ANNUAL

PERFORMANCE METRICS REPORT

CALENDAR YEAR 2019

Metropolitan Transportation Authority

December 2021

Introduction

Performance measurement and benchmarking is a critical tool that the Metropolitan Transportation Authority (MTA) uses to assess whether it is effectively achieving its mission; measure its performance when compared to peers; and determine whether industry best-practices can be applied to its own operations and cost-structure.

The MTA and its operating agencies regularly monitor and review a myriad of key performance metrics (KPIs). This information is used every day to shape policy and decision-making. Many of these metrics are publicly reported on social media, the MTA's website and during public meetings. Others are submitted to government oversight agencies such as the Federal Transit Administration (FTA) for inclusion in its National Transit Database (NTD).

As far as peer benchmarking is concerned, the New York City Transit Subways Division (NYCT) is a member of the Community of Metros (COMET), an international benchmarking group managed by the Transport Strategy Centre at Imperial College London. COMET, of which NYCT is a member, is made up of large and medium size metros. COMET provides NYCT with network to share experiences, identify best practices and learn from other agencies in a confidential environment. COMET collects annual performance indicators and publishes case studies on key challenges facing the members to support decision making and establish best practices. NYCT is also a member of IBBG (International Bus Benchmarking Group), also managed by the Transport Strategy Centre at Imperial College.

The MTA's two railroads are founding members of the International Suburban Rail Benchmarking Group (ISBeRG), which is also managed by the Transport Strategy Centre at Imperial College. ISBeRG's principal aim is to identify and share best practices in a confidential environment. Through ISBeRG, members share comparative KPI data and conduct in-depth benchmarking studies on issues of shared interest. ISBeRG also offers an online forum for immediate inquiries to members about specific issues and strategies.

In June 2019 the New York State Legislature passed legislation that amended Public Authorities Law, Section 1276 to require the MTA to provide an annual performance metrics report that compares NYCT and MTA railroads' performance with other national and international peer agencies. Final peer benchmarking data typically is not available to the MTA until 11 months after the prior calendar year end. The Legislature also required the submission of monthly performance metrics data for all customer trips provided by these agencies.

This report contains data for calendar year 2019 including, but not limited to, the following metrics:

- **Total operating cost per car per mile**;
- **Total operating cost per passenger;**
- **Maintenance cost per car per mile**;
- **Passenger journeys per total staff and contractor hours**; **and**
- **Staff hours lost to accidents**

In addition to providing data, this report summarizes the primary factors contributing to the MTA's performance compared to peers and identifies some of the initiatives being undertaken to drive improvement.

New York City Transit - Subways

National Benchmarking

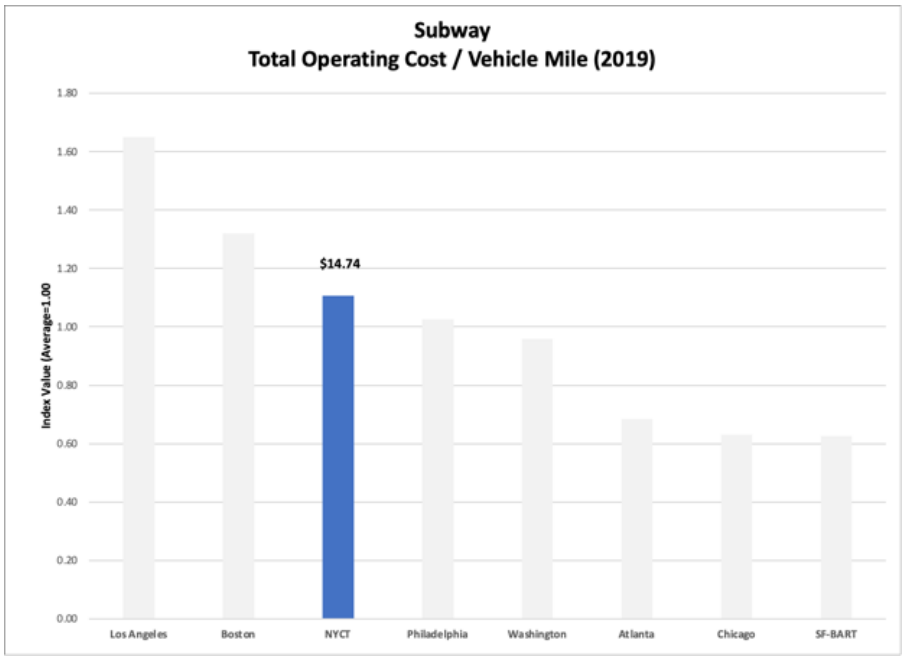
For comparison to domestic subway/metro systems, the FTA collects operating and financial data for its annual NTD. MTA subway data is compared to peer systems in:

- San Francisco (BART)
- Chicago (CTA)
- Washington (WMATA)
- Atlanta (MARTA)
- Philadelphia (SEPTA)
- Boston (MBTA)
- Los Angeles (LACMTA)

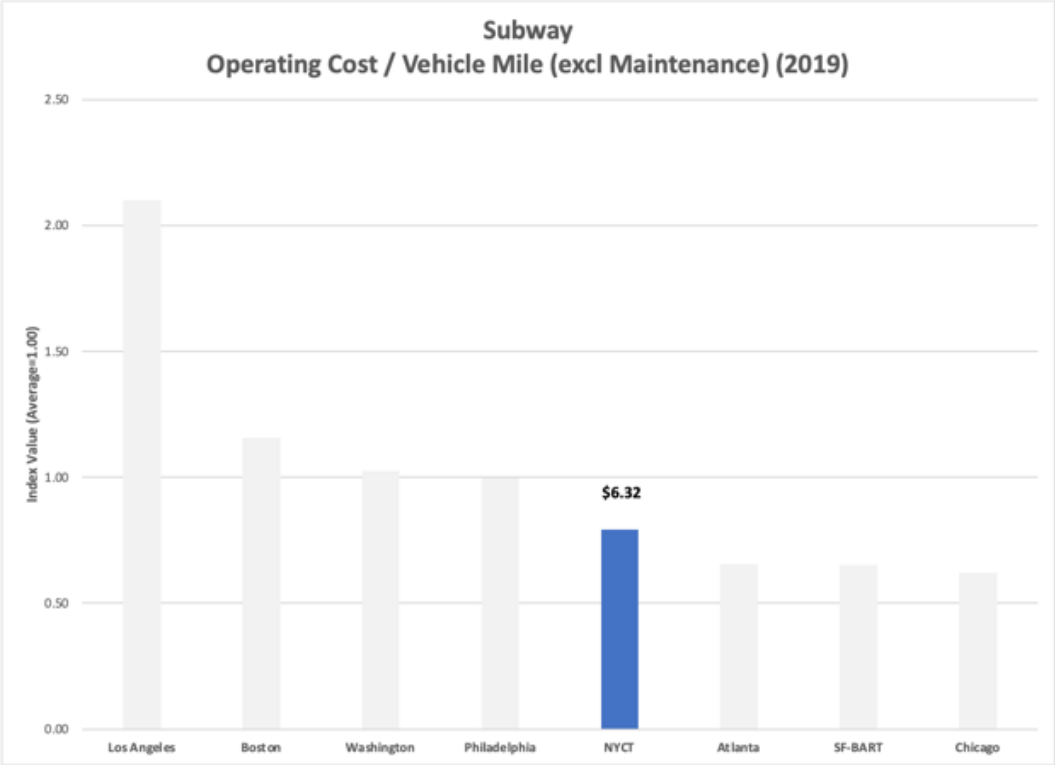
National Benchmarking - Operating Costs

There are several metrics that transit operators use to benchmark their operating costs versus peers. One important one is operating cost per passenger. NYCT spent $1.91 per passenger in 2019. This is the lowest cost in the peer group – similar to Boston and only 58% of the $3.28 average.

Total NYCT subway operating costs per car mile are just above average compared to other rapid transit systems in the United States. Operating costs include service operations, maintenance and administrative costs.



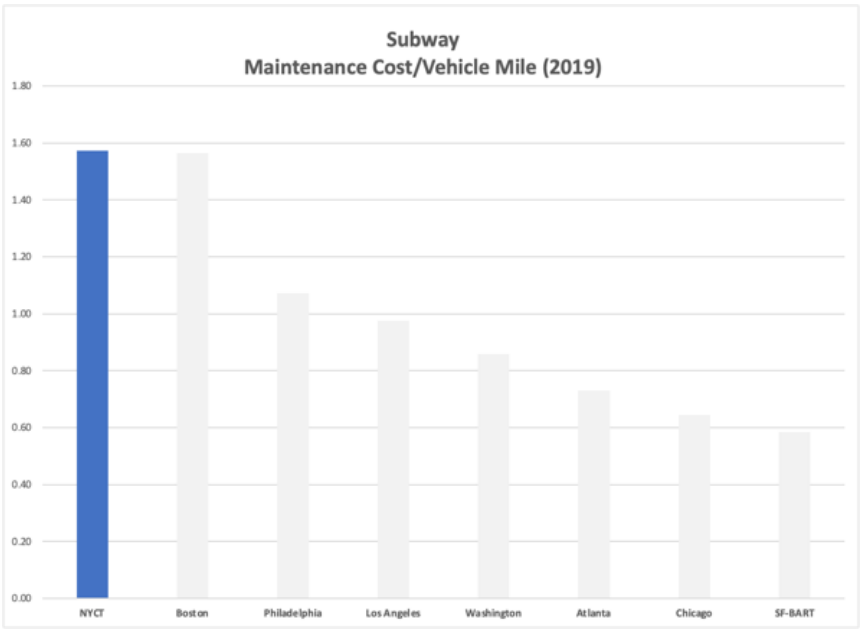
The following chart provides greater detail on subway operating costs by excluding maintenance costs. When evaluating costs on this basis NYCT subway is among the most efficient in terms of cost per car mile.



National Benchmarking - Maintenance Costs

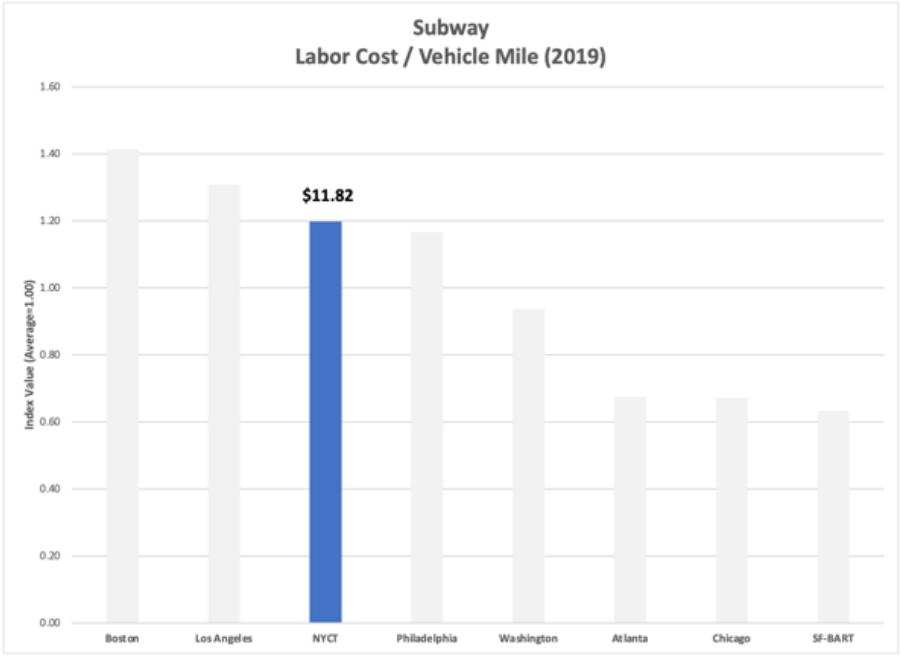
Maintenance costs make up 57% of total operation costs. NYCT has a range of subway fleet types with differing operating and maintenance requirements. Currently, there are 6,455 subway cars and the average age is 23.6 years. Approximately 33% of the cars are 15 years old or younger, 28% are between 16 and 30 years old, 27% are between 31 and 40 years old, and the remaining 12% are at least 41 years old. The oldest car class is the R46 with an average age of 45 years, and the youngest is the 2.3-year-old R179 fleet. The oldest fleet of R46s is in the process of being replaced with new R211s over the next few years with a base contract for 460 cars and options for 640 and 437 additional cars.

The combination of the age of the system and the addition of express tracks and platforms on many routes adds to the number of components requiring state of good repair and routine replacement work. Compounding this is the system's 24-hour service commitment, providing short and inefficient windows of opportunity to perform in system maintenance in the overnight hours. In comparison, virtually all other national peer agencies close overnight, allowing for efficient maintenance to occur. Chicago, Philadelphia and Atlanta maintenance costs represent roughly 40% of their total operating costs, and San Francisco, Los Angeles, Washington D.C. and Boston maintenance range from 30%-38% of total operating costs.



National Benchmarking - Labor Costs

Labor costs per vehicle mile are above average compared to national peer agencies. This is largely because NYCT is one of the few national metro systems which operates most trains with both an operator and a conductor, contributing to greater operating costs. Several shuttle services are operated with an operator and no conductor. Given the significantly greater length of NYCT trains compared to most peer agencies, maintaining both the existing operator and conductor has been strongly and consistently advocated for by riders and elected officials.



International Benchmarking

For comparison to international metro systems, MTA subway data is provided to the Community of Metros (COMET) international benchmarking groups managed by the Transport Strategy Centre (TSC) at Imperial College London. COMET, of which NYCT is a member, is made up of large and medium size metros.

All COMET activities are carried out within a framework of confidentiality, to ensure open and honest information exchange among the member metros. Any information that is released externally is therefore anonymized.

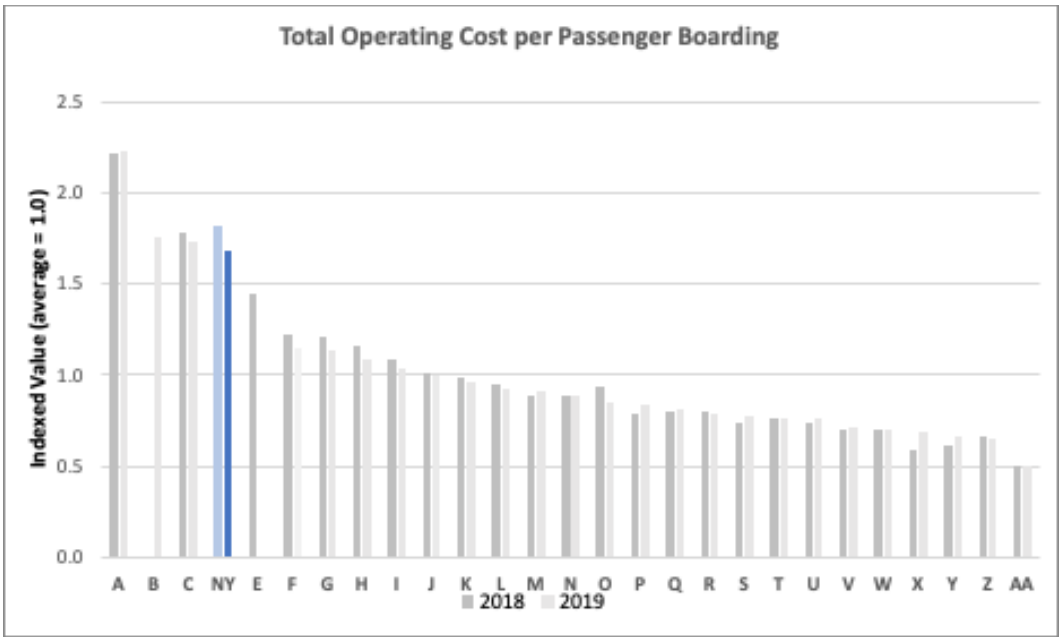
The international metros included in the comparison are:

- Buenos Aires Metrovias
- Mexico City Metro
- Montreal Metro
- New York City Subway
- Metro de Santiago
- Metro Sao Paulo
- Ottawa OC Transpo
- Metro Rio
- Toronto Subway
- Vancouver SkyTrain
- Metro de Barcelona
- Berlin U-Bahn
- Brussels Metro
- Istanbul Metro
- Lisbon Metro
- London DLR
- London Underground
- Metro de Madrid
- Moscow Metro
- Newcastle Tyne and Wear Metro
- Oslo T-Bane
- Paris Metro and Paris RER
- Bangalore Namma Metro
- Bangkok MRT
- Beijing Subway
- Delhi Metro
- Dubai Metro
- Guangzhou Metro
- Hong Kong MTR
- Kuala Lumpur RapidKL Rail
- Nanjing Metro
- Seoul Metro
- Shanghai Metro
- Shenzhen Metro
- Singapore MRT
- Sydney Metro
- Sydney Trains
- Tokyo Metro
- Taipei Metro

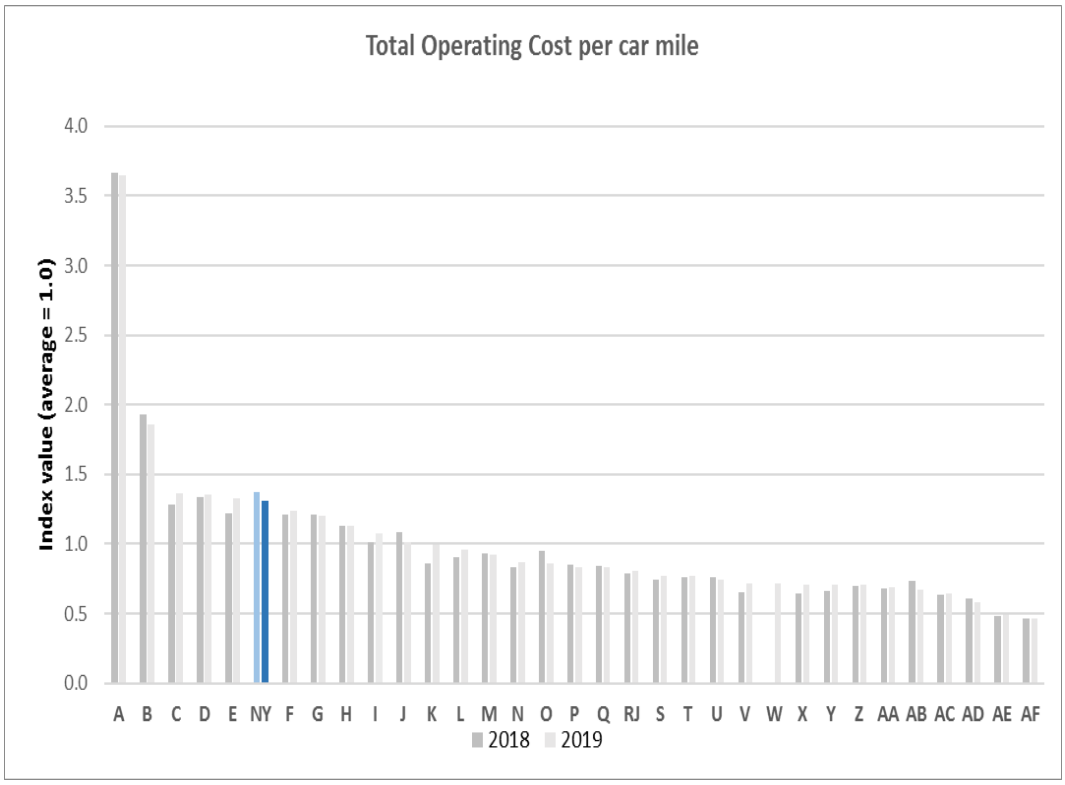
The charts developed for this report have been anonymized in line with the confidentiality agreement. The charts are indexed to an average value and each metro is represented by a letter. To maintain the anonymization, the lettering is unique to each chart. The most current year which comparable data is available is 2019.

International Benchmarking - Operating Costs

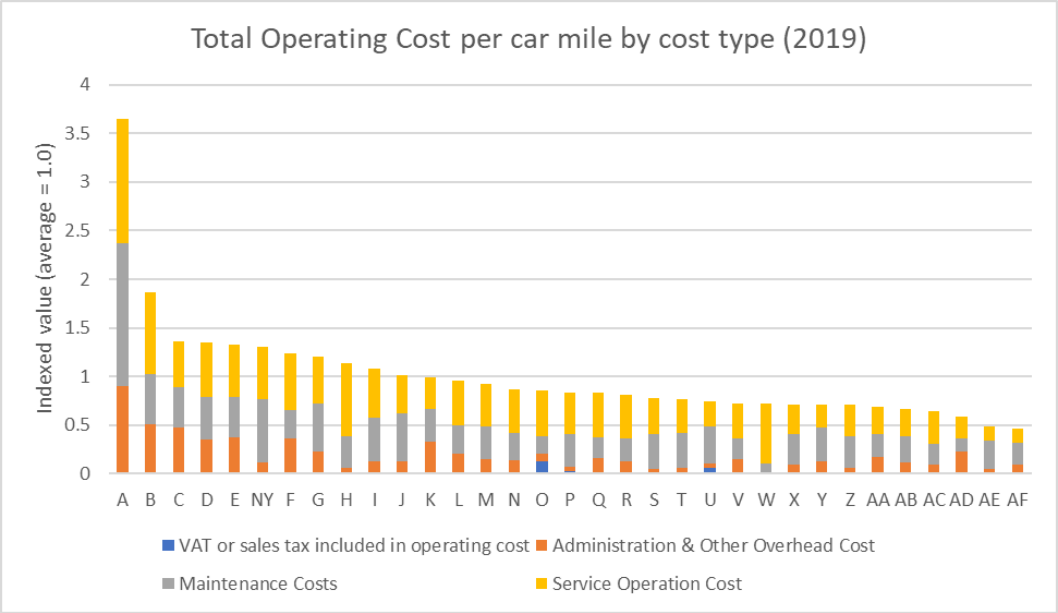
The following chart shows total operating cost per passenger for 2018 and 2019. While NYCT has the fourth highest cost per passenger among the international peer group, there was a notable decline from 2018 to 2019.



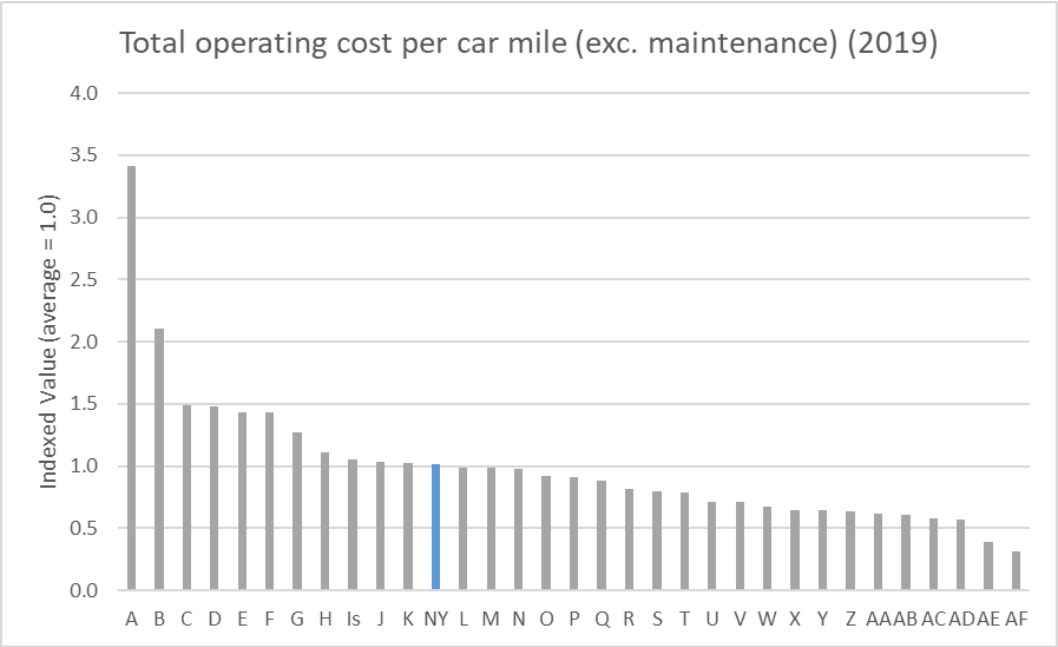
The 2019 total operating cost per car per revenue mile chart below shows all non-capital costs. These include both operations and maintenance costs. Between 2018 and 2019 NYCT total operating costs moved closer to the average.



The following chart shows the breakdown of costs between service operations, maintenance and administration. NYCT experienced a drop in total operating cost per mile between 2018 and 2019.

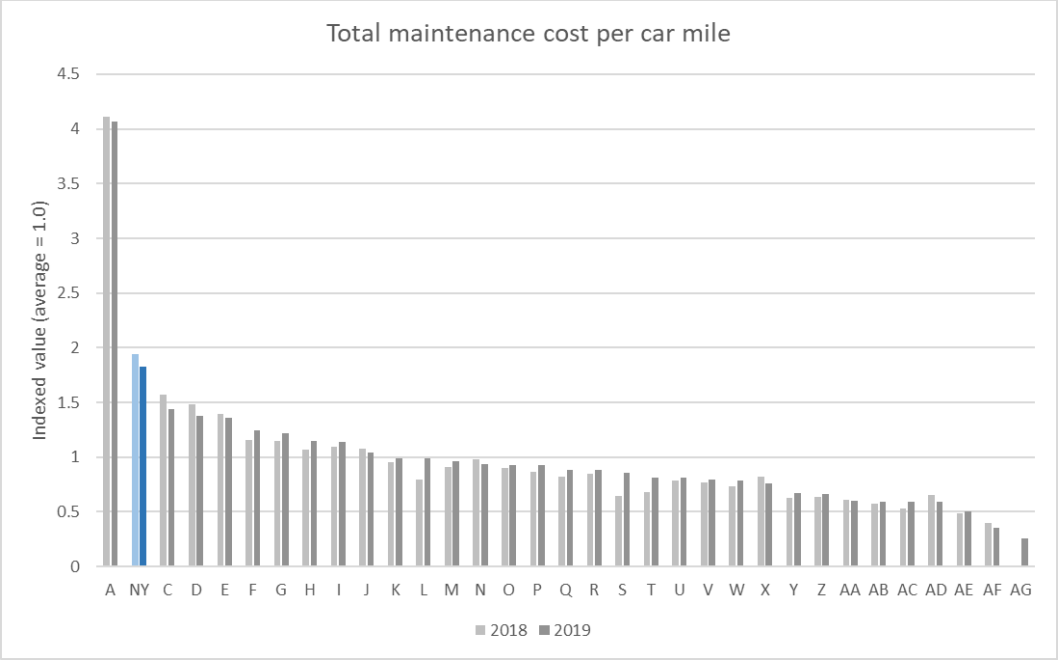


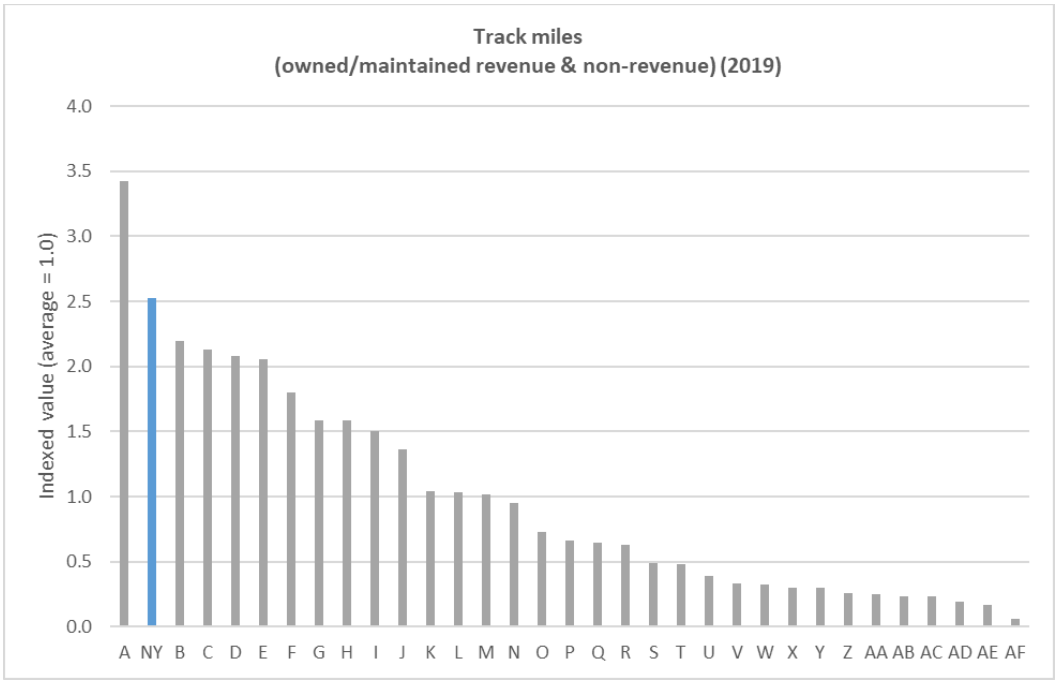
The following table includes the cost of service operation, administration and other overheads and sales tax; maintenance costs are excluded and shows NYCT operating costs (excluding maintenance) are at the average level for all COMET members.



International Benchmarking - Maintenance Costs

The 2019 total maintenance cost per car per revenue mile shows only non-capital maintenance costs. Only one COMET member spends more than NYCT on maintenance activities. NYCT maintenance costs moved closer to the average between 2018 and 2019.

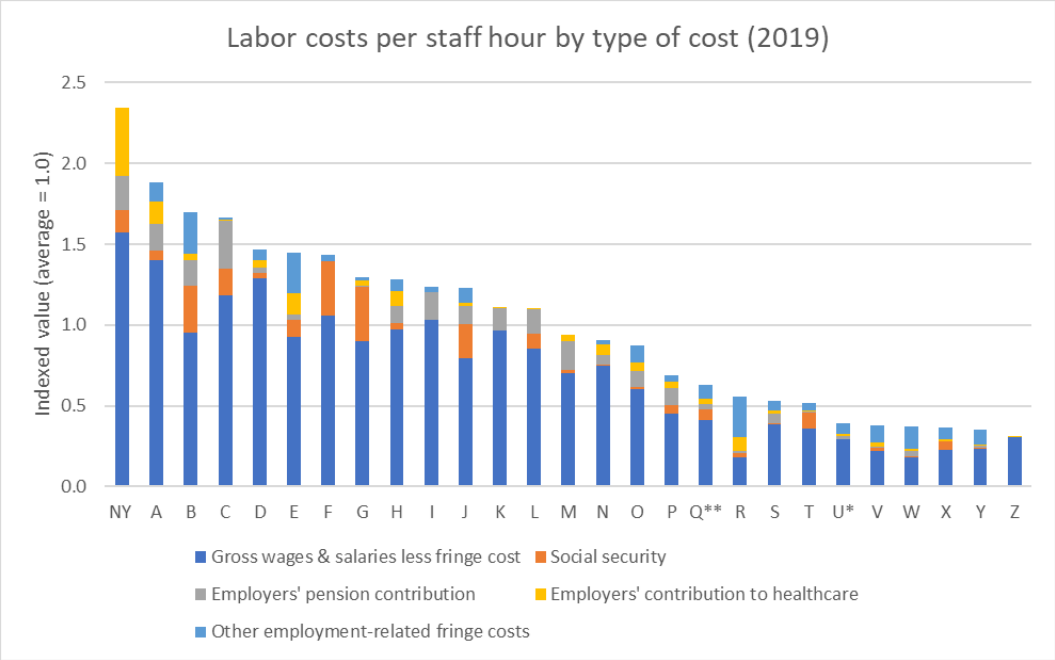




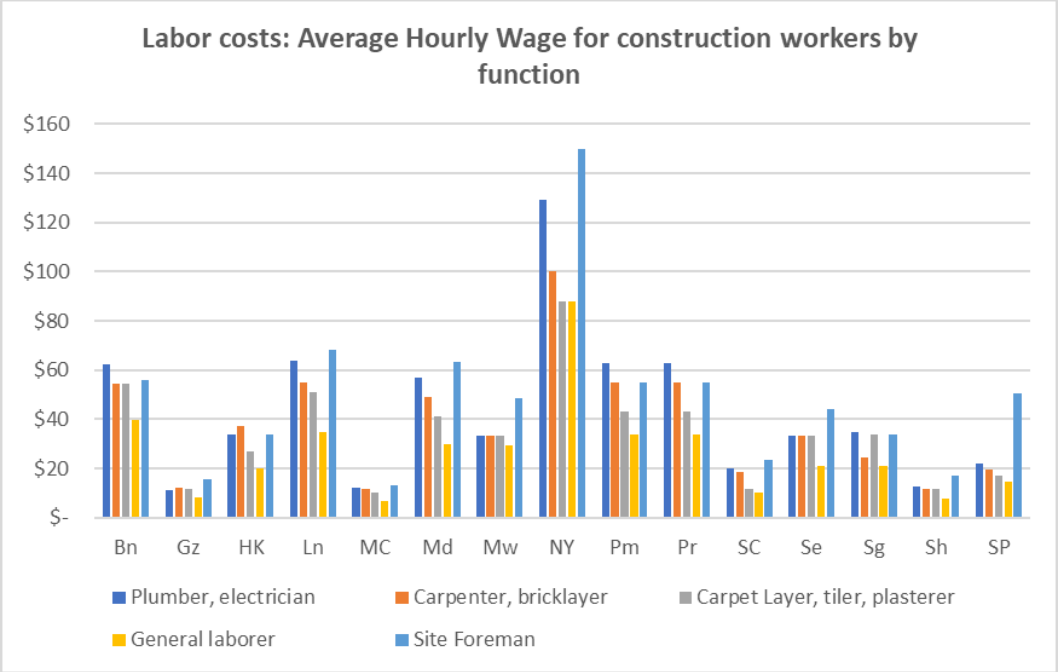
High maintenance costs for NYCT are largely attributable to 24-hour service.[1] Most COMET peer agencies shut down every night, allowing for four hours of continuous daily maintenance. In comparison, NYCT subway's 24-hour service requires maintenance to occur within 20-minute windows between late night trains, reducing work efficiencies. Additionally, maintenance costs for NYCT have risen recently to support the improvements as part of the Subway Action Plan, which have led to a significant improvement to on-time performance year over year since inception.

International Benchmarking - Labor Costs

Higher costs of labor also have a significant impact on the costs of operating and maintaining NYCT. The total labor costs for NYCT are over double the average for other agencies. This is due in part to health insurance costs (covered by Government in most other peer countries). The following graph shows that health insurance is the highest labor expense aside from wages and salaries.



[1] Due to the COVID-19 health crisis, NYCT subways temporarily suspended overnight service from May 6, 2020 to May 17, 2021.



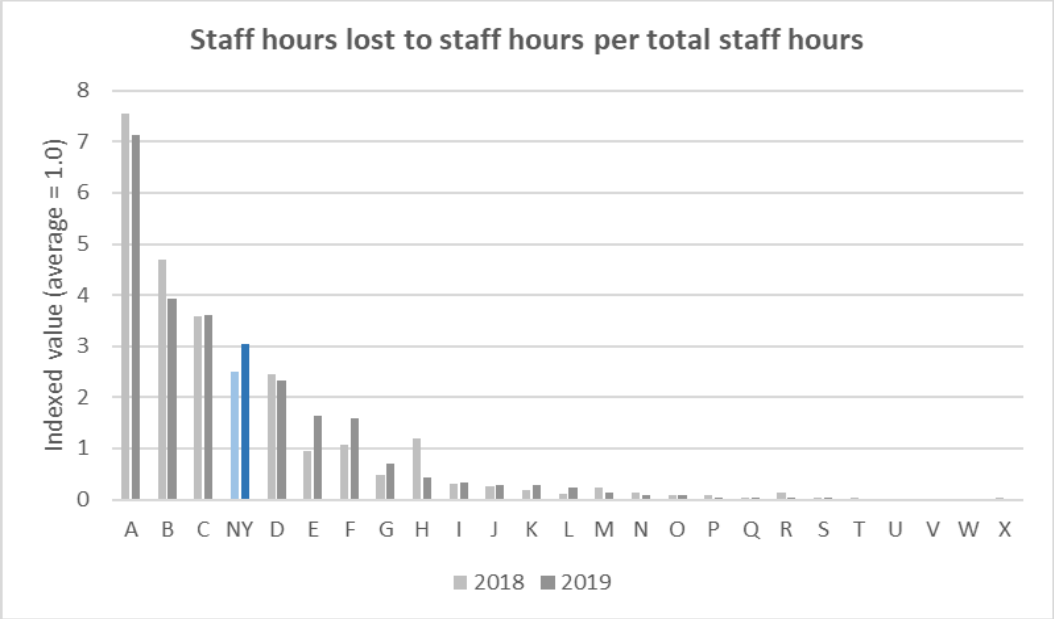
International Benchmarking - Passenger Journeys

NYCT provides slightly under the average of passenger journeys per total staff and contractor hours among international peers. The number of passenger journeys per total hours increased between 2018 and 2019, getting closer to the average.

Staff Hours Lost to Accidents

NYCT has the fourth highest proportion of staff hours lost per total staff hours, with a small increase between 2018 and 2019. There is a large range in this data which may be influenced by cultural factors, industrial relations and working practices, such as the extent to which staff who have had an accident can be reassigned to other tasks (i.e. "light duty") and still be productive.

One of the key drivers of staff hours lost at NYCT is the workers compensation program. The average number of unavailable days due to workers compensation/injured on duty causes more than doubled between 2010 and 2019, from 2.65 days to 6.84 days. The increase versus 1999 was even greater, when the number unavailable days totaled only 2.19. The MTA estimates that each one-day change in NYCT hourly employee average availability costs $17 million annually. To address the number and duration of employee unavailability, in June of 2019 the Workers' Compensation Division implemented a new, comprehensive litigation model to address meritless and excessive schedule loss of use ("SLU") claims (which may or may not relate to lost time from work) being filed with an increasing frequency. The WCD provided training and continuing oversight of outside counsel regarding the litigation of these claims. For the 12-month period prior to the implementation of the litigation model, the average amount of monthly SLU payments was $2.4 million. With the implementation of the litigation model, the average amount of monthly SLU payments from July 2019 through December 2019 was reduced to just under $1 million - a substantial reduction from the benchmark. WCD continues to focus on this initiative to drive improvement.



Efficiency Initiatives

NYCT is dedicated to utilizing KPI data and benchmarking to inform decision-making, improve service delivery and increase cost-effectiveness. The information contained in this report, and COMET participation has helped management identify areas of concern and opportunities for improvement. Some of the key initiatives currently underway or on the immediate horizon are:

Fleet Modernization

NYCT's Capital Program is making crucial investments in rolling stock to maintain and improve safety, reliability, and customer convenience. Major Rolling Stock projects that are already underway and will impact NYCT's operating environment over the next several years include:

- the purchase of a base order of 535 R211 cars from Kawasaki. This order includes 440 R211A cars, 20 R211T (Open Gangway test cars), and 75 R211S cars for the Staten Island Railway. As of October 2021, 10 R211A cars have been delivered and are undergoing qualification. Future options for the R211 program include 660 for Option 1 and up to 437 cars for Option 2.
- the delivery of R211 cars with Communications Based Train Control (CBTC) to support NYCT's on-going signaling modernization program.
- the purchase of 25 R255 Diesel-Battery hybrid locomotives that are compliant with all state and OSHA emission requirements.
- the conversion of 10 R77E electric locomotives to low emission units in support of on-going infrastructure work.
- the conversion of four R110A revenue cars to 2-pump and 2-generator cars for flood mitigation.

Safety Enhancements

A joint labor/management safety task force recently approved use, in certain instances, of a train as a safety barrier, instead of individuals flagging. This reduces the number of workers placed in traffic to provide a safe work area, thereby helping to improve the efficiency and reduce the cost of maintenance work on the track.

Enterprise Asset Management

NYCT Subways is in the final phases of a rollout of an asset management system that provides real-time data through use of hand-held devices for inspection and maintenance data. This in turn is available in dashboard format to inform managers of areas in need of dedicated resources, areas where managers are achieving more efficient results to allow for replication of best practice, and the use of mapping tools to better plan work and improve the efficiency of maintenance.

Schedule Optimization

NYCT seeks to make its base schedules as efficient as possible, while also ensuring reliable operations. In 2021 and 2022, NYCT is capitalizing on the results of the SPEED initiative to lift speed limits, calibrate timed signals, and adopt optimal operation techniques to reduce scheduled running times on selected lines. In addition to speeding up trips for passengers, the reduced running times allow for more efficient use of crews and reduced operating costs.

MTA Railroads

Performance measurement and the focus on key metrics is an important component of the management strategy of the MTA's railroads. Much of the work involves the daily review of performance, but equally important is understanding how MNR and LIRR compare to national and international peers. For this reason, the MTA railroads routinely share data with other operators, whether it's on an "informal" staff basis or through membership in groups such as the American Public Transportation Association (APTA), the Commuter Rail Coalition (CRC) or the International Suburban Rail Benchmarking Group (ISBeRG).

While it is true that benchmarking provides useful insights, it is also important to acknowledge that significant differences exist among the railroads that pose challenges for drawing apples-to-apples conclusions, particularly when it comes to comparisons with international peers. Differing local economies, prevailing wages and collective bargaining agreement provisions can have dramatic impacts on respective labor costs. Government mandates, including safety regulations, vary widely, and each railroad exists in a unique operating environment, often with different service schedules, geographic layouts and protocols. Together these factors have also have a significant impact on relative cost structures.

National Benchmarking

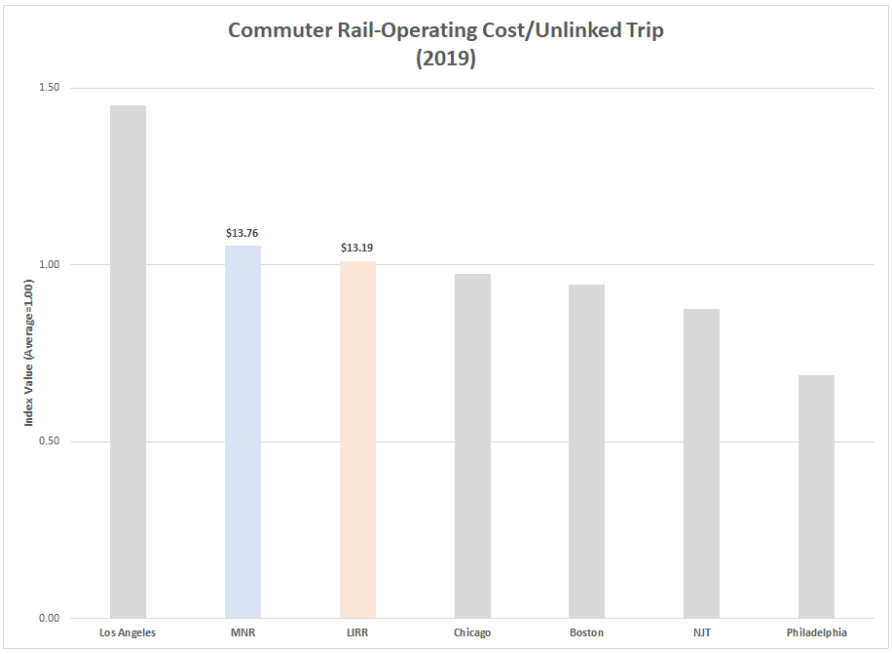
For comparison of MNR and LIRR operations and costs to domestic commuter rail systems, the Federal Transit Administration (FTA) collects operating and financial data for its annual National Transit Database (NTD). In this report, MNR and LIRR data is compared to the following peer systems in NTD:

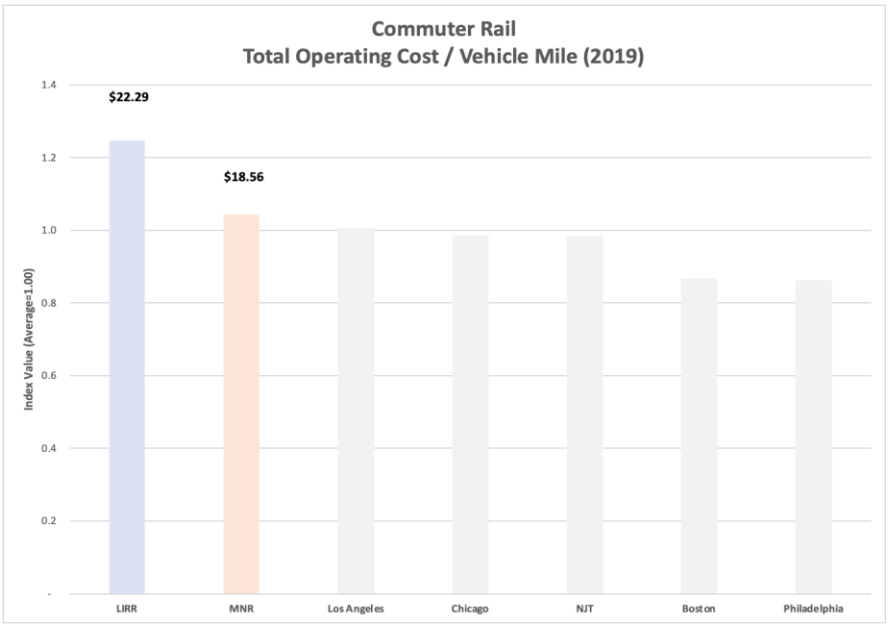
- New Jersey (NJ Transit)
- Chicago (Metra)
- Philadelphia (SEPTA)
- Boston (MBTA)
- Los Angeles (Metrolink)

National Benchmarking - Operating Costs

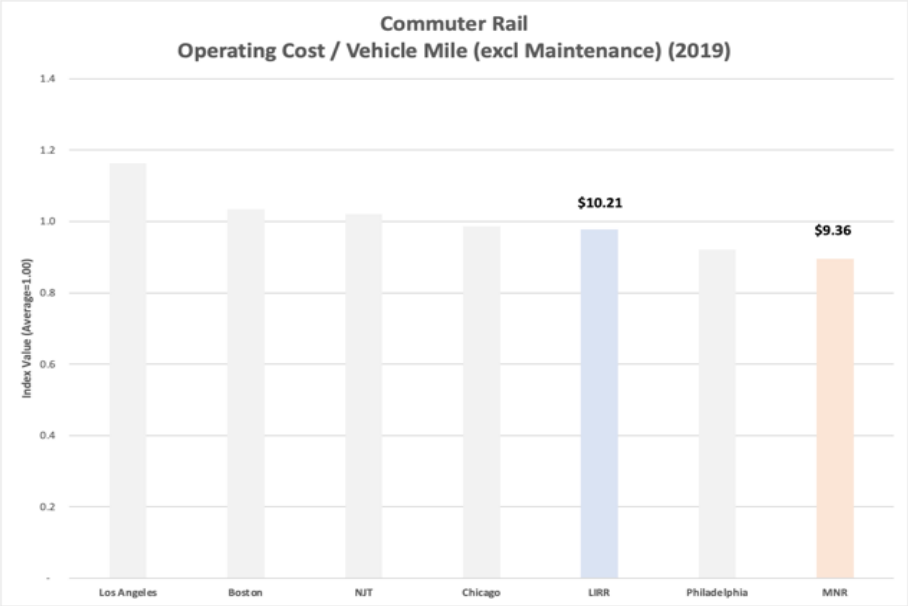
As shown in the following graph, among the seven national peer operators, the LIRR and MNR rank second and third highest when measured by average operating cost per trip. They are the highest when measured by cost per vehicle mile. As defined in the NTD, total operating costs include all train service, maintenance and administrative expenses. Some of the most significant operational factors that drive costs at MNR and LIRR include:

- Hours of Operation: LIRR provides 24 hours of service 7 days per week, and MNR provides 20-22 hours of service 7 days a week
- Ungated System: Neither LIRR nor MNR operate gated systems, therefore they require onboard fare validation/collection
- Branch Service: Both LIRR and MNR run service to and from a central business district (New York City) and do not have ability to offer through-running service
- Electrification: Both LIRR and MNR operate over both electrified and non-electrified territory, thereby requiring both electric and diesel fleets





It is important to note, however, that when one excludes maintenance costs from the equation, LIRR's costs per vehicle mile are just below average and MNR's are the lowest.



National Benchmarking - Maintenance Costs

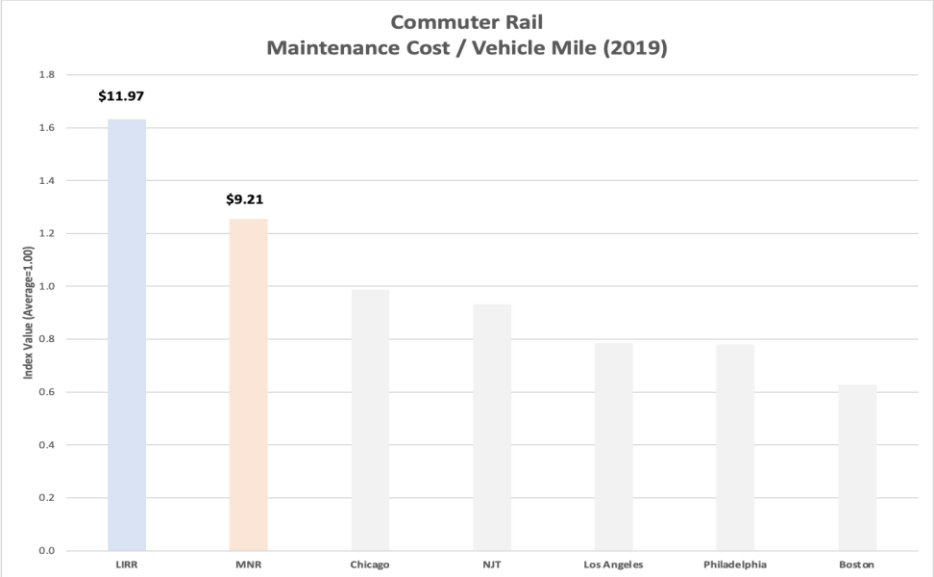
The following graph demonstrates that LIRR and MNR have the highest maintenance costs per vehicle mile among the peer group. Maintenance costs fall into two primary categories: those pertaining to the fleet and those pertaining to right of way infrastructure.

A primary driver of fleet maintenance costs at both MTA railroads is that they operate multiple fleet types, each with their own set of components, facilities and maintenance requirements.

For example, the LIRR operates an M3 electric fleet that is over 30 years old, an M7 fleet that is approaching 20 years old, a C3 diesel coach fleet that is just under 25 years old, and a fleet of diesel locomotives that is also approaching 25 years old. It was not until 2020 that the first new M9 cars became arriving on the property and being placed into service.

MNR also uses M3s and M7s on its Hudson and Harlem lines that are comparable in age to LIRR. MNR received a fleet of M8s for the New Haven Line that arrived in the early 2010s. The M8s have dual power modes utilizing third rail as well as overhead catenary. Finally, MNR utilizes dual-mode diesel locomotives for non-electrified territory at the outer reaches of the service area.

Right of way maintenance costs at MNR and LIRR are largely driven by the railroads' strong commitment to maintaining their infrastructure assets in a state of good repair. This requires the dedication of substantial in-house staff resources including trackworkers and signalworkers.

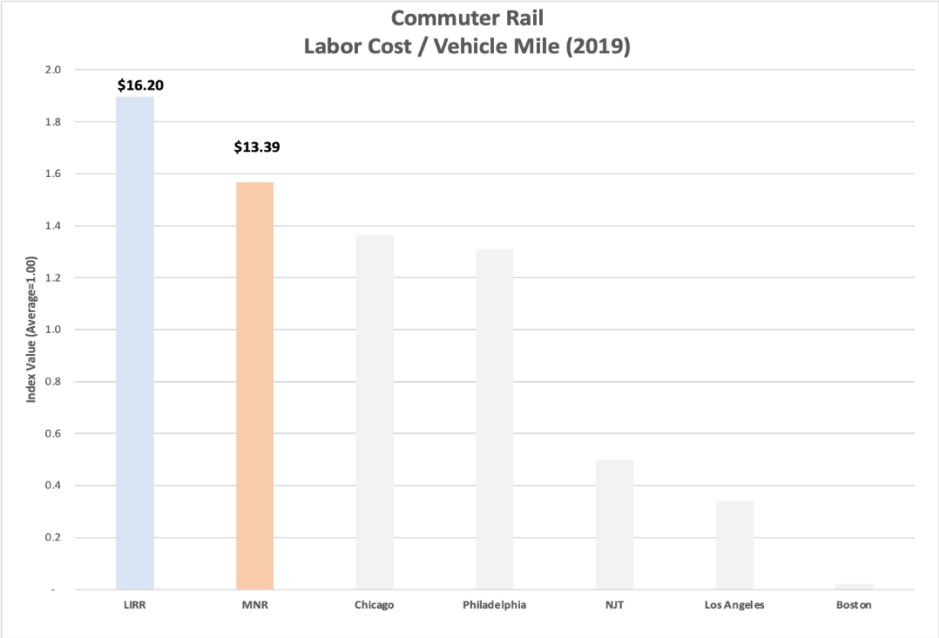


National Benchmarking - Labor Costs

Labor-related costs including fringe benefits represent between 50 and 60% of total costs at the LIRR and MNR. As discussed earlier in this report, benchmarking labor costs among peers is challenging because costs of living differ by region, and each railroad has its own unique set of collective bargaining agreements, benefits packages and wage patterns.

Nevertheless, the following table shows that LIRR and MNR have the highest labor costs per vehicle mile among the national peers. There are several factors that drive labor costs at the MTA commuter railroads including:

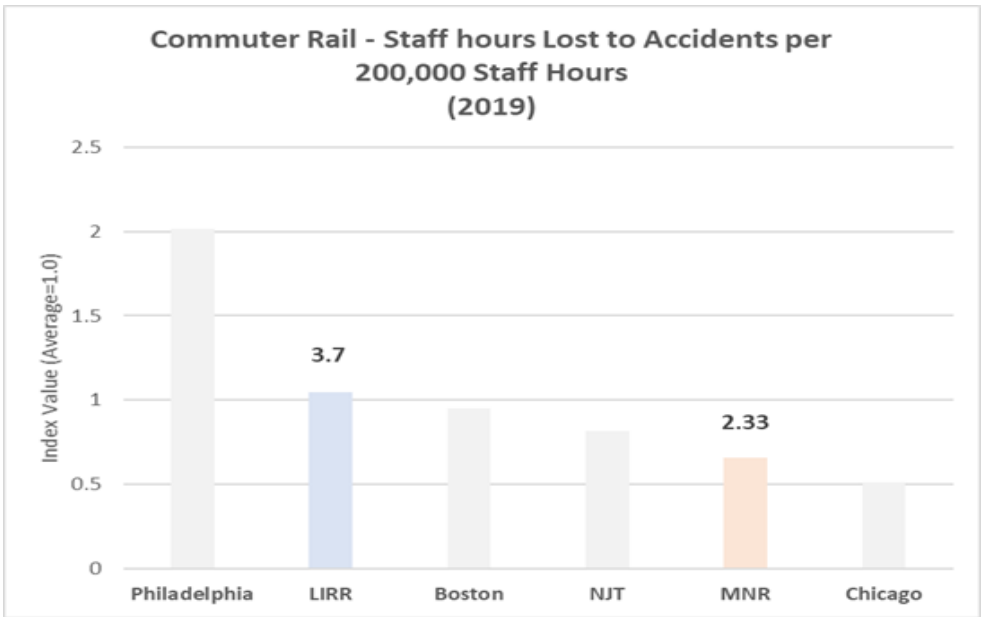
- Force Account vs Third Party: In many instances, the MTA railroads perform work in house rather than using third party contractors and consultants
- Unfunded Pension Liability: Labor costs at the LIRR include expenses related to covering the unfunded liability of a closed pension plan



Boston and Los Angeles contract for commuter rail service; Labor costs are limited to Administration

MNR has continued an aggressive infrastructure renewal program by expanding Maintenance of Way spending and staffing since 2014. This has also been accompanied by additional staffing in the areas of safety and training.

National Benchmarking - Employee Injury Rate



Over the past five years, Metro-North Railroad's Office of System Safety has launched a series of successful programs and initiatives aimed at improving employee and customer safety. An increasingly data-driven

and holistic approach to safety solutions combined with new messaging and communication strategies has led to a steady decline in both employee and customer injuries.

For employees, MNR has placed a strong emphasis on employee training with initiatives such as New Employee Safety Orientation, specialized Supervising for Safety training and quarterly Safety Focus Weeks where targeted safety topics are covered with all employees, including reviews and lessons from actual safety incidents. MNR also engages employees and recognizes their contributions with initiatives like the annual Safety Excellence Awards, where employees nominate coworkers who have made an exemplary effort to improve the railroad's safety, reliability and efficiency. Additionally, MNR's Safety Culture Survey is used to evaluate programs, establish priorities and monitor performance.

Long Island Rail Road's corporate safety program works toward an accident-free workplace through the implementation of a comprehensive, sustainable, and measurable safety initiative. This initiative is a collaborative effort between the Corporate Safety Department, LIRR operating, support, and administrative departments, and labor partners. Designed to engage every level of the organization in promoting the value of safety, communication of safety begins at the highest executive levels and is reinforced through the entire workforce.

LIRR conducts quarterly "Safety FOCUS Days" across the agency, each attended by approximately 4,000 employees. Additionally, LIRR's participation in C3RS, a collaborative effort between management, labor, and the FRA, provides a mechanism for employees to confidentially report incidents that could have resulted in operating and safety incidents.

In November 2019, LIRR was recognized by the Federal Railroad Administration for a nation-leading program that dramatically improved railroad safety. The implementation of flexible delineators at railroad crossings and enhanced GPS alerts through a partnership with technology companies virtually eliminated motorists from inadvertently turning into train tracks.

LIRR and MNR continue to prioritize the safety of customers and communities through the "Together Railroads and Communities Keeping Safe" (TRACKS) program. TRACKS is a free community outreach program that covers grade crossing safety, rider safety, trespassing and suicide prevention. TRACKS is designed for students, drivers, customers, pedestrians and residents who work and live in or around the communities MNR and LIRR serves. The success of the TRACKS program earned the Gold Award for Safety In 2018, the highest safety award presented by the American Public Transportation Association (APTA).

International Benchmarking

For comparison to international commuter rail systems, MNR and LIRR data is provided to ISBeRG, an international benchmarking group for suburban rail operators. ISBeRG's principal aim is to identify and share best practices in a confidential environment. The group is managed by the Transport Strategy Centre (TSC) at Imperial College London. Through ISBeRG, members share comparative KPI data and conduct in-depth benchmarking studies on issues of shared interest. ISBeRG also offers an online forum for immediate inquiries to members about specific issues and strategies.

ISBeRG uses different definitions for the required benchmarking data than that of COMET and NOVA.

In this report, LIRR and MNR data is compared to the following ISBeRG members:

- JR East (Tokyo)
- Sydney Trains (Sydney)
- Metro Trains (Melbourne)
- Ferrocarrils de la Generalitat de Catalunya (Barcelona)
- PRASA (Cape Town)
- Queensland Rail (Brisbane)

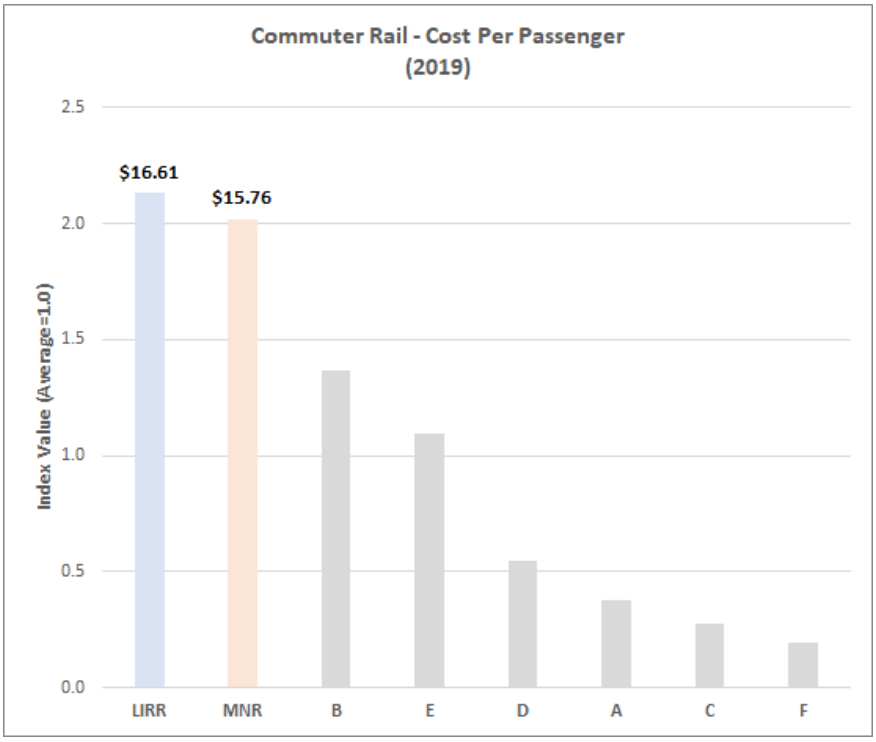
The charts developed for this report have been anonymized and indexed to the average, in line with the confidentiality agreement. To maintain anonymization, the lettering is unique to each chart. The most current year which comparable data is available is 2019. It is important to note that conducting metrics benchmarking versus international peers is difficult because each commuter railroad operates in a unique environment with widely varying mandates and service standards, and within dramatically different economies that affect labor and non-labor unit costs.

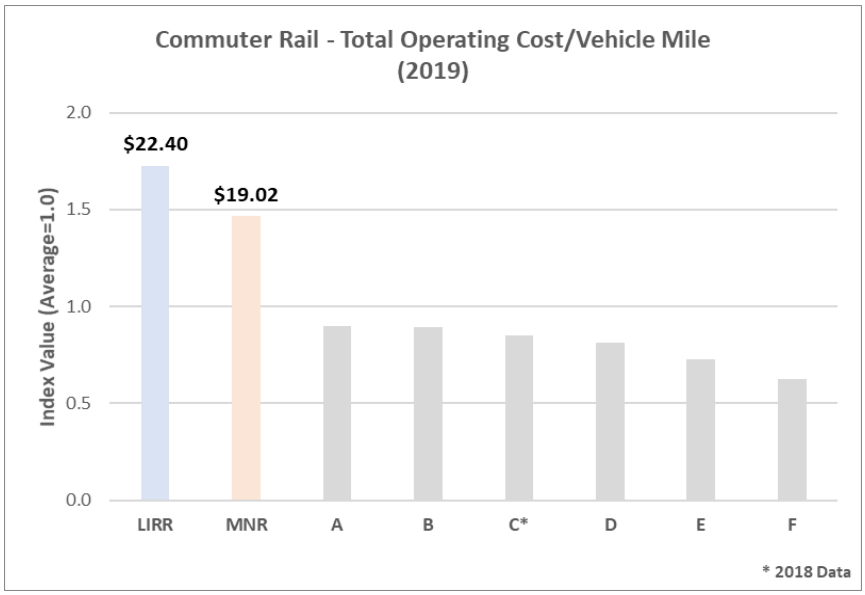
International Benchmarking - Operating Costs

The following graphs demonstrate that the two MTA railroads have the highest total operating cost per trip and per vehicle of the eight selected ISBeRG peers. There are many reasons for this variance, some of which are operational in nature and some of which are financial in nature.

From the operational perspective, MNR and LIRR operate in an ungated environment, which requires additional onboard train crew staffing to validate and collect tickets. This contrasts to most of the ISBeRG peer agencies, which have gated or proof-of-payment systems that do not require this level of staffing. The two railroads fall more in line with peer agencies when factoring this out of benchmarked agency operating costs.

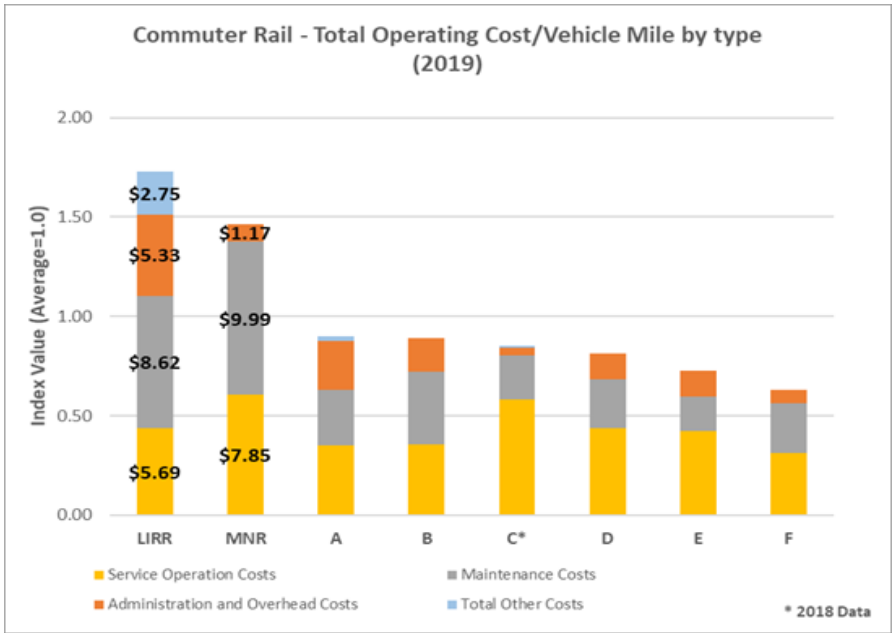
Another consideration is that many international commuter rail systems feature through-running from one branch to another through their Central Business District (CBD), offering an efficient operating environment. In contrast, MNR and LIRR run terminal service operations into New York's CBD, which requires making additional non-revenue train moves and drives up costs.





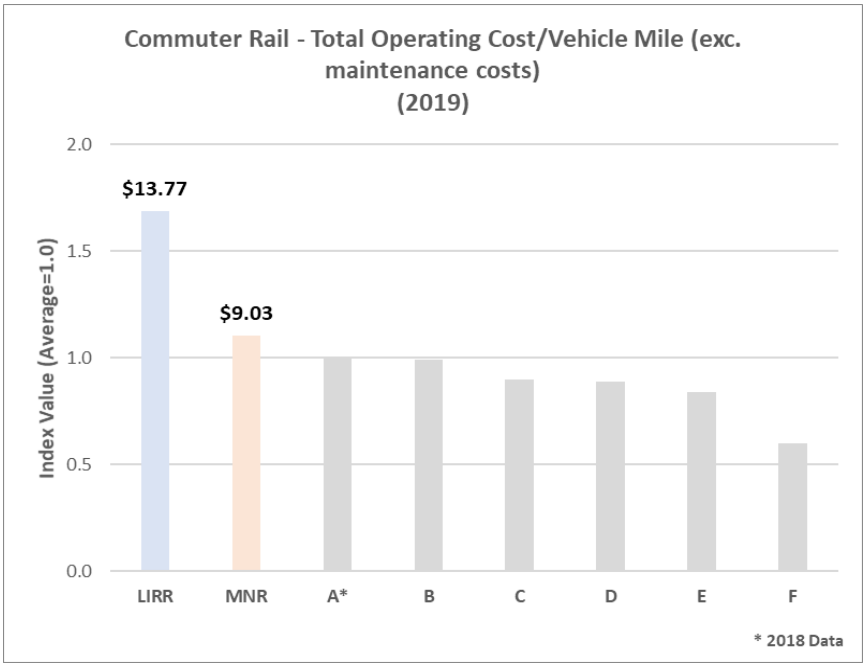
The following chart shows that one of the biggest drivers of cost variances between the MTA railroads, particularly the LIRR, and their peers is the category of administrative costs. This is largely because almost half of the LIRR's administrative costs are attributable to pension contributions. In many of the other agencies, including MNR, these costs are incorporated into functional departments and not counted as administrative in nature. In addition, as discussed in other parts of this report, fringe benefits costs such

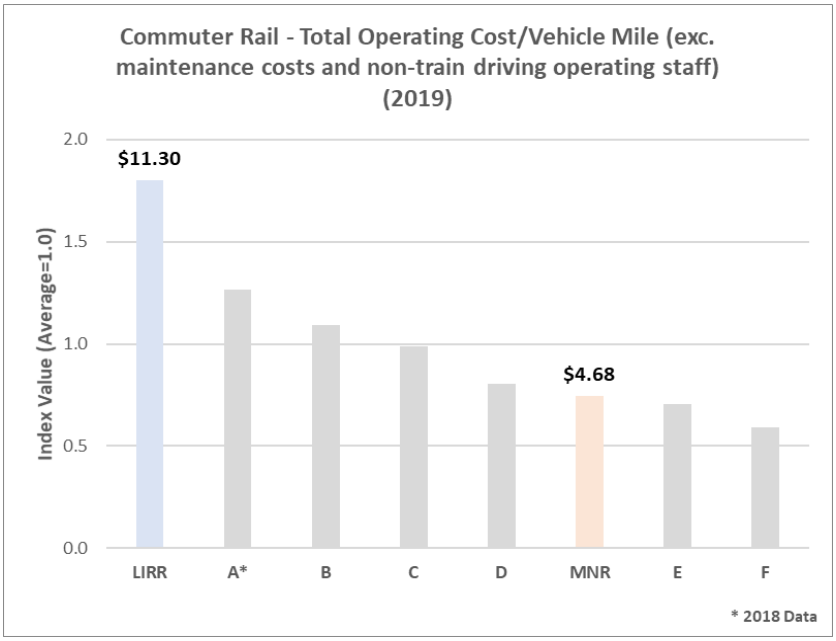
as pensions and health insurance are incurred by MNR and LIRR directly, whereas they are covered by governmental entities in many ISBeRG countries.

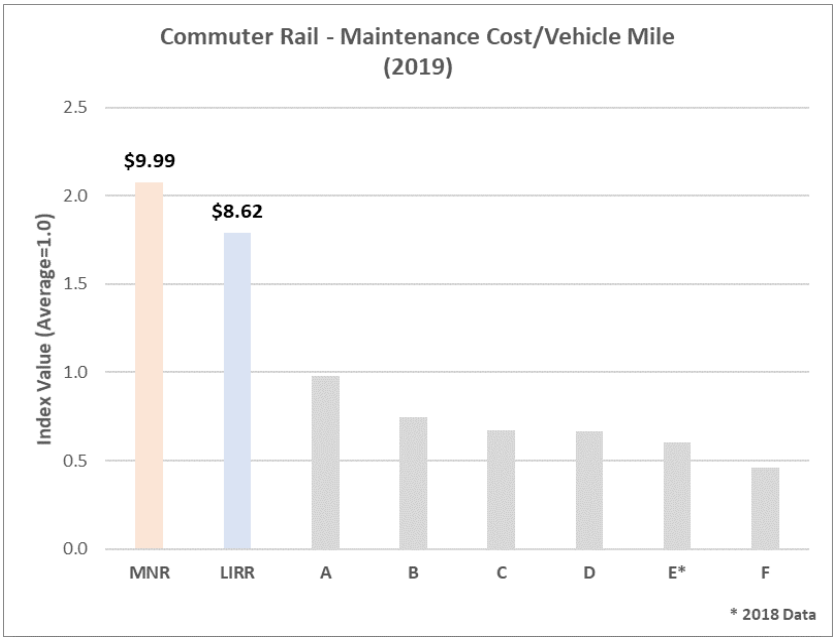


International Benchmarking - Maintenance Costs

The following three charts provide greater detail on the operating costs of the benchmarked agencies and show that maintenance expenses are a major factor that explains the cost differential between the two MTA railroads and their international peers.







FRA Regulations require more frequent inspections of train equipment and infrastructure, which drives up maintenance and total operating costs. Each fleet type is scheduled for maintenance events at various shop and yard locations. Daily inspections and brake tests are performed, in addition to 92-day, 180-day, 1-year interval maintenance events.

A significant amount of state of good repair work is being done in the MTA region, driving up both maintenance and total operating costs. Planned maintenance programs consist of interval based preventive maintenance and fleet modification programs in efforts to provide optimum levels of rolling

stock safety, reliability and availability. Reliability Centered Maintenance (RCM) procedures have contributed to the fleets' improved performance measured by Mean Distance Between Failure (MDBF) and On Time Performance (OTP). Additionally, interior cleaning is also a critical part of the maintenance plan adding to higher overall maintenance costs.

High demand for service during peak and off-peak periods causes high duty cycles with limited contact time resulting in loss of workforce efficiencies. High service demands additionally result in reduced spare ratios and maintaining a higher level of reliability.

In recognition of these challenges, the railroads have launched several productivity and cost-cutting efforts, which are detailed on pages 27-30 of this report.

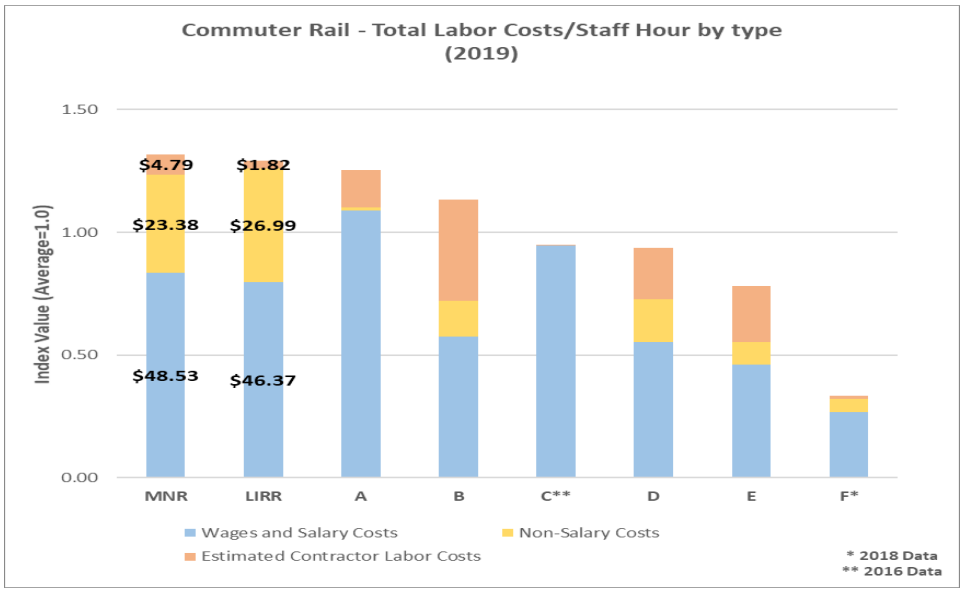
International Benchmarking - Labor Costs

Labor related costs including fringe benefits represent between 50% and 60% of total costs at the LIRR and MNR. As discussed earlier in this report, benchmarking labor costs among peers is challenging because costs of living differ by region, and each railroad has its own unique set of collective bargaining agreements, benefits packages and wage patterns. As with NYCT, MNR and LIRR have high labor costs associated with New York's high cost of living and wages and health care costs.

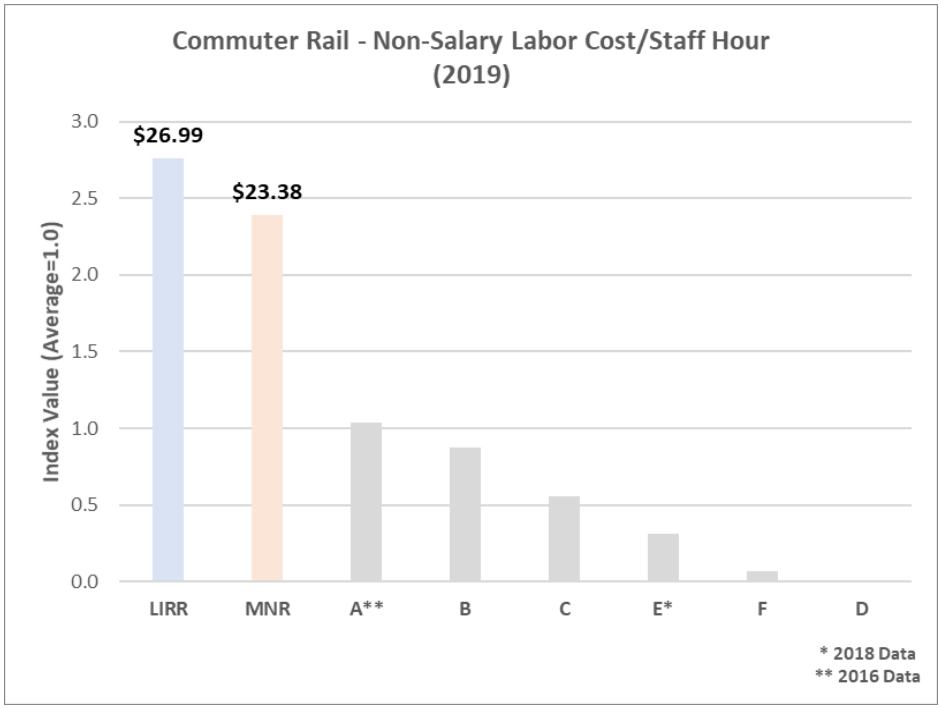
There are several factors that drive labor costs at the MTA commuter railroads including:

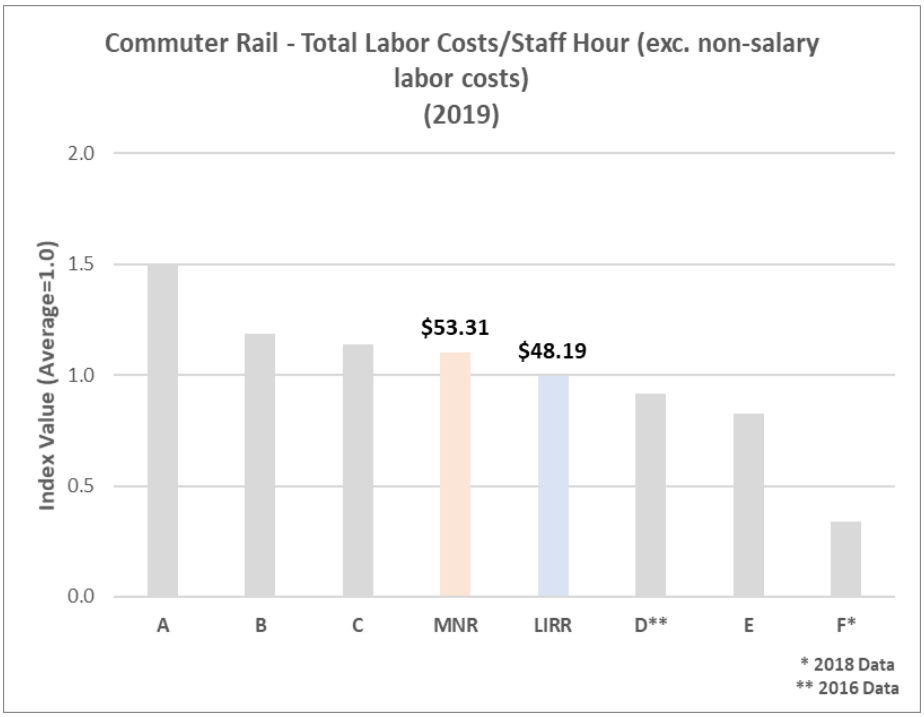
- Force Account vs Third Party: In many instances, the MTA railroads perform work in house rather than using third party contractors and consultants
- Unfunded Pension Liability: Labor costs at the LIRR include expenses related to covering the unfunded liability of a closed pension plan
- East Side Access: in recent years, the LIRR has begun to ramp-up staffing in advance of East Side Access opening day, which is not scheduled to launch until 2022.
- On Board Fare Validation and Collection: Since LIRR and MNR are ungated systems, they must deploy sufficient train crew staff for fare collection

The table below shows that LIRR and MNR have the highest labor costs per staff hour among the international peers.



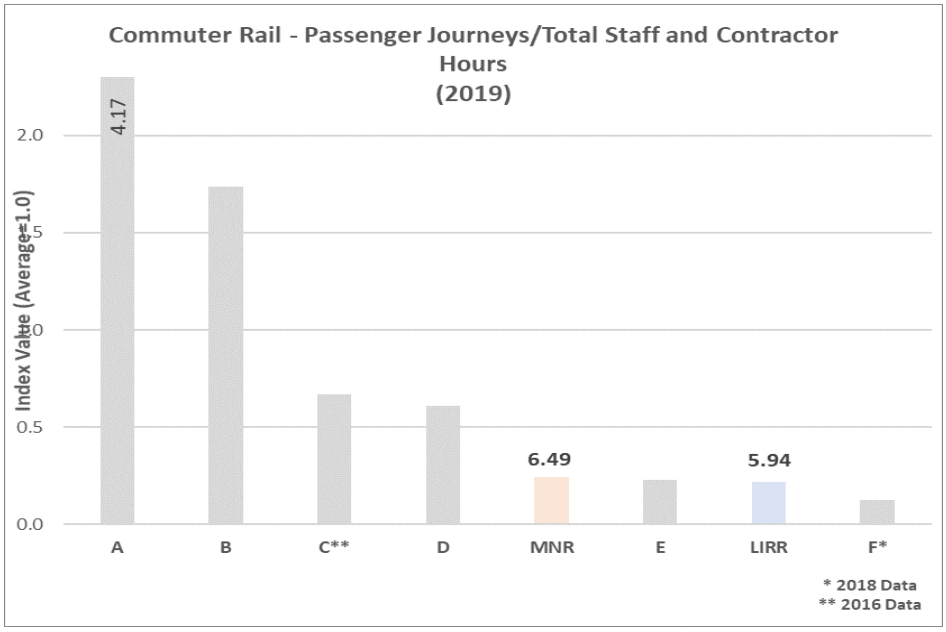
The following tables highlight the impact that non-salary expenditures have on total labor costs. Composed primarily of pension and benefits costs, these mandated expenditures are dramatically higher than those of the other ISBeRG members. When excluding these non-salary costs, both railroads place in the middle of the spectrum.



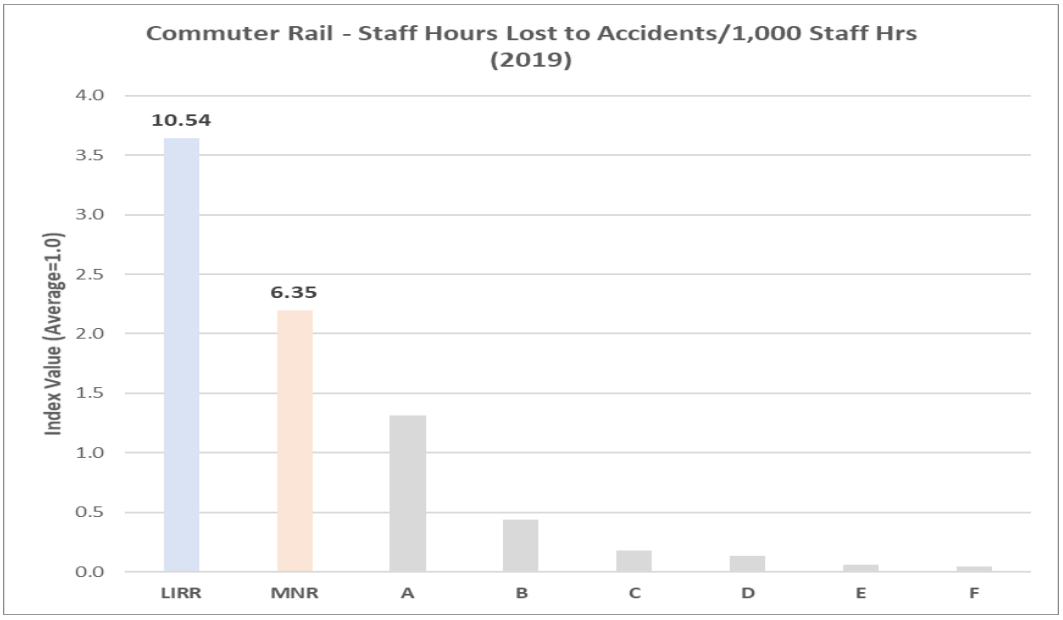


International Benchmarking - Passenger Journeys

MNR and LIRR operate in an ungated environment, which requires additional onboard train crew staffing to validate and collect tickets. This incremental staff need results in a lower metric as shown in the following tables.



International Benchmarking - Staff Hours Lost to Accidents



While benchmarking safety performance to international peers is challenging due to widely varied reporting and criteria, the railroads do analyze the data and use it to drive decision making. The most significant cause of employee lost time due to accidents at the MTA railroads are slips, trips and falls that result in soft tissue injuries. At the LIRR, the Corporate Safety Department launched a "Walking Is Working" campaign to raise awareness about hazards that can exist on the property. The campaign highlighted concrete strategies and tips for reducing risk. Leveraging membership with the National Safety Council, posters, toolbox/tailgate talks and five-minute safety talks are distributed each week for use by employees in their safety meetings and job briefings. MNR efforts, including the New Employee Safety Orientation Program, the Annual Safety Excellence Award Program and the Safety Culture Survey are discussed on page 19 of this report.

MTA Railroads Efficiency Initiatives

The MTA railroads use benchmarking information developed through ISBeRG, such as KPI data and in-depth study findings, to identify best practices and inform decision-making. Benchmarking provides comparative information across all aspects of operations and support, including safety, service quality, and cost-effectiveness, which enables the railroads to assess how current and future programs and plans align with those findings. The data reveals that there are several key opportunities to reduce costs including modernizing the fleet, applying effective fleet maintenance, proactively addressing right of way maintenance, and improving employee availability. These are among the key principles of the LIRR Forward Program and MNR's Way Ahead Plan, each of which focus on conducting enhanced preventative maintenance to improve service reliability and reduce costs in the long term. The benefits of these investments have been evident on both railroads in recent years with improved on-time performance (OTP) and increased mean distance between failures (MDBF) for rolling stock. The following are examples of initiatives currently underway and planned that address areas ripe for improvement.

Fleet Modernization

The LIRR's Capital Program is making crucial investments in rolling stock to maintain and improve safety, reliability, and customer convenience. Major Rolling Stock projects that are already underway and will impact the LIRR's operating environment over the next several years include:

- Purchase of 202 M9 electric cars to replace the aging M3 fleet and expand service. As of December 2021, 114 cars have been Conditionally Accepted with all 202 cars scheduled to be accepted by the 4th quarter of 2022;
- Purchase of 54 M9 option cars to continue the expansion of LIRR fleet. Negotiations with the M9 car builder are ongoing; and
- Purchase of up to 10 work locomotives to replace an aging fleet that is very expensive to maintain and has low reliability. Procurement is ongoing and is trending to a 3rd quarter 2022 award.

In addition to the Rolling Stock projects that have commenced or are scheduled to be underway by 1st quarter 2022, the LIRR's Capital Program also includes funding for the following fleet projects:

- Purchase of 160 M9A electric cars for ESA service.
- Purchase of 30 coaches and up 10 Dual Mode Locomotives to address service needs and ridership growth and LIRR's non-electric fleet service

Separately, the LIRR has begun a study to determine the feasibility of being the first in the nation to use battery-operated trains in the non-electrified territory. This may result in significant environmental and customer service improvements across the LIRR.

Metro-North has the following rolling stock acquisitions in process, both of which are included in the 2020-2024 Capital Program:

- Purchase of additional 66 M8s for use on the New Haven Line. Delivery of all 66 new M8s are currently estimated by June 2022.
- In December 2020, MTA Board approved a contract with Siemens Mobility Incorporated to purchase 27 new locomotives to replace 27 existing Genesis P32s owned MTA/MNR. Also, the Connecticut Department of Transportation is participating in this contract to obtain 5 new locomotives to replace their Genesis P32s that are used in the Metro-North system.

Fleet Maintenance

Reliability-Centered Maintenance (RCM) is a process used to determine the maintenance requirements of rolling stock in its operating environment. The key principle of RCM is to evaluate the performance and life cycle of asset components and to perform scheduled maintenance at a frequency that corresponds to this information rather than per the schedule by original manufacturers.

The adoption of the RCM principles and procedures by LIRR has enabled it to optimize the maintenance plans for increased reliability and resource efficiencies. RCM procedures have contributed to the fleets' improved performance as measured by Mean Distance Between Failure (MDBF), Mean Distance between Component failure (MDBCF) and On Time Performance (OTP). The RCM program has resulted in the LIRR being able to extend fleet maintenance repairs including those related to the Heating/Ventilation/Air-Condition System (HVAC), air brakes, batteries and couplers.

In 2019, LIRR modified an M3 train with laser technology to mitigate the negative effects of the leaf season on train performance in the fall. By utilizing the laser technology and two high-pressure washer trains with increased pressure from 4,000 to 20,000 psi the Railroad was able to effectively cover more territory daily. These innovative approaches have made a big difference by reducing the low adhesion related train delays as compared to the same period in the previous year.

MNR's Maintenance of Equipment Department produces and executes an annualized Maintenance Plan, which in turn supports the 20-Year Rolling Stock Plan. RCM at Metro-North Railroad is applied to assure the design level of reliability, safety and regulatory compliance. Evaluation and adjustment of the Maintenance Plan to improve rolling stock availability and performance is achieved through continuous assessment. Reliability Centered Maintenance has contributed to the MNR fleets' improved Mean Distance Between Failures (MDBF) and Consist Compliance.

Right of Way Maintenance

The LIRR is taking several important steps to perform infrastructure maintenance more cost effectively with an eye toward improving service reliability. For example, the LIRR increased the frequency of rail safety tests performed by a Sperry Rail Car, a train car fitted with ultrasonic and induction test equipment designed to detect internal rail defects that are not readily visible from two times per year to three times per year. These investments have produced positive results, as the number of train delays caused by infrastructure defects and failures dropped dramatically.

Over the last couple of years, there has been an unprecedented increase in major construction projects (mainline third track between Floral Park and Hicksville, double track between Farmingdale and Ronkonkoma, East Side Access, etc.) along the right of way resulting in full branch extended weekend shutdowns. The LIRR has taken advantage of these continuous shutdowns to perform maintenance work as well. The full weekend shutdowns allow the maintenance employees to be significantly more productive.

As part of LIRR Forward, the right of way maintenance group has proactively rebuilt priority switches, rails and track circuits to reduce unplanned maintenance. The LIRR has also been proactive in working with PSEGLI to replace over 200 PSEGLI utility poles.

MNR's updated strategy launched in Summer 2021, called Way Ahead – Moving Forward, includes a commitment to accelerating maintenance and major rehabilitation projects to support safe and reliable train service. Plans include expansion of the SMARTRACK program (described below), partnering with MTA C&D on the first phase of the Park Avenue Viaduct Rehabilitation project, to minimize customer impacts; improving infrastructure planning and project delivery by integrating schedules for maintenance and rehabilitation projects; and advancing the cyclical replacement of rail through a new, dedicated rail gang.

MNR has continued to expand its SMARTRACK Program, in which crews undertake critical infrastructure work by strategically shutting down continuous segments of track, giving multiple work groups uninterrupted access to maintain and improve the system. As one example, MNR expedited the replacement of four track switches at a critical interlocking directly south of the Scarsdale Station (CP119) in less time than originally planned, resulting in less impact on train service and an increased improvement in the reliability of Harlem Line train service.

In addition, MNR took advantage of reduced service levels due to COVID-19 to provide extended work access to multiple work sites across MNR territory to improve the infrastructure. This critical work continues to increase rail service reliability by reducing infrastructure-related train delays. Examples include track rehabilitation work in Grand Central Terminal; cable installation and signal house work for the Waterbury Branch Cab Signal Project, which took advantage of bussing on the branch line because of COVID-19; acceleration of the Tree Trimming Program, which mitigates against extreme weather events by trimming or removing trees along the MNR right-of-way that can fall on MNR tracks; installation of fiber for Positive Train Control; and multiple bridge construction projects in Mount Vernon.

Through the work of MNR's Production Tie Gang, Safety (FRA) and Maintenance exceptions were reduced considerably between the Fall 2019 and Spring 2020. Track Geometry Inspection Services (TGIS) scans results indicate MNR reduced Maintenance Exceptions by 9% and reduced Safety (FRA) Exceptions by 12% during this same period. Switch Failure Incidents decreased by 10% from the prior year's monthly average.

MNR also deployed its own Brandt Road Rail Powered Continuous Work Platform (CWP). The CWP is made up of nine connected rail cars with an articulated digging arm and other attachments that can travel the length of the consist to load or unload materials (e.g., stone, riprap, dirt, debris) from the side of the train. The CWP is used to remove large debris, stabilize the track bed and shoreline, and expedite the restoration of passenger service after a storm. It can carry 425 tons, allowing it to distribute or remove

large amounts of material quickly and efficiently. Shoreline restoration often requires the replacement and movement of ballast and large riprap, which can be very time consuming without the right equipment. Obtaining its own CWP ensures MNR has this important resource available on demand. As one example, in the aftermath of Hurricane Ida, the MNR CWP worked 24/7 for several weeks and can be credited with helping to restore passenger service more quickly.

Public Metrics Reporting

The MTA was also directed to prepare and publish meaningful and informative performance metrics for all customer trips provided by New York City Transit Authority (subways), Long Island Rail Road (LIRR) and Metro-North Railroad (MNR) on a monthly basis. The monthly reports cover:

- **Additional platform time** (for the subways, the average added time that customers spend waiting on the platform for a train, compared with their scheduled wait time)

- **Additional train time** (for the subways, the average additional time customers spend onboard the train [due to various service issues], compared with their scheduled on-train time)

- **Customer journey time performance** (for the subways, the percentage of customer trips with an estimated total travel time within five minutes of the scheduled total travel time)

- **Elevator availability** (for the subways, LIRR and MNR, the percentage of time that elevators are operational systemwide)

- **Escalator availability** (for the subways, LIRR and MNR, the percentage of time that escalators are operational systemwide)

- **Additional journey time** (for the subways, the comparison of measured or estimated actual journey time compared to schedule)

- **Journey time** (for the subways, time on platform and the time on train. Journey time is calculated as either actual journey times that customers experience, or as scheduled journey times. Journey time and its components may be based on a manual or an automatically generated sample)

- **Major incidents** (for the subway, incidents that delay fifty or more trains where a train is considered delayed if it is more than five minutes late or skips planned stops; for MNR and LIRR, incidents that delay ten or more trains greater than five minutes and fifty-nine seconds)

- **Lost time accidents** (for the subways, LIRR and MNR, a job-related incident that results in the inability of an employee to perform full job duties for at least one working day beyond the day of the incident. Rates are based on lost time accidents per one hundred employees)

- **Employees' lost time days** (for MNR and LIRR, the total number of calendar days employees' treating medical professionals have determined that they cannot work due to an occupation injury or illness)

- **Employee lost time rate** (for MNR and LIRR, the number of occupational injuries or illnesses per two hundred thousand employee hours worked)

- **Terminal on-time performance** (for the subways, the percentage of trains arriving at their destination terminals as scheduled with a train counted as on-time if it arrives at its destination early, on time, or no more than five minutes late, and has not skipped any planned stops; for MNR and LIRR, the percentage of trains arriving at their final destination terminals as scheduled with a train counted as

on-time if it arrives at its destination early, on-time or no more than five minutes and fifty-nine seconds late, provided that the percentage of trains not arriving at their final destinations shall include unscheduled cancellations)

- **Additional data** (for the subways, the percentage of trains arriving at their scheduled terminals between four and five minutes after their scheduled arrival time; for MNR and LIRR, the percentage of trains arriving at their scheduled terminals between four and five minutes and fifty-nine seconds after their scheduled arrival time as well as the percentage of cancelled trains)

Implementation

The MTA agencies have all previously introduced performance metrics dashboard pages accessible on the MTA website (https://new.mta.info/transparency/metrics). Some of the monthly performance metrics required in the legislation were already being reported.

Beginning in October, 2019, monthly data for the required additional categories were added to the MNR and LIRR performance metrics pages under the category of "New York Public Authorities Law Metrics": The web addresses are:
LIRR: http://lirrdashboard.mta.info/Home/LegislationMetrics
MNR: http://mnrdashboard.mta.info/Home/MNRNYLaw

New York City Transit (NYCT) is in the process of revising its dashboard pages, and as an interim step is publishing the required performance metrics in a downloadable Microsoft Excel file:
https://subway-dash-files.s3.amazonaws.com/CombinedMetricsNYCT.xlsx