Los Angeles County
Metropolitan Transportation Authority

2013 Metro Energy and Resource Report

Metro®

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List of Acronyms and Abbreviations

APTA	American Public Transit Association
AQMD	Air Quality Management District
BMT	bus miles traveled
BRT	Bus Rapid Transit
CMF	Central Maintenance Facility
CNG	compressed natural gas
CO	carbon monoxide
EBOM	Existing Building Operations and Maintenance
EMS	Environmental Management System
FTA	Federal Transit Administration
FY	fiscal year
GGE	gallons of gasoline equivalent
GHG	greenhouse gas
ISO	International Standards Organization
kW	kilowatt
kWh	kilowatt hour
LADWP	Los Angeles Department of Water and Power
lb	pound
LCFS	Low Carbon Fuel Standard
LED	light-emitting diode
LEED	Leadership in Energy and Environmental Design
LEED-EB	Leadership in Energy and Environmental Design – For Existing Buildings
LEED-NC	Leadership in Energy and Environmental Design – For New Construction and Major Renovations
Metro	Los Angeles County Metropolitan Transportation Authority
MSIP	Metro Sustainability Implementation Plan
MT	million tons
MT CO_2e	carbon dioxide equivalent
NOx	oxides of nitrogen
PM	particulate matter
PMT	passenger miles traveled
PSM	produced seat miles
PV	photovoltaic
PWP	Pasadena Water and Power
ROG	reactive organic gases
RVL	revenue vehicle length
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SWPPP	Storm Water Pollution Prevention Plan
UPT	unlimited passenger trips
VM	vehicle miles
VMT	vehicle miles traveled
VRH	vehicle revenue hours
VRM	vehicle revenue miles
WESS	wayside energy storage substations


Exit
Exit 1st St/Soto St

Executive Summary

This Energy and Resource Report analyzes Metro's 2012 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 (Moving Towards Sustainability: 2012 Metro Sustainability Report Using Operational Metrics) by presenting sustainability data for calendar year 2012. The report compares trends, focusing on the previous year's report data (2011) and this year's report data (2012), 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, direct resources, and improve performance towards sustainability in a cost-effective manner 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, including Metro receiving Platinum recognition in 2012 from APTA for leadership in sustainability as a signatory of the APTA Sustainability Commitment. This report focuses on Metro's activities for calendar year 2012 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 management.

From these five key areas, nine indicators and eight subindicators are used to evaluate Metro's sustainability progress, as shown in Table 1. The indicators used in this report were derived using the Global Reporting Initiative 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. The format and other aspects of the 2013 report continued to improve from previous sustainability reports to reflect the development of the *Recommended Practice for Quantifying and Reporting Transit Sustainability Metrics*[1] prepared by the APTA Standards Sustainability Metrics Working Group.

1 American Public Transportation Association (APTA). *Recommended Practice for Quantifying and Reporting Transit Sustainability Metrics.* Published June 2012. Prepared by APTA's Sustainability Metrics Working Group.

This 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, this report 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 follows.

Table 1 - Indicator Area Summary Table

Indicator	Unit	2011	2012	Progress
Water Use	Gallons of Water	238,000,000	303,456,868	R+
Criteria Air Pollutant Emissions	Tons of Criteria Pollutants	1,420	817.7	I
Greenhouse Gas Emissions	Metric Tons of CO2e	457,000	484,983	R
Greenhouse Gas Displacement	Metric Tons of CO2e	419,344	491,118	I
Energy Use > Fuel Use > Rail Propulsion Power > Facility Electricity Use	Gallons of Gas Equivalents	43,000,000	43,419,368	NC
	Kilowatt Hours	261,000,000	296,590,596	R+
Waste and Recycling > Solid Waste and Recycling > Used Oil Waste > Hazardous Liquid Waste > Nonhazardous Liquid Waste > Anti-Freeze Waste	Tons of Solid Waste	8,600	7,418	I
	Recycling Percentage	41	36	R
Operating Expenses	Operating Expense per Boarding	$2.77	$2.68	I
Unlinked Passenger Trips	Boardings	457,000,000	464,875,164	I
Vehicle Miles Traveled per Capita	Miles	7,869.00	7,916.00	NC

I = Improved R = Regressed + = Cobenefit Achieved (benefits achieved other than the benefit included)
NC = No Change (less than 1% difference)


Los Angeles
101A

Water Use R+

Water is an integral part of Metro's operations. In 2012, we first began to incorporate all suppliers in Metro's water consumption evaluation to obtain a more complete understanding of trends and opportunities. The Los Angeles Department of Water and Power (LADWP) supplies 85% of Metro's water, with the remaining 15% supplied by California Water Services, Golden State Water Company and other municipal water providers. Compared with 2011 water usage provided by LADWP, a 15% increase in water consumption occurred from 2011 to 2012 at an additional 47 million gallons. A cobenefit of this increase in water consumption is achieved with the requirement to wash solar panels on a regular basis.

The average cost for each gallon of water used at Metro remains similar to 2011 levels. By incorporating the additional expenditures from the other water providers, the total water cost in 2012 increased over $3 million. Despite increased ridership, overall water consumption increase outpaced transit service growth, which leads to a decrease in water efficiency. Water efficiency in 2012 was 44 gallons per revenue hour (LADWP-provided water efficiency was 37 gallons), compared to 32 gallons per revenue hour in 2011.

Further analysis demonstrated that, on average, bus divisions have higher consumption rates compared to other major divisions. Water will continue to be a limited resource particularly in the current climate changing environment. Metro is taking action to focus on reducing water consumption, stabilizing annual costs, and becoming a leader in contributing to a regional water conservation effort.

Figure 1 - Historic Water Use and Cost[1]

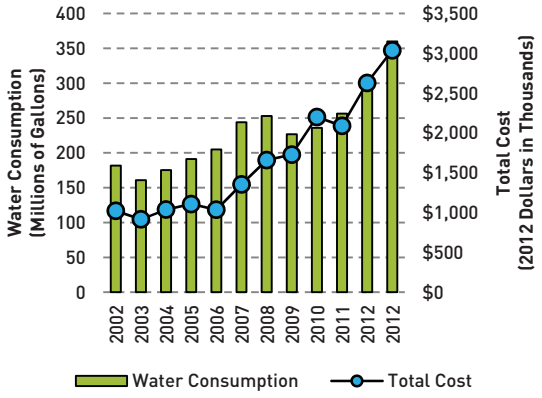
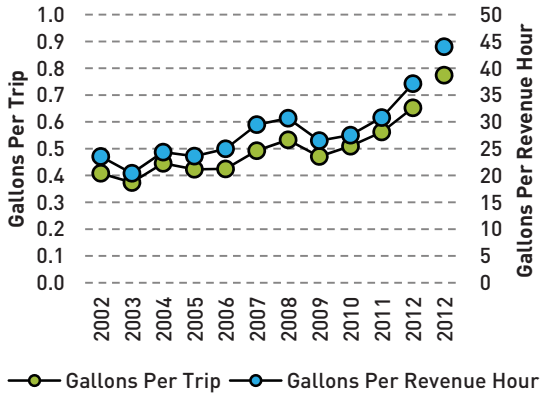


Figure 2 - Historic Water Use and Efficiency



1 The second 2012 data column also includes additional water providers such as Pasadena Water and Power (PWP), California Water Services, and other municipal providers.

Criteria Air Pollutant Emissions

In 2012, Metro bus and rail operations continued to achieve significant reductions in criteria air pollutants. In comparing 2012 fleet emission levels to those previously calculated for 2011, Metro's overall fleet emission levels demonstrated significant reductions. The 2012 fleet emissions of Reactive Organic Gases (ROG), carbon monoxide (CO), oxides of nitrogen (NOx), and particulate matter (PM) were reduced by 47.9%, 37.5%, 48.6%, and 12.3%, respectively. Overall, total criteria air pollutant emissions dropped approximately 606.8 tons, or 42.4%, from 2011 to 2012.

The substantial reduction can be attributed to the following factors:

> Repowering of older, higher-emitting natural gas buses with new state-of-the-art compressed natural gas (CNG) engines. In many cases, the new technology engines are 700% lower emitting for NOx compared to the engine they replaced.

> Reducing transit bus miles traveled (BMT) in 2012 as compared to 2011. Total transit BMT for all divisions in 2011 were recorded as 89,118,221 miles. The total BMT in 2012 was 86,505,433 miles, a reduction of 2,612,788 miles as compared to 2011. This equates to an approximate 2.9% reduction in BMT.

> Eliminating all diesel and gasoline-fueled BMT from the revenue-generating fleet in 2012. Division 3 operated limited gasoline fleet vehicles in year 2011. Metro recorded no petroleum-based fuel usage for the revenue-generating fleet in year 2012.

Figure 3 - Historic Criteria Air Pollutant Emissions

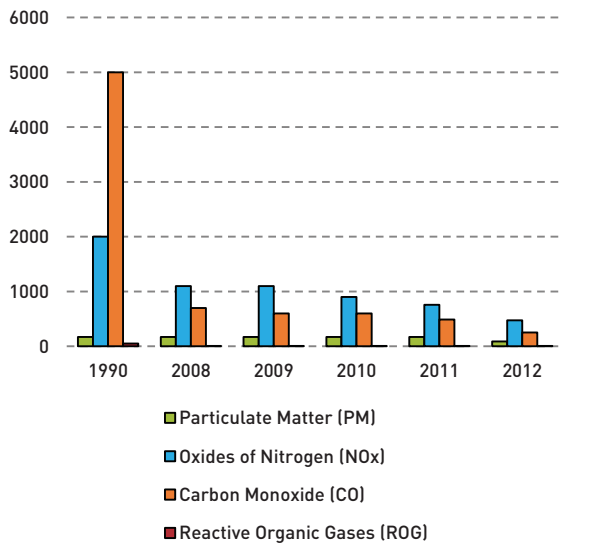
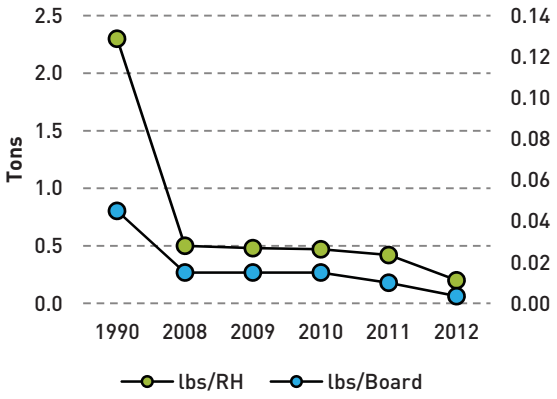


Figure 4 - Criteria Air Pollutant Emission Efficiency



Greenhouse Gas Emissions R

Increased levels of GHG emissions cause global climate change, which have and will continue to impact the Los Angeles region. In 2012, Metro emitted approximately 485,000 metric tons of carbon dioxide equivalents (MT CO2e), which is approximately 6% higher than in 2011 and 1% higher than in 2007, the first year Metro's emissions were inventoried. This increase can be partially attributed to the introduction of the Expo Line in 2012. Additionally, approximately 82% of Metro's GHG emissions during 2012 was related to fuel from moving passengers.

Further analysis has shown that, in 2012, bus operations continued to become more efficient on a per-boarding basis, while rail operations were less efficient than in 2011. As the carbon-intensity of Metro's operations decrease, emissions decrease. Metro's emissions are also linked to the efficiency of its services: as ridership increases, the emissions-per-passenger tend to decrease. Currently, Metro's buses provide the most efficient services in terms of GHG emissions per boarding, emitting 1.73 pounds (lbs) CO2e per passenger boarding.

Figure 5 - Historic Greenhouse Gas Emissions

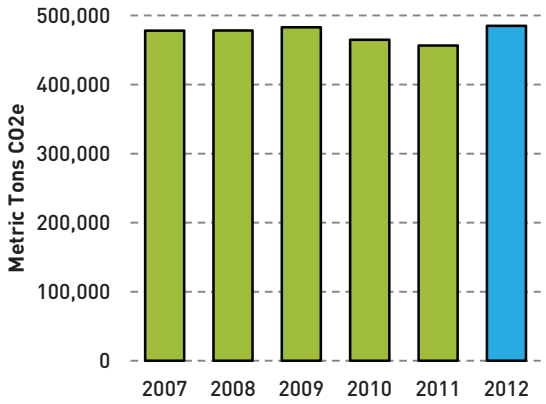
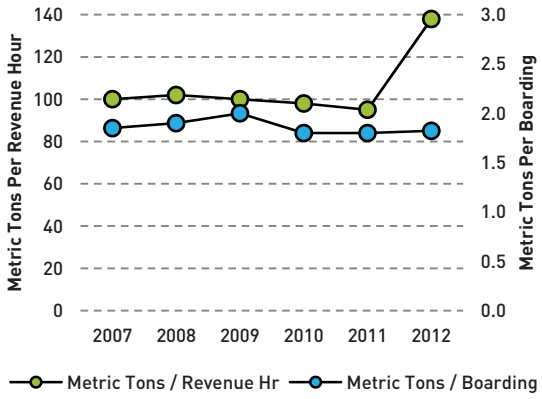
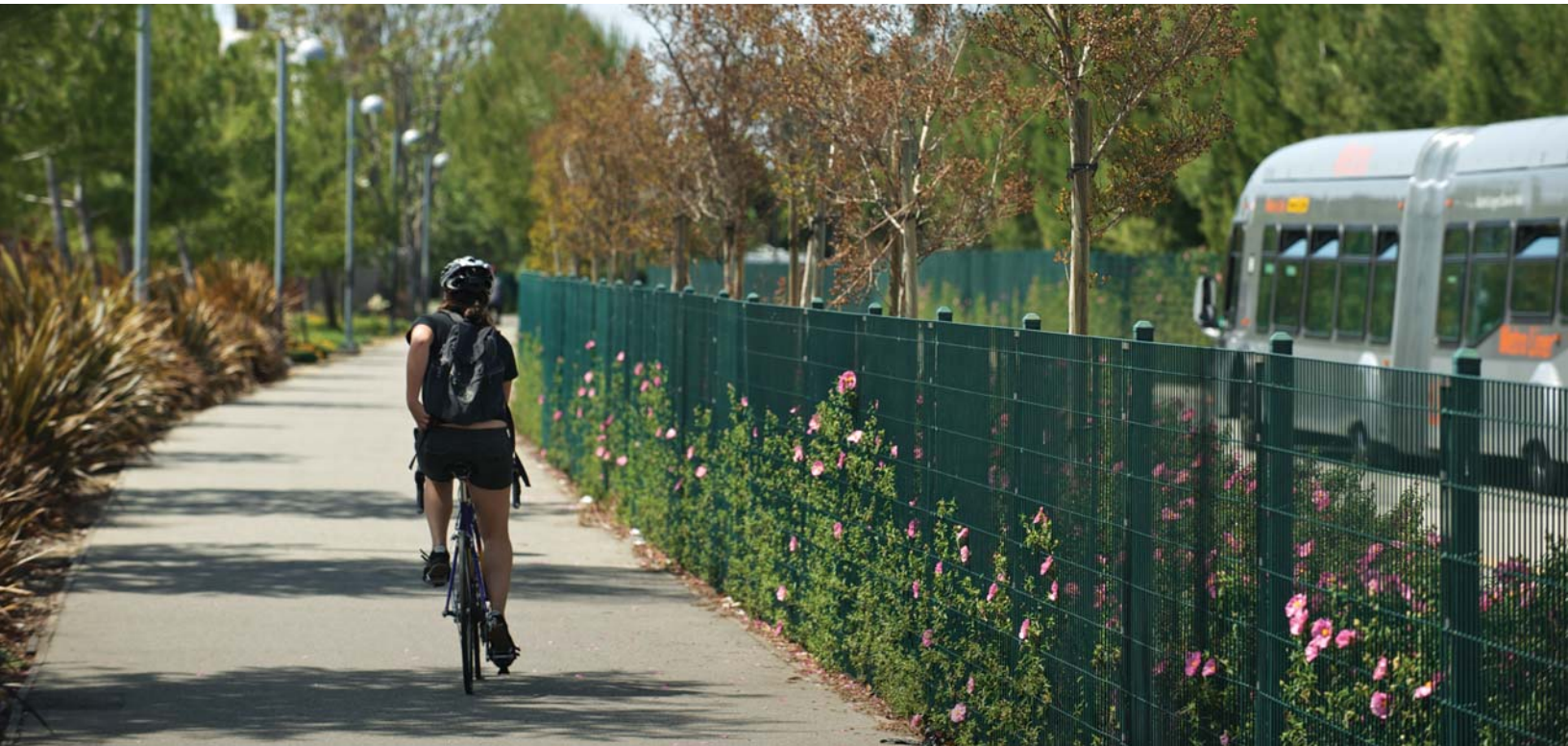


Figure 6 - Greenhouse Gas Emissions Efficiency





Greenhouse Gas Displacement

Metro plays a larger role in sustainability and reducing GHG emissions in the region. By providing transit options, Metro is reducing GHG emissions that would otherwise have occurred from passenger vehicles, increased congestion, and potentially more sprawl. When combined effects of these factors are considered, Metro prevented more GHG emissions than it produced.

In 2012, Metro achieved carbon displacement of over 491,000 MT CO2e by shifting passengers from vehicular travel to transit. This alone resulted in more GHG emissions displaced by passengers not driving than by all of Metro's operational emissions. Congestion relief and land use GHG displacement estimates have not yet been applied as they require more detailed modeling but they would demonstrate even greater emissions avoidance and Metro's central role in creating a more sustainable region.

Table 2 - Net Greenhouse Gas Emissions

Source	Quantity of Emissions Displaced (MT CO2e)
Total Emissions Displaced from Mode Shift	(491,118)
Emissions from Metro Operations	484,983
Net Emissions from Metro Operations	(6,135)

Energy Use NC R+

APTA's recommended guidelines include energy usage as a key indicator of operational efficiency and environmental responsibility. In support of APTA's recommended guidelines, Metro identified additional subindicators for analysis: Fuel Use, Rail Propulsion Power, and Facility Electrictiy Use.

Fuel Use

In 2012, Metro's fleet, excluding vanpool services, used over 41.7 million gallons of gasoline equivalent (GGEs) fuel, 1.2 million GGEs less than 2011. Service cuts in 2009 caused fuel usage to decrease and additional planned service cuts in 2011 resulted in a further decline of fuel usage. CNG now accounts for 93.7% of total fuel used by Metro. Gasoline accounts for 6% and Diesel accounts for 0.3%. CNG fuel continues to be the preferred and most used fuel type by Metro.

In 2012, Metro spent $30.5 million on fuel, including vanpool fuel, which is nearly half of the amount spent on fuel in 2008 and $5.4 million less than 2011. This significant decrease is due to Metro's transition to a 100% CNG-powered bus fleet, which offers a lower price per GGE. This is a sharp reversal of the trend from 2002–2008, when fuel expenditures rose by 121% (after adjusting for inflation).

In addition, Metro switched from natural gas-powered to electric-driven

The fuel intensity of Metro's service, as measured in GGEs per revenue hour, demonstrated a steady increase since 2002, then decreasing after 2008 and stabilizing in recent years.

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%. In addition to its cleaner burning, CNG continues to be the lowest priced fuel per GGE.

Figure 7 - Historic Fuel Use

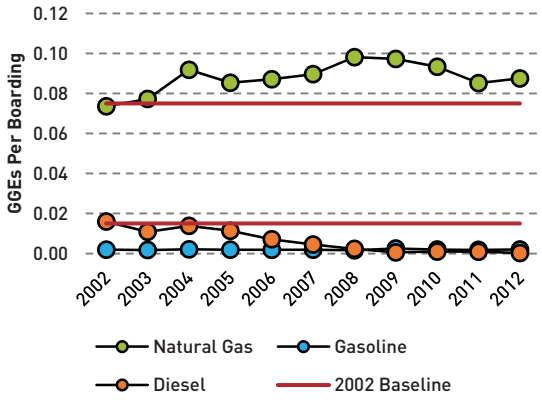


Figure 8 - Total Gallons of Gasoline Equivalent per Revenue Hour

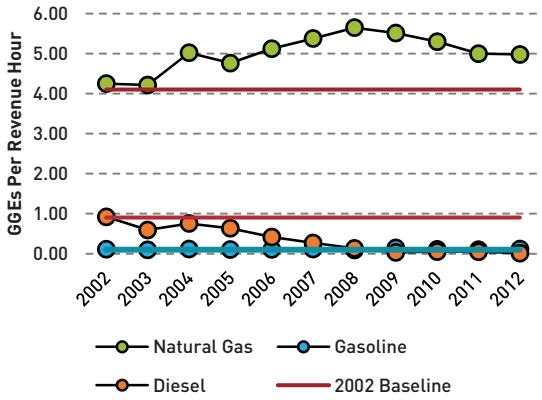
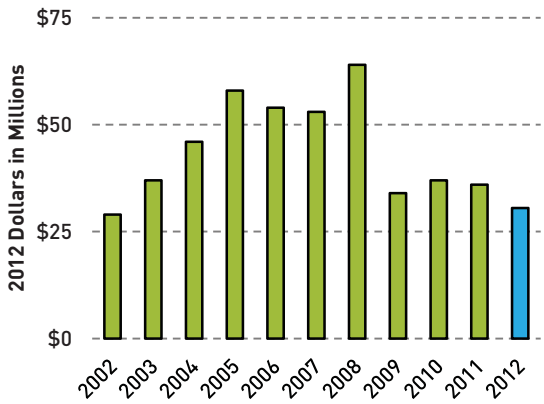


Figure 9 - Historic Fuel Expenditures, 2012 Dollars



Rail Propulsion Power

In 2012, rail propulsion power was provided by three utility providers: LADWP, Southern California Edison (SCE), and the Pasadena Water and Power (PWP). Metro's rail lines consumed approximately 199 million kilowatt hours (kWh) of electricity in 2012, which represents an 18% increase from 2011 of which 4% is attributed to the introduction of the Expo Line. In terms of expenditures, rail propulsion increased approximately 16%, from $21 million in 2011 to $25 million in 2012. The increase in consumption and expenditure is partially due to the opening of the Expo Line in 2012 and an increase in total rail vehicle passenger revenue miles, and extended operating hours beginning July 2012.[1] The Red Line continued to consume more power than any other Metro rail line.

In 2012, Metro used 2.18 kWh of electricity per rail boarding compared to 2.26 kWh per boarding in 2005, which represents a 4% increase in efficiency and a 11% decrease from 2011. In 2012, Metro consumed 253 kWh per revenue hour compared to 250 kWh per revenue hour in 2011.

1 http://thesource.metro.net/2012/07/13/metro-to-run-all-trains-and-orange-line-busway-until-2-a-m-on-friday-and-saturday-nights/

Figure 10 - Changes in Rail Propulsion Power and Expenditures

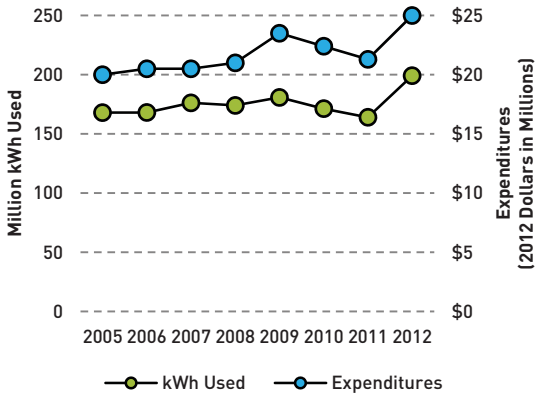
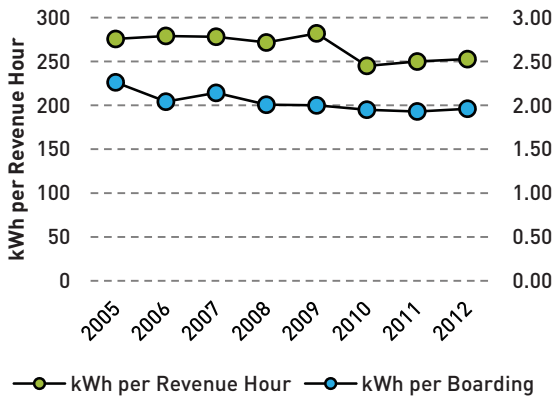


Figure 11 - Rail Propulsion Power Efficiency



Facility Electricity Use

In 2012, facility electricity use increased 10% from 97 million kWh to 108 million kWh. For all facility-based electricity consumption, 83.5 million kWh consumed (77%) was provided by LADWP, 24.3 million kWh (23%) was provided by SCE, and 333,434 kWh (0.3%) was provided by other city electricity providers. LADWP continues to be the highest electricity provider for Metro's facility electricity use. In 2012, Metro spent $12.2 million on facility electricity, 0.2% more than in 2011.

From an electricity efficiency perspective, Metro has experienced a steady decrease in efficiency due to an increase in electricity consumption since 2009 due to the switch from natural gas-powered to electricity-powered CNG compressors at bus facilities.

Figure 12 - Facility Electricity Use and Expenditures

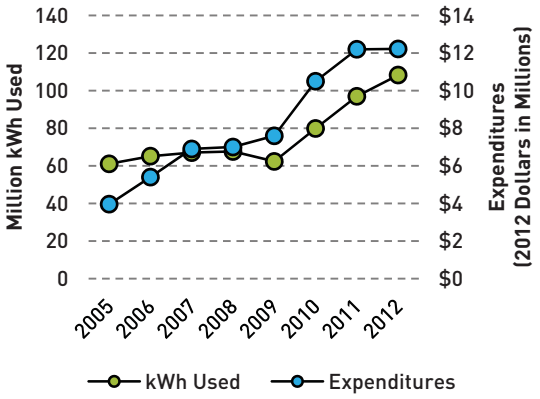
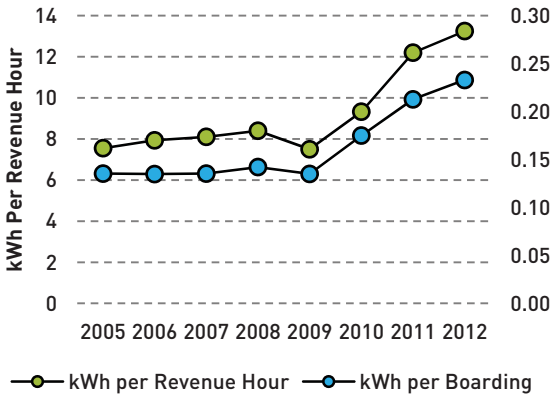


Figure 13 - Facility Electricity Use Efficiency



Waste and Recycling

I R

Metro continues to actively work on reducing waste and expanding recycling efforts. Overall, solid waste output has decreased every year since 2008, from approximately 12,500 tons in 2008 to 7,400 tons in 2012. Overall solid waste output has decreased since 2008; recycling rates dropped from 45% of solid waste being recycled in 2008 to 36% in 2012. Metro has implemented several internal programs to divert waste from landfills. These recycling programs focus on products such as bus batteries, printer cartridges, scrap metal, e-waste, and other office products.

Solid waste efficiency has increased every year since 2008, with the decrease in the number of pounds of solid waste produced per revenue hour and boarding. Solid waste production per revenue hour decreased from 3.03 pounds of waste in 2008 to 1.82 pounds of waste in 2012. Solid waste production per boarding decreased from 0.053 pounds of waste in 2008 to 0.032 pounds of waste in 2012. As the overall waste reduction efficiency increases, the recycling efficiency has shown a decline each year after 2008.

Specific discussions regarding used oil waste, hazardous liquid waste, nonhazardous liquid waste, and anti-freeze waste are included in the indicator areas analysis section of this report.

Figure 14 - Historic Waste Production

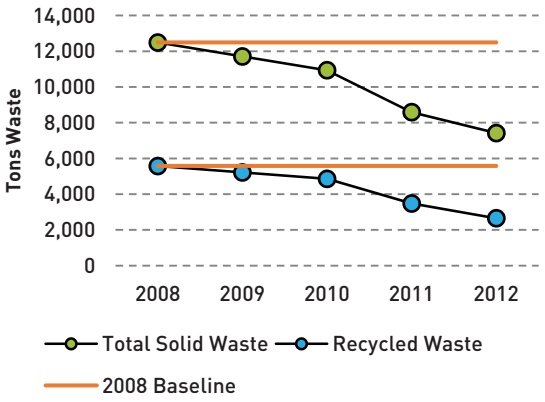


Figure 15 - Waste and Recycling Efficiency (per Boarding)

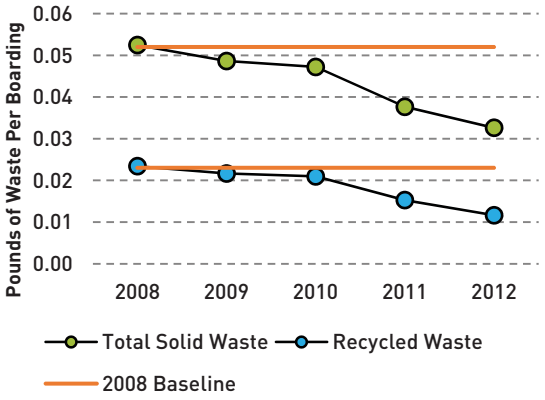
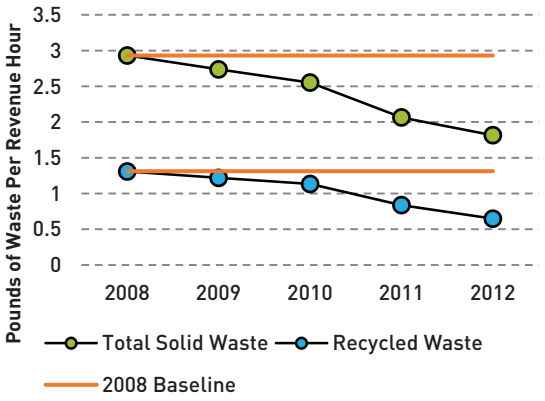


Figure 16 - Waste and Recycling Efficiency (per Revenue Hour)



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. In 2012, Metro's operational expenses were approximately $2.68 per boarding, which represents a 5-cent increase from 2003 and a 9-cent decrease from 2011 after adjusting for inflation. Operational expenses per vehicle revenue mile (VRM) have improved from 2003 and have kept steady around $10.30 per mile over the last 4 years. When compared to 2011, both operational efficiency indicators have experienced slight improvements in 2012.

Figure 17 - Historic Operating Expense

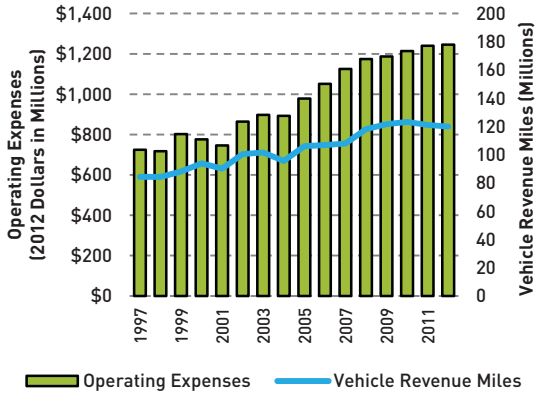
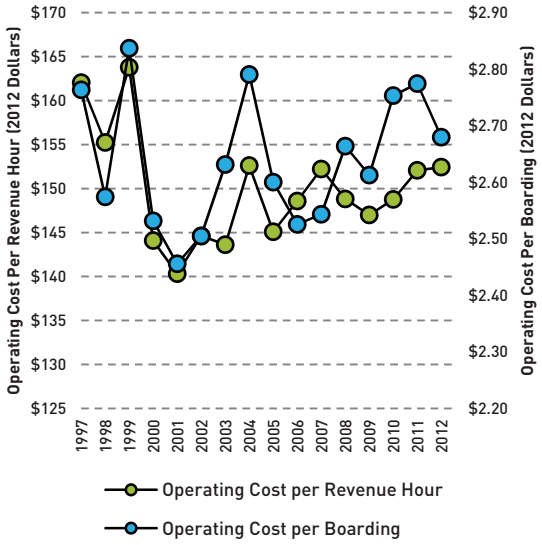


Figure 18 - Operating Expense Efficiency



Unlinked Passenger Trips per Capita I

This section analyzes transit ridership as a means to assess the environmental performance of Metro's operations. Transit service is measured using ridership boarding and revenue hours. Ridership boardings is the sum of unlinked trips on all of our transit vehicles. Revenue hours are the sum of the revenue hours from all of Metro's transit vehicles. Transit vehicles used in calculations includes heavy rail, light rail, bus operated by Metro, bus not operated by Metro and vanpool services.

Since the 2007 recession, 2012 is the second year that has witnessed an increase in the total ridership for all modes of transit. Compared to 2011, the total number of transit trips increased approximately 2%. Bus service remains the dominant transit mode for the transit riders on Metro's system, with 77% of transit trips occurring by bus in 2012. It is worth noting that the ridership increases are not evenly distributed among the different transit modes. Despite having the lowest ridership volume compared to the other transit modes in 2012, vanpools experienced a 12% increase in ridership, which equates to an annual growth of approximately 10% over the last four years. Light rail also experienced a significant increase in ridership at approximately 9%. This trend aligns with Metro's commitment to expanding and enhancing services by adding 12 additional mass transit projects over the next decade.

Figure 19 - Historic Boardings by Mode

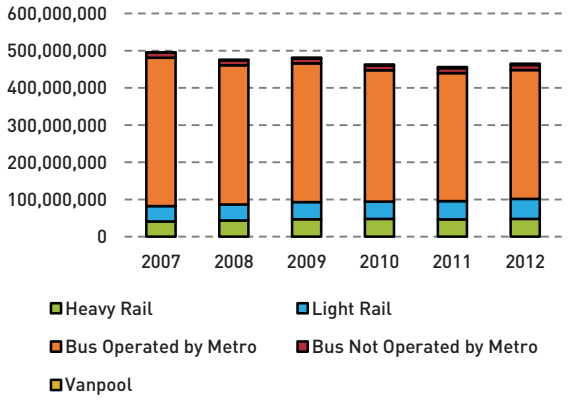
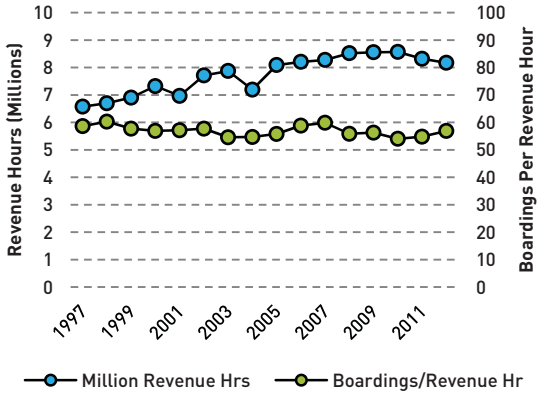


Figure 20 - Boardings Efficiency

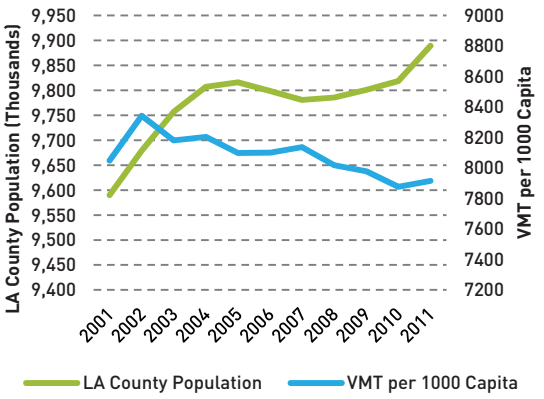


Vehicle Miles Traveled per Capita NC

In 2001, 211.5 million vehicle miles were traveled daily within Los Angeles County; this increased to 214.5 million in 2011.[1] This constitutes a 1% increase in VMT compared to a 3% total population growth over the past 10 years. The annual VMT per capita decreased from its 10-year peak of 8,342 in 2002 to 7,916 in 2011, with 2011 the first year to show an increase of total VMT. This reduction in VMT per capita is attributable to a number of factors, including Metro's increasing focus on improving transit service efficiency and convenience. The expansion of transit service provides increased opportunities for mobility and accessibility for the general public, while also providing alternative transit options for single-occupant vehicle drivers.

1 State of California Department of Transportation (Caltrans). *Highway Performance Monitoring System: 2011 California Public Road Data.* Published October 2012. Prepared by Division of Transportation System Information.

Figure 21 - Los Angeles County Annual VMT per Capita and Population Trends



Message from the Chairman

Effective, responsible, and sustainable resource management has long been an integral component to execute Metro's mission to be "responsible for the continuous improvement of an efficient and effective transportation system for Los Angeles County." As an organization we are committed to reducing impacts to the environment and efficiently managing our resources in all of our planning, construction, operations, and procurement activities in conjunction with improving and expanding the region's transit systems. Both are necessary to support to region's transportation needs.

Transit operations, in conjunction with our sister transit agencies in Los Angeles County, improve our region's mobility by reducing congestion, increasing linkages, removing vehicles from roadways, and creating conditions for transit oriented developments, bringing jobs, services, and housing together. Our transit operations also help reduce the impacts of congestion on air quality.

Metro leads the nation with a 100% CNG bus fleet and is aggressively pursuing more efficient, renewable sources of fuel and energy for its growing operations. Metro has also implemented congestion pricing programs such as ExpressLanes on the I-110 and I-10 Freeways.

Metro's bus and rail divisions throughout the region have been maintaining, servicing, and coordinating our transit operations for many decades.

Metro has committed to efficiently managing our water, energy, waste, and other resources at these facilities. To this end, Metro is implementing its comprehensive energy management plan which includes numerous energy efficiency measures, renewable energy projects, and collaboration with regional utility partners.

Additionally, Metro is dedicated to sustainable resource management through implementation of Environmental Management System principles in operations and incorporation of Leadership in Energy and Environmental Design (LEED) elements in construction and retrofits of new and existing facilities.

These efforts have achieved significant reductions and savings in resources, costs, and agency-wide carbon footprint. However, these actions are only part of an ongoing commitment to make Metro and Los Angeles County more sustainable. Our staff is dedicated to continuing this commitment while simultaneously enhancing and expanding our transit system, making us a national leader in energy and resource conservation and sustainability.

Sincerely,

Mike Antonovich

Michael D. Antonovich
Chairman, MTA Board of Directors

Message from the CEO

Los Angeles is committed to building a world-class transportation system; one that is safe, clean, reliable, on-time and courteous. All of these actions are done in ways that are as sustainable as possible to conserve energy and resources.

Energy and resource management at Metro ties into managing all environmental aspects of our operations. Air quality, water management, energy and fuel consumption, emissions, and recycling and waste management are some elements that characterize Metro's efforts in this field.

Recent successes include:

> Opening of the Expo Light Rail Line, which has already reached 25,000 weekday boardings per month;

> Opening of the Metro Orange Line Extension connecting Canoga Park to Chatsworth, which has increase overall ridership along the Orange Line by 22%;

> Recognition by APTA's Sustainability Commitment at the Platinum level; the first transit agency to achieve this level of recognition;

> Formation the Energy Blue Ribbon Collaborative to assist Metro with energy reduction and conservation strategies and initiatives;

> Initiation of the ISO 14001 certification at Division 10;

> Adoption of Metro's Industrial Stormwater Pollution Prevention Program; and

> A continuing commitment to achieve Leadership in Energy and Environmental Design (LEED) Silver certification standards on new construction projects.

Metro is dedicated to integrating energy and resource management into all aspects of planning, construction, operations, and procurement to ensure environmental impacts are reduced while high levels of service are maintained and cost-savings are realized agency-wide. This is why Metro serves as an example for the region and for the nation.

I congratulate our staff and partners in leading the way by effectively managing the limited resources of Los Angeles and working towards a more sustainable region.

Sincerely,

Arthur T. Leahy
Chief Executive Officer


Metro

Metro

Metro's (Los Angeles County Metropolitan Transportation Authority) mission is to be responsible for the "continuous improvement of an efficient and effective transportation system in Los Angeles County." Metro's role is unique among the nation's transportation agencies by serving as transportation planner and coordinator, designer, builder, and operator for one of the country's largest, most populous counties. More than 9.89 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 90 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 that service 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 two subway lines (Red and Purple Lines) and four light rail lines (Blue, Gold, and Green Lines and the first segment of Expo Line, which opened in April of 2012). The 19.7-mile-long Red Line opened in 1993. The Red Line includes 16 stations with an average of 145,000 weekday boardings, for a fiscal year (FY) 2011 total of 46.5 million boardings. Combined, the four light rail lines (Metro Blue Line - 1990; Metro Red Line - 1993; Metro Gold Line - 2003; and Metro Green Line - 1995) are 68 miles long, include 67 stations, and average 154,000 weekday boardings, for a FY2011 total of 49.3 million boardings.

As the region's transportation planner, Metro's Long Range Transportation Plan (2009) calls for investments to expand the region's rail system by another 105 miles and to 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 28, 2012; the Orange Line Extension started revenue service on June 30, 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 over 400,000 new jobs and annual reductions in vehicle miles traveled (VMT) (208 million miles); annual reductions in 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 the urban landscape of Los Angeles 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 encourage walking and bicycle improvements, in tandem with TOD projects, 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. Four buildings have received a LEED Gold rating and the newly renovated and expanded El Monte Bus Station is currently pursuing LEED certification.

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 other facilities; and 15 other facilities are currently being assessed.

3. Adopting Metro's Renewable Energy Policy (2011) to incorporate renewable energy into Metro facilities. Solar panels have been installed at five Metro facilities and projects for a combined 2.5 megawatts of energy, and solar panels are 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 and projects performed on Metro rights-of-way.

5. Adopting Metro's Energy Management and Conservation Plan (2011), which provides a blueprint to direct Metro's overall energy management and use in a sustainable, cost-effective, and efficient manner.

Energy Policy is the basis for all these initiatives, with a commitment to using EMS as the tool. 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.


TO TICKETING & TRAINS
METROLINK SERVICE

Introduction

Since 2009, Metro has developed a sustainability report on an annual basis to summarize the agency's continual efforts in achieving higher sustainability performance through the implementation of planning, construction, operations, and management activities. Preparation of this 2013 Metro Energy and Resource Report is a continuation of this effort and reflects the agency's sustainability performance for calendar year 2012. The development of this report will continue to bring visibility to Metro's sustainability efforts and help explore new ways to manage environmental impacts, while maintaining a high level of service.

The purpose of this report is to compare data with previous years in order to track Metro's progress towards our goals for sustainability and provide an update on Metro's resource use and contribution to the reduction of pollutant emissions and GHGs. 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, the best available data as of April 2013 was used along with the most reliable sustainability guidelines to develop this report.

Data is organized according to indicator area, with each area focusing on a resource or economic cost by which Metro can analyze the effectiveness of its sustainability strategies over time. This report reflects the *Recommended Practice for Quantifying and Reporting Transit Sustainability Metrics*[1] as developed by the American Public Transit Association (APTA). The indicator areas selected for historic and ongoing analysis are listed on the next page.

1 American Public Transportation Association (APTA). *Recommended Practice for Quantifying and Reporting Transit Sustainability Metrics.* Published June 2012. Prepared by APTA's Sustainability Metrics Working Group.

Water Use

Criteria Air Pollutant Emissions

Greenhouse Gas Emissions

Greenhouse Gas Displacement

Energy Use

Fuel Use, Rail Propulsion Power, Facility Electricity Use

Waste and Recycling

Solid Waste and Recycling, Used Oil Waste, Hazardous Liquid Waste, Nonhazardous Liquid Waste, and Anti-Freeze Waste

Operating Expenses

Unlinked Passenger Trips per Capita

Vehicle Miles Traveled per Capita

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 analysis summaries and data graphs.

> Next Steps: Discusses specific actions and general next steps that Metro is considering for future implementation.

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, Metro projects will comply with all local, state, and federal codes, ordinances, and regulations, and applicable Federal Transit Administration (FTA), Federal Highway Administration, and APTA guidelines. Furthermore, Metro employs, at a minimum, the following strategies to achieve a sustainable approach to our projects:

> 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.

> Reduce waste, reuse materials, recycle, and procure environmentally friendly products.

Additionally, the Environmental Management System (EMS) is a tool identified in Metro's Environmental Policy (2009) to ensure the implementation of sustainable principles in all of their planning, construction, operations, and procurement activities. Using EMS, Metro is further identifying environmental issues of significant concern; proactively addressing those issues; implementing specific solutions as issues developed; and regularly engaging management to ensure continual improvement.

This report includes a technical appendix that identifies all data collected and provides the sources of information that serve as the basis for the analysis.


11:57AM 7/14/2011
Service Alert
After 8pm all Blue Line trains will continue to depart 7th Street/Metro Center from platform 2. (Figueroa Side)
Train to
Union Station
12:01 pm
12:13 pm
mergency
ntercom

Reporting Methodology

As a founding member of the APTA Sustainability Commitment, Metro follows the guidance provided by APTA to report and track key indicators of sustainability for the transit agency. APTA's *Recommended Practice for Quantifying and Reporting Transit Sustainability Metrics*[1] provides the framework and methodology for the 2013 Energy and Resource report and provides guidance for reporting and tracking key indicators of sustainability. This Recommended Practice identified nine sustainability performance metrics to be reported on an annual basis, as follows: 1) Water Use, 2) Criteria Air Pollutant Emissions, 3) Greenhouse Gas Emissions, 4) GHG Displacement, 5) Energy Use, 6) Waste and Recycling, 7) Operating Expenses, 8) Unlinked Passenger Trips per Capita, and 9) Vehicle Miles Traveled per Capita.

1 American Public Transportation Association (APTA). *Recommended Practice for Quantifying and Reporting Transit Sustainability Metrics.* Published June 2012. Prepared by APTA's Sustainability Metrics Working Group.

Normalization Factors

APTA also recommends that a transit agency select normalization factors that "tell its story" by providing context for its operations. The eight possible normalization factors are: 1) passenger miles traveled (PMT), 2) vehicle revenue hours (VRH), 3) vehicle miles, 4) vehicle revenue miles (VRM), 5) unlinked passenger trips (UPT), 6) produced seat miles (PSM), 7) revenue vehicle length (RVL), and 8) per capita in service area of operation. As one of the nation's largest transit agencies, Metro's service area encompasses more than 1,400 square miles of Los Angeles County, with an estimated average weekday ridership of over 1.5 million (bus and rail). It is Metro's core mission to provide efficient and effective transit service to the Los Angeles region. This report focuses on PMT, VRH, and UPT as the primary normalization factors to measure Metro's sustainability performance and examine the balance between Metro's service expansion and sustainability impact.

Passenger Miles Traveled (PMT)

PMT is the sum of the distances traveled by all passengers of Metro. This metric directly shows the potential VMT and associated GHG emission savings. It highlights Metro's operational efficiency and effectiveness as it relates to GHG savings.

Vehicle Revenue Hours (VRH)

VRH refers to the total number of hours that Metro's vehicles are in revenue service (including vehicles that operate in fare-free service). This metric captures the effectiveness of the transit service provided by Metro. Measuring Metro's sustainability performance through VRH helps to reveal how its overall sustainability performance is impacted by the transit service expansion. This metric enables the comparison of sustainability efficiency year-to-year regardless of the service size and scale.

Unlinked Passenger Trips (UPT)

UPT, also called boarding, is defined as the total number of times passengers board public transportation vehicles, regardless if the boarding results in one trip or multiple trips. This metric captures the scale and effectiveness of Metro's transit service. It helps to reveal the relationship between Metro's efforts to attract passengers and increase service productivity and the resulting impact on the sustainability performance brought on by such efforts.

Division Level Analysis

Major facilities at Metro deliver high-quality public transit services to Los Angeles County. At the same time, they also account for a large portion of Metro's overall environmental and resource footprint. Measuring Metro's sustainability performance at the major facility level in terms of water and electricity has been included in Metro's annual sustainability report in the last few years. In this report, sustainability performance and an efficiency comparison analysis has been expanded by major facilities (divisions) for all metrics with available data. This division level performance measurement and analysis tie the performance of a division's operation to its fulfillment of sustainability goals and objectives.

A Note on the Data

Analyzing the environmental performance of an agency as large and complex as Metro involves the collection of large amounts of data from many sources. The best data available as of April 2013 that provided an accurate analysis of the agency's performance was used for this report. However, the following shortcomings were encountered that should be addressed in future reports.

> Lack of Submeters: Because a few of Metro's current utility meters monitor several buildings within a division (for example), it can be difficult to accurately identify the source of increasing or decreasing energy usage within a specific division.

> Lack of Data:

- Prior to 2012, only water data from Metro's main water supplier, LADWP, was analzyed. Starting with this 2012 report, water data from all water suppliers will be included for analysis.
- Facility Electricity and Solid Waste and Recycling: Data was not available dating back to 2002 so only available data was used for the analysis.
- Rail Propulsion Electricity: Data was not available before 2005.
- Specific waste streams for waste and recycling were not available. Therefore, the correlation between solid waste output and recycling rates could not be analyzed. In 2013, Metro hired a new solid waste contractor that will provide this additional information.

> Metering: Water billing and electricity use were provided by meter address, which does not always match a specific division/major facility.

> All US dollars presented in this report are 2012 US dollars, unless otherwise noted.

Accomplishments

Throughout 2012, 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 are discussed by indicator area, along with the sustainable strategies that were recommended in the previous sustainability report and the accomplishments achieved in 2012. Some sustainable strategies are considered relevant and ongoing; therefore, they are carried forward on an annual basis. Each accomplishment is a confirmation that Metro is committed to increasing its sustainability, efficiency, and environmental performance.

In 2012, Metro received Platinum recognition from APTA for leadership in sustainability as a signatory of the APTA Sustainability Commitment. Additionally, Metro organized and conducted FTA compliance training on cultural resources, noise, and vibration. Metro took part in FTA's Climate Adaptation Pilot and obtained a Livability Grant. Metro supported planning, design, environmental, archaeological and paleontological monitoring activities on the following Metro capital projects:

> New Bus Maintenance Facility, Division 13

> Lankersheim Train Depot

> Metro Orange Line Pedestrian Connector

> Universal Pedestrian Overpass

> Crenshaw/LAX Transit Corridor

> Regional Connector Transit Corridor

> Westside Subway Extension

> Wilshire BRT

> Patsaouras Transit Plaza Renovation

> Conducted groundwater sampling, monitoring, and reporting at Divisions 10 and 18

A summary of Metro's accomplishments follows, along with a few case studies that highlight Metro's success.

Water Use

In 2012, Metro developed stormwater best management practices and implemented the agency's Industrial Stormwater Pollution Prevention Plan (SWPPP) in support of operational activities at Metro facilities. In addition, Metro incorporated the use of drought-resistant plants and landscaping at the Orange Line and Orange Line Extension.

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

Criteria Air Pollutant Emissions

Metro's transit bus and rail emissions continue to decline, with overall levels decreasing from 2011 to 2012. Emissions in 2012 of ROG, CO, NOx, and PM were reduced by 47.9%, 37.5%, 48.6%, and 12.3%, respectively, as compared to 2011 levels. Overall, total criteria pollutant emissions were reduced by approximately 606.8 tons, or 42.4%, from 2011 to 2012. These improvements can be attributed to the following actions:

> Repowering of older, higher-emitting natural gas buses with new state-of-the-art CNG engines.

> Reduction in transit BMT in 2012 as compared to 2011. Total transit bus miles traveled for all divisions in 2011 were recorded as 89,118,221 miles. The total BMT in 2012 was 86,505,433 miles, a reduction of 2,612,788 miles as compared to 2011. This equates to an approximate 2.9% reduction in BMT.

> Eliminating all diesel and gasoline-fueled BMT in 2012. Division 3 operated limited gasoline fleet vehicles in year 2011. Metro recorded no petroleum-based fuel usage in year 2012.

Greenhouse Gas Emissions

In 2012, Metro received Platinum recognition from APTA for leadership in sustainability as a signatory of the APTA Sustainability Commitment. Also in 2012, Metro accomplished the following:

> Achieved a LEED-New Construction (NC) Gold Certification Rating for construction of the Bauchet St. Warehouse.

> Developed Low Carbon Fuel Standard Reserves to participate in the Low Carbon Fuel Standard (LCFS) market.

> Installed solar photovoltaic (PV) panels and light-emitting diode (LED) lights at El Monte Transit Station.

Greenhouse Gas Displacement

In 2012, Metro's 2.27 trillion passenger miles resulted in over 491,000 MT CO2e avoided through Mode Shift. This resulted in more emissions displaced by people not driving than by all of Metro's operational emissions.

In addition, Metro incorporated sustainability and environmental elements into Metro's Baseline Design Specifications in 2012, and developed FTA's Climate Change Adaptation Pilot.

Energy Use

In 2012, Metro continued to implement its Energy Conservation and Management Plan and formed the Energy Blue Ribbon Collaborative.

Metro continues to implement 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 or to regulate the line. A WESS for the Metro Gold Line is being funded by the South Coast Air Quality Management District 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 FTA grant funds.

Metro has implemented lighting retrofit plans that assist in the replacement of old, inefficient light fixtures throughout Metro facilities. In 2012, Metro completed lighting upgrades at the Division 20 Vehicle Shop and Division 10 Tire Shop. Metro also installed solar (PV) panels and LED lights at El Monte Transit Station.

Additionally in 2012, Metro accomplished the following:

> Installed new air drying systems at the Division 10 bus washers.

> Expanded the number of submeters installed in Metro's Gateway Headquarters Building.

> Installed electric submeters at Divisions 7, 10, and 30.

> Developed Submetering Plan for Division 20.

> Enrolled the Expo Line Rail Yard into the utility provider's Savings by Design Program, which will incorporate energy efficiency features into the building that are calculated to be 37% more efficient than state code requirements. This saves 177,000 kWh annually, reduces electricity demand by 66 kilowatts (kW), and avoids 4,000 therms. Based on these numbers, over $76,000 in incentives will be awarded to the project.

Waste and Recycling

Metro continues to implement strategies that reduce its chemical, nonhazardous liquid, oil usage, and associated waste.

In 2012, Metro accomplished the following:

> Implemented Metro's Green Construction Equipment Policy and conducted meetings of the Green Construction Policy Technical Working Group.

> Supported and managed agency-wide soil remediation/disposal activities.

> Managed the agency's on-call emergency response to hazardous soils/waste/liquid spills.

> Increased desk-side recycling at the Metro Gateway Headquarters Building, as well as other major facilities.

Operating Expenses

When compared to 2011, the operational efficiency indicators have experienced slight improvements in 2012. Although operating expenses for the vanpool are the highest among the transit modes (bus, heavy rail, light rail and vanpool) the vanpool program plays a critical role in serving a long distance radius, especially for areas that are underserved by other transit modes. As a sustainable travel option compared to the single-occupant vehicle, the vanpool program plays a key role in reducing traffic and associated GHG emissions.

Unlinked Passenger Trips per Capita

Metro provides 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 use alternative modes for commutes to and from Metro offices.

In 2012, Metro started revenue services on the Expo Light Rail Line (April 2012) and started revenue service on the Metro Orange Line Extension (June 2012).

Vehicle Miles Traveled Per Capita

Over the past 10 years, Los Angeles County has seen a 1% increase in VMT compared to a 3% increase in total population. Although VMT is a regional issue, this reduction in VMT per capita is attributable to a number of factors, including Metro's increasing focus on improving transit service efficiency and convenience. The expansion of transit service provides increased opportunities for mobility and accessibility for the general public, while also providing alternative transit options for single-occupant vehicle drivers.

Other Accomplishments

The following are additional efforts or programs that have been implemented by Metro.

> Conducted groundwater sampling, monitoring, and reporting at Divisions 10 and 18.

> Implemented Metro's Climate Change Adaptation Pilot.

Case Study

American Public Transportation Association (APTA) Sustainability Commitment

Platinum Recognition

Challenge

In 2009, Metro became one of the first signatory agencies to APTA's Sustainability Commitment, and Metro has remained dedicated to pursuing sustainability projects and initiatives to enhance operations and reduce impacts on the environment. As part of APTA's Sustainability Commitment, members are encouraged to implement sustainability action items and stretch goals to achieve recognition levels within the Commitment framework.

Action

The APTA Sustainability Commitment encourages public transportation agencies across the country to become signatories, and subsequently contains five recognition levels: Platinum, Gold, Silver, Bronze, and Entry. Based on Metro's abundance of sustainability-related achievements over the past two decades–from the decision to convert the diesel bus fleet into a 100% clean CNG bus fleet (completed in 2011) to ensuring all new facilities attain a LEED Silver rating–led to the conclusion that a Platinum level recognition was achievable. Metro's proactive stance on environmental considerations has resulted in a comprehensive list of completed and forthcoming projects, such as the implementation of Metro's agency-wide EMS, five LEED-certified projects, five energy-efficient lighting projects, and the procurement of two wayside energy storage substations (WESS) for the Red and Gold Lines, just to name a few.

Outcome

Throughout the application process, Metro's Environmental Compliance and Services Department created an inventory of Metro's sustainability-related efforts, which resulted in 50 tangible, completed projects and 13 forthcoming projects (also known as Action Items); and 13 established policies and programs, and 6 forthcoming programs (also known as Stretch Goals). While many of these projects and initiatives were completed long before the application came to fruition, Metro's long-term commitment and comprehensive approach to its environmental efforts contributed to a Platinum level recognition, which further showcases its accomplishments over the years. As the first agency to receive Platinum level recognition for the APTA Sustainability Commitment, Metro has helped to set the standard for transit agencies with its commitment to the environment. With guidance and action from various Metro departments during this process, Metro will continue to pursue innovative policies and programs to enhance the agency's overall goals, as well as its level of influence both regionally and nationally.

Case Study

Federal Transit Administration (FTA) Climate Change Adaptation Pilot

Challenge

In 2011, Metro was one of seven transit agencies nation-wide to be selected to participate in an FTA grant-funded pilot program to address the issue of climate change in their agency's region of service. The pilot is a 15-month endeavor, involving regular peer exchange opportunities and the submission of a final report to the FTA by August 2013. The ultimate objective for the pilot is to assist transit agencies jumpstart their planning processes, either internally or externally, in order to help their agency and their region prepare for the impacts of climate change. There is an emphasis on information sharing so that agencies may learn from one another throughout this process. As Metro has already completed its Climate Action and Adaptation Plan in advance of the pilot, Metro's challenge is how to implement, measure, and continually improve upon the climate adaptation strategies that have been identified.

Action

Metro's Climate Change Adaptation Pilot involves three main components: the integration of climate change into Metro's Environmental Management System (EMS) and the development of parallel procedures to help Metro divisions assess their vulnerability to climate change; the development of climate adaptation metrics and a synthesis of those metrics that Metro should seek to prioritize to mitigate climate impacts both within the agency and throughout the region; and the development of a messaging strategy that culminates in a roundtable discussion for other transit agencies in the Los Angeles region on the regional impacts of climate change, and how agencies are already – and can soon begin – preparing for such impacts.

Outcome

Metro's Climate Change Adaptation Pilot largely focuses on how the agency can integrate climate adaptation into its internal operations, which can be documented through EMS. While this pilot examines Metro's Red Line Yard (Division 20) for such integration, Metro is in the process of implementing the EMS on an agency-wide scale, which provides great opportunities for all divisions to integrate impacts of extreme weather events into their operational activities. The pilot also outlines more generalized recommendations for other transit agencies to begin to incorporate climate assessments into an asset management system of their choice.

The metrics development portion of the pilot incorporates many issues specific to Metro and the Los Angeles region, but also allows for the generalization and expansion of such metrics for other transit agencies in other areas of the country. The methodology for prioritizing those metrics for Metro to consider when continuing its climate adaptation planning is also applicable to other agencies nation-wide.

The culmination of the pilot came in the form of a messaging strategy, with the ultimate objective to help Metro communicate its efforts in preparing for the impacts of climate change in the region. It offers the opportunity for other transit agencies in the region to share experiences and to work together to develop innovative initiatives to prepare for these impacts. Metro successfully hosted a roundtable in May for other transit agencies in the Los Angeles region to learn more about climate change in the region, as well as the strategies and available resources to prepare for change ahead.


North Hollywood
Union Station

How Did We Do?

Metro's environmental performance throughout 2012 is assessed by our performance in each indicator area. This analysis provides Metro data to track progress from year to year, as well as to set new targets, establish strategies, and recommend goals for future years. Each indicator section presents accomplishments achieved in 2012 followed by general indicator information. Annual performance data is also discussed and presented graphically. Finally, next steps are provided for future implementation.

INDICATOR AREA

Water Use

Accomplishments

- Received Platinum recognition from APTA for environmental stewardship and leadership in sustainability.
- Incorporated sustainability and environmental elements into Metro's Baseline Design Specifications.
- Included drought-resistant plants and landscaping at the Orange Line and Orange Line Extension.
- Installed water submeters at Division 10.

Data and Analysis

Water is an integral part of Metro's operations. In 2012, Metro operations expended over 360 million gallons of water. Daily water use includes bus and rail car washing, maintenance operations, daily water use by employees, and facility landscape irrigation. The majority of water (85%) is supplied by LADWP, with the remaining 15% supplied by California Water Services, Golden State Water Company and other municipal water providers (Figure 22).

It is worth noting that prior to 2012, only water data from LADWP was analyzed. Therefore, to capture water usage from the additional water providers, the following figures and analysis display 2012 water use in terms of LADWP-provided water (for comparison purposes) as well as 2012 water use in terms of all water providers (including LADWP). According to water usage provided by LADWP, a 15% increase in water consumption occurred from 2011 to 2012 with an additional 47 million gallons of water used (Figure 23).

Figure 22 - Metro Water Supply Source

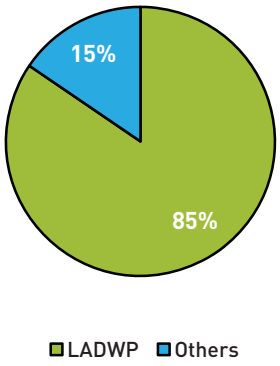
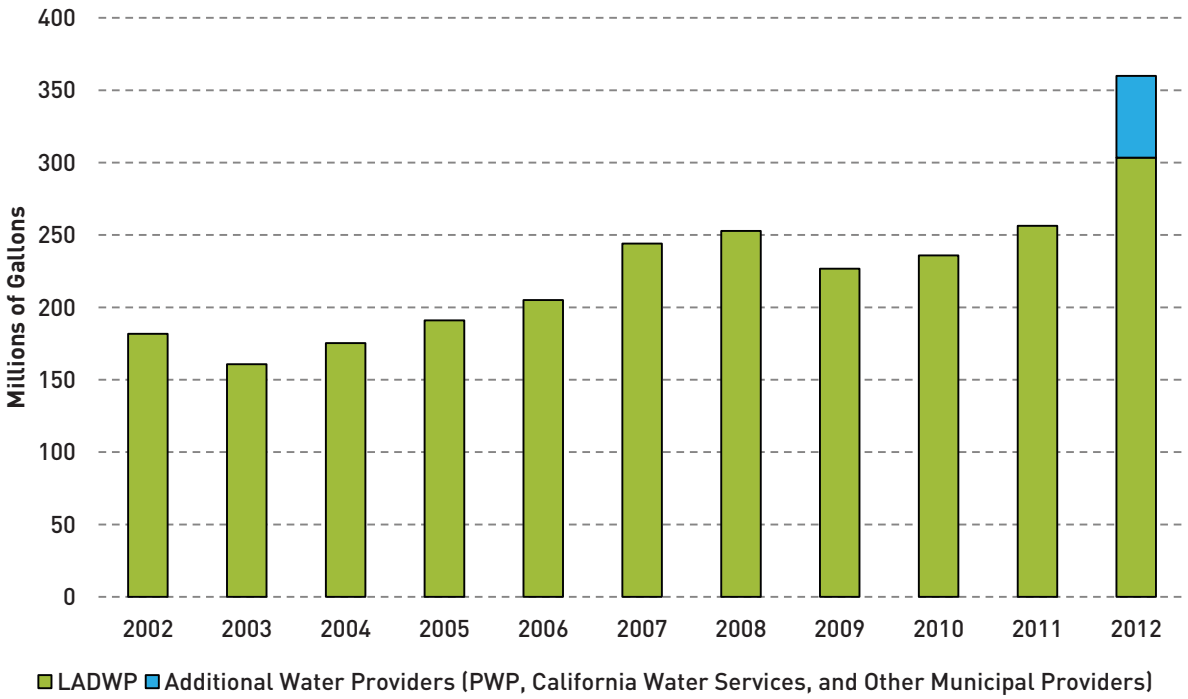


Figure 23 - Historic Total Water Consumption[1]



1 The second 2012 data column also includes additional water providers such as PWP, California Water Services, and other municipal providers.

Figure 24 - Historic Water Cost

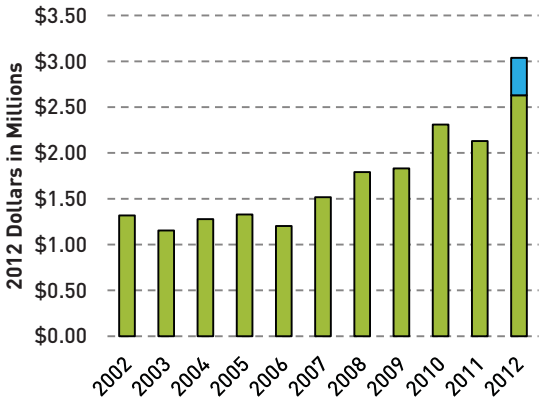


Figure 25 - Historic Average Water Cost[1]

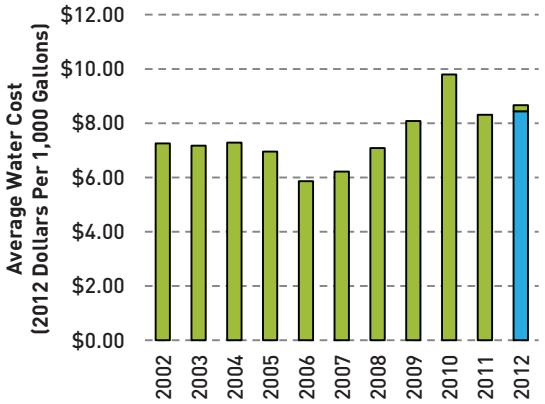
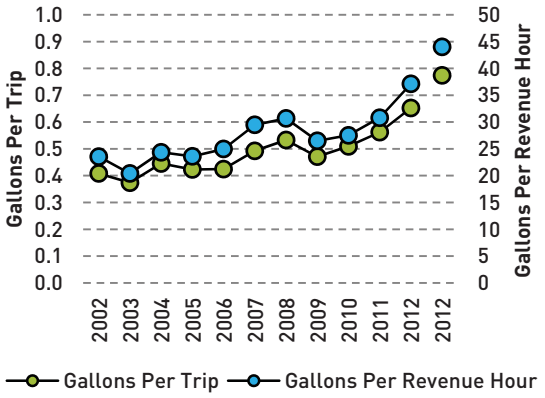


Figure 26 - Water Efficiency Trend[2]



Due to the increase in water use, the associated water costs increased by 20% from 2011 to 2012 for LADWP-provided water. By incorporating the additional expenditures from the other water providers, the total water cost in 2012 rose to over $3 million (Figure 24). In terms of average water unit cost, there was only a cost increase of $0.35 per 1,000 gallons for LADWP-provided water from 2011 to 2012. Non-LADWP water providers that serve Metro are mostly at lower service/usage charge rates; therefore, the overall average water cost in 2012 was similar to the 2011 average water cost, despite the fact that 2011 data only depicts LADWP-provided water (Figure 25).

Overall water consumption experienced an increase that outpaced transit service growth, which leads to a decrease in water efficiency. Water efficiency in 2012 was 44 gallons per revenue hour (LADWP-provided water efficiency was 37 gallons), compared to 32 gallons per revenue hour in 2011 (Figure 26).

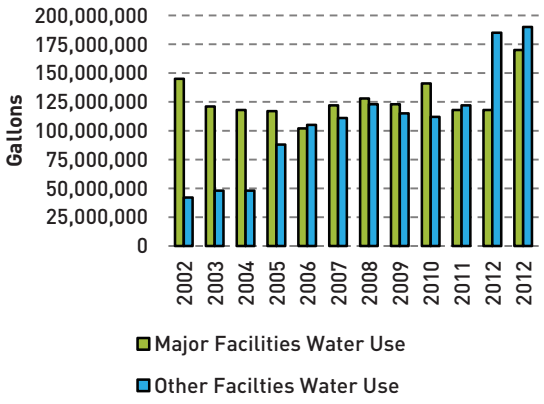
1 2012 dollars

2 The second 2012 data column also includes additional water providers such as PWP, California Water Services, and other municipal providers.

Major Facilities

Metro's major facilities, which include 16 bus/rail divisions, and five maintenance/administration facility locations, account for approximately 47% of Metro's overall water footprint in 2012. Annual water consumption for major facilities in 2012 was approximately 118 million gallons of water with the addition of approximately 53 million gallons of water use data available from the other water providers (Figure 27). Consumption of LADWP-provided water for 2012 is similar to water consumption in 2011.

Figure 27 - Major Facilities and Other Facility Water Use[1]



1 The second 2012 data column also includes additional water providers such as PWP, California Water Services, and other municipal providers.

Figure 28 - Major Facilities Water Use

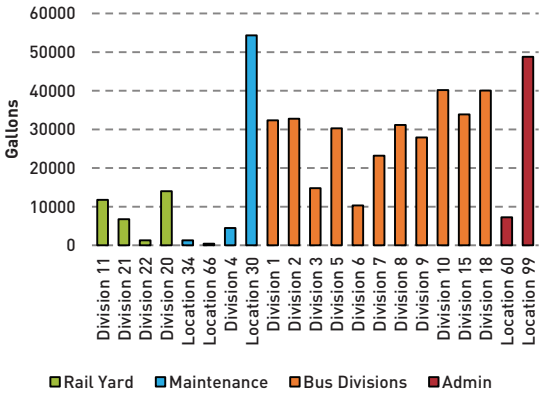


Figure 29 - Water Usage by Major Facility Type, 2012

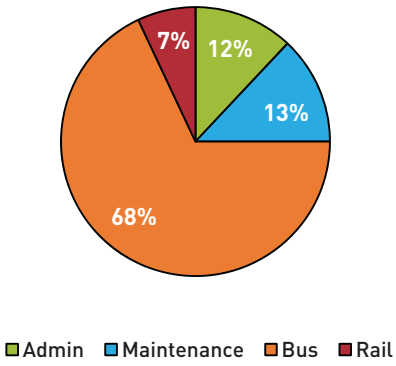
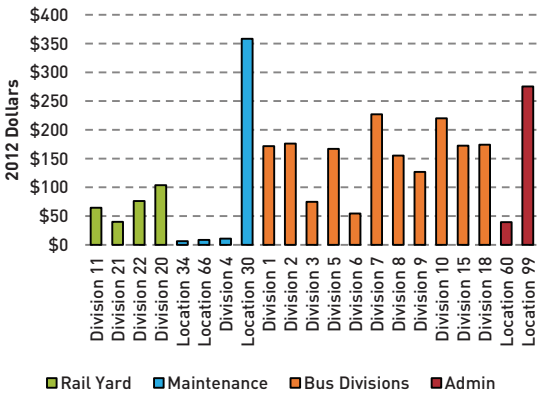


Figure 30 - Average Daily Water Expenditure by Major Facilities, 2012



In general, Metro has four types of major facilities in terms of functionality and operations: bus divisions, rail yards, other maintenance, and administrative buildings. The Central Maintenance Facility Building (Location 30) and Metro's Gateway Headquarters Building (Location 99) are the top two water users among all major facilities in 2012, similar to the previous year (Figure 28). On average, the bus division buildings are the largest consumers of water. Bus divisions generally consume more water than the rail yards due to the large water demand associated with the bus wash for Metro's bus fleet, considered one of the largest bus fleets in the nation. The water usage from the 11 bus divisions accounts for approximately 68% of the total major facilities' water consumption (Figure 29).

In terms of expenditures, most of the major facilities are served by LADWP-provided water and have the same service charge rates. Average daily water costs of those major facilities reflect their daily water usage (Figure 30).

Change Analysis

An operational change that contributed to a significant increase in Metro's overall water usage from 2011 is the opening of the Expo Line on April 28, 2012. This new 8.6-mile-long addition to the Metro system resulted in an additional 8.5 million gallons of water used in 2012.

Next Steps

- > Connect recycled water lines to the Division 3 Steam Bay and Undercarriage Wash.
- > Install recycled water capability along a portion of the Metro Orange Line.
- > Install water recycling systems at Divisions 9 and 18 Steam Racks.
- > Achieve LEED-Existing Buildings (EB) Certification at Division 10.
- > Install cistern for stormwater collection at Division 13.
- > Initiate LEED-EB Certification activities at Divisions 7, 20, and 30.

Case Study

Construction Stormwater Pollution Prevention Plan

Challenge

Metro has many projects in the works; rail and rapid transit expansion, high occupancy vehicle lanes, traffic reduction, public transportation, and active transportation projects all run simultaneously throughout Los Angeles County. Many of these projects require heavy or light construction, which means that Metro needs to take extra steps to minimize impacts from noise, emissions, and pollution.

Action

Stormwater runoff is a particularly high concern in Southern California. Infrequent rainfall means that pollutants accumulate on surfaces over a long period of time, leading to significant environmental impacts when it does rain. Therefore, Metro developed the Stormwater Pollution Prevention Plan (SWPPP), designed to protect our water resources.

Outcome

Required by the National Pollutant Discharge Elimination System, a SWPPP identifies best management practices that are put in place to minimize negative impacts from stormwater runoff to the environment. Metro's SWPPPs ensure that each Metro project in Los Angeles County is prepared for inclement weather and protects the region's sensitive resources like oceans from harmful pollutants.

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INDICATOR AREA

Criteria Air Pollutant Emissions

Accomplishments

- Incorporated sustainability and environmental elements into Metro's Baseline Design Specifications.
- Developed cleaner and newer technology for CNG engines.
- Developed Metro's Climate Change Adaptation Pilot.

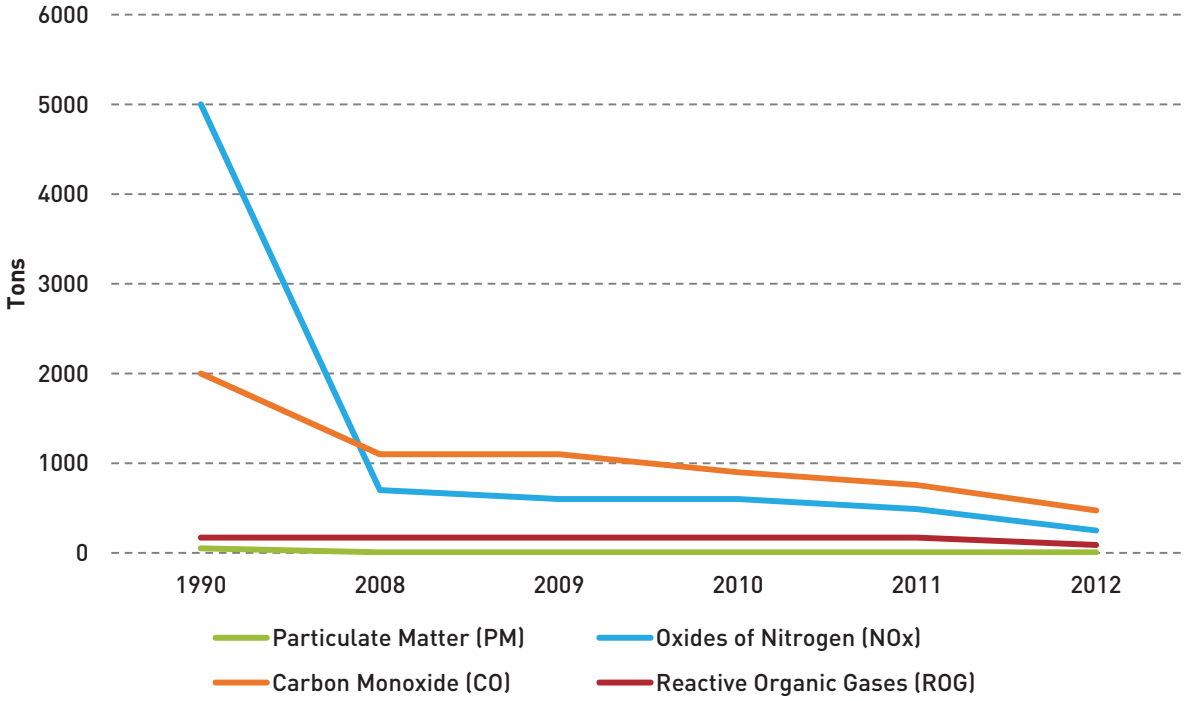
Overall Performance

Metro's transit bus and rail emissions continue to decline, with overall levels of criteria pollutants decreasing approximately 20.3% from 2010 to 2012. While transit bus VMT decreased approximately 8.7% between 2010 and 2012, rail demonstrated an increase in revenue hours of approximately 4.5% during this period. The most significant factor in the continued reduction of Metro's 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 repower their buses with the newest technology engines.

Data and Analysis

In comparing fleet emission levels from 2011 to 2012, Metro's overall fleet emission levels demonstrated significant reductions (Figure 31). The 2012 fleet emissions of ROG, CO, NOx, and PM were reduced by 47.9%, 37.5%, 48.6%, and 12.3% respectively. Overall, total criteria pollutant emissions dropped approximately 606.8 tons, or 42.4%, from 2011 to 2012.

Figure 31 - Historic Criteria Air Pollutant Emissions



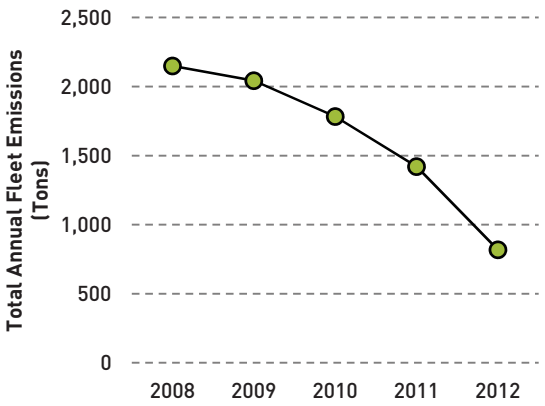
The substantial reduction in emissions is primarily attributable to the repowering of older, higher-emitting natural gas buses with new state-of-the-art CNG engines. In many cases, the new technology engines are 700% lower emitting for NOx compared to the replaced engines. Metro's transit bus fleet includes approximately 2,332 transit buses; approximately 991 of these buses (42%) have been re-powered with new-technology compressed CNG engines. Additional factors that contributed to the lower overall 2012 fleet emissions include the following:

> A reduction in transit BMT in 2012 as compared to 2011. Total transit BMT for all divisions in 2011 were recorded as 89,118,221 miles. The total BMT in 2012 was 86,505,433 miles, a reduction of 2,612,788 miles as compared to 2011. This equates to an approximate 2.9% reduction in BMT. Approximately 37,115,913 miles of total BMT in 2012 can be attributed to the re-powered transit buses (43% of BMT).

> Eliminating all diesel and gasoline-fueled BMT in 2012. Division 3 operated limited gasoline fleet vehicles in year 2011. Metro recorded no petroleum-based fuel usage in year 2012.

These reductions are slightly offset by increased electrical energy purchased to support Metro rail operations. From 2011 to 2012, the electrical energy purchased (kWh) increased by approximately 3.2%. It should be noted that electricity purchases in year 2011 were 3.3% lower as compared to 2010; thus, Metro 2012 electricity purchase level is similar to the 2010 purchase levels.

Figure 32 - Metro Fleet Emission Levels



In comparing 2012 fleet emission levels to those previously reported, Metro's overall fleet emission levels continue to decrease (Figure 32). Total fleet emissions in 2012 decreased 54.1% as compared to 2010, and decreased 61.9% as compared to 2008. The magnitude of emission reductions realized by Metro from 2008 to 2012 is significant. The reduction in NOx, an ozone precursor criteria pollutant, is approximately 67% from 2008 levels. The reduction in NOx emissions is a primary objective of the SCAQMD.

Even more significant are the reductions in diesel PM emissions from 2008 to 2012, which have decreased by 52.5%. This is important from an air quality perspective because diesel PM is classified as a toxic air contaminant by the California Air Resources Board and is a known carcinogen.

Change Analysis

The factors behind these significant reductions in criteria air pollutants include the following:

> Repowering a substantial number of older-technology buses with new, state-of-the-art natural gas engines. Metro has repowered buses equipped with DDC Series 50 engines with new engines, including the Cummins ISL G 8.9-liter CNG engine and Doosan GL11K 11.1-liter CNG engine.

> Reduction in transit bus VMT over the period from 2008 to 2012 by approximately 16%.

> Elimination of remaining diesel and gasoline transit bus engines from the revenue-generating fleet, which has significantly contributed to the reduction in criteria air pollutants. The reduction is greater than the percent reduction in VMT; thus, air pollutant emission reductions correlate directly to reductions in Metro fleet emissions. The significant reduction in NOx and PM emissions from 2008 to 2012, 67.4% and 53.3%, respectively, is directly related to eliminating older buses. Additional reductions in NOx emissions are anticipated as Metro continues to replace or repower existing older CNG buses with new engines.

Next Steps

> Explore the feasibility of bio-gas usage to determine the feasibility of using bio-gas in the bus fleet to reduce carbon emissions. This approach has the potential to reduce carbon emissions of Metro's bus fleet by up to 80%.

INDICATOR AREA

Greenhouse Gas Emissions

Accomplishments

- Received Platinum recognition from APTA for leadership in sustainability as a signatory of the APTA Sustainability Commitment.
- Achieved a LEED-NC Gold Certification Rating for the construction of the Bauchet Street Warehouse.
- Incorporated sustainability and environmental elements into Metro's Baseline Design Specifications.
- Developed Low Carbon Fuel Standard Reserves to participate in the LCFS market.
- Installed solar (PV) panels and LED lights at El Monte Transit Station.

While Metro's primary role is to provide safe and effective transportation options for the Los Angeles region, they also seek to do so in a cost-effective and environmentally sustainable manner. The greenhouse gas section of this report addresses the impact of Metro's services and climate change.

Figure 33 - Historic Greenhouse Gas Emissions

Data and Analysis

GHGs occur naturally in the atmosphere but are also emitted through activities such as burning fossil fuels. Increased levels of GHG emissions cause global climate change, which has and will continue to impact the Los Angeles region. In 2012, Metro emitted approximately 485,000 MT CO2e (Figure 33). GHG emissions in 2012 were approximately 6% higher than in 2011 and 1% higher than in 2007, the first year Metro's emissions were inventoried. GHG emissions are tightly linked to activity data and many of the trends from 2011 to 2012 have been described in other sections of this report, including facility electricity, rail propulsion, and revenue-generating fuel consumption. In addition, Metro's nonrevenue transportation fuel consumption increased in 2012 while facility natural gas consumption decreased. Approximately 82% of Metro's GHG emissions during 2012 were related to fuel associated with moving passengers (Figure 34).

Figure 34 - Greenhouse Gas Intensity by Service Mode

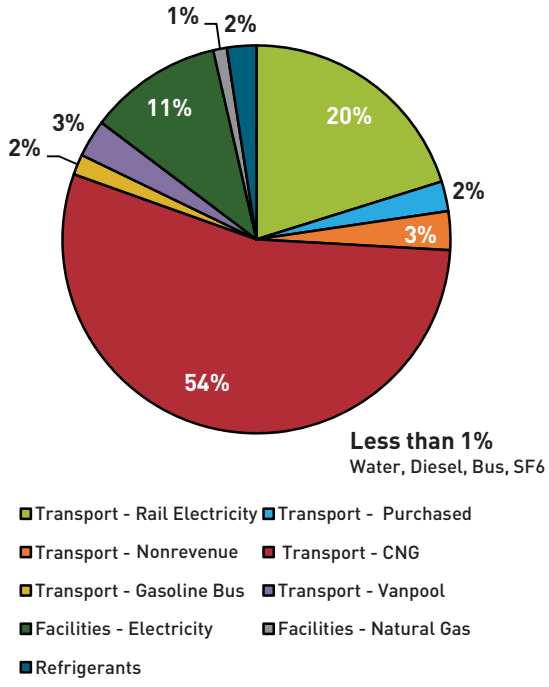
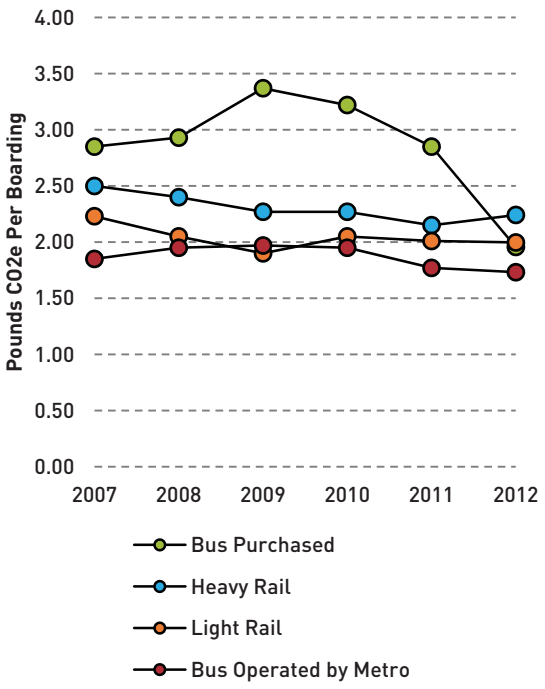


Figure 35 - Percentage of Total Greenhouse Gas Emissions by Source



In 2012, bus operations (both those operated directly by Metro and those purchased by Metro) continued to become more efficient on a per-boarding basis and light rail remained steady, while heavy rail operations were less efficient than in 2011 (Figure 35). As the carbon-intensity of Metro's operations decrease, emissions decrease. Metro's directly-operated buses are 100% CNG while the others are being converted to CNG, including those not directly operated by Metro, lowering the carbon-intensity of bus emissions compared to diesel emissions. Metro's emissions are also linked to the efficiency of its services: as ridership increases, the emissions-per-passenger tend to decrease. Currently, Metro's buses are the most efficient transit mode in terms of GHG emissions per boarding, emitting 1.73 lbs CO2e per passenger boarding.

Table 3 - Greenhouse Gas Intensity by Service Mode

Mode	Lbs CO2e/Veh Mile	Lbs CO2e/Rev Hour	Lbs CO2e/ Pas Mile
Heavy Rail	17.38	398.04	0.46
Light Rail	9.64	207.03	0.29
Bus Not Operated by Metro	4.74	58.44	0.55
Bus Operated by Metro	8.48	94.50	0.41
Vanpool	1.26	57.01	0.22
Total Lbs CO2e/Metric (Total)	**7.06**	**103.71**	**0.37**

While buses are the most efficient in terms of per-boarding, bus passengers tend to travel fewer miles than rail passengers. GHG emissions per mile traveled is another method of assessing Metro's efficiency. When calculated by passenger mile, light rail and vanpools are the most carbon-efficient mode of Metro's operations (Table 3). Metro's efficiency per passenger mile is more efficient at 0.37lbs/CO2e/Metric for all travel modes than a typical passenger vehicle, which emits approximately 1 lb of carbon per mile.[1]

Next Steps

- Achieve LEED-EB Certification at Division 10.
- Initiate LEED-EB Certification activities at Divisions 7, 20, and 30.
- Participate in APTA working groups to develop sustainability indicators.
- Develop Energy, Water, and Recycling Conservation Training and conduct training at Metro locations.
- Install Electric Vehicle (EV) Charging Stations at Union Station, Sierra Madre Villa Station, Willow Station, Universal City Station, and El Segundo Station.

1 EPA Office of Transportation and Air Quality, Greenhouse Gas Emissions from a Typical Passenger Vehicle, December 2011. (www.epa.gov/oms/climate/documents/420f11041.pdf)

INDICATOR AREA

Greenhouse Gas Displacement

Metro is continuing to implement strategies that will reduce GHG emissions, such as retrofitting facilities to be more energy-efficient and converting buses from diesel to CNG. However, it is important to understand Metro's larger role in sustainability and reducing GHG emissions in the region. By providing transit options, Metro is reducing GHG emissions that would otherwise have occurred from passenger vehicles, increased congestion, and potentially more sprawl. These avoided or displaced emissions are not as directly quantifiable as Metro's operational emissions, but APTA has provided guidance for estimating three forms of displaced emissions.

> **Mode Shift** refers to the GHG emissions displaced by shifting from a passenger vehicle to transit. This is calculated on a per-passenger-mile basis and APTA has estimated that 0.47 vehicle miles are avoided for every passenger mile of transit for a region the size of Los Angeles.

> **Congestion Relief** refers to the GHG emissions displaced by improving roadway conditions for those who continue to drive passenger vehicles. Fewer cars on the road lead to increased road speeds, less traffic, and less idling, which increases the efficiency of the remaining on-road vehicles.

> **Land Use** refers to emissions displaced when transit enables denser land-use patterns, which encourage shorter trips and increased walking and cycling instead of vehicle use.

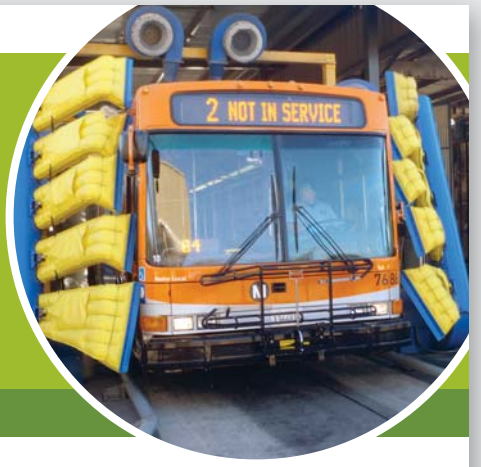
In 2012, Metro's 2.27 trillion passenger miles resulted in over 491,000 MT CO2e avoided through Mode Shift (Table 4). This alone results in more emissions displaced by people not driving than by all of Metro's operational emissions. Congestion relief and land use GHG displacement estimates have not yet been applied as they require more detailed modeling but would demonstrate even greater emissions avoidance and Metro's central role in creating a more sustainable region.

Table 4 - Net Greenhouse Gas Emissions

Source	Quantity of Emissions Displaced (MT CO2e)
Total Emissions Displaced from Mode Shift	(491,118)
Emissions from Metro Operations	484,983
Net Emissions from Metro Operations	(6,135)

Case Study

Division 10 Bus Air Dryer



Challenge

Everyday bus maintenance such as bus washing can consume a great deal of energy. Bus washing systems operating many hours per day were identified as a resource-savings opportunity. In order to realize these savings, Metro embarked on a path to identify and implement innovative technology for its bus dryer systems.

Action

In 2012, we purchased two new air-drying systems for the bus-washers at Division 10. This system uses inflatable arms that dry buses quicker and more efficiently than conventional systems. Cleaner busses in less time results in decreased maintenance costs, making for a better rider experience.

Outcome

Metro has conserved energy by utilizing these dryers. The older system uses sixteen 10horsepower (HP) blowers, whereas the new system only uses four 10HP blowers and four 7.5HP blowers with inflatable arms. This translates to estimated energy savings of 230,000 kWh per year; reducing energy costs by over $25,000 annually, and reducing GHG emissions by 128 metric tons CO_2e/year in LADWP's service area.

INDICATOR AREA

Energy Use

Fuel Use

Accomplishments

- Overall fuel use by Metro is at an 8-year low.
- CNG now accounts for 93.7% of total fuel use by Metro.
- Metro's fuel use expenditure continues to decrease and at a 9-year low.

Data and Analysis

In 2012, Metro's fleet used over 43.3 million GGEs fuel, approximately 1.2 million GGEs less than 2011 (Figure 36). Service cuts in 2009 caused fuel usage to decrease and additional planned service cuts in 2011 resulted in a further decline of fuel usage.[1] Vanpool fuel use accounts for 4% of total fuel usage in 2012.

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

Figure 36 - Historic Total Fuel Consumption

Figure 37 - Percentage of Fuel Used by Fuel Type

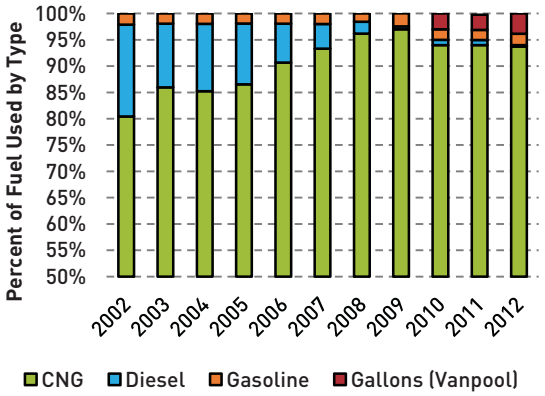


Figure 38 - Historic Fuel Expenditures, 2012 Dollars

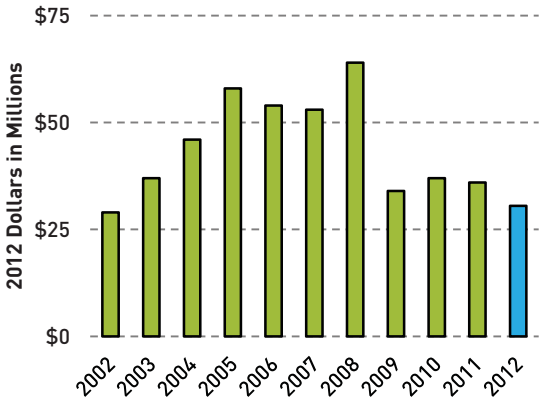
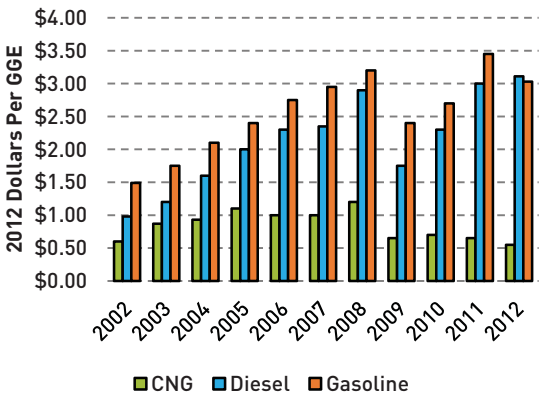


Figure 39 - Average Cost per Gallons of Gasoline Equivalent, 2012 Dollars



Metro's fleet used 7.9 million more GGEs of CNG in 2012 than in 2002 (Figure 37). CNG now accounts for 93.7% of total fuel used by Metro. Gasoline accounts for 6% and Diesel accounts for 0.3%. CNG continues to be Metro's preferred and most used fuel type.

In 2012, Metro spent $30.5 million on fuel, including vanpool fuel, which is nearly half of the amount spent on fuel in 2008 and $5.4 million less than 2011 (Figure 38). This is a sharp reversal of the trend from 2002–2008, when fuel expenditures rose by 121% (after adjusting for inflation). This decrease is due to Metro's transition to a 100% CNG-powered bus fleet, which offers a 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, and $5 million, or 17% in 2012, on unleaded gasoline for this particular service.

Fuel expenditures on diesel in 2012 decreased by 38% compared to 2011 due to Metro ending dependence on diesel fuels. Decreases in GGEs of CNG also contribute to the overall slight dip in fuel expenditures. Prices of all three fuels fell dramatically from 2008 to 2009, an average of 45%, and increased varyingly in 2010 and 2011 (Figure 39). Prices of diesel and gasoline then increased sharply from 2010 to 2011 by 33% and 25%, respectively, while the price of natural gas decreased by 2%.

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 partially due to the decline in ridership and service cuts from 2008 to 2011. In 2012, GGEs per Metro-operated bus boarding stayed at 0.09 GGE per boarding (Figure 40). Total GGEs per revenue hour also stayed the same at 5.00 in 2012 (Figure 41). No change is due to only a slight increase in boarding and slight decrease in revenue hour.

Next Steps

> Continue replacing bus fleet batteries with absorbed glass mat (AGM) batteries to further reduce fuel use during bus idling.

Figure 40 - Total Gallons of Gasoline Equivalent per Boarding

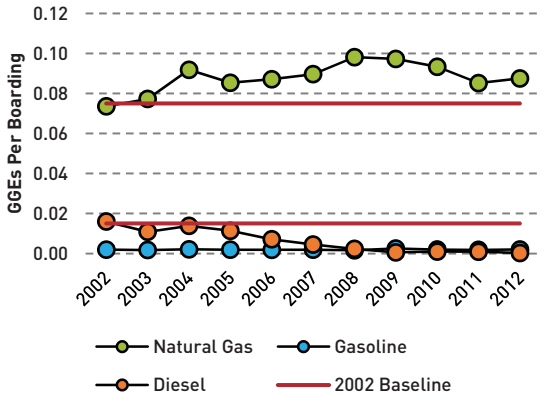
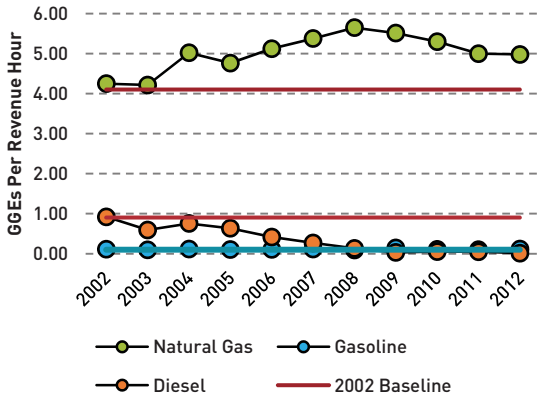


Figure 41 - Total Gallons of Gasoline Equivalent per Revenue Hour



Rail Propulsion Power

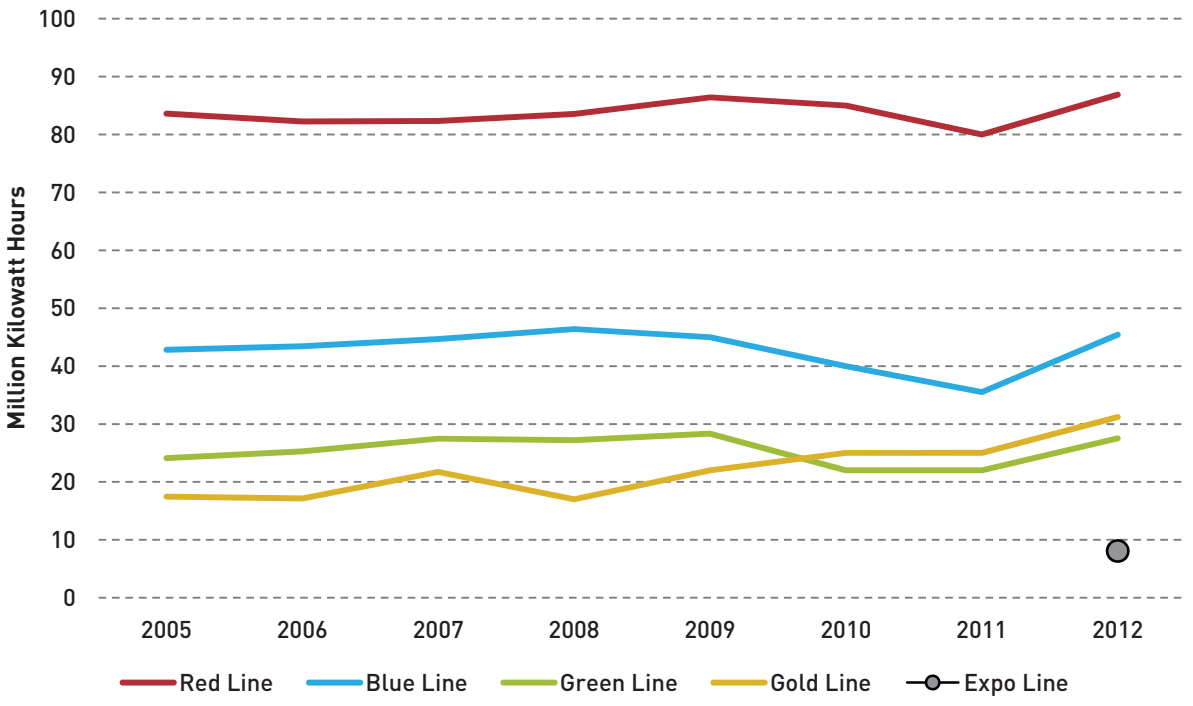
Accomplishments

> Metro is in the process of replacing 20 aging traction power substations with help from two ARRA grants totaling over $71,000,000. The new substations utilize energy efficient components and designs including the elimination of interface transformers which reduces overall energy use, wasted energy from heat generation, and demand reduction throughout the system. Metro has completed sixteen of the twenty substations and anticipates full project completion by September of 2013.

Overall Performance

Overall, rail propulsion power use has increased from the previous year, with the Red Line continuing to consume more power than any other Metro rail line. Metro's rail lines consumed approximately 199 million kWh of electricity in 2012, which represents a 21% increase from 2011 (Figure 42). The majority of the increase in electricity consumption is due to an increase in ridership, revenue hours, and extended operational hours in 2012. Total revenue hours increased by 10% from 716,326 in 2011 to 787,547 in 2012. This increase in electrical consumption is also partially due to the introduction of the Expo Line in 2012, with the Expo Line's rail propulsion power comprising 4% of the total power used.

Figure 42 - Rail Propulsion Power Use by Rail Line, 2012 Dollars



Historically, LADWP has provided more than 58% of Metro's rail propulsion power (Figure 43). In 2012, rail propulsion power was provided by three utility providers: LADWP, SCE, and PWP. Approximately 130 million kWh (66%) of the rail propulsion power was provided by LADWP, 58 million kWh (29%) by SCE, and 9 million kWh (5%) by PWP. Rail propulsion power consumed by LADWP and SCE both experienced an increase, with the most significant increase in supplied rail propulsion power coming from LADWP with approximately 35 million kWh (38%) difference compared to 2011. This increase is partially due to the introduction of the Expo Line and the increase in passenger miles from all other rail lines.

In terms of expenditures, rail propulsion increased approximately 19%, from $21 million in 2011 to $25 million in 2012 (Figure 44). In 2012, the Red, Blue, Green and Gold Lines all experienced an increase in propulsion power consumed and an increase in the amount of Metro dollars spent. This increase can also be attributed to the introduction of the Expo Line and an increase in passenger miles in 2012.

Figure 43 - Historic Rail Propulsion Power Use by Provider, 2012 Dollars

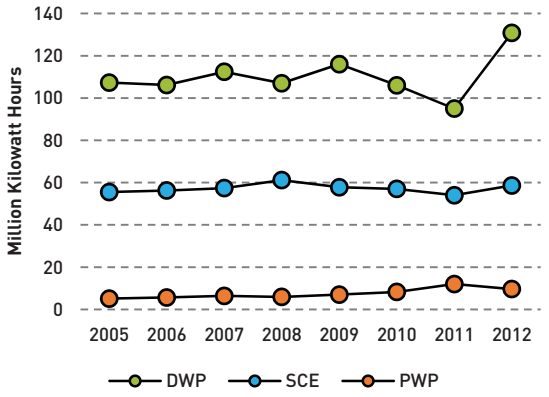


Figure 44 - Changes in Rail Propulsion Power and Expenditures

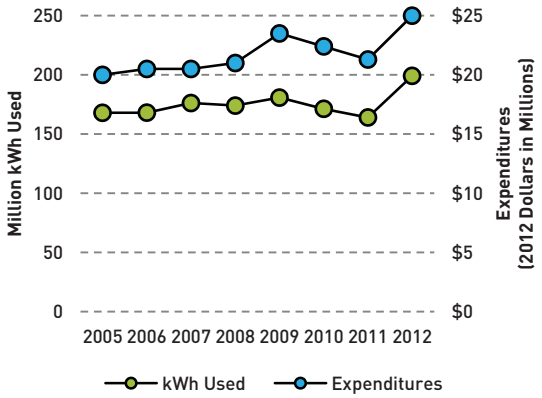
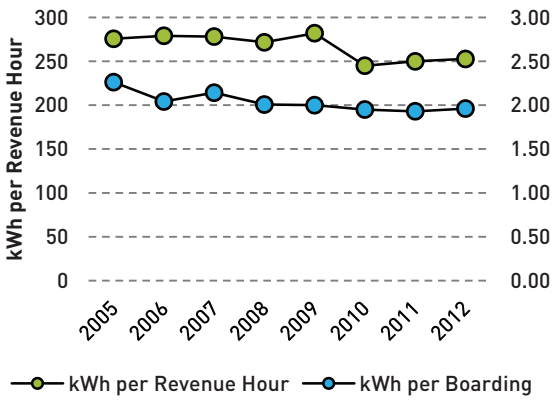


Figure 45 - Rail Propulsion Power Efficiency



In 2012, Metro used 1.96 kWh of electricity per rail boarding compared to 2.26 kWh per boarding in 2005, which represents a 13% increase in efficiency and a 2% decrease from 2011 (Figure 45). Since 2005, the efficiency of rail car operations has fluctuated between 243 and 281 kWh per VRH, a difference of 14%. In 2012, Metro consumed 253 kWh per revenue hour compared to 250 kWh per revenue hour in 2011.

Case Study

MBL TPSS Replacement Project

Challenge

To replace aging traction power substations along the Metro Blue Line. Traction power substations convert electric power provided by the utility to the appropriate voltage, current type, and frequency required for Metro's railways.

Action

Metro is in the process of replacing 20 aging traction power substations with help from two ARRA grants totaling over $71,000,000. Engineering and project management was done in-house by Wayside Traction Power Engineering and Wayside Systems Maintenance. The new substations utilize energy efficient components and designs including the elimination of interface transformers which reduces overall energy use, wasted energy from heat generation, and demand reduction throughout the system. Metro has completed sixteen of the twenty substations and anticipates full project completion by September of 2013.

Result

In appreciation of Metro's effort to improve energy usage and reduce energy demand, Southern California Edison (SCE) has awarded the Demand Response MVP Award to Metro. The elimination of the interface transformers saves about 17,155 kWh per month, which translates to an estimated savings on energy bills from about $2500 to $3400 per month. The savings on wasted heat energy reduction translate to an additional $500 to $800 per month. New substations will improve reliability of Metro Blue Line Operation and reduce long-term maintenance costs as well.

Facility Electricity Use

Accomplishments

- Completed lighting upgrades at the Division 20 Vehicle Shop and Division 10 Tire Shop.
- Installed new air drying systems at the Division 10 Bus Washers.
- Installed solar (PV) panels and LED lights at El Monte Transit Station.
- Developed Submetering Plan for Division 20.
- Expanded the number of submeters installed in Metro's Gateway Headquarters Building.
- Installed electric submeters at Divisions 7, 10, and 30.
- Renewable Energy Inventory: Metro is developing an inventory of its facilities and properties that identifies their renewable energy potential (solar, wind, geothermal, etc.). Properties include bus and rail maintenance facilities, park and ride sites, and other locations, for a total 100 to 200 assessed properties. This inventory will assist Metro in selecting forthcoming renewable projects.
- Enrolled the Expo Line Rail Yard into the utility provider's Savings By Design Program, which incorporates energy efficiency features into building design that are approximately 37% more efficient than state code requirements. This produces a saving of 177,000 kWh annually, reduces electricity demand by 66 kW, and avoids 4,000 Therms. Based on these numbers, over $76,000 in incentives will be awarded to the Expo Line Rail Yard project.

Overall Performance

The use of electricity plays a large role in Metro's everyday operations. In 2012, Metro used 296 million kWh of electricity,[1] of which 35% was used for facilities and 65% was used for rail propulsion (Figure 46). In 2011, 37% of electricity was used for facilities and 63% was used for rail propulsion (Figure 47). Compared to 2011, overall electricity use increased by 14% (Figure 48).

Data and Analysis

Electricity use by facilities increased 12% from 97 million kWh in 2011 to 108 million kWh in 2012. Electricity consumption increased between 2006 and 2008, dropped in 2009, and had an artificial rise in 2010 due to changes in how facility versus rail propulsion electricity was calculated. In 2011, Metro experienced a rise in electricity consumption due to the switch from diesel-powered compressors to electricity-driven CNG compressors at bus facilities. Electricity for facilities is provided by three main providers: LADWP, SCE, and other local electricity providers. Approximately 83.5 million kWh of the electricity consumed (77%) was provided by LADWP, 24.3 million kWh (23%) was provided by SCE, and 333,434 kWh (0.3%) was provided by other local electricity providers (Figure 48). LADWP continues to be the largest electricity provider for Metro's facilities.

1 Metro's use of 296 million kWh of electricity accounts for the overlap of electricity used by facilities and rail propulsion. Some of the electricity consumption may be double counted as Metro currently does not separate how much electricity is used for traction power and how much is used for facilities operations.

Figure 46 - Facility Electricity Use by Major Facilities in 2012

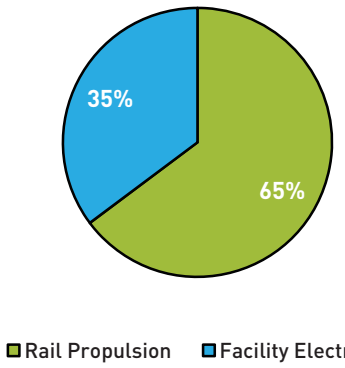


Figure 47 - Facility Electricity Use by Major Facilities in 2011

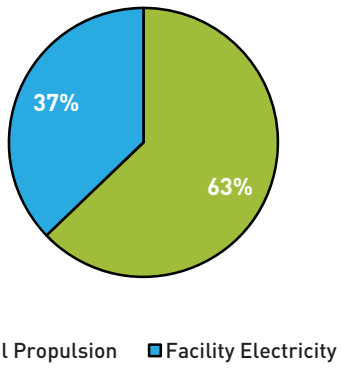


Figure 48 - Facility Electricity Use in Kilowatt Hours

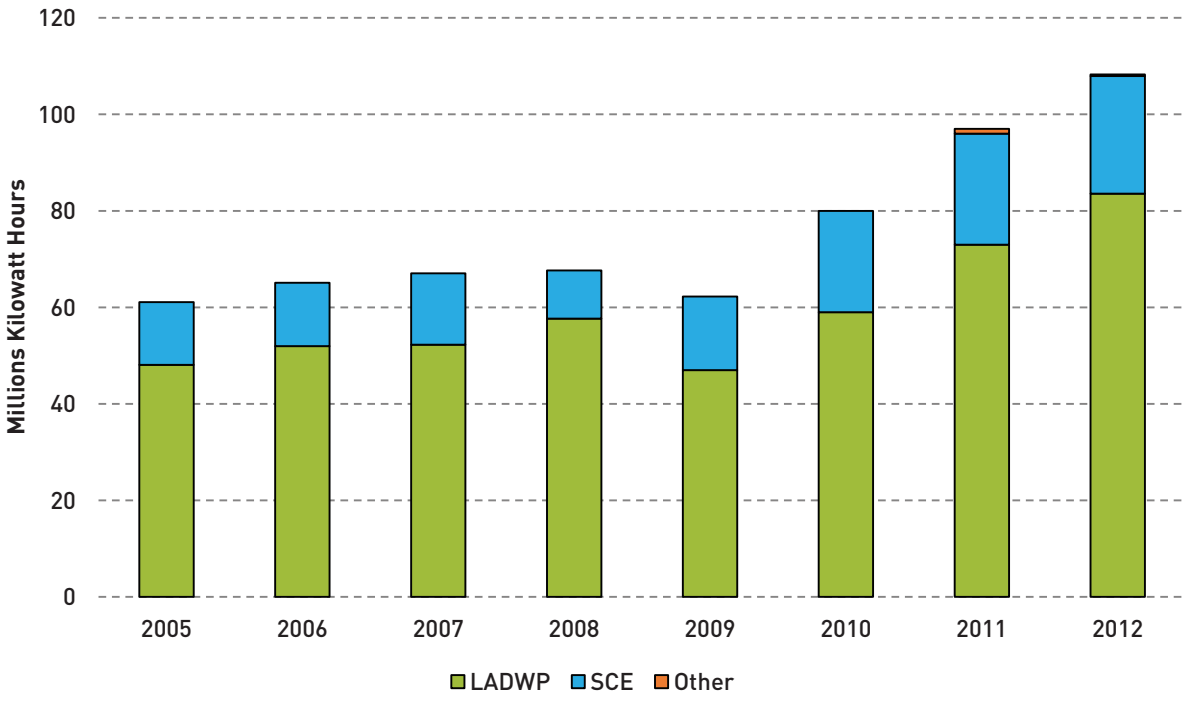


Figure 49 - Facility Electricity Use and Expenditures

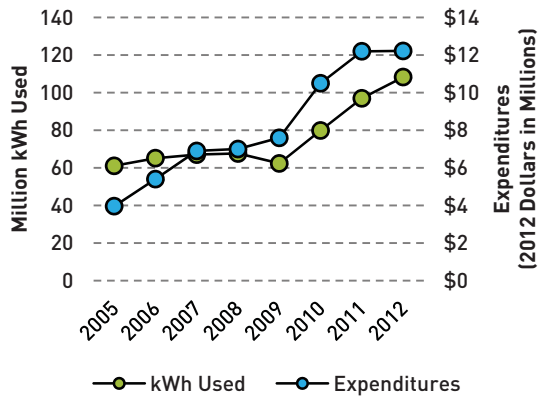


Figure 50 - Facility Electricity Use in Efficiency

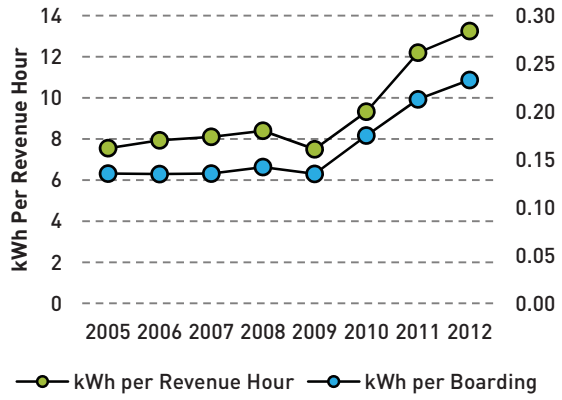
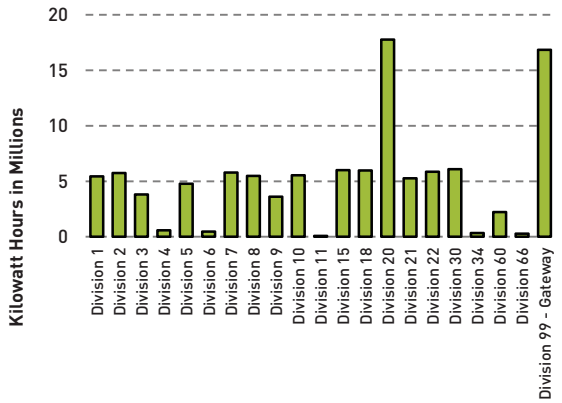


Figure 51 - Facility Electricity Use by Major Facilities in 2012



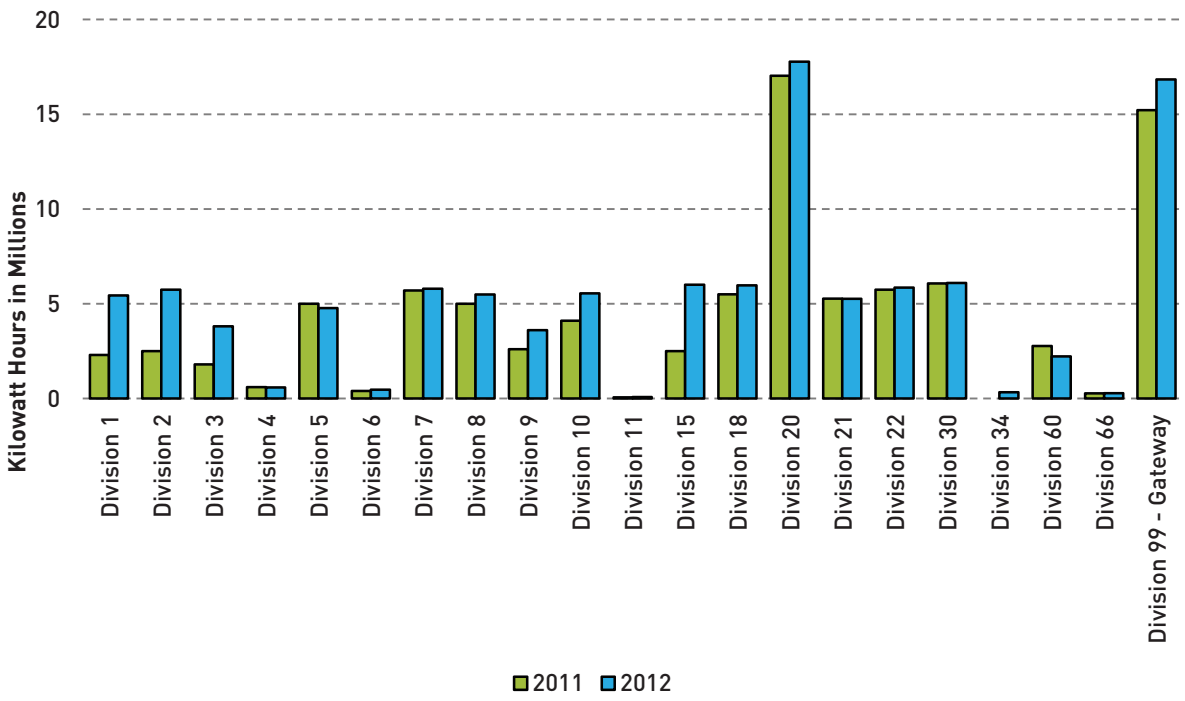
In 2012, Metro spent $12.2 million on electricity for facilities, 0.2% more than in 2011 (Figure 49). Compared to 2011, electricity expenditures for facilities remained steady while electricity use increased by 12%.

In 2012, Metro experienced a 147,000 decrease in revenue hours and an 8.8 million increase in unlinked passenger trips, which led to an increase in kWh per revenue hour from 12 to 13 kWh per revenue hours and 0.02 increase in kWh per boarding from 0.21 to 0.23 in 2012, as compared to 2011 (Figure 50).

In 2012, the highest consumers of electricity were the Metro Gateway Headquarters (16 million kWh), and Division 20 (6 million kWh) (Figure 51). The combined electricity consumption at these two facilities accounted for 32% of Metro's total facility electricity use in 2012.

Metro experienced an increase in electricity consumption at a majority of the major facilities compared to 2011. Divisions 4, 6, 11, 21, 30, and 66 had little or no change in electricity consumption compared to 2011 (Figure 52).

Figure 52 - Facility Electricity Use by Major Facilities, 2011 vs. 2012



Next Steps

- Install submeters at Division 20.
- Design and install submeters at Divisions 3, 6, 8, 15, and 21.
- Install Electric Vehicle (EV) Charging Stations at Union Station, Sierra Madre Villa Station, Willow Station, Universal City Station, and El Segundo Station.
- Install energy efficient lighting project – Gateway.
- Procure and install energy-efficient lights at Division 7 Maintenance Bay.
- Procure and install new air drying systems at Divisions 8, 9, 11, 15, and 18.
- Procure and install energy-efficient lighting at Divisions 7, 9, 11, 15, 18, and 22.
- Renewable Energy Inventory: Metro is developing an inventory of its facilities and properties that identifies their renewable energy potential (solar, wind, geothermal, etc.). Properties include bus and rail maintenance facilities, park and ride sites, and other locations, for a total 100 to 200 assessed properties. This inventory will assist Metro in selecting forthcoming renewable projects.

Case Study

Division 10 Tire Shop LED Retrofits

Challenge

Reduce energy consumption at Metro's maintenance facilities. A large portion of Metro's energy consumption comes from older lighting fixtures. Replacing these fixtures with new, more energy efficient technologies can result in significant energy and cost-savings.

Action

Metro identified inefficient high bay lighting fixtures used at a tire repair shop located at Division 10. Sixty-one 400 watt metal halide fixtures were replaced with 180 watt LED high bay fixtures as part of a pilot installation program at a cost of over $60,000.

Outcome

Staff estimates an annual savings in energy consumption of about 15 MWh and $20,000 in utility costs. The LEDs also provide better light and will last longer, reducing maintenance and replacement costs by $270 per year.

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INDICATOR AREA

Waste and Recycling

Solid Waste and Recycling

Accomplishments

> Increased desk-side recycling at the Metro Gateway Headquarters Building, as well as other major facilities.

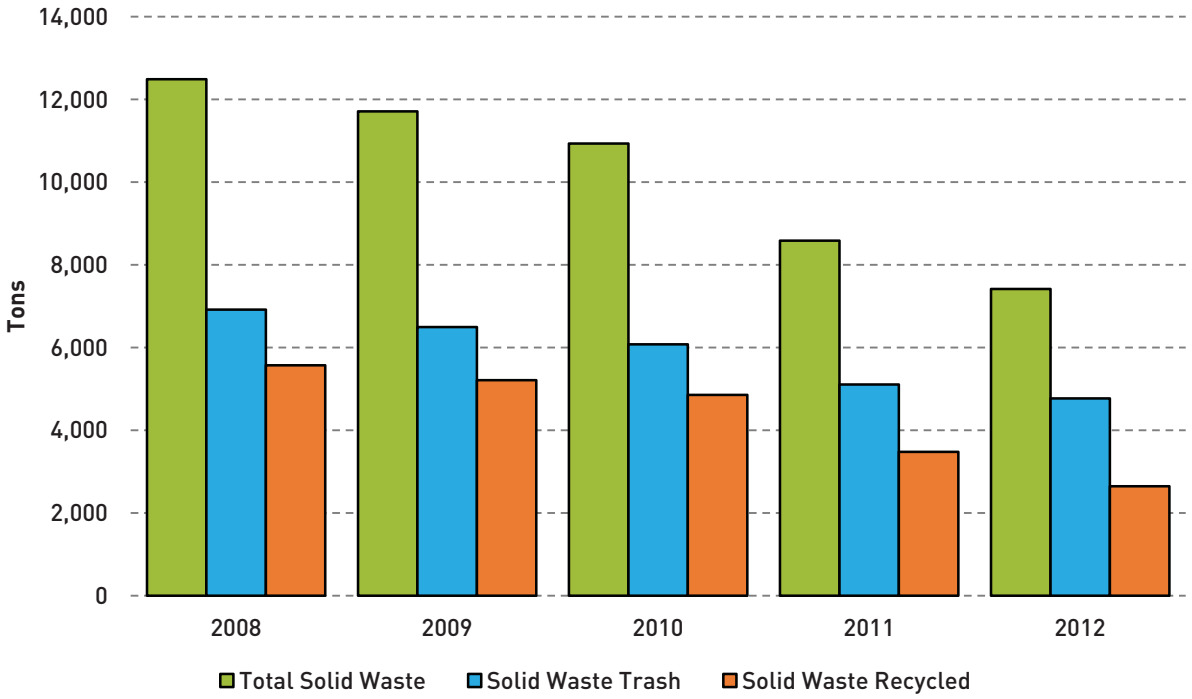
Data and Analysis

Metro continues to actively work on reducing waste and expanding recycling efforts. Overall, solid waste output has decreased every year since 2008,[1] from approximately 12,500 tons in 2008 to 7,400 tons in 2012 (Figure 53). Improvements to existing recycling programs and implementation of waste reduction targets will continue to reduce overall waste production and increase diversion rates.

Metro uses a contractor to separate landfill waste from recyclable waste (paper, cardboard, cans, and plastic bottles). Although solid waste output has decreased since 2008, recycling rates dropped from 45% of solid waste being recycled in 2008 to 36% in 2012. Metro has implemented several internal programs to divert waste from landfills. These recycling programs focus on products such as bus batteries, printer cartridges, scrap metal, e-waste, and other office products.

1 Due to changes in data collection techniques, recycling data is only available as recent as 2008.

Figure 53 - Historic Waste Production



Solid waste efficiency has increased every year since 2008, with the decrease in the number of pounds of solid waste produced per revenue hour (Figure 54) and boarding (Figure 55). Solid waste production per revenue hour decreased from 2.93 pounds of waste in 2008 to 1.82 pounds of waste in 2012. Solid waste production per boarding decreased from 0.052 pounds of waste in 2008 to 0.032 pounds of waste in 2012.

However, recycling efficiency has decreased every year since 2008, with 1.31 pounds of waste recycled per revenue hour in 2008 to 0.65 pounds of waste recycled per revenue hour in 2012 (Figure 54). Recycled waste efficiency per boarding decreased from 0.023 pounds of waste recycled per boarding in 2008 to 0.011 pounds of waste recycled per boarding in 2012 (Figure 55).

Next Steps

- Implement EMS at Divisions 9, 10,11, and 21 and receive ISO 14001 certification for these divisions.
- Increase solid waste recycling and accounting with new waste hauling contractor. The contractor should perform waste and recycling audits at each division to improve recycling and waste reduction at all Metro facilities.
- Develop Recycling Conservation Training (in tandem with Energy and Water Training) and conduct training at Metro facilities.
- Continue to roll out desk-side recycling efforts at all applicable Metro facilities.
- Use recyclable materials, when feasible.

Figure 54 - Solid Waste and Recycling Production Efficiency per Revenue Hour

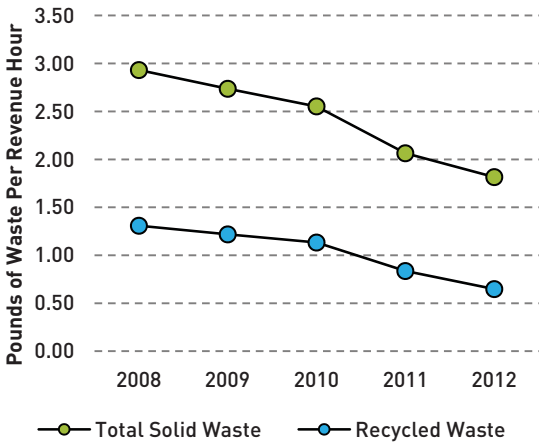
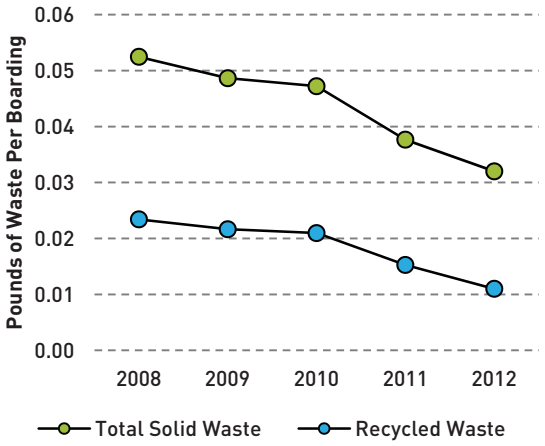


Figure 55 - Solid Waste and Recycling Production Efficiency per Boarding



Used Oil Waste

Accomplishments

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

Data and Analysis

During 2012, Metro produced approximately 142,000 gallons of used oil, which represents a decrease of 2.8% from 2011 and a decrease of 26.9% from 2002 (Figure 56). This significant decrease can generally be attributed to the increased use of synthetic oil.

Similar to 2011, the bus divisions (Divisions 1, 2, 3, 5, 6, 7, 8, 9, 10, 15, and 18) are the main producers of used oil waste at approximately 90% of the total (Figure 57). Division 18 remains the top producer of used oil waste at 17,100 gallons in 2012, mainly due to having the largest bus fleet. The range in used oil produced across the other bus divisions is attributed to varying fleet sizes.

Figure 56 - Historic Used Oil Waste

In terms of incurred costs for waste disposal, a no-fee service contract initiated in 2006 eliminated the cost of used oil waste disposal (Figure 58). Additionally, effective September 2011, used oil disposal became a revenue-generating service with Metro receiving 10 cents for each gallon of used oil it recycles.

Used oil waste efficiency has increased slightly since 2011, with the decrease in the amount of used oil produced per revenue hour and boarding (Figure 59). In 2012, 0.139 pints of used oil were produced per revenue hour, which is only a slight decrease from the 0.140 pints produced in 2011 but represents a significant decrease from 2002 with 0.201 pints of used oil produced per revenue hour. Used oil waste production per boarding decreased from 0.056 ounces of used oil waste in 2002 to 0.039 ounces of used oil waste in 2012.

Next Steps

> Continue the use of synthetic oils and other alternative oil products.

> Reduce oil use through improved technology and operational procedures.

Figure 57 - Used Oil Waste Generated by Division

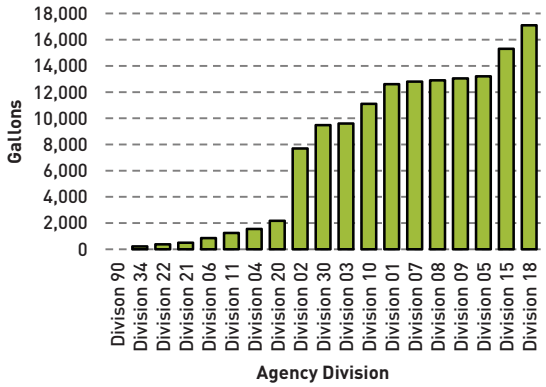


Figure 58 - Used Oil Waste Disposal Cost

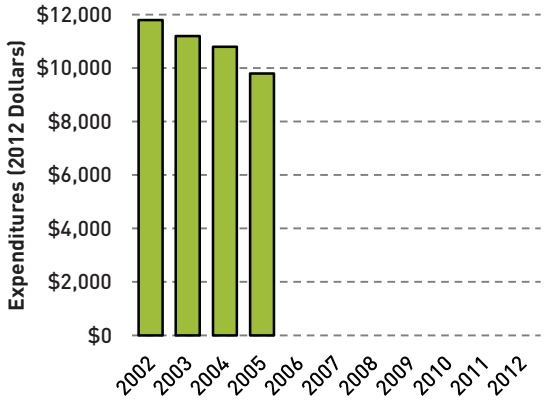
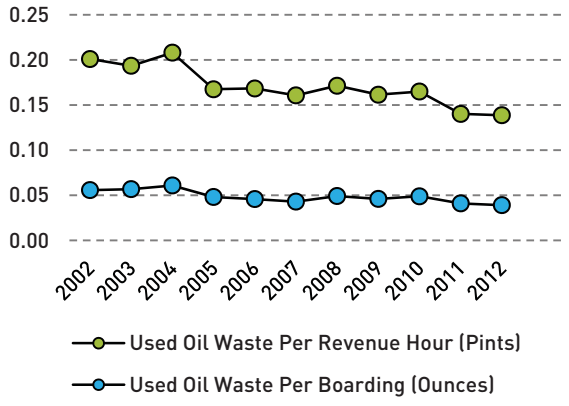


Figure 59 - Used Oil Waste Efficiency



Hazardous Liquid Waste

Accomplishments

- Managed Metro's on-call emergency response to hazardous soil/waste/liquid spills.
- Continued implementation of the Chemical Standard Committee goals to reduce hazardous waste. This committee's primary function is to review and approve products based on effectiveness and cost.

Data and Analysis

Metro produced approximately 668,000 gallons of hazardous liquid waste in 2012, which represents a 1.9% decrease from 2011 and 5.9% decrease from 2003 (Figure 60). The largest decrease to date occurred from 2002 to 2003 (40%), which can be attributed to changes in equipment maintenance techniques.

Waste disposal costs for hazardous liquids have remained steady over the last few years. In 2012, Metro paid approximately $517,000 in hazardous liquid waste disposal fees, which is a decrease (3%) from 2011 (Figure 61).

Figure 60 - Historic Hazardous Liquid Waste

In 2012, hazardous liquid waste produced by the divisions ranged from a low of 280 gallons at Division 21 to a high of approximately 91,500 gallons at Division 30 (Figure 62). Similar to previous years, Divisions 18 (bus maintenance facility) and 30 (central maintenance facility) are the highest producers of hazardous liquid waste.

Hazardous liquid waste efficiency has remained steady since 2008, with a slight decrease in the amount of hazardous liquid waste produced per revenue hour and boarding (Figure 63). In 2012, 0.184 pints of hazardous liquid waste were produced per boarding, which is only a slight decrease from the 0.191 pints produced in 2011. Hazardous liquid waste production per revenue hour remained steady for 2011 and 2012 at 0.654 ounces of hazardous liquid waste per boarding.

Next Steps

> Manage and support hazardous liquid waste remediation and disposal activities.

> Reduce hazardous chemical use, whenever feasible.

Figure 61 - Hazardous Liquid Waste Costs

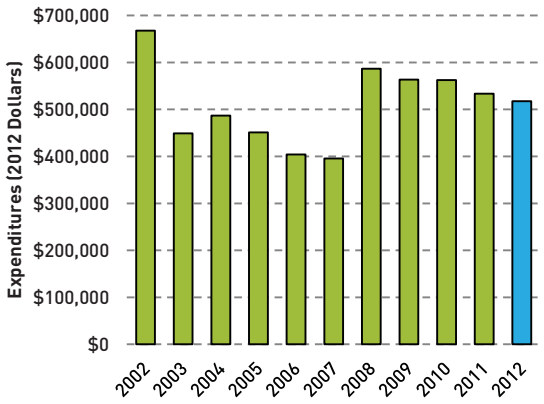


Figure 62 - Hazardous Liquid Waste Produced by Division

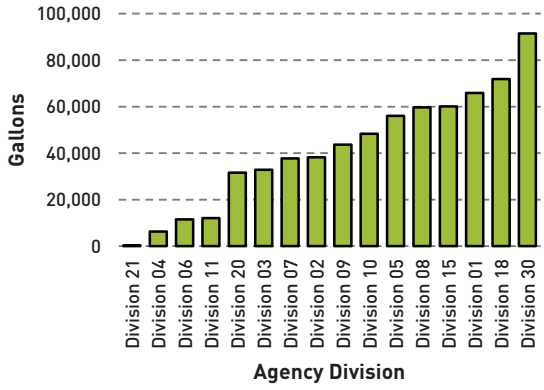
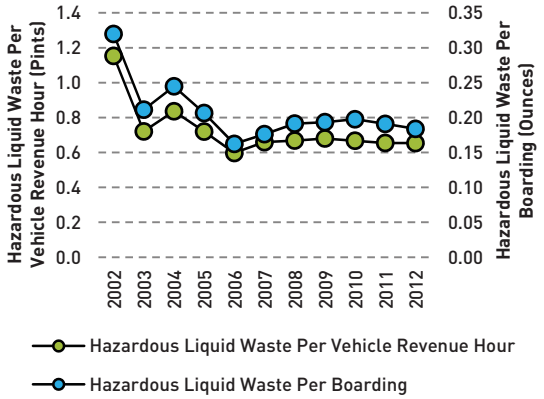


Figure 63 - Hazardous Liquid Waste Efficiency



Nonhazardous Liquid Waste

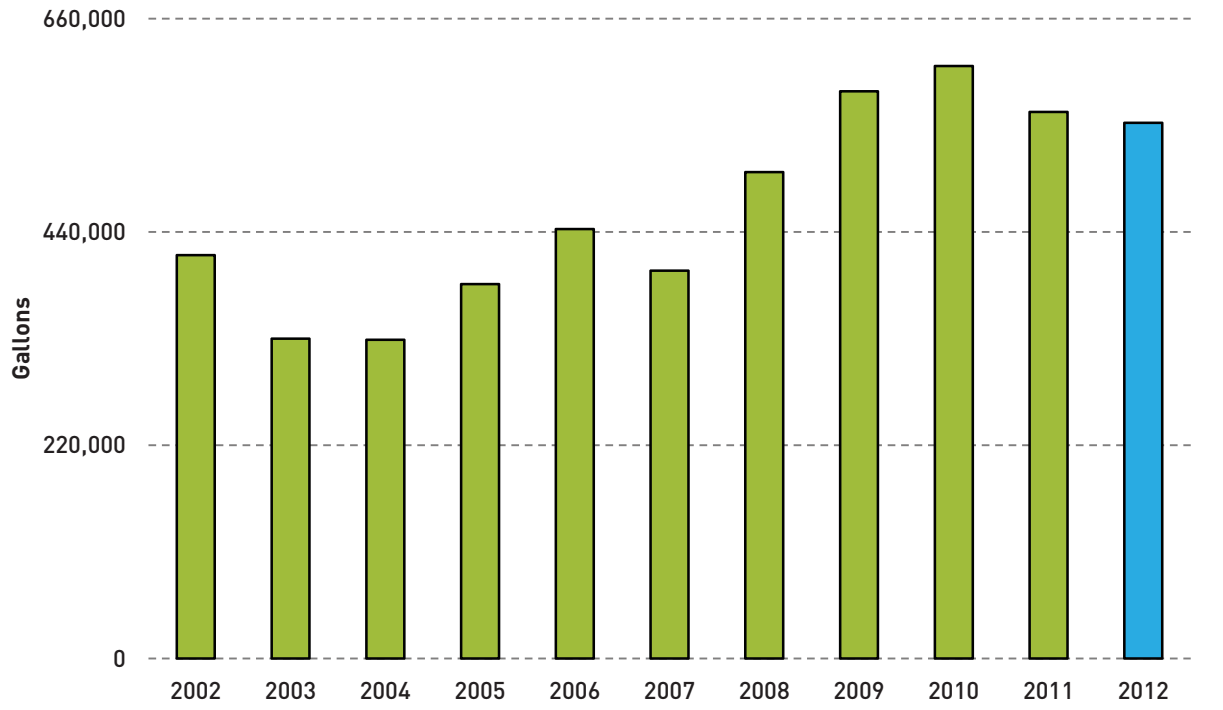
Accomplishments

> Continued proper disposal of nonhazardous liquid waste.

Data and Analysis

Nonhazard liquid waste is generated in the servicing of bus/rail washer clarifiers and other wastewater processing systems. Metro produced approximately 552,000 gallons of nonhazardous liquid waste in 2012, which represents a 2.0% decrease from 2011 but a 32.8% increase from 2002 (Figure 64). This gradual increase in nonhazardous liquid waste stream can be attributed to the increase in the number of bus washers, which is reflected in the increase from 2007 to 2010.

Figure 64 - Historic Nonhazardous Liquid Waste



Waste disposal costs for nonhazardous liquids have remained steady over the last few years, with the highest fees being paid in 2010 and 2012 over the last decade. In 2012, Metro paid approximately $210,000 in nonhazardous liquid waste disposal fees, which is similar to fees paid in 2010 but an increase (3.5%) from 2011 due to annual escalation costs (Figure 65).

Across most divisions, nonhazardous liquid waste remained steady or increased from 2011 to 2012. The largest producers of nonhazardous liquid waste are Bus Maintenance Divisions 7 and 10, and the Orange Line, at approximately 49,000 gallons each in 2012 (Figure 66). The waste generated from these divisions is generated from servicing bus/rail car wash clarifiers. Orange Line waste is generated from servicing stormceptors.

Nonhazardous liquid waste efficiency has remained steady since 2009, with a slight decrease in the amount of nonhazardous liquid waste produced per revenue hour and boarding (Figure 67). In 2012, 0.541 pints of nonhazardous liquid waste were produced per revenue hour, which is only a slight decrease from the 0.542 pints produced in 2011. Nonhazardous liquid waste production per boarding experienced a 3.8% decrease in ounces of nonhazardous liquid waste per boarding from 2011 to 2012 and a 26.7% increase from 2002.

Next Steps

> Manage and support nonhazardous liquid waste disposal activities.

> Reduce nonhazardous liquid waste, whenever feasible, through improved technologies and operational procedures.

Figure 65 - Nonhazardous Liquid Waste Costs

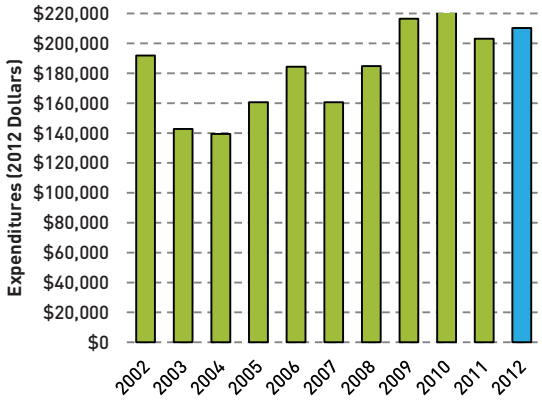


Figure 66 - Nonhazardous Liquid Waste Produced by Division

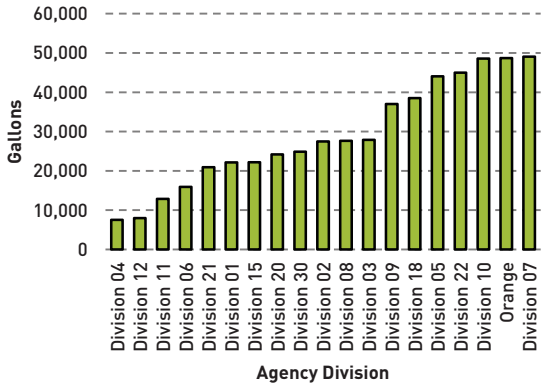
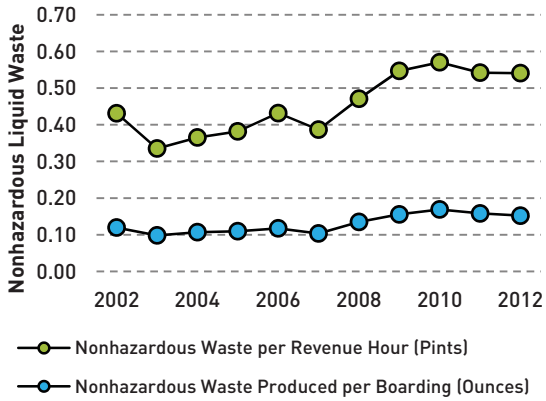


Figure 67 - Nonhazardous Liquid Waste Efficiency



Anti-Freeze Waste

Accomplishments

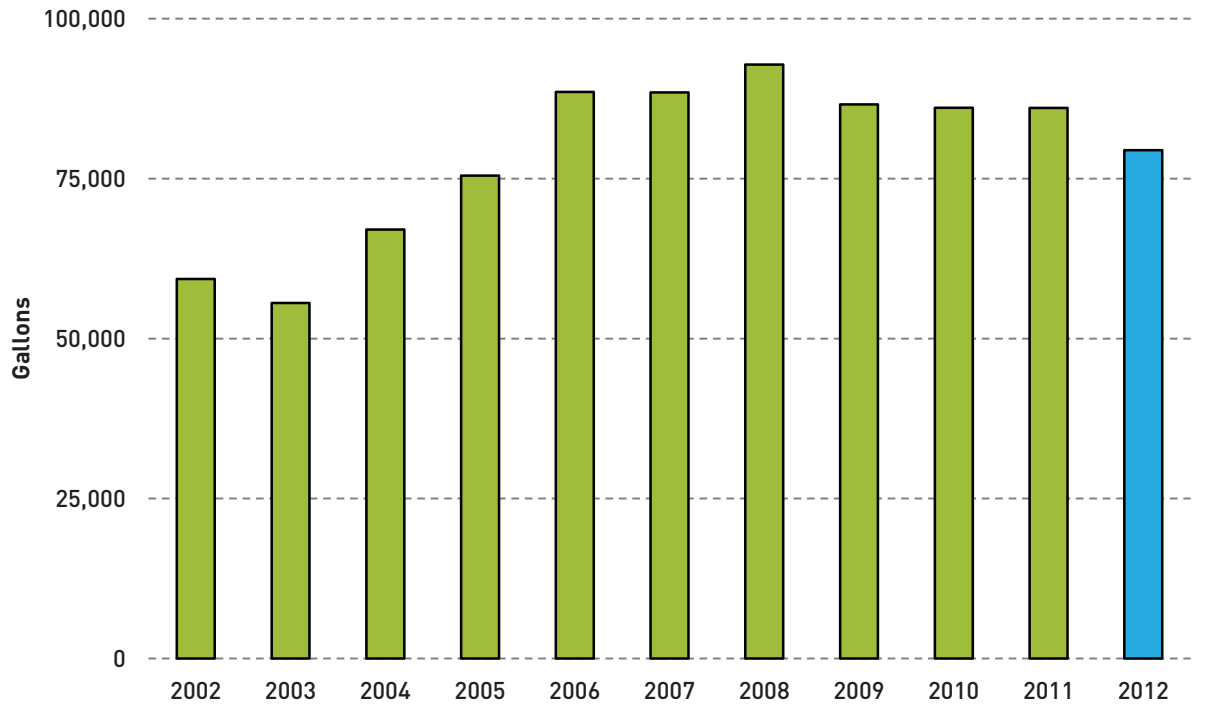
> Continued recycling of anti-freeze waste.

Data and Analysis

Anti-freeze is mainly used in Metro's bus maintenance facilities. Metro produced approximately 79,440 gallons of anti-freeze waste in 2012, a decrease of 7.7% from 2011 (Figure 68). Since 2008, anti-freeze waste production has been trending downward, which may be partly attributed to enhanced recycling efforts and programs.

A new contract was enacted on July 1, 2011, in support of Metro's continuing recycling efforts for anti-freeze, resulting in the elimination of disposal fees. Therefore, disposal fees were only paid through June 30, 2011, and no disposal fees were incurred in 2012.

Figure 68 - Historic Anti-Freeze Waste



Anti-freeze waste produced varied by divisions in 2012, with Divisions 10 and 18 being the highest producers of anti-freeze waste, similar to 2011 (Figure 70). Overall, anti-freeze waste has decreased across the divisions, with the only notable increases occurring at the following vehicle maintenance divisions: Division 10 (12%), Division 15 (7%), and Division 18 (21%). The divisions that generate smaller amounts of anti-freeze as compared to other divisions are Division 20, a rail maintenance division for the Red Line, and Division 34, a facilities maintenance location.

Anti-freeze waste efficiency has increased since 2011, with a decrease in the amount of anti-freeze waste produced per revenue hour and boarding (Figure 71). In 2012, 1.244 ounces of anti-freeze waste were produced per revenue hour, which is a 6.0% decrease from the 1.324 ounces produced in 2011. Anti-freeze waste production per boarding experienced an 8.3% decrease in ounces of anti-freeze waste per boarding from 2011 to 2012 and a 29.4% increase from 2002 to 2012.

Figure 69 - Anti-Freeze Waste Costs

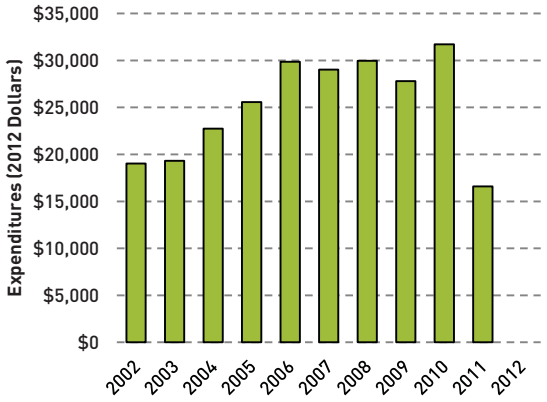


Figure 70 - Anti-Freeze Waste Produced by Division

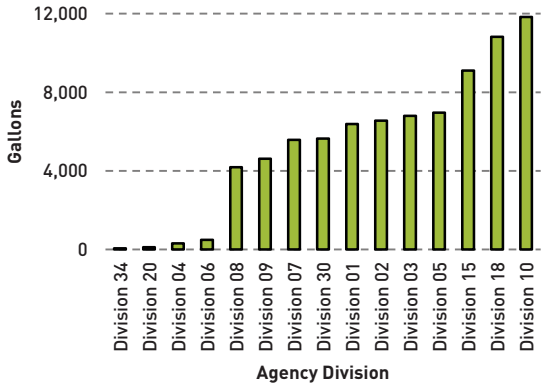
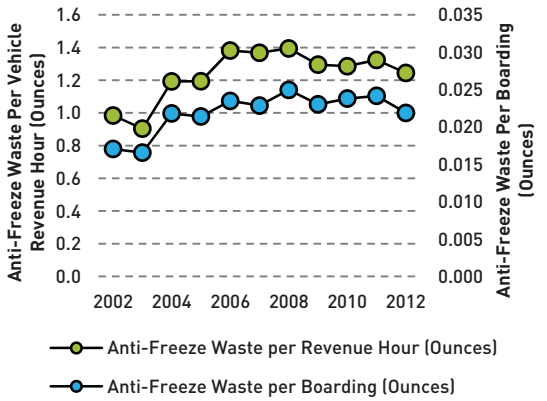


Figure 71 - Anti-Freeze Waste Efficiency



Case Study

Division 10 ISO 14001 Certification

Challenge

Metro's EMS is a compilation of operational best practices, which help Metro's divisions monitor and measure their impacts on the environment. The International Standards Organization (ISO) developed the 14001 standard to certify an entity's environmental practices, which are established and documented in their EMS. With Metro's Red Line Yard (Division 20) already ISO 14001 certified, Division 10, a bus facility, is the next facility in the process of receiving certification for its EMS.

Action

The ISO certification process hinges entirely upon a facility's EMS, thus, the process itself involved the development of a comprehensive and successful EMS at Division 10. The EMS program can best be explained through a four-step process: Plan, Do, Check, and Act. Each facility has its own set of daily operational activities, so this process necessarily involves identifying those activities and their subsequent impacts on the environment. This is the "Plan" stage of EMS, where the Division 10 Core Team, composed of bus maintenance and transportation staff, worked with Environmental Compliance, Quality Assurance, Corporate Safety, and others to identify their specific activities and subsequent impacts. The second step, "Do," involves the development of procedures and tracking progress on reducing environmental impacts at the facility. At Division 10, one such process established the redesign of the brake lathe room to minimize dust and improve air quality for Metro employees involved in that activity. The third step, "Check," involves the monitoring and measurement of Division 10's EMS, where both the internal and external audits took place. The final step, "Act," involves an annual management review meeting, which Division 10 will participate in at the end of this calendar year.

Outcome

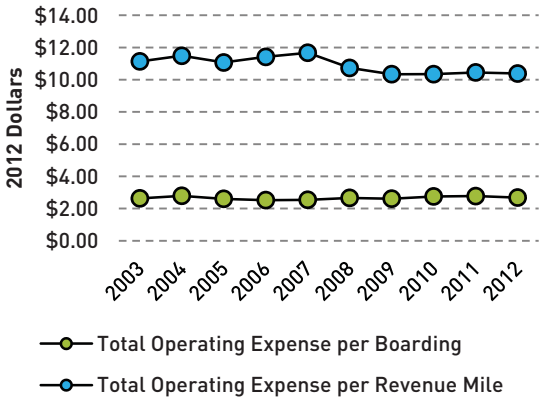
The ISO 14001 certification process involves performing both an internal and external audit to evaluate a facility's ability to comply with the various elements of its EMS program. The internal evaluation was conducted in early May 2012 by an ISO 14001 accredited Metro employee, and the external audit was conducted by a third party agency in late May. Metro's Division 10 successfully passed both audits, and is now in the process of being ISO 14001 certified. As EMS advocates for continual improvement of each facility's impact on the environment, Division 10 will continue to identify areas of improvement in its daily operational activities.

INDICATOR AREA

Operating Expenses

As a key component of the triple bottom line (economic, environmental, and social), operating expenses are an important economic indicator that reflects the broader agency's economic sustainability goals. This section analyzes Metro's overall operating costs and efficiency in terms of each transit mode.

Figure 72 - Historic Operating Expense Efficiency



Overall Performance

In 2012, Metro's operating expenses were approximately $2.68 per boarding, which represents a 5-cent increase from 2003 and a 9-cent decrease from 2011 after adjusting for inflation (Figure 72). Operating expenses per VRM have improved from 2003 and have kept steady around $10.30 per mile over the last 4 years. The total operating expense per boarding has fluctuated between $2.50 per boarding to $2.80 per boarding over the last decade. When compared to 2011, both operational efficiency indicators have experienced slight improvements in 2012.

Over 70% of Metro's operating expenses were spent on bus service, which accounts for 74% of total Metro ridership in 2012 (Figure 73 and Figure 74). Light rail is the only transit mode whose portion of ridership contribution is less than its portion of operating expenses. This may be attributed to the recently opened Expo Line, which requires time to build up ridership to its designed level of use.

Bus Service

In 2012, bus service that was operated by Metro cost approximately $2.56 per boarding, which is $0.16 lower than 2011 and $0.09 higher than 10 years ago. Metro experienced a reduction in operating expenses in 2012, which has not occurred since 2007, due to fluctuations in the price of natural gas, a decrease in therm consumption, and a reduction in parts consumption relative to a corresponding reduction in fleet size.

However, in terms of VRM, it costs $1.60 more per mile to operate the bus service system as compared to 10 years ago. This has led to Metro is experiencing an increase in operating expense per revenue mile for the seventh straight year since 2005, which can be attributed to Metro's continuing expansion of its bus service, such as the Orange Line Extension.

Light Rail

Operating expenses per boarding for light rail have generally been higher than for bus service and heavy rail. At $3.70 per boarding in 2012, operating expenses for light rail are approximately 45% to 65% higher than bus service and heavy rail. The fluctuation in year to year operating costs per boarding has lessened since 2005 (Figure 75). In terms of revenue miles, the operating cost to provide light rail services is approximately $18.10 per revenue mile in 2012 (Figure 76). This follows the stable projection of operating efficiency since 2004 of approximately $18 per revenue mile.

Figure 73 - Operating Expense by Transit Mode

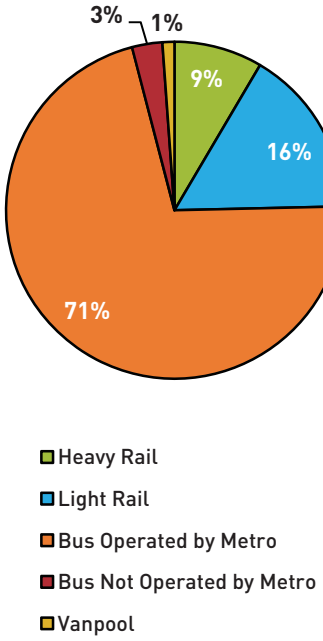


Figure 74 - Boarding by Transit Mode

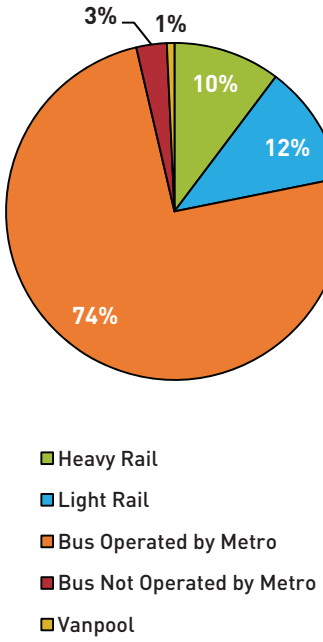


Figure 75 - Operating Costs Per Boarding

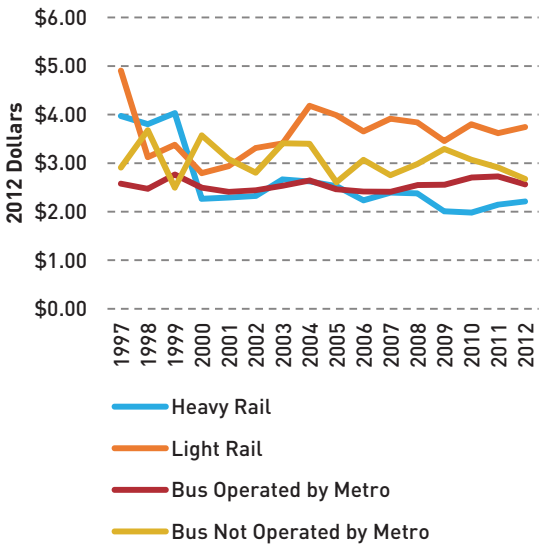
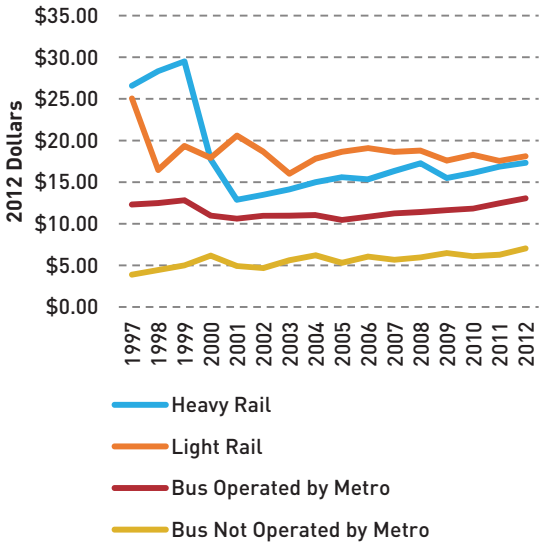


Figure 76 - Operating Costs Per Revenue Mile



Heavy Rail

Operating expenses per boarding for heavy rail have been stable at around $2.00 over the past five years (Figure 75). It cost approximately $2.20 per boarding in 2012, which is a slight increase from $2.10 per boarding in 2011. In terms of revenue miles, the operating costs per revenue mile have been gradually increasing at an average rate of 2.6% over the past 10 years, and reached $17.20 per revenue mile in 2012 (Figure 76).

Vanpool

Operating expenses for the vanpool are the highest among transit modes. Metro started its vanpool program in 2007 and, after the initial setup period, the operating cost per boarding has steadily increased. In 2012, it cost $4.20 per boarding for the vanpool, which is approximately 60% higher than Metro's bus service and 15% more expensive than Metro's light rail service. However, in terms of capturing PMT, the operating cost per PMT for Metro's vanpool is also much higher than the other transit modes at 45.4 miles per PMT; which is more than 10 times the bus service's 4.3 miles per trip and more than six times the light rail service's 6.8 miles (Figure 78). In terms of operating expenses for PMT, the vanpool program becomes a cheaper option ($0.09 per PMT) than any other transit mode (ranges from $0.50 to $0.75 per PMT) (Figure 79).This indicates that the vanpool program plays a critical role in serving a longer distance radius, especially for areas that are underserved by other transit modes. As a sustainable travel option compared to the single-occupant vehicle, the vanpool program plays a key role in reducing traffic and associated GHG emissions.

Figure 77 - Vanpool Ridership and Operating Expense, 2007 – 2012

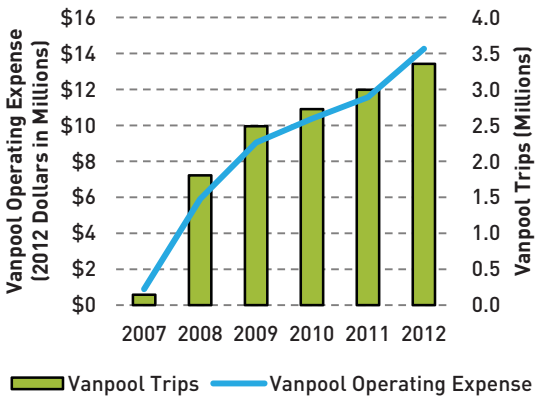


Figure 78 - Passenger Miles Traveled per Trip

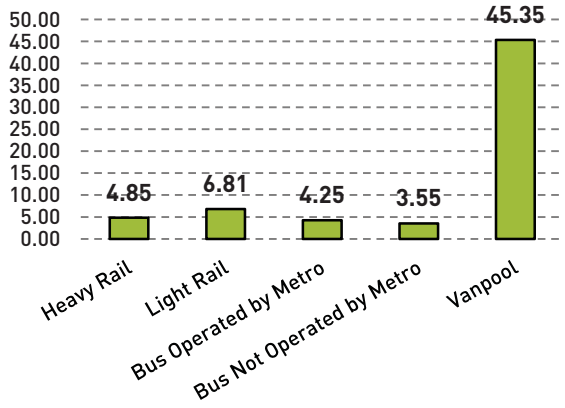
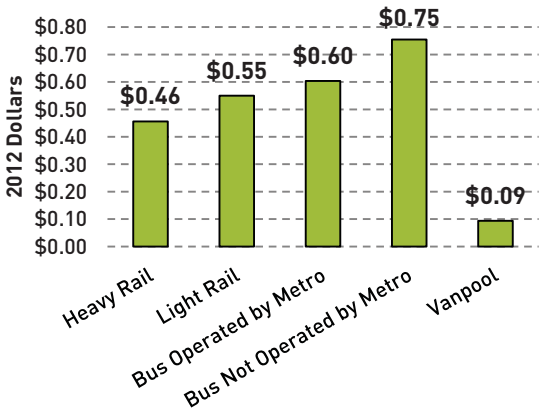
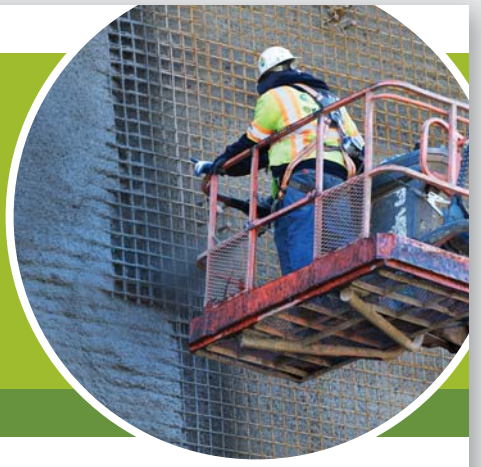


Figure 79 - Operating Expense per Passenger Miles Traveled by Mode



Case Study

Metro Expo Line Extension



In April 2012, Metro opened Phase 1 of the Exposition Line. After less than a year of operation, the line already supports around 25,000 weekday boardings per month, and more than half that number on weekends. The line is on-pace to far exceed projected ridership statistics of 27,000 monthly weekday boardings by 2020.

The line is particularly beneficial during special events like football games at the University of Southern California (USC), where it is not unusual for the Expo line to see around 8,000 additional riders. The first phase of the Expo Line has already helped take a bite out of traffic and emissions, and the opening of the second phase will only serve to make the transit option more appealing to riders.

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INDICATOR AREA

Unlinked Passenger Trips per Capita

Figure 80 - 2007–2012 Boarding by Mode Trend

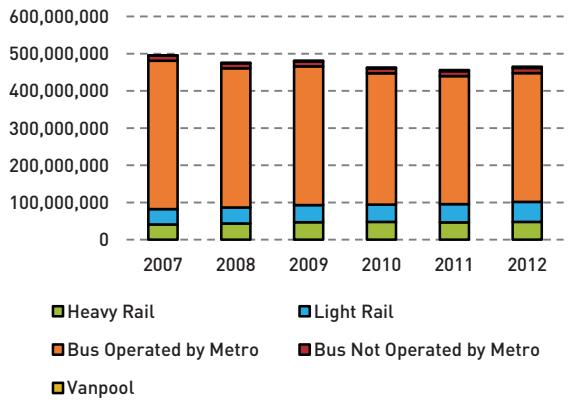
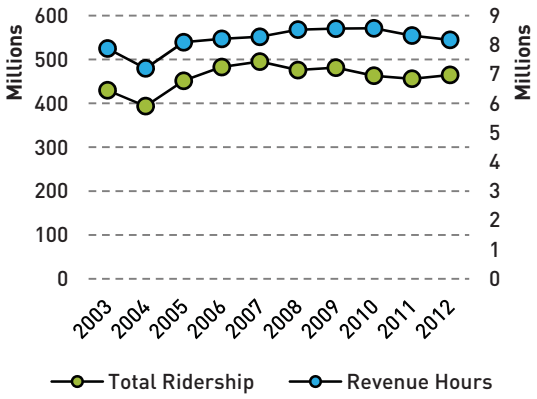


Figure 81 - Historic Boarding and Revenue Hours



Accomplishments

- Started revenue service on the Expo Light Rail Line (April 2012).
- Started revenue service on the Metro Orange Line Extension (June 2012).

Overall Performance

Over the past five years, although overall ridership for all modes of transit has trended downward, the ridership for rail transit has consistently increased each year by approximately 4% (Figure 80). Since the 2007 recession, 2012 is the second year that has witnessed an increase in the total ridership for all modes of transit.

Historically, the trend for vehicle revenue hours has generally followed the ridership trend before the 2007 recession (Figure 81). From 2011 to 2012, despite a nearly 2% increase in ridership, the total vehicle revenue hours dropped by 2%.

Transit Modes

Bus service remains the dominant transit mode among Los Angeles County's transit rider population, with 77% of transit trips occurring by bus in 2012 (Figure 82). Heavy rail and light rail combined account for 22% of total transit trips. Compared to 2011, the total number of transit trips increased approximately 2%. It is worth noting that the ridership increases are not evenly distributed among the different transit modes. Despite having the lowest ridership volume compared to the other transit modes, the vanpool experienced a 12% increase in ridership, which equates to an annual growth of approximately 10% over the last four years (Figure 83). Light rail also experienced a significant increase in ridership at approximately 9%. This trend aligns with Metro's commitment to expanding and enhancing services by adding 12 additional mass transit projects over the next decade.

Unlinked Passenger Trips per Capita

Historically, data for UPT per capita shows that ridership increased rapidly despite the decrease in County population between 2005 and 2007. The ridership per capita dropped between 2008 and 2010, from a peak of 51 trips per capita per year in 2007 to 46 trips per capita per year in 2011 (Figure 84). Since the peak in 2007, 2012 is the first year to show an increase in unlinked passenger trips per capita.

Figure 82 - 2012 Boarding by Transit Mode

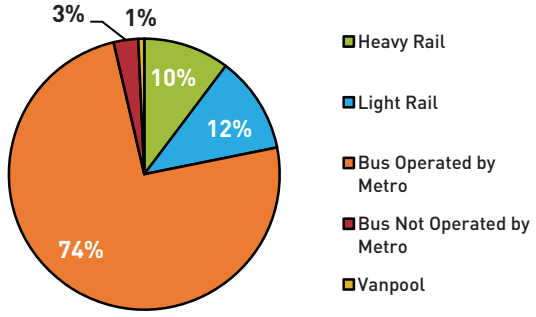


Figure 83 - Passenger Miles Traveled per Mode

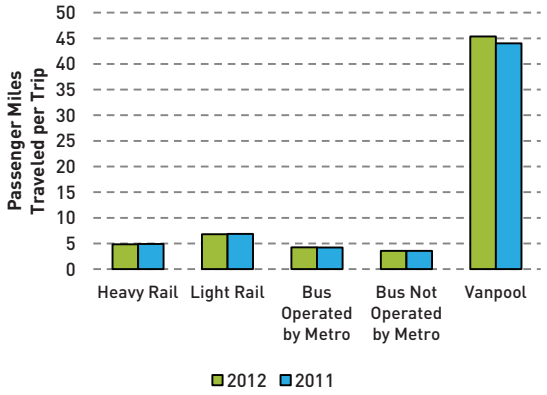
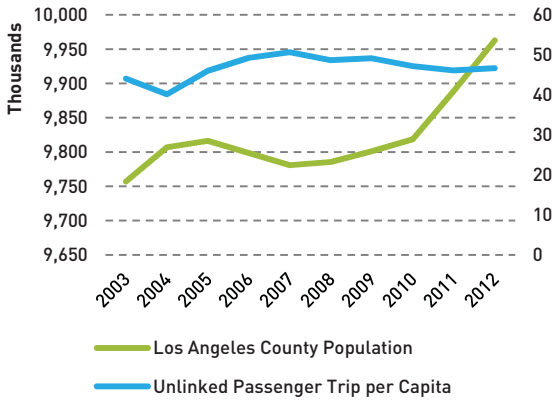


Figure 84 - Operating Expense per Passenger Miles Traveled by Mode



Case Study

Metro Orange Line Extension

On June 30, 2012, revenue service started on the Metro Orange Line Extension in the San Fernando Valley. The Extension project added an additional four miles of dedicated busway northward from the existing Metro Orange Line Canoga Station to the Chatsworth Station.

This dedicated busway improves north-south mobility in the western San Fernando Valley by connecting activity centers along the corridor to frequent and reliable bus service from the Metrolink and Amtrak service in Chatsworth to destinations in North Hollywood and beyond. Since the opening of the Metro Orange Line Extension, overall Orange Line ridership has jumped a huge 22% from 2011 numbers, cementing its position as the single most popular bus line in Metro's system.

Specific sustainable features include:

> Pedestrian path runs the length of the alignment

> Bicycle path runs the length of the alignment

> Bicycle parking is provided at stations

> Native species/drought-tolerant planting is incorporated along the alignment, requiring minimal maintenance and water

> Traffic signal prioritization may be incorporated

> Public art from local artists may be incorporated in station designs

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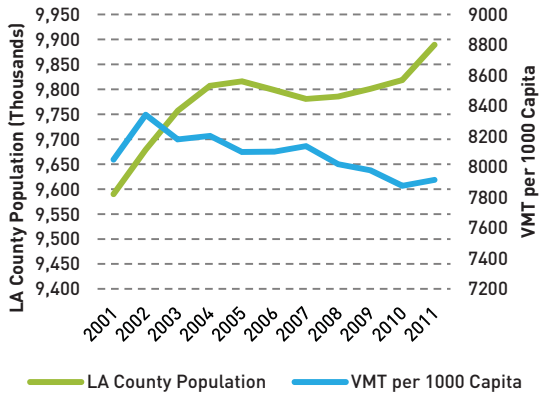
INDICATOR AREA

Vehicle Miles Traveled per Capita

According to the State Department of Finance's adjusted annual population estimation from 2001 to 2010, and 2010 Census data, the total population of Los Angeles County increased 3% between 2001 and 2011, from 9.59 million to 9.89 million. According to annual reports from the Highway Performance Monitoring System California Public Road Data, 211.5 million vehicle miles were traveled daily in 2001 within Los Angeles County; this has increased to 214.5 million in 2011. This constitutes a 1% increase in VMT compared to a 3% total population growth over the past 10 years. The Annual VMT per capita decreased from its 10-year peak of 8,342 in 2002 to 7,916 in 2011. Since 2007, 2011 is the first year to show an increase of total VMT from the previous year (Figure 85). This reduction in VMT per capita is attributable to a number of factors, including Metro's increasing focus on improving transit service efficiency and convenience. The expansion of transit service provides increased opportunities for mobility and accessibility for the general public, while also providing alternative transit options for single-occupant vehicle drivers.

Figure 85 - Annual VMT per Capita (1,000)[1]



1 2012 data is currently unavailable.

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Appendix

Table A1 - Indicator Results Matrix

Indicator	2012 Efficiency	% Change from 2002	2012 Performance	% Change from 2002	2012 Expenditures	% Change from 2002
Water Use	0.65 gallon per boarding	60%	303 million gallons	67%	$2.6 million	146%
Criteria Air Pollutant Emissions	0.01 pounds per Vehicle Mile	-81% (1990)	817 Tons	-89% (1990)	Not Applicable	Not Applicable
Greenhouse Gas Emissions	2.35 MT CO2e per boarding	Not Applicable	484,983 MT CO2e	Not Applicable	Not Applicable	Not Applicable
Greenhouse Gas Displacement	Not Applicable	Not Applicable	491,118 MT CO2e	19%	Not Applicable	Not Applicable
Fuel Use	0.09	-18%	41.7 Million GGE	2%	$30.3 Million	-4%
Rail Propulsion Power	2.33 Kilowatt Hours per Rail Boarding	-3% (2005)	213 million Kilowatt Hours	21% (2005)	$27 million	8%
Facility Electricity Use	0.19 Kilowatt hours per Boarding	28% (2005)	85 Million Killowatt Hours	28% (2005)	$10 Million	46%
Solid Waste and Recycling	1.82 Tons Solid Waste per Revenue Hour	-38% (2008)	4,770 Tons Trash; 2,647 Tons Recycling	-31% Trash (2008); -53% Recycling (2008)	n/a	n/a
Used Oil Waste	0.139 Gallons per Revenue Hour	-31%	142,000 Gallons	-27%	$0	-100%
Hazardous Liquid waste	0.654 Pints per Revenue Hour	-43%	668,000 Gallons	-40%	$517,000	-22%
Nonhazardous Liquid Waste	0.541 Pints per Revenue Hour	25%	552,000 Gallons	33%	$210,000	10%
Anti-Freeze waste	1.244 Ounces per Revenue Hour	26%	79,000 Gallons	34%	$0	-100%
Operating Expenses	$152.4 per revenue hour	5%	$1.2 Billion	12%	Not Applicable	Not Applicable
Unlinked Passenger Trips per Capita	$2.68 per boarding	7%	464,875,164	4%	Not Applicable	Not Applicable
Vehicle Miles Traveled Per Capita	Not Applicable	Not Applicable	230	20%	Not Applicable	Not Applicable

GHG Notes: First year of data=2007; indicator is total emissions (facilities + transit)/total boardings; % change from2007 is +1.5%; % change from 2011 is +5.6%

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