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EARTH DAY 2011

Report

2011 MTA Sustainability Report

More MTA = Less CO_2

Metropolitan Transportation Authority
A public benefit corporation chartered by the State of New York

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Mention sustainability and people think of solar power, recycling, hybrid vehicles, or LEED-rated buildings. While the MTA is a leader in all such "green" advances, this technical focus can easily miss the forest for the trees.

The fact is that the MTA itself is arguably the nation's most powerful engine of sustainable growth. As North America's largest transit network, the MTA offers some 15 million people in one of the world's most dynamic economic regions a fast, reliable, carbon-cutting alternative to the automobile.

This not only reduces fuel use and greenhouse gas (GHG) emissions, it circulates the area workforce with maximum flexibility, resulting in a highly productive urban economy with a uniquely low-carbon footprint. Thanks largely to the MTA network, New York State has the lowest per-capita energy consumption in the United States[1] and the lowest energy consumption per Real Dollar of GDP![2] That's a growth model worth growing.

The challenge today is to grow that model in the face of a less than robust economy and austerity. Do more, save more, spend less. That aim is achievable. The MTA is already doing more for transit customers through low-cost, low-energy IT innovations, while our many internal sustainability projects continue to "green the system," reducing energy use and GHG emissions, lowering costs and improving performance. Consider sustainability a green synonym for the kind of continuous improvement MTA Chairman and CEO Jay H. Walder is delivering via Making Every Dollar Count: Agenda 2011.

The MTA has a tremendous role to play in "greening the region" in the first half of the 21st Century. Every improvement that attracts new transit users –every growth in transit capacity– helps to lower the carbon costs of regional GDP. More than ever, it is vital to quantify and "price" this hidden economic value. Following are a few examples of the ways in which the MTA network is increasing productivity by lowering energy costs.

Can our buses run greener? You bet.

One of our latest green initiatives can be seen flying past the traffic on Fordham Road in the Bronx. Except for its speed, it appears to be your typical city bus. Yet behind the Bx12 bus route lies a new level of strategic planning. Launched in partnership with the City of New York, the Bx12 was the first route adapted for the MTA's new Select Bus Service (SBS), a bus rapid transit initiative that is radically increasing the impact of the MTA bus fleets. Why is this a breakthrough in sustainability?

First introduced on Fordham Road in the Bronx, the MTA's new Select Bus Service (SBS) increases the speed, capacity, and ridership of city buses, thus decreasing automobile GHGs.

Right now, MTA buses carry some 2.8 million riders every weekday. In many neighborhoods, these bus lines are the only alternative to cars, linking residents with essential jobs, shopping, and recreational activities. Over the years, the MTA has boosted the capacity and the efficiency of its hybrid-electric and CNG fleets.

Even so, bus transit wasn't achieving its full potential. For one thing, buses could not move faster than city traffic. Enter the SBS strategy. Using designated lanes, express stops, traffic signal prioritization, and off-board fare collection, the SBS route on Fordham Road swiftly increased travel speed by 20 percent and ridership by 10 percent. Cost savings, environmental benefits, better service. What Jay Walder likes to call sustainability's trifecta.

Now proven, the SBS strategy is rolling out on other routes. They include First and Second Avenues in Manhattan, soon to be followed by SBS routes on Nostrand Avenue in Brooklyn, 34th Street in Manhattan, Hylan Boulevard in Staten Island, and a feasibility study on creating an SBS route to LaGuardia Airport in Queens.

And there's more. Many SBS techniques can work on regular bus routes. Bus lanes on 34th Street, one of the city's slowest crosstown rides, have boosted speed by 17 percent and ridership by 6 percent. The traffic signal prioritization (TSP) used on SBS routes, which enables traffic lights to recognize approaching buses and either turn the light green or keep it green, is expanding to 11 additional routes. In addition, camera enforcement of bus-only lanes and a new system (developed by MTA engineers) for tracking next-bus arrivals by web and cell phone are further expanding the speed, reach, and ease of bus transit.

All of this moves tens of thousands of area commuters out of cars and into clean-fuel, energy-efficient buses. It may not seem like a glamorous technical breakthrough, but as bus ridership grows, the region steadily decreases its per-capita fuel use and GHG emissions. You could put every New York driver into a Prius, and come nowhere close to the environmental benefits of a well-designed bus transit system.

Squeezing electricity out of the system

Within the MTA's infrastructure, a different sort of "greening" is ceaselessly underway. With the nation's biggest subway system, its two largest commuter railroads, a vast infrastructure, and public facilities to handle millions daily, the MTA is a very, very big energy customer. This gave rise to the MTA Energy Services Program, a partnership with the New York Power Authority, which shares a vested interest in rationalizing, stabilizing, and lowering MTA energy consumption.

The program focuses on introducing new technology, equipment and operations that increase the energy efficiency of MTA assets. Projects are generally paid back through lower electricity and fuel costs without impacting either the operating or capital budgets. Some of the projects involve energy-efficiency equipment as small as a LED light; some as large as an electrical substation. But taken together, the savings are large. Since its inception, the program has carried out 99 separate projects (with an investment value of $65 million) that save 78,000 megawatt hours (MWh) annually.

The beauty of these projects is their incremental progress. They build a more sustainable infrastructure piece by piece. The program extends to bus depots, train yards, subway tracks and stations, bridges, tunnels, and office buildings. It covers the adaptation or installation of energy-efficient technologies, such as new motors and compressors, solar heating, demand-control ventilation, and rapid roll-up doors.

Program investment has more than quadrupled since 2005, from $2 million in the first year to over $14 million in 2010, with savings going forward. Two recent examples demonstrate how the investments are both greening the system and reducing costs over the long term.

How to heat a third rail

This project solves a seasonal problem that plagues transit systems in cold climates, where winter icing on third rails can shut down segments of train lines. To avoid outages during winter storms, heaters must be activated to prevent ice build-up on the third rail. The existing system requires the heaters to run constantly during the late fall, winter, and early spring.

By installing 181 control points linked to 309 remote-controlled heaters, the MTA's new energy-cutting third-rail heaters switch on and off remotely, when and where heat is needed. The project costs $4.9 million for equipment and won an additional $2 million for labor costs through a competitive bid for federal Transit Investments in Greenhouse Gas and Energy Reduction (TIGGER) funding. It will save approximately 12,000 MWh (usage) and 81 KW (demand) annually, and will reduce the MTA's yearly energy bill by an estimated $793,000.

Icy third rails can disrupt a train line. The new remote-controlled rail heaters use energy only when and where needed, and will save over $793,000 annually.

Catching some rays at Coney Island

In another recent project, the MTA utilized a new solar hot water technology to heat the water supply at Coney Island Yard, the MTA's largest subway maintenance facility, replacing the shop's old 240 KW electric heating system. The new solar heating technology now supplies around 75 percent of the facility's total hot water. For a cost of $585,000, the vacuum tube solar collectors realize an annual energy savings of 156 MWh (usage) and 217 KW (demand), eliminate an estimated 160,000 pounds of GHGs annually, and cut the MTA's energy bill by $94,000 annually.

The solar thermal hot water system at the Coney Island Yard provides domestic hot water for the MTA's largest subway maintenance facility. The system replaced an electric water heater, saving both energy and greenhouse gas emissions.

Greening the MTA's Bi-State Region

While the MTA can point to many internal projects that are advancing sustainability, a larger point needs to be made. That is the quantifiable relationship between increasing the use of transit and decreasing both fossil fuel consumption and GHG emissions. In fact, it is even true to say that increases in the MTA's internal carbon footprint will generally mean decreases in the region's carbon footprint overall.

At one level this is well understood and readily measurable. We know, for example, that energy consumption among New Yorkers is one quarter the national average, due largely to the MTA's operations and the correspondingly lower rates of driving. This translates into lower rates of GHG emissions. Transit and non-motorized modes carry two-thirds of all NYC commutes, and contribute only three percent of transportation-related GHG emissions.[3]

The challenge today is to quantify these benefits in a way that can be "priced," both in the marketplace and in public policy. The answer is the concept of measurable carbon avoidance.

Can you measure prevention?

Traditionally, the market system is not well-suited to measuring the energy inputs and carbon outputs entailed in producing goods and services. It does not capture the value of the MTA's avoidance of carbon emissions. Nor does it measure the very real, if dispersed, returns on transit investment. But there is a way.

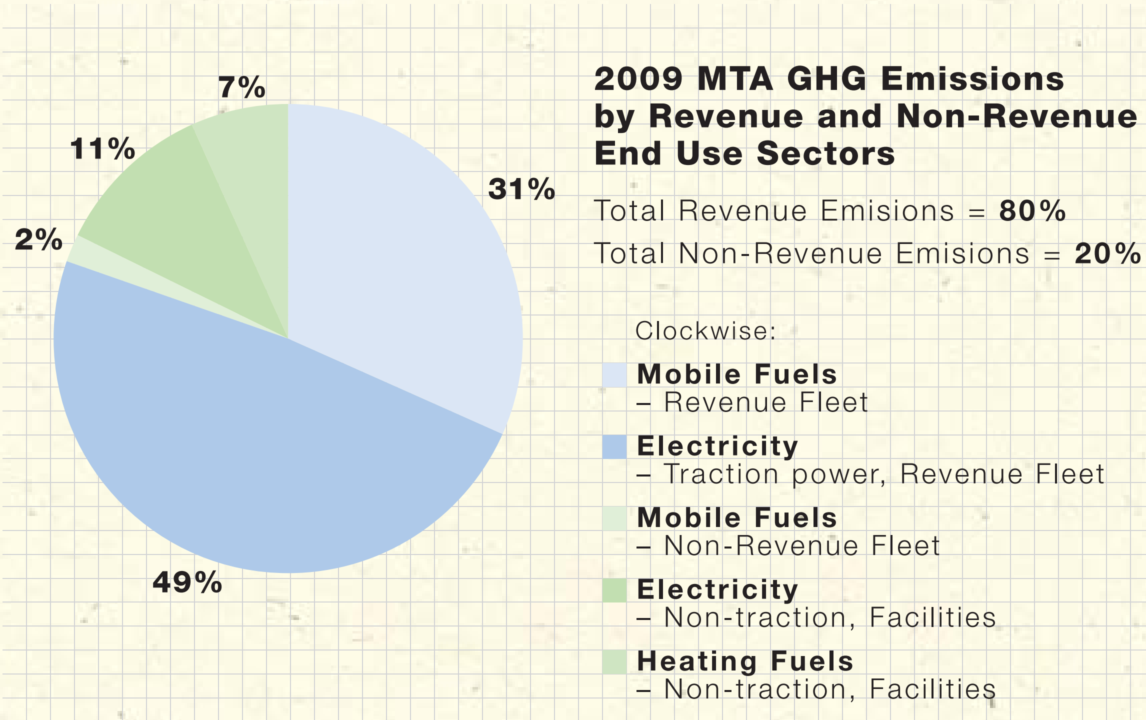
Recently, economists, environmental engineers, and others have begun focusing on the measure of carbon avoidance. In particular, the American Public Transportation Association (APTA) formed a working group of transit professionals, private sector experts, and academics to develop a methodology for measuring transit's GHG emission impacts using three interrelated factors—mode shift, congestion relief, and land use.[4]

- **Mode shift** refers to the reduced GHG emissions that result from shifting from one mode of transportation to another, measured on a per-passenger-mile basis. For example, the difference in carbon emissions between one passenger mile traveled in a single occupancy vehicle (SOV) and one passenger mile traveled on the subway.

- **Congestion relief** quantifies a secondary effect often overlooked. Transit ridership frees up roadway capacity, which in turn means smoother traffic flow, optimal engine efficiency, fewer starts, stops, and traffic jams, with their cumulative oil and carbon impacts. It is possible, using existing traffic data, to measure the gains in terms of vacated traffic capacity, average flows, and estimated emissions avoided. The congestion-relief factor also anticipates and accounts for the rebound effect, i.e. the relief captured is the net of the vacated capacity and the incremental demand anticipated as a result of better flow in the traffic lanes.
- **Land use** measures the reduced carbon outputs due to the denser land-use patterns created by transit systems. Such density reduces distances by any mode of travel, producing efficiencies attributable to transit and beyond. It could include shorter driving distances from home to work or "trips not taken" by, for example, walking to a local store. One important note. In measuring carbon avoidance, only travel factors are considered in the land-use component and not such additional energy benefits as those that come with compact offices, smaller homes, and multi-family dwellings.

Our carbon costs per passenger

So how does the MTA calculate the value of its carbon avoidance? First, we need the total carbon emissions of the MTA itself. The MTA meticulously quantifies its GHG emissions for all facilities, vehicles, and operations using a protocol established by The Climate Registry (TCR), a non-profit reporting agency of which the MTA is a Founding Member. The results are then verified by a third party verifier (currently LRQA Americas Sustainability, Inc.) and published on TCR's website. In 2009, the MTA became the largest transit agency ever to have its GHG emissions successfully calculated, independently verified, and reported by TCR.[5]



Nearly 80 percent of MTA's GHG emissions are due to rail and transit service, thus offsetting the higher oil consumption and emissions it would take to move the same passengers by automobile.

LRQA Americas Sustainability, Inc. verified the MTA's total GHG emissions for 2009 at 2.29 million metric tons of carbon dioxide equivalent, or 2.29 $MMTCO_2e$, to use the standard term. Keep in mind the following. The figure of 2.29 $MMTCO_2e$ does not include MTA paratransit operations, which are funded by the MTA but operated by independent contractors.

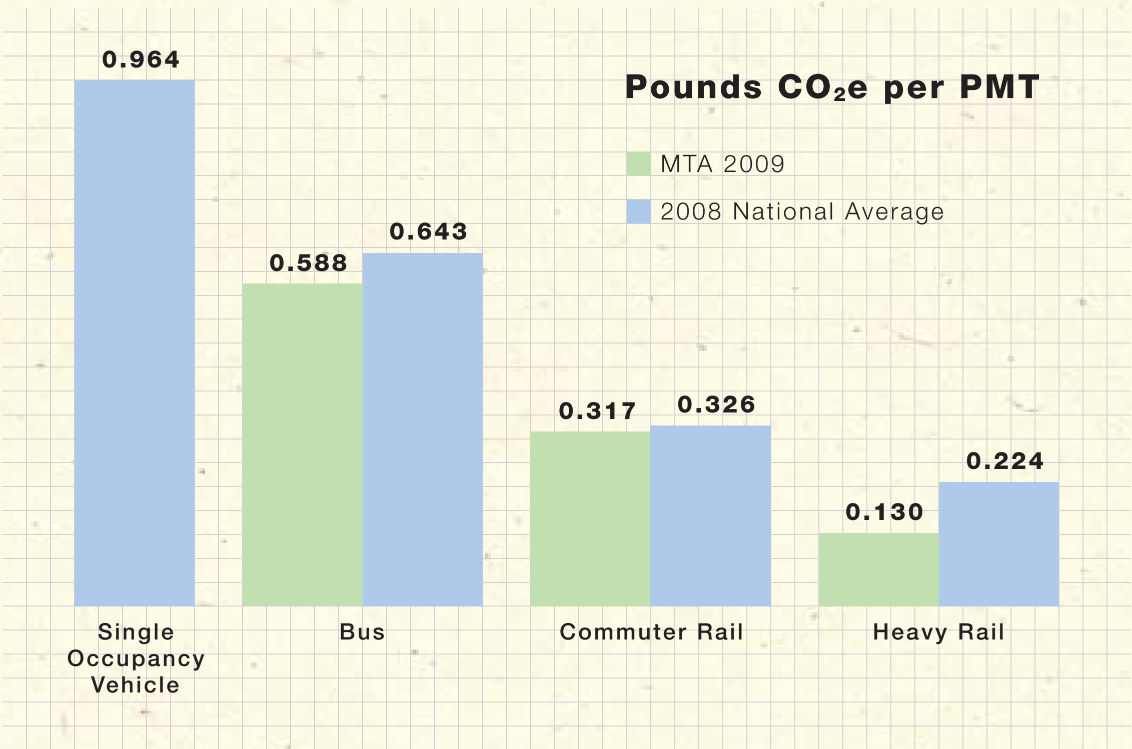
To be consistent with TCR protocols for reporting emissions, paratransit emissions are reported separately and are not part of the verification process because paratransit operations are not under the MTA's direct operational control. When paratransit is included the MTA's total 2009 footprint is 2.38 $MMTCO_2e$.

The MTA's greenhouse gas emissions include many different sources. One distinction is especially important. The vast majority of GHG emissions, nearly 80 percent, result from traction power or revenue operations. Nearly two-thirds of this is electricity for third-rail power for subways and commuter trains. Only 20 percent comes from "behind-the-scenes" operations, like maintenance facilities or office space.

In other words, the MTA is highly carbon-efficient at moving people. This efficiency can be measured by looking at carbon output per passenger mile traveled (PMT). PMT is simply the measure of one passenger moving one mile. For example, one driver traveling five miles equals 5 PMT. A bus with 30 passengers traveling the same five miles equals 150 PMT.

Calculating carbon avoidance

Combining verified carbon emissions with PMT brings us closer to our calculation of carbon avoidance. Once MTA's footprint is verified, carbon data is analyzed for each of the different transit modes we operate. The chart below shows CO_2 emissions divided by PMT for each MTA transit mode – buses, commuter rail, and subway (heavy rail). As you can see, the MTA compares favorably with national averages for transit. But the real story is the huge contrast with single occupancy vehicle drivers. At 0.130 pounds of CO_2 per PMT, the MTA's subway system is seven times more efficient than single occupancy vehicles. No wonder New Yorkers have a carbon footprint approximately one quarter of the average American's![6]



In terms of per passenger miles, an MTA subway ride (heavy rail) is about seven times more carbon-efficient than a single driver in a car.[7]

To arrive at a carbon avoidance factor, the MTA commissioned Booz Allen Hamilton to apply the APTA Methodology on Quantifying Greenhouse Gas Emissions from Transit in a carbon model.[8] The analysis uses survey data, geospatial information systems (GIS), and statistical methods to quantify the three carbon avoidance factors identified by APTA. According to this model, the MTA's carbon avoidance factor is 8.24. What this means is that for every ton of GHG emitted by the MTA, 8.24 tons are avoided regionally. Subtracting our own emissions, this means MTA helped the region avoid 16.6 $MMTCO_2e$ in 2009.

In other words, though the MTA itself produces 2.29 $MMTCO_2e$, its transit operations actually reduce the overall carbon emissions of the region by 16.6 $MMTCO_2e$ each year. Without the MTA, annual GHG emissions in the region would be almost 17 $MMTCO_2e$ higher than they are today.

This is, of course, an estimate only. And it is the very first foray into measuring this type of benefit provided by public transportation. As research in this area progresses, and other transit agencies follow suit, the model will be refined and improved. That said, this model is a realistic way to begin to quantify transit's value in reducing carbon emissions. If the United States places a monetary value on carbon-avoidance in the years ahead, public transportation agencies across the country could use this model to make a strong case that transit operators should be entitled to a share of the carbon revenue.

Conclusion: More MTA = Less GHGs

As these examples show, the true economic value and carbon efficiency of MTA transit modes must be measured on two levels. First, by greening the system the MTA is continually increasing its own internal energy efficiency, improving performance and reducing fuel costs and GHG emissions. This process steadily increases MTA's efficiency per passenger mile in relation to automobile travel. It also increases the entire region's carbon efficiency per unit of GDP, making it by far the nation's highest.

Second, this relative efficiency means that every increase in transit ridership—even those that increase the MTA's own GHG emissions—means a corresponding decrease in GHG emissions overall. Thus, we have an inverse relationship between the growth of MTA GHG emissions and the decrease of GHG emissions overall.

More MTA equals less GHG. This important ratio can now be quantified and "priced" by the carbon-avoidance factor. In the same way that acres of rainforest hold a measurable value in the world of carbon trading today, carbon avoidance from public transportation can also be recognized, priced, and valued—not just for transporting people, but for doing so in a way that is good for the planet.

For more information on the greening of the MTA modes (subway, bus and commuter rail), how the MTA greens the city and the region, and to learn more about the carbon-avoidance benefits of MTA transit services, visit http://www.mta.info/sustainability.

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