5 pounds of waste per revenue hour in 2010 to 2.2 pounds of waste per revenue hour in 2011.

Recycling Rates Were Higher Throughout the First Half of 2011



Figure 52. Percent Recycled by Month (2011)

Recycling rates were above the mean recycling rate from January through July 2011, reaching a peak recycling rate during March 2011 (44.6%). Recycling rates reached a low of 33.9% during August 2011, and stayed below the mean for the rest of the year.



Next Steps

- SW1 Continue to roll out desk-side paper recycling at additional facilities.
- SW2 Put clear instructions on recycling bins as to what should be placed inside.
- SW3 As feasible, increase desk-side recycling capabilities to include bottles and cans.
- SW4 Use recyclable materials whenever possible.
- SW5 Implement recycling education outreach to Metro staff.

Case Study – Construction and Demolition Debris Recycling and Reuse Policy

Challenge

Construction activities generate a large amount of debris, most of which can be reused in another capacity. A significant portion of waste generated by Metro is related to construction activities, and with impending Measure R projects, construction activities will increase dramatically.

Action

Metro is committed to reducing the amount of solid waste produced at the agency, and this includes solid waste from construction activities. In order to minimize waste produced, Metro passed the Construction and Demolition Debris Recycling and Reuse Policy. The policy requires that recyclable and recycled products are given preference during the design and construction of Metro-funded capital projects. Additionally, Metro will not use a landfill or recycling facility that has not been vetted by the agency or can't present documentation indicating its disposal and diversion legitimacy.

Outcome

Because of this policy, Metro now vets landfills and recycling facilities that are used for disposal of construction waste and reuses construction and demolition debris when feasible. During construction of the Metro Orange Line, concrete and asphalt debris from preparation of the right-of-way were reused in construction of the new BRT roadway. Aspects of this policy have been integrated into the construction specifications of several major capital projects, including the Orange Line Extension, which is currently under construction.

Used Oil Waste

Accomplishments

- Continued to strengthen underground and above-ground storage tank programs.
- Extended use of synthetic oils service intervals and reduced used oil volumes.

Data and Analysis

Used Oil Waste Decreased Significantly

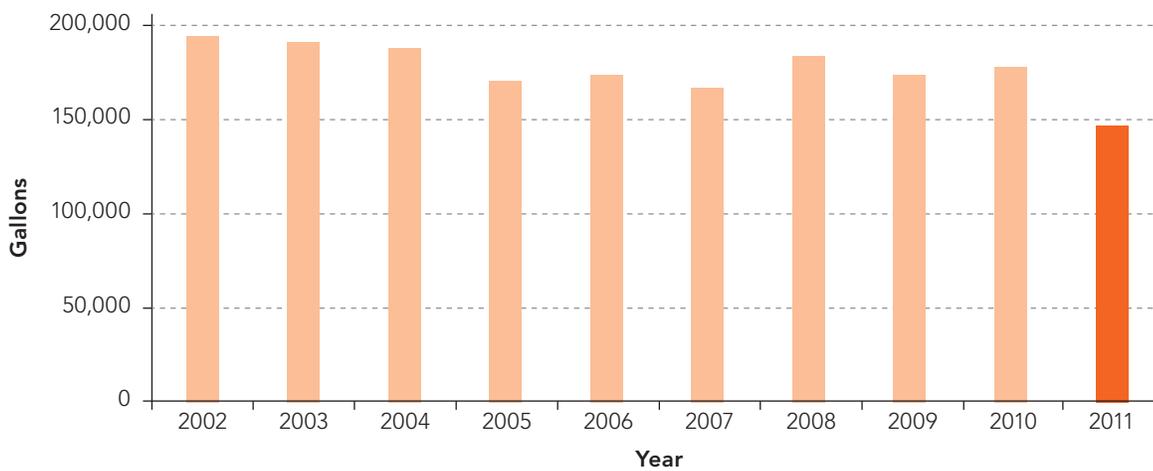


Figure 53. Historic Used Oil Waste (2002-2011)

During 2011, Metro produced approximately 146,000 gallons of used oil. This number represents a decrease of 17.5% from 2010, a decrease of 24.8% from 2002, and a 9-year low. The use of synthetic oil has decreased the amount of used oil waste produced.



Used Oil Waste Generation Varies Across Divisions

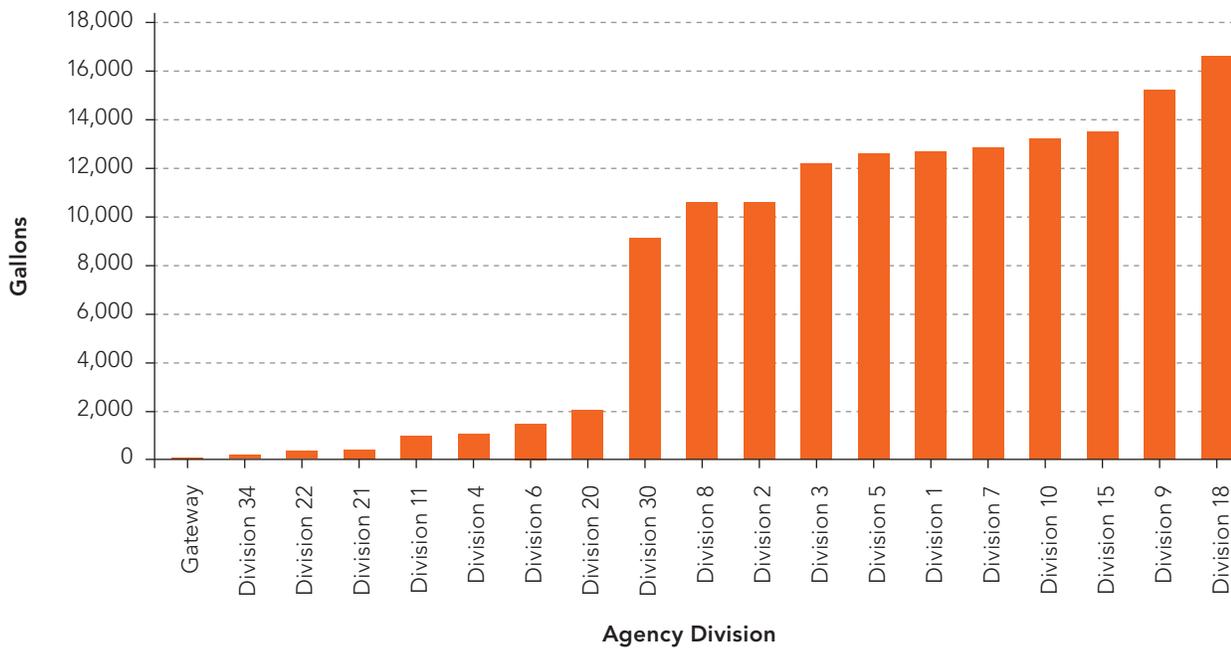


Figure 54. Used Oil Waste by Division (2011)

The amount of used oil produced in 2011 varied from a low of 55 gallons at Metro's Gateway headquarters to a high of 16,600 gallons at Division 18. Similar to 2010, Divisions 10, 15, 9, and 18 continue to be among the top used oil waste producers at approximately 30% of the total. Furthermore, Division 18 continues to maintain the highest used oil average since 2002. The large range in used oil produced is attributed to varying fleet sizes across divisions.

*Average used oil waste produced per division was calculated using data from 2002 to 2011.

Used Oil Costs Are No Longer Incurred

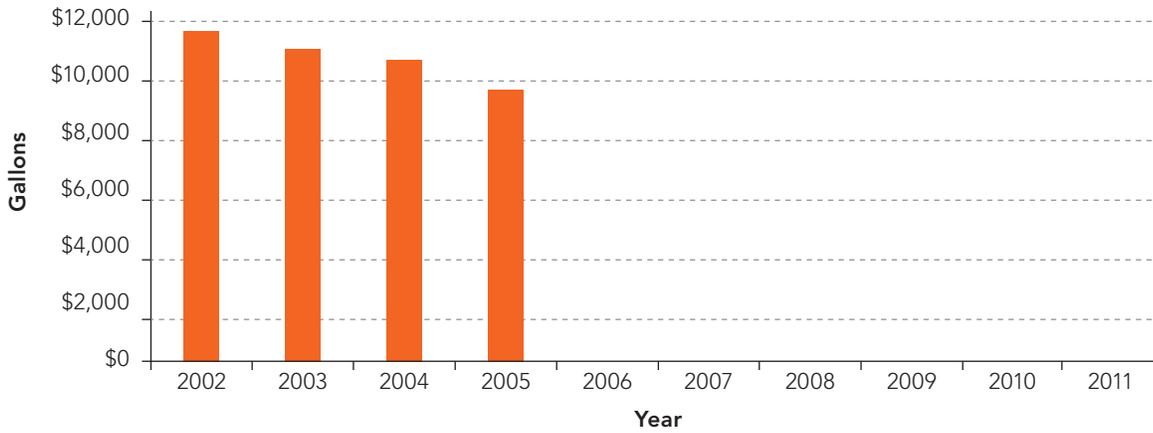


Figure 55. Used Oil Waste Disposal Cost – 2011 Dollars (2002-2011)

A no-fee service contract initiated in 2006 eliminated the cost of used oil waste disposal. Additionally, effective September 2011, used oil disposal became a revenue generating service. Metro receives 10 cents for each gallon of used oil it recycles.

Used Oil Waste Efficiency Increased in 2011

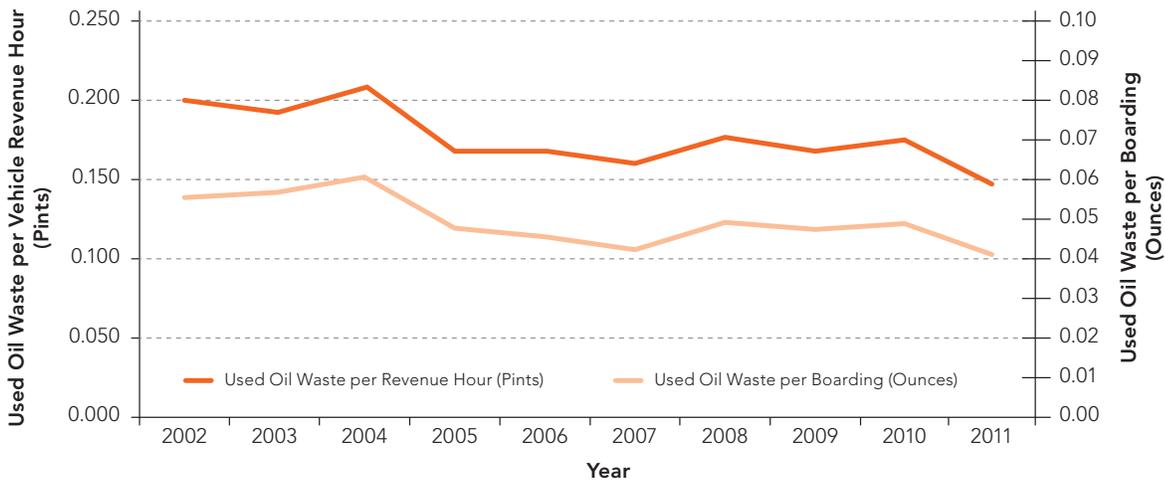


Figure 56. Used Oil Waste Efficiency (2002-2011)

In 2011, 0.147 pints of used oil were produced per revenue hour. This is approximately a 27% decrease from 2002 and approximately a 16% decrease from 2010.



Next Steps

- UO1 Decrease waste as much as possible through improved technology and operational procedures.
- UO2 Reduce oil use whenever feasible.

Hazardous Liquid Waste

Accomplishments

- Continued implementation of Chemical Standard Committee goals to reduce hazardous waste throughout the organization. Metro's Chemical Standards Committee meets on occasion to discuss possible "green" alternatives to chemicals currently being used at Metro.

Data and Analysis

Waste Stream Decrease Continues

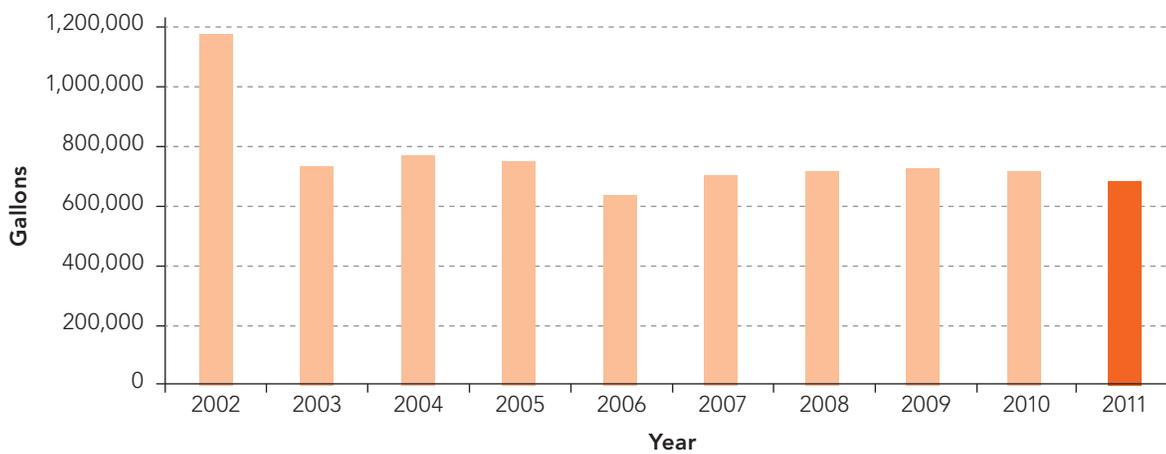


Figure 57. Hazardous Liquid Waste Volume (2002-2011)

Metro produced 680,000 gallons of hazardous liquid waste during 2011. This is a 5% decrease from 2010 and a 7% decrease from 2009. The largest decrease (to date) continues to be from 2002 to 2003 (approximately 39%) and is attributed to changes in equipment maintenance techniques.



Waste Disposal Costs are Steady

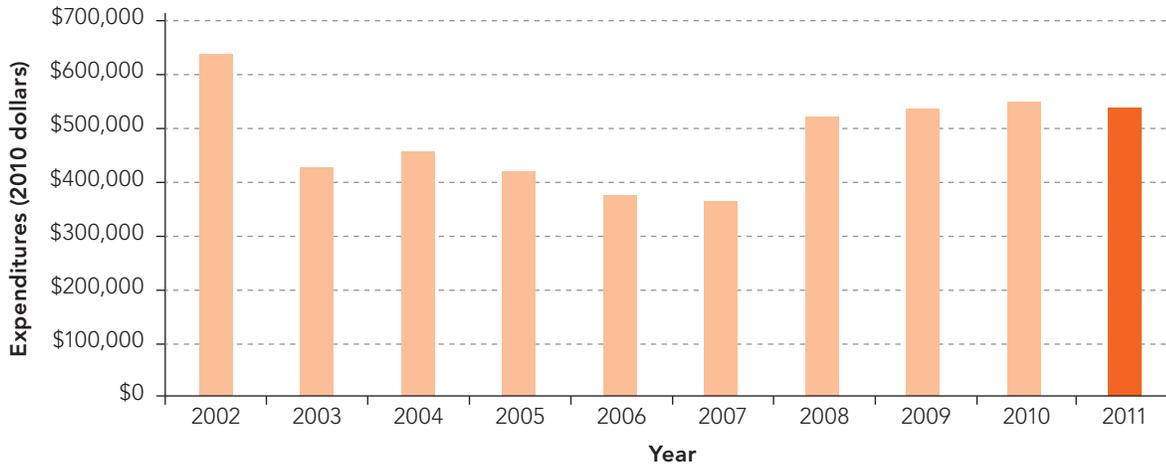


Figure 58. Hazardous Liquid Waste Costs – 2011 Dollars (2002-2011)

In 2011, Metro paid approximately \$536,000 in hazardous liquid waste disposal fees. This amount is approximately \$96,000 less than in 2002 (adjusted for inflation) and approximately \$9,800 less than 2010 (also adjusted for inflation). The rate for hazardous liquid waste disposal increased in 2008, accounting for the difference in dollars paid for 2007 versus 2008.

Over Half of the Divisions Produced Lower than Average Waste

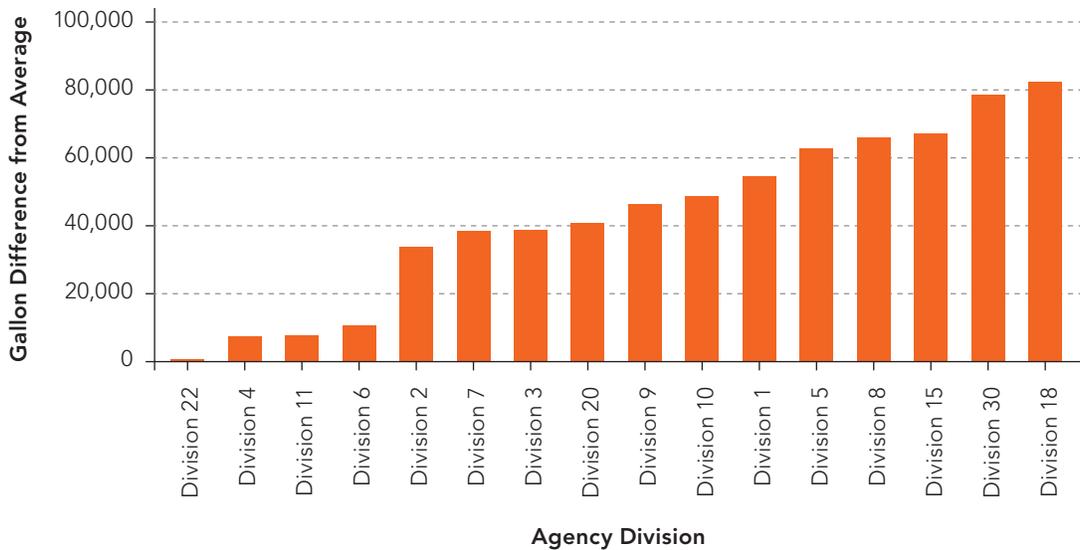


Figure 59. Hazardous Liquid Waste Produced by Division (2011)

In 2011, hazardous liquid waste produced by the divisions ranged from a low of 200 gallons at Division 22 to a high of 82,000 at Division 18. Divisions 30 and 18 produced the most hazardous liquid waste in 2011 and 2010. Divisions not included in the graph above did not produce any hazardous liquid waste.

*Average hazardous liquid waste produced per division was calculated using data from 2002 to 2011.

Hazardous Waste Efficiency Increased

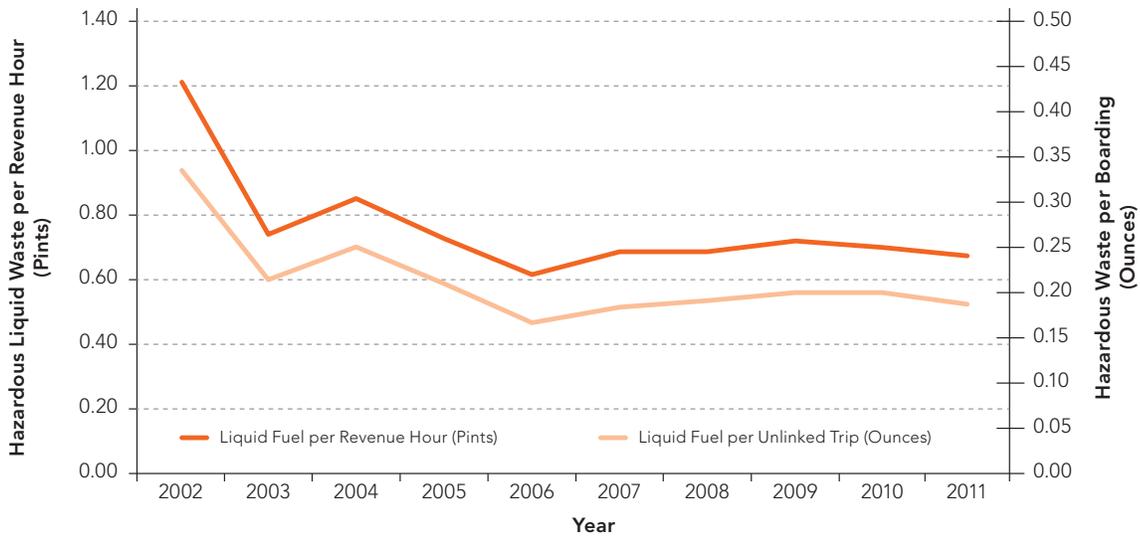


Figure 60. Hazardous Liquid Waste Efficiency (2002-2011)

In 2011, 0.684 pints of hazardous liquid waste were produced per revenue hour. This is a slight 3% decrease from 2010, but continues to be a substantial decrease from 2002 at 44%.

Next Steps

- HW1 Decrease waste as much as possible through improved technology and operational procedures.
- HW2 Reduce hazardous chemical use whenever feasible.



Case Study – ISO 14001 Certification

Challenge

Metro rail and bus maintenance facilities enable Metro to provide efficient and reliable transportation services for the Los Angeles region. Activities conducted at these facilities include cleaning and performing routine maintenance on bus and rail vehicles as well as addressing mechanical issues that may arise with the vehicles. These activities sometimes require the use of hazardous or toxic materials, which puts employees and the environment at risk for any number of accidents or emergencies.

Action

Metro's Red Line Yard, the maintenance and storage yard for heavy rail cars, is one of our most critical facilities. To protect Metro Red Line Yard staff, rail cars, assets, and environment, Metro adopted an Environmental Management System (EMS). Among other things, this system established specific operational procedures that employees must follow when handling hazardous materials or responding to an accident. These procedures ensure that Metro complies with federal, state, and local environmental regulations and help reduce environmental impacts and operational costs. The EMS established for the Red Line Yard has earned Metro international recognition for environmental management efforts.

Outcome

In 2011, Metro earned an ISO 14001 certificate for the Red Line Yard, making it the first major rail yard in the nation to earn this certification. This certificate reflects the fact that Metro runs the rail yard in a way that conforms to the set of world class environmental management standards of the International Organization for Standardization (ISO). The facility operates 24/7 under 558 employees; each is now trained and familiar with EMS protocol and procedures. Metro is working on establishing EMS at all major facilities to further our goals of protecting employee and environmental health.

Non-Hazardous Liquid Waste

Accomplishments

- Developed the Green Chemical Procurement Collaboration Project.

Data and Analysis

Non-Hazardous Waste Stream Decreases

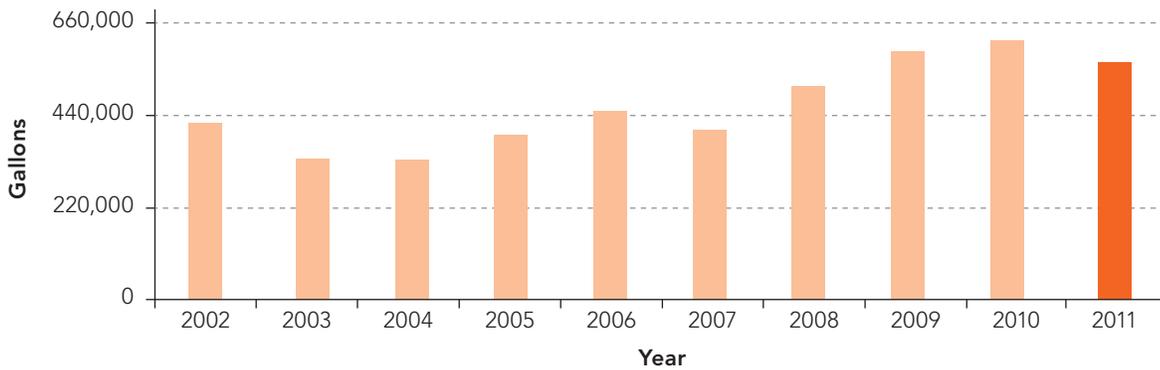


Figure 61. Non-Hazardous Liquid Waste Volume (2002-2011)

Metro produced 564,000 gallons of non-hazardous liquid waste in 2011. This number reflects approximately an 8% decrease from 2010 and a 26% increase from 2002. The waste output decrease for 2011 is the first since 2007. Non-hazardous liquid waste production had been gradually increasing from 2007 to 2010. This gradual increase in non-hazardous liquid waste stream is attributed to the increase in number of bus washers.



Non-Hazardous Liquid Waste Disposal Costs Decreased in 2011

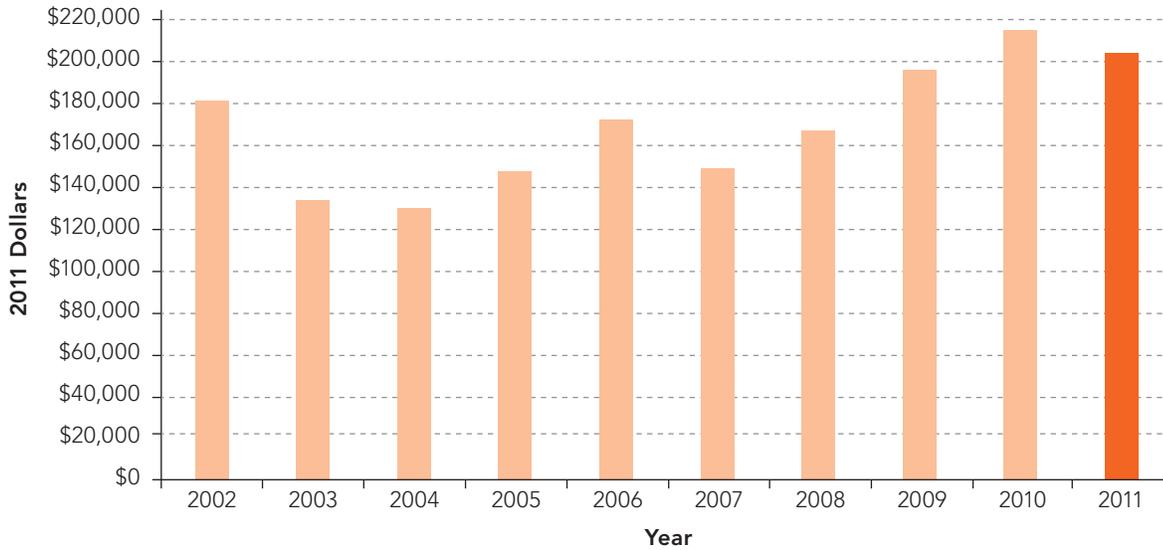


Figure 62. Non-Hazardous Liquid Waste Costs – 2011 Dollars (2002-2011)

Non-hazardous liquid waste disposal fees paid by Metro in 2011 were approximately \$205,000. This represents a 5% decrease from 2010. Fees paid in 2010 were the most Metro had spent in a 9-year period, thus the fees paid in 2011 still represent the second highest since 2002.

Waste Stream Across Divisions

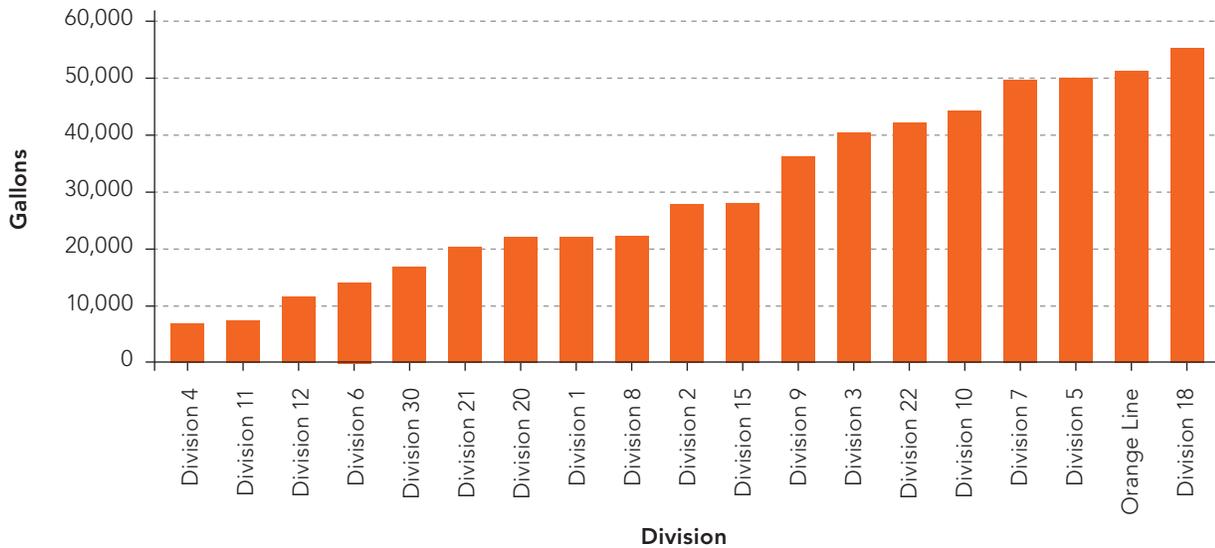


Figure 63. Non-Hazardous Liquid Waste by Division (2011)

Across most divisions, non-hazardous liquid waste decreased from 2010 to 2011. Only four divisions and the Orange Line saw an increase during that time. Divisions 15 and 18 had the highest increase from 2010 to 2011 at 20%. Alternately, the most significant decreases from 2010 to 2011 occurred in Divisions 1 and 21, approximately 33% and 34%, respectively. Divisions 5, 7, 10, 18, and the Orange Line continue to contribute a larger percentage of the total waste stream, approximately 44%. For some of these divisions, the greater contribution can be attributed in large part to having two bus washers and/or the servicing of stormceptors.



Non-Hazardous Waste Production Efficiency Increases from 2010

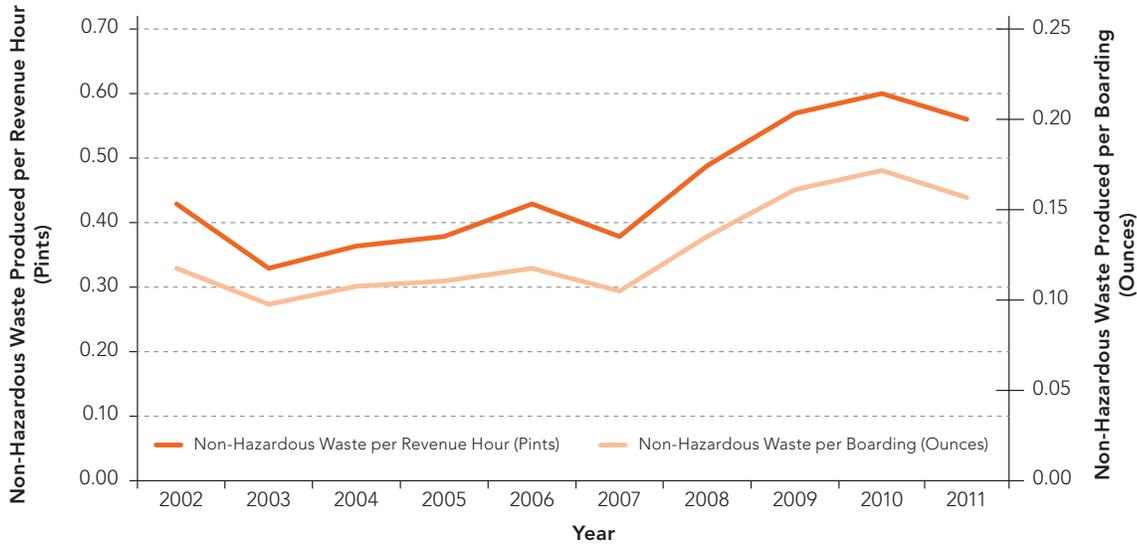


Figure 64. Gallons of Non-Hazardous Liquid Waste Efficiency (2002-2011)

In 2011, 0.567 pints of non-hazardous liquid waste were produced per revenue hour versus 0.602 pints per revenue hour produced in 2010. This number reflects a 6% decrease from 2010 but an approximate increase of 24% since 2002.

Next Steps

NW1 Decrease waste as much as possible through improved technology and operational procedures.

Anti-Freeze Waste

Accomplishments

- Implemented a program to recycle all anti-freeze waste.

Data and Analysis

Anti-Freeze Use Continues Decreasing Trend in 2011

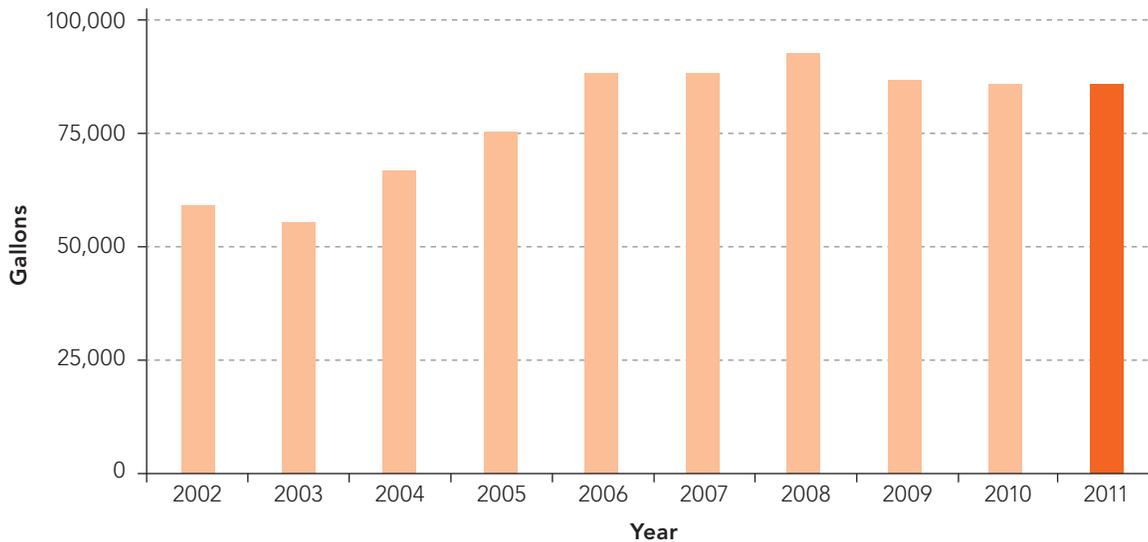


Figure 65. Anti-Freeze Waste Volume (2002-2011)

Metro produced approximately 86,050 gallons of anti-freeze waste in 2011. This number reflects a slight (25 gallon) decrease from 2010. Since 2008, anti-freeze waste production has been trending downward.



Anti-Freeze Waste by Division

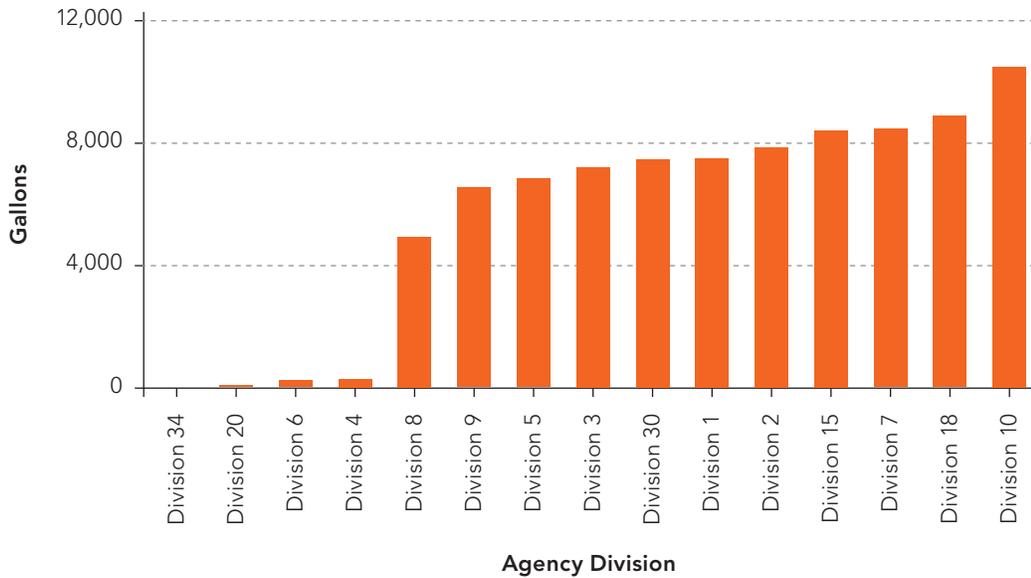


Figure 66. Anti-Freeze Waste by Division (2011)

Antifreeze waste produced varied by divisions in 2011. Antifreeze production in 2011 ranged from a low of 70 gallons at Division 20 to a high of 10,560 gallons at Division 10. Similar to 2010, Divisions 2, 10, and 18 continue to produce some of the largest quantities of antifreeze waste. Divisions 7 and 15 replaced Divisions 1 and 9 in top five antifreeze production from 2010 to 2011. Divisions 2, 7, 10, 15, and 18 accounted for 52% of Metro’s total waste production in 2011. Similar to 2010, Divisions 4, 6, 20, and 34 continue to produce the smallest quantities of antifreeze waste in 2011. Division 34 saw its production reduced to zero from 50 gallons produced in 2010. Divisions 4, 6, and 20 account for 0.7% of Metro’s total antifreeze waste production. Antifreeze waste generated at Divisions 4, 20, and 34 is related to non-revenue vehicle maintenance.

Anti-Freeze Waste Disposal Costs Decreased Significantly in 2011

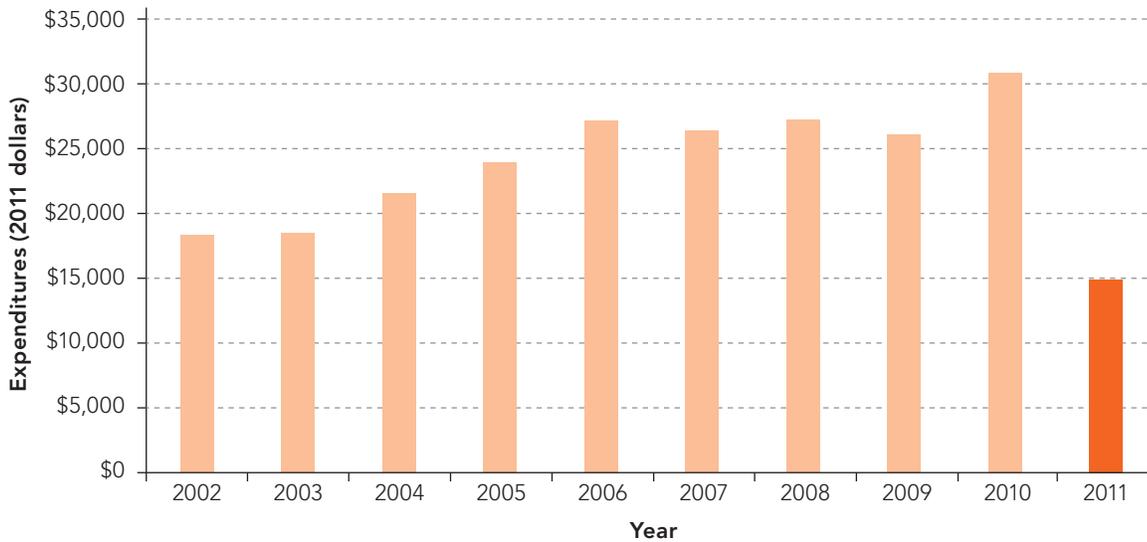


Figure 67. Anti-Freeze Waste Disposal Cost – 2011 Dollars (2002-2011)

In 2011, Metro spent approximately \$16,000 less (adjusted for inflation) in anti-freeze disposal costs than in 2010. Effective July 1, 2011, a new contract was enacted to recycle all anti-freeze waste; therefore, disposal fees were paid only through June 30, 2011. The amount paid in 2011 represents a 48% decrease from 2010.



Efficiency per Revenue Hour Decreased Slightly in 2011.



Figure 68. Anti-Freeze Waste per Revenue Hour (2002-2011)

In 2011, 1.384 ounces of anti-freeze waste were produced per revenue hour versus 1.357 in 2010. This is approximately a slight 2% increase from 2010. Waste produced per revenue hour was at its peak efficiency in 2002 and 2003 where 0.984 and 0.903 ounces of anti-freeze waste were produced per revenue hour respectively.

Next Steps

- AF1 Decrease anti-freeze waste as much as possible through improved technology and operational procedures.



7 Operating Expenses

As recommended in the APTA Sustainability Commitment,¹ this section of the report analyzes our operating costs in terms of passenger boardings and vehicle revenue miles (VRM) by transportation type (bus, light rail, heavy rail, and vanpool).

Since 1997, the cost of operating bus and rail transit (in terms of boardings and VRM) at Metro has varied but stabilized in recent years.² Currently, on a per-boarding basis, vanpools require the highest operating cost of all transit modes, followed by light rail, bus, and then heavy rail transit. Per VRM, light rail requires the highest operating cost of all transit modes, followed by heavy rail, bus, and then vanpool transit modes. The cost trends by two metrics reflect the ridership and the physical operation of the transit vehicles.

- **Bus Service** – In 2011, bus transport cost \$2.63 per boarding, which is 33 cents higher than in 2007, but only 2 cents lower than in 2010. In contrast, fare revenues and subsidies for buses in 2011 were \$0.76 and \$2.71 per boarding, respectively. Fare subsidies for bus transit were higher in the last year due to the increased capital expenses for new bus rapid transit corridors, such as the Orange Line Extension, as part of the 30/10 initiative.

In terms of vehicle revenue miles, Metro has been paying \$1.63 more per mile to move buses than in 2005, when operating costs were lowest. Bus transport costs have been gradually increasing since 2005, from \$9.60 to about \$11.30 per VRM in 2011. From the beginning of the historical record, however, transport costs have remained nearly the same. Costs increased by only 17 cents per VRM from 1997, adjusting for inflation.

- **Light Rail** – For rail transport, light rail operating costs per boarding have been generally higher in the last decade than both bus and heavy rail transport. In recent years, light rail costs have remained steady, requiring \$3.58 to be spent for operations per boarding. Fare subsidies for both bus and rail were higher in 2011 due to increased funding for the construction of several new rail projects, including the Expo Corridor, Orange Line, and Gold Line Foothill Extension, as part of the 30/10 initiative.

The cost to move light rail vehicles in service has been recovering from cost fluctuations and is remaining steady at about \$17 per VRM. From 1997 to 2004, adjusting for inflation, costs per light rail VRM fluctuated by almost \$20 per VRM. From 2004 to 2011, costs gradually increased from \$17.00 to \$17.30 per VRM. Light rail vehicles have been consistently more expensive to operate than buses and, more recently, slightly more expensive than heavy rail.

¹ <http://www.apta.com/resources/hottopics/sustainability/Pages/default.aspx>

² Cost statistics related to vanpools were only available for 2011.



- Heavy Rail** – Heavy rail costs also remained steady at nearly \$2.00 per boarding. Average rail operating cost was \$2.79 per boarding in 2011, while fare revenues and subsidies were \$0.75 and \$7.44 per boarding, respectively. As with Light Rail, fare subsidies were higher in 2011 due to increased funding for new rail projects.
- Vanpools** – While not included in Figures 69 and 70, vanpool operating cost was \$3.71 per boarding and \$0.48 per VRM in 2011. No fare subsidies were applied to vanpools. This difference in cost per boarding and vehicle revenue mile indicates that passengers who board vanpools travel longer distances than when traveling by other transit modes. This difference also reflects the smaller operating costs of the smaller vanpool vehicles when compared to other larger rail and bus transit vehicles.

Operating Expenses per Boarding

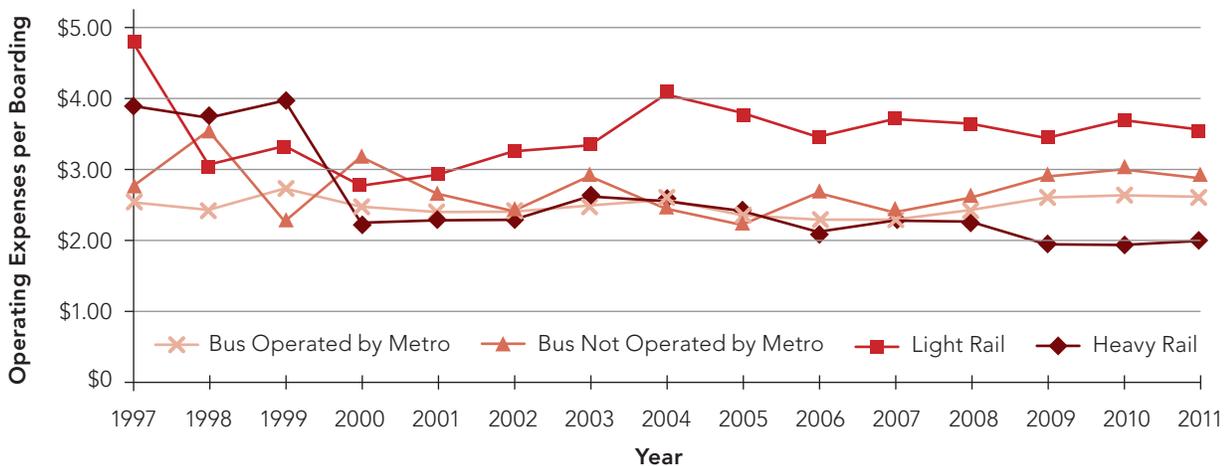


Figure 69. Operating Expense Efficiency (1997-2011)

Operating Expenses per Vehicle Revenue Mile

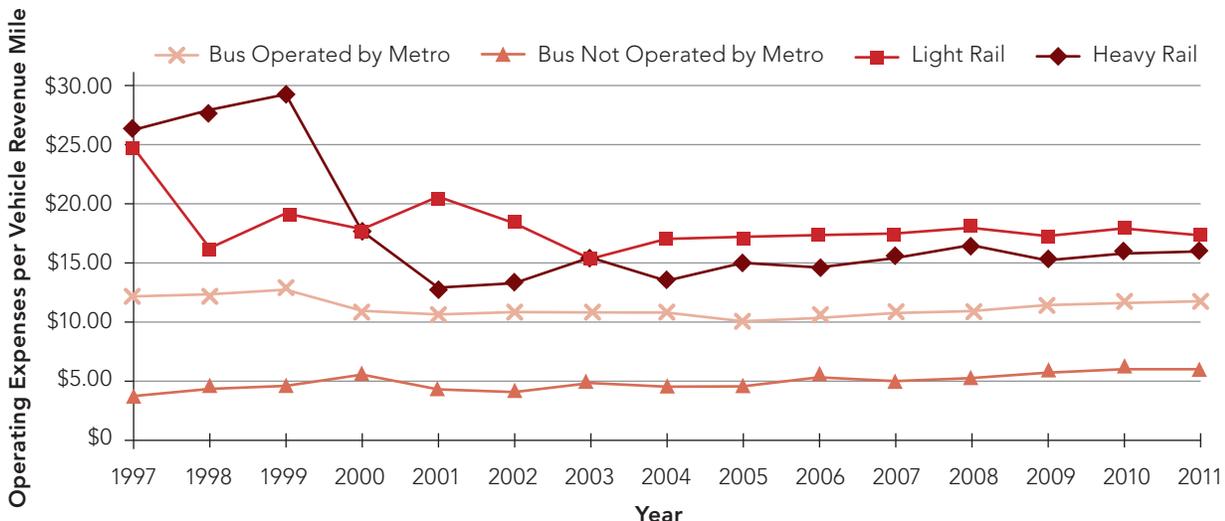


Figure 70. Operating Expense Efficiency (1997-2011)



8 Unlinked Passenger Trips per Capita

Accomplishments

- Began Live Help travel assistance for riders on Metro.net.¹
- Began testing real time bus arrival system mobile application, Nextrip, to facilitate and encourage transit ridership.
- Continued to provide a variety of services and product offerings to commuters in Los Angeles County to promote carpooling and transit as alternatives to driving alone.
- Continued to provide a transit subsidy to Metro employees to encourage the use of alternative commuting.
- Tested locking gates at rail stations to examine the level of fare evasion and plans to lock gates at all rail station starting in mid-2012.²
- Continued integration of TAP RFID fare technology at Metro rail stations and buses.

¹ <http://thesource.metro.net/2011/01/07/need-assistance-live-help-beta-arrives-on-metro-net/>

² <http://thesource.metro.net/2012/02/23/metro-board-moves-to-lock-gates-at-metro-rail-stations-within-next-six-months/>



Data and Analysis

The Majority Of Transit Riders Take the Bus

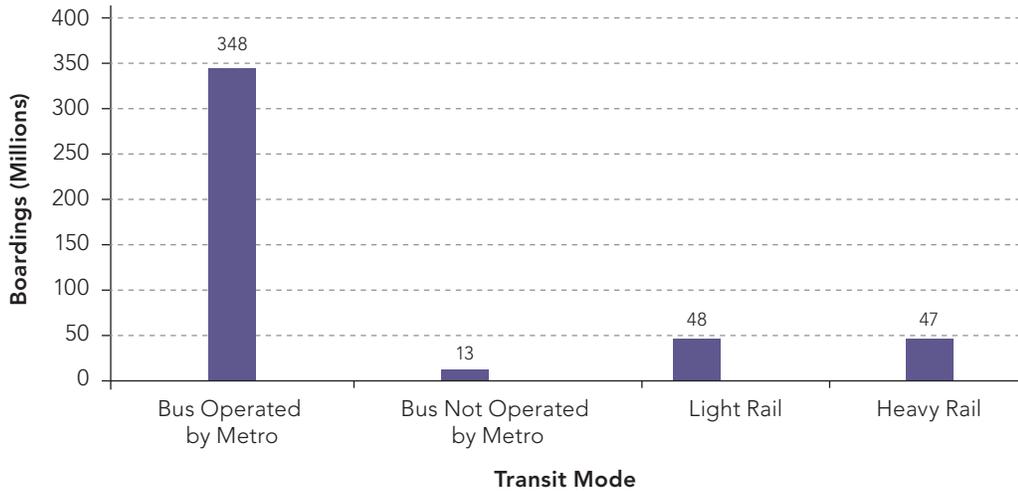


Figure 71. 2011 Boardings by Mode

Bus riders continue to make up the majority of Metro ridership. In 2011, more than three and a half times as many boardings were made on Metro buses than on the Metro rail. From 1997 to 2011, our customers boarded Metro bus service 5.5 billion times and Metro rail 1.03 million times. This is largely because Metro’s bus service is far more extensive than its rail service.

Since the Recession in 2007 and 2008, Ridership Has Been Slightly Declining

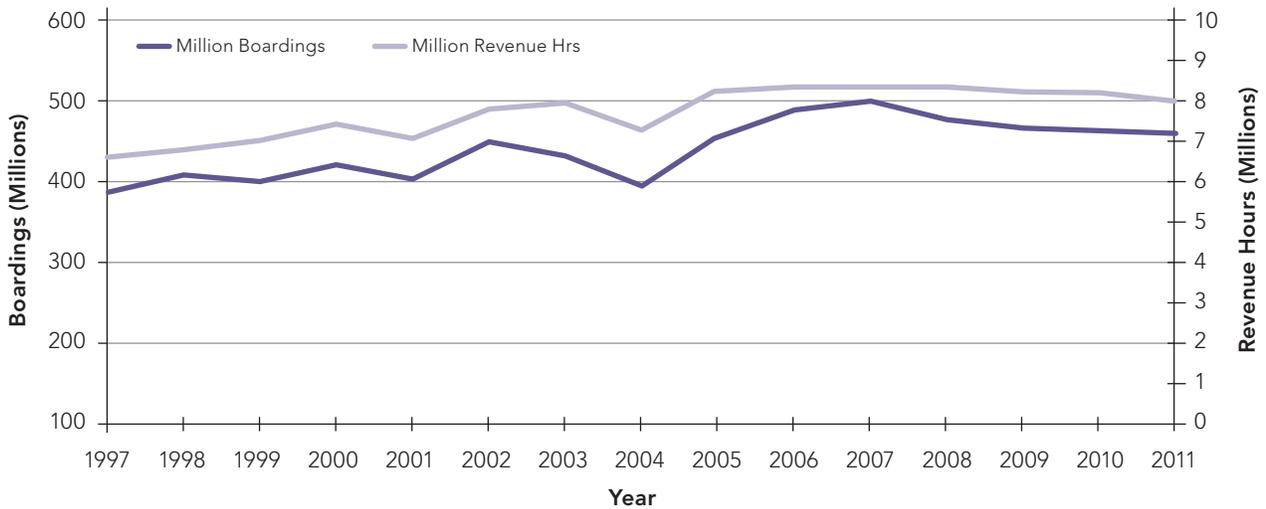


Figure 72. Historic Boardings and Revenue Hours

In 2011, 456 million boardings were made on Metro’s transit system. While this contributes to a decreasing, but steadying trend since 2008, overall, total ridership has trended upward in the last 14 years. Lower boarding totals in 2011 are likely due to the continued, but slowed, effects of the regional economic downturn and subsequent unemployment. Historically, the most boardings, 495 million, were made in 2007. The fewest, 386 million, were made in 1997. Overall, boardings increased 18% between 1997 and 2011, outpacing population growth in Los Angeles County by 11 percentage points.

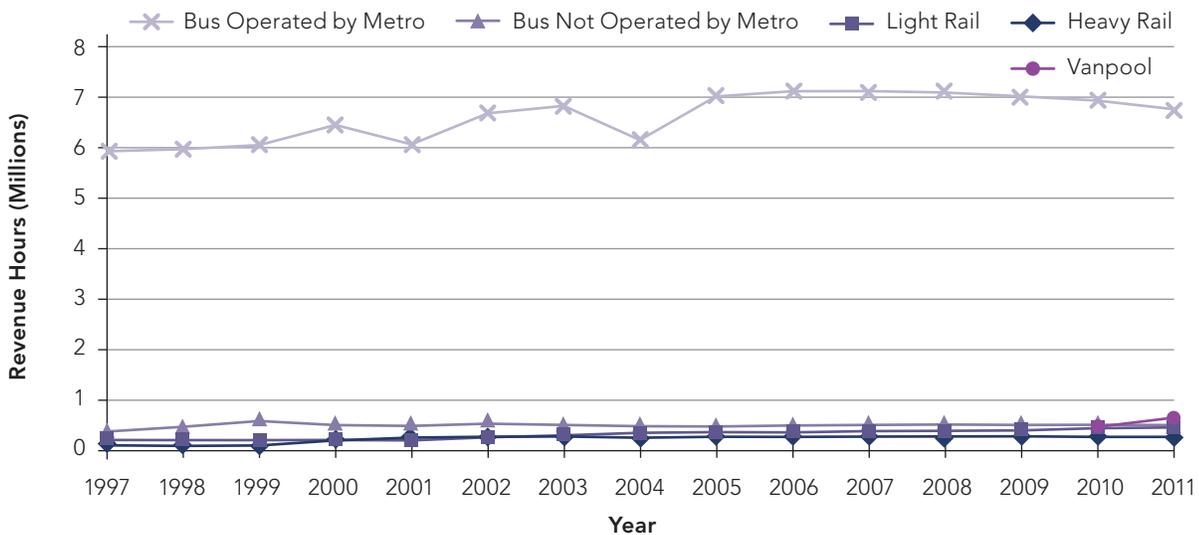


Figure 73. Historic Revenue Hours by Mode



All Mode Shares Gradually Steadying

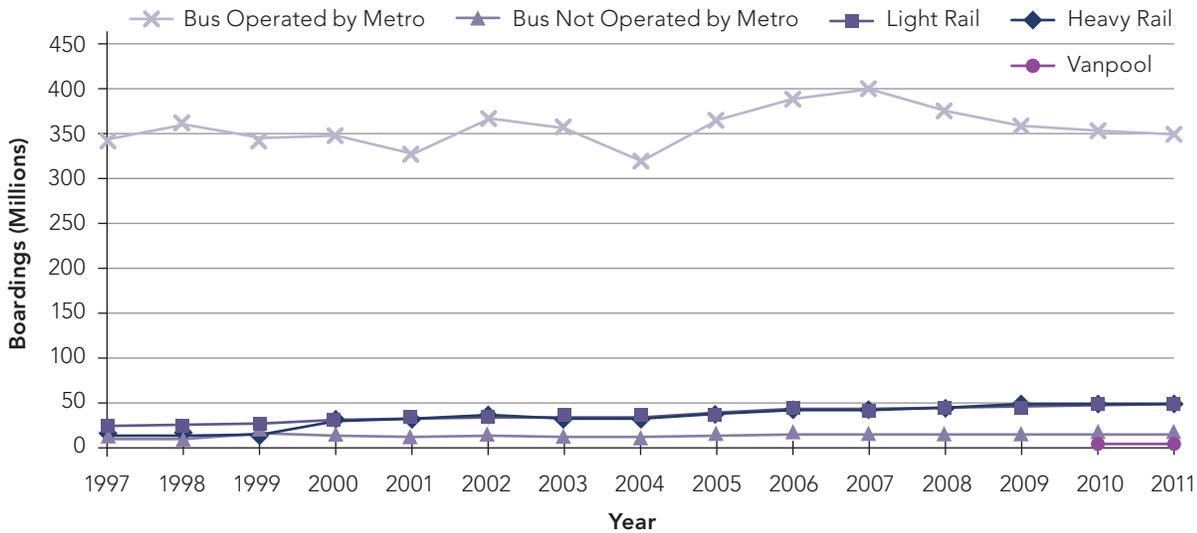


Figure 74. Historic Boardings by Mode (1997-2011)

Rail and bus mode shares have both been gradually steady in the last four years. Since 1997, however, rail has taken a larger percentage of the mode share, supported by a slowed decreasing bus mode share on Metro transit. Metro plans on adding more rail lines as outlined in our 30/10 initiative, which plans to build 12 additional mass transit projects within the next 9 years beginning in 2011. Included since 2010, vanpools have had relatively small contributions to overall transit boarding in Metro with 2.8 million boardings in 2011.

Between 1997 and 2011, 61 million, or 85%, of all new transit boardings were rail boardings. This is an increase from 80% in 2010. In this same period, bus revenue hours increased by 966,000, while rail revenue hours increased by only 417,000. For every increased rail revenue hour, rail gained 146 new boardings, while bus gained only 11 new boardings for each increased bus revenue hour. Compared to 2010 values, bus revenue hours decreased by 174,000, while rail revenue hours increased by 15,000. This is a slightly lower deviation from the trend in overall boardings, which is likely due to the reduction in transit service while serving unchanged transit demand.

Unlinked Passenger Trips per Capita

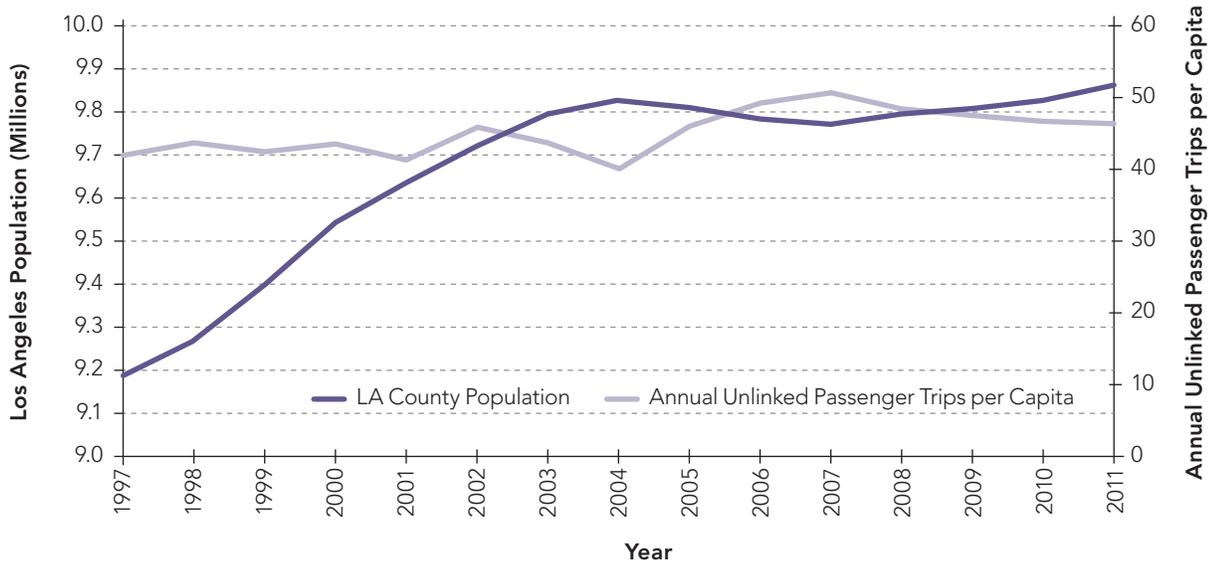


Figure 75. Historic Unlinked Passenger Trips per Capita and Los Angeles County Population (1997-2011)

Historical unlinked passenger trips per capita records show that Los Angeles residents rode Metro transit more often during economic hardships (2006 – 2008) and less often during economic growth (2005 and earlier). Before 2004, even as population was increasing, transit use among Los Angeles residents remained consistent at an average of 43 boardings per person per year. During the economic and population peak around 2004, residents took transit less (and likely drove more), taking transit only 40 times a year. However, this trend was reversed in 2006 and 2007 during the economic downturn and during a 5-year population low, with ridership reaching a peak of 51 boardings per person per year. With the economy recovering and population increasing, per capita rates among Los Angeles residents are gradually lowering.



Next Steps

- R1 Continue to encourage transit ridership through innovative solutions to improve service quality and convenience, such as through the NexTrip and Live Help travel assistance programs.
- R2 Continue to improve quality of service to riders by continuing to reduce bus delays and providing better transit information.
- R3 Complete integration of TAP into all Metro transit modes: rail, bus, and vanpool.
- R4 Coordinate with other transit agencies to adopt TAP to provide better service for interregional riders, allowing seamless transfers between transit organizations.
- R5 Continue ridesharing and transit pass programs for Los Angeles employers.
- R6 Continue to provide a Metro Employee Transit Subsidy Program.
- R7 Continue to expand rail and BRT service.
- R8 Continue to expand the number of composite fiberglass buses used by Metro.
- R9 Support strategic and creative marketing efforts to promote transit in neighborhoods with underutilized existing or newly improved transit service.
- R10 Continue to support and plan Transit Oriented Development in strategic Metro-owned properties and locations.
- R11 Continue to facilitate, analyze, and respond to travel surveys that reveal origin-destination areas with the least service, either in frequency or number of transit stations.
- R12 Utilizing the existing TAP program, continue to improve bus and rail ticketing and barrier strategies to improve accuracy of ridership and origin-and-destination statistics.



9 Vehicle Miles Traveled per Capita

As recommended in the APTA Sustainability Commitment,¹ this section of the report analyzes the impact of our transit service on VMT by all vehicles within our service area. Metro's bus and rail services cover nearly the entire urbanized area of Los Angeles County south of the San Gabriel Mountains. From 1997 to 2004, the County's population rose by 7% from 9.1 million and has since remained around 9.8 million with a gradual increase every 5 years (CADO 2001a, 2011b, 2011c). According to annual reports from the Caltrans Highway Performance Monitoring System, the VMT per person decreased from 8,243 in 1997 to 7,869 in 2010 (22.6 to 21.6 daily VMT per capita). According to the most recent Highway Performance Monitoring System report from Caltrans, in 2010 over 211.9 million vehicle miles were traveled daily within Los Angeles County.² Due in part to Metro's transit services taking drivers off the road and onto bus, rail, and vanpools, this trend in population growth and simultaneous reduction in VMT per capita means that while more people were living in Los Angeles, they traveled 374 miles less per-person-per-year than in the past.

¹ <http://www.apta.com/resources/hottopics/sustainability/Pages/default.aspx>

² As of April 2012, VMT data for Los Angeles County was not available for 2011.



Data and Analysis

Despite Population Increases, VMT Per Capita Is Decreasing

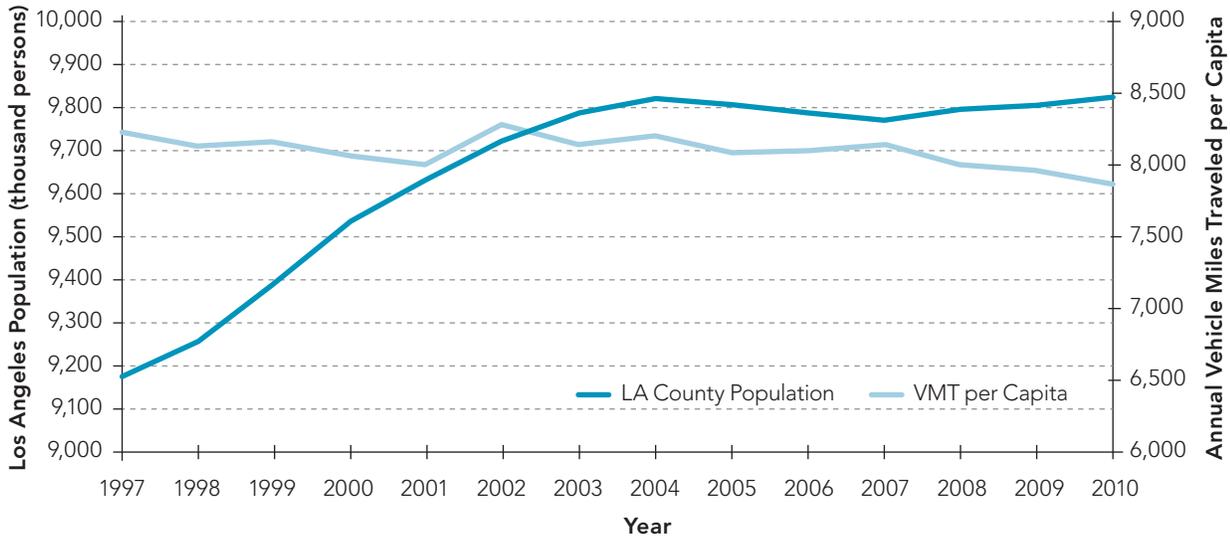


Figure 76. Los Angeles County VMT per Capita and Population Trends from 1997 to 2010

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Appendix



Indicator Results Matrix

Indicator	2011 Efficiency	% Change from 2002	2011 Performance	% Change from 2002	2011 Expenditures	% Change from 2002
Water Use	32 Gallons per Revenue Hour	25%	238 Million Gallons	22%	\$1.3 Million	42%
Criteria Air Pollutant Emissions	0.03 Pounds per Vehicle Mile	-79% (1990)	1,420 Tons	-81% (1990)	Not Applicable	Not Applicable
Greenhouse Gas Emissions	1.86 Pounds CO ₂ e per Boarding	-3% (2007)	457 Metric Tons CO ₂ e	-5% (2007)	Not Applicable	Not Applicable
Greenhouse Gas Displacement	Not Applicable	Not Applicable	420,000 Metric Tons CO ₂ e	2%	Not Applicable	Not Applicable
Fuel Use	0.12 Gallons per Boarding	8%	43 Million GGE	5%	\$36 Million	-19%
Rail Propulsion Power	1.93 Kilowatt Hours per Rail Boarding	-15% (2005)	164 Million Kilowatt Hours	-3% (2005)	\$21 Million	5%
Facility Electricity Use	0.21 Kilowatt Hours per Boarding	33% (2005)	97 Million Kilowatt Hours	37% (2005)	\$12 Million	69%
Solid Waste and Recycling	2.16 Tons Solid Waste per Revenue Hour	-29% (2008)	5,107 Tons Trash 3,479 Tons Recycling	-26.2% Trash (2008) -38% Recycling (2008)	Not Applicable	Not Applicable
Used Oil Waste	0.15 Gallons per Revenue Hour	-27%	146,000 Gallons	-25%	\$0	-100%
Hazardous Liquid Waste	0.68 Pints per Revenue Hour	-44%	680,000 Gallons	-42%	\$536,000	-15%
Non-Hazardous Liquid Waste	0.57 Pints per Revenue Hour	24%	564,000 Gallons	26%	\$205,000	11%
Anti-Freeze Waste	1.38 Ounces per Revenue Hour	29%	86,000 Gallons	31%	\$15,000	-21%
Operating Expenses	Not Available	Not Available	\$8.19 [a] Combined Dollars per Boarding	1% (2010)	Not Applicable	Not Applicable
Unlinked Passenger Trips per Capita	Not Available	Not Available	456 Million Boardings	18% (1997)	\$153 per Revenue Hour	-4%

*Where 2002 data was not available, the earliest year was used and is noted in parentheses.

[a] Operating Expenses data excludes Vanpool transit mode.

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