



Passenger & Freight Rail Performance: Quality and Methodology Report

Release Date: September 2017

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Introduction

This is a report on the quality of the Passenger & Freight Rail Performance statistical release and data portal tables. It helps users to understand the quality of our statistics, and also ensures ORR is compliant with Principle 4 of the Code of Practice for Official Statistics¹.

The quality report covers the following areas:

- **Methodology** – detail on the various data sources and methodology used to compile the statistics;
- **Historic background** – a background to each statistic and details of changes throughout the time series;
- **Relevance of the data** – the users of the statistics, and our engagement;
- **Accuracy and reliability** – the accuracy of each statistic;
- **Timeliness and punctuality** – our timescales for the production, quality assurance and publication of each statistic;
- **Accessibility and clarity** – the format of our statistics and where they can be found;
- **Coherence and comparability** – comparisons to similar statistics published elsewhere.

All performance data are supplied by Network Rail and train service performance is measured using a range of performance metrics, which are covered in detail in the methodology section below.

¹ Principle 4: Sound methods and assured quality. Statistical methods should be consistent with scientific principles and internationally recognised best practices, and be fully documented. Quality should be monitored and assured taking account of internationally agreed practices. The Code of Practice can be accessed here <http://www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html>

Methodology

Quarterly and periodic data

The rail industry reports data on a periodic basis rather than the more recognised reporting cycles such as monthly or quarterly. A period is normally a 28-day, or four weekly, period for business reporting purposes (Sunday to Saturday) and there are 13 periods in a financial year. The length of a period may differ at the end of the financial year, 31 March, and the beginning of the financial year, 1 April, to ensure that a break is made at 31 March.

Some quarterly datasets, such as quarterly Public performance measure and Freight performance measure, require apportionment of these data.

The standard method for apportionment is based on the number of days within the period that fall into the relevant quarter. For example, the dates in period 4 cover both Q1 and Q2. When the quarterly data are calculated for 2017-18, 6/28 of the data are assigned to Q1 (covering 25 June to 30 June) and 22/28 of the data are assigned to Q2 (covering 1 July to 22 July).

The breakdown of the calculations used for 2017-18 are as follows:

Quarter	Calculation
2017-18 Quarter 1	Period 1 + Period 2 + Period 3 + 6/28 of Period 4
2017-18 Quarter 2	22/28 of Period 4 + Period 5 + Period 6 + 14/28 of Period 7
2017-18 Quarter 3	14/28 of Period 7 + Period 8 + Period 9 + 22/28 of Period 10
2017-18 Quarter 4	6/28 of Period 10 + Period 11 + Period 12 + Period 13

Moving Annual Average

The moving annual average (MAA) reflects the proportion of trains on time/cancelled or significantly late in the last 4 quarters or 13 periods. For example, periodic PPM MAA data are calculated by taking the sum of the last 13 periods and dividing by the number of periods (13).

We use MAAs to smooth out short term spikes in the data and highlight longer term trends and measure performance against the [regulatory targets](#) which are presented as MAAs.

Public Performance Measure (PPM)

PPM is the main cross-industry measure of operational performance for all passenger services and is a key performance metric for evaluating the overall punctuality and reliability of train services.

- **Public performance measure (PPM):** A train is defined as on time if it arrives within five minutes (i.e. four minutes 59 seconds or less) of the planned destination arrival time for London and South East and regional operators; or ten minutes (i.e. nine minutes 59 seconds or less) for long distance operators. Non-franchised operators (First Hull, Grand Central and Heathrow Express) are recorded as on time if they arrive at their final destination within ten minutes of the planned timetable, except for Heathrow Express services which count as on time if they are within five minutes.

We publish PPM data quarterly at sector and Train Operating Company (TOC) level. We also publish PPM MAA (MAA) data at this level and disaggregated PPM data by train operator and sub-operator² for each period.

Cancellations and significant lateness (CaSL)

- **Cancellations and significant lateness (CaSL)** – the percentage of passenger trains cancelled or arriving at their final destination more than 30 minutes later than planned.

CaSL was developed as a supplementary measure to PPM and delay minutes to ensure trains were not 'written off' by controllers or signallers once they exceeded their PPM threshold. This measure helps performance recovery by not terminating a train short of its final destination and incentivising controllers or signallers to ensure the train arrives less than 30 minutes late.

A cancellation is defined as the termination of a train prior to reaching its destination or the failure of a train to depart from its point of departure; for which it was scheduled to run in the applicable timetable. There are two types of cancellations:

- **Part** – A train is considered to be a part cancellation if it covers more than half the scheduled mileage and either failed to run the whole journey or failed to stop at any station on the way. Trains completing their scheduled journey but arriving at their final destination late by 120 minutes or more also count as part cancellations;

² Sub operator PPM provides a breakdown of each operator's performance. For example, PPM data for Virgin Trains East Coast is available for Anglo-Scottish services and London-Leeds and North East (including Lincoln) services.

- **Full** – A train is considered to be a full cancellation if it covers less than half the scheduled mileage, or does not run at all.

CaSL data are calculated by taking the total number of passenger trains cancelled (part or full) and significantly late (between 30 and 119 minutes) and dividing by the number of trains planned. This figure is expressed as a percentage and a lower figure indicates fewer cancellations and significant lateness. CaSL and CaSL (MAA) data are available by quarter and sector. We also publish CaSL data by TOC. Furthermore, data are available periodically and for the number of trains planned.

Freight Delivery Metric (FDM)

A new measure, FDM, was introduced for [Control Period 5](#) and replaced the Freight Performance Measure (FPM) which was previously used to provide an indication of the punctuality of freight journeys.

- **Freight delivery metric (FDM)** – the percentage of commercial freight trains that arrive at planned destination within 15 minutes of scheduled time. This measure only covers delay caused by Network Rail.

FDM tracks the punctuality of all commercial freight services (excluding class 0) at destination as well as taking into account cancellations (not planned) as a result of Network Rail performance. Freight operator caused cancellations are not captured as this measure is focusing on trains that Network Rail could have delivered on time.

FDM is calculated by dividing the sum of Network Rail delayed trains, Network Rail assumed cancelled trains and Network Rail caused service variations by the sum of trains run and Network Rail assumed cancelled trains.

A regulatory target exists for [FDM](#).

This measure includes all freight operators, not just the major operators and includes any freight train except test trains, measurement trains, engineering trains, tampers, yellow plant movements and light engines. Also, long term planning (LTP), short term planning (STP) and very short term planning (VSTP) schedules and unloaded services are all included in this measure.

Sector definitions

The rail network is subdivided into three sectors, long distance, London and South East and Regional. At the time of privatisation these three sectors were based on the business units of British Rail.

- **London and South East sector** – based on the British Rail Network SouthEast services which operated commuter trains in the London area and the inter-urban services in South East England, although the network reached as far west as Exeter and as far north as Worcester, Northampton and King’s Lynn;
- **Long Distance sector** – based on the British Rail InterCity services which were long-distance express services. Caledonian Sleeper services are not included in the Long Distance sector. They do, however, have a 10 minute threshold for PPM purposes;
- **Regional and Scotland sector** – based on the British Rail Regional Railways services which were all other services not included in the other two sectors. In some cases, for example in the Network Rail Monitor, services in Scotland (ScotRail and Caledonian Sleeper only) and Wales (Arriva Trains Wales) are treated separately from regional services. For the statistics published in our themed statistical releases services in Scotland and Wales are defined as regional services.

Following the refranchising of some services in 2006 and 2007 a number of TOCs operate services in more than one of the sectors. The current mapping of services to within each sector is listed below.

Long Distance:

- Abellio Greater Anglia (Inter city services)
- CrossCountry
- East Midlands Trains (services to and from London St Pancras)
- TransPennine Express (*performance statistics only*)
- Grand Central (Open Access Operator)
- Great Western Railway (High speed services)
- Hull Trains (Open Access Operator)
- Virgin Trains East Coast
- Virgin Trains West Coast

London and South East:

- Abellio Greater Anglia (all non inter city services)
- c2c
- Chiltern Railways
- Govia Thameslink Railway
- Great Western Railway (London and Thames Valley commuter services)
- Heathrow Express (Open Access Operator)
- London Midland (Euston, St Albans and Bletchley services)
- London Overground
- South West Trains
- Southeastern
- TfL Rail

Regional:

- Arriva Train Wales
- East Midlands Trains (services in the East Midlands and in Central and Northern England)
- Great Western Railway (services in the west of England)
- London Midland (other services)
- Merseyrail
- Northern

Scotland:

- Caledonian Sleeper (10 minute threshold for PPM)
- ScotRail.

Transfer of services from Long Distance to Regional

The new Northern and TransPennine Express (TPE) franchises commenced operation on the 1 April 2016. Services between Manchester Airport and Blackpool North/Barrow-in-Furness and between Oxenholme and Windermere were transferred from TPE to Northern. Having previously had ten minutes to meet the Long Distance threshold for PPM, these services now have a five minute threshold in the Regional sector.

The historic data for TPE and Northern have been remapped to allow like for like comparisons to be made for these TOCs. At the national and sector level, however, the historic data have not been remapped. Using disaggregated data it is possible to assess what the effect of these changes would have been on PPM and PPM MAA between 2010-11 and 2015-16:

- **National:** Quarterly PPM adjustments of between -0.1 pp and 0.1 pp leading to reductions of between 0.01 pp and 0.02 pp for the PPM MAA;
- **Long Distance:** Reductions of between 0.2 pp and 0.6 pp to quarterly PPM values resulting in a fall in the PPM MAA of between 0.3 pp and 0.5 pp;
- **Regional and Scotland:** Quarterly PPM adjustments of between -0.2 pp and 0.2 pp leading to changes to the PPM MAA ranging from -0.05 pp to 0.03 pp.

Peak Services

Train services arriving into London termini between 07:00 and 09:59 in the morning and departing London termini between 16:00 and 18:59 in the evening are classified as peak services. PPM data are available for these services.

Rail usage data sectors

Data within the LENNON (Latest Earnings Networked Nationally Over Night) ticketing and revenue database was changed following refranchising in 2006 and 2007 as the Association of Train Operating Companies (ATOC) wished to keep a consistent time series. However, because ORR is able to extract data at a route level the data for multi-sector TOC's can be assigned to the relevant sectors. There is a difference between the rail usage and performance data as TransPennine Express services are classed as Regional services within [rail usage data](#) as opposed to Long Distance in performance data.

Historical background

Regulatory targets

Network Rail has regulatory targets for:

- **PPM** for England & Wales and each franchised TOC including a separate PPM target for Scotland;
- **CaSL** for England & Wales and each franchised TOC (no CaSL target for Scotland);
- National **FDM**.

Through consultation with Network Rail and the rail industry, ORR conducts periodic reviews of Network Rail to determine the outputs they must deliver, and the levels of access charge paid by train operators for use of its infrastructure. Subsequently ORR produces a determination document for a 5 year period. This five year period is known as a control period (CP). We are currently in [Control Period 5](#) (CP5) which covers 1 April 2014 to 31 March 2019.

The determination document provides challenges and incentivises Network Rail to work together effectively with its industry partners to provide:

- further improvements in train service performance;
- for growth in passenger and freight demand;
- reduced levels of disruption.

It is for Network Rail to define and deliver its work programme to achieve this.

Public Performance Measure (PPM)

In the mid-1980s the Passenger's Charter was introduced as the main metric of measuring passenger train performance. This measure provides different metrics for punctuality and reliability/cancellations and was originally intended to measure entitlement for season ticket discounts. The main weaknesses of the Passenger's Charter are:

- completeness – Sundays are excluded and for some operators only Monday-Friday peak services are included;
- exclusions – trains that are disrupted due to external/non-railway causes, such as extreme weather or fatalities, are not counted. Furthermore, entire days that have seen very poor performance for any reason could be declared 'void';

- different metrics – separate metrics for punctuality and reliability/cancellations.

Concerns over poor performance, trains not being accurately captured and reported and two metrics for every TOC or service group, led to the Strategic Rail Authority (formerly Office of Passenger Rail Franchising (OPRAF)) being tasked to come up with a new measure.

PPM was introduced during June 2000 and combines figures for punctuality and reliability into a single performance measure and is calculated by dividing the number of trains on time (trains within PPM) by the number of trains planned. This figure is expressed as a percentage and a higher figure indicates a greater number of trains 'on time'.

Due to the different scope for the Passenger's Charter and PPM, these two measures are not directly comparable. The Passenger's Charter is still used for some season ticket refunds³.

Right time

Right time data focuses on the arrival time of a train and is a supplementary metric to PPM. It was first published on our data portal in July 2012 as part of the rail industry's commitment to improving information to customers and increasing transparency.

- **Right time** – the proportion of trains that arrive at final destination early or within one minute of the scheduled arrival time.

Right time data are calculated by dividing the number of trains within 'right time' by the number of trains planned. This figure is expressed as a percentage and a higher figure indicates a greater number of 'right time' trains. We publish [right time data](#) periodically at sub operator level.

There is no regulatory target for right time.

³ [National Rail Enquiries](#)

Delay minutes

Delay minutes are a useful diagnostic measure underpinning the punctuality of passenger and freight train services.

- **Delay minutes** – delays to train journeys experienced by passenger and freight companies due to disruption.

Delay minutes data are captured on Network Rail's TRUST system (a nested acronym standing for Train Running System on TOPS (Total Operation Processing System)).

In CP5 there are no regulatory targets for maximum levels of delays minutes.

We currently publish limited Network Rail caused delay minutes and freight delays per 100 train kilometres data in the [Network Rail Monitor](#) and associate [key statistics](#).

We also publish periodic data on normalised passenger and freight delay minutes due to possession overruns on the data portal.

Network Rail attributed delays and freight delays data are also available in the Annual Return and historical record of Network Rail stewardship on the Network Rail website at:

<http://www.networkrail.co.uk/publications/Annual-return/>

Measures of freight performance

Freight performance measures provide an indication of punctuality for freight journeys and allow freight operators to measure their performance in a similar manner to the public performance measure (PPM). They are used by the industry to identify and address freight performance issues on the network.

Up until the 2014-15 financial year, which is the start of CP5, the Freight Performance Measure (FPM) used to provide an indication of the punctuality of freight journeys. Network Rail and the freight operators agreed FPM did not provide the information needed to improve performance and a more representative measure of freight customer interests was needed. A new measure, the Freight Delivery Metric (FDM) was introduced for CP5. It has been recorded since April 2013-14. FPM is ceased to be recorded at the end of 2014-15, but is still available on the [Data Portal](#).

- **Freight performance measure (FPM)** – the percentage of freight trains that arrive at final destination within ten minutes of their scheduled arrival time.
- **Freight delivery metric (FDM)** – the percentage of freight trains that arrive at their destination within 15 minutes of their scheduled arrival time. Freight trains are only considered to have failed FDM where the delay was caused by Network Rail.

The measures of freight performance differ from PPM as there is a uniform measure for the entire freight network, each train being 'on time' if it arrives at its final destination within 10 minutes of its scheduled arrival time for FPM and within 15 minutes of scheduled time for FDM.

These measures include all freight trains (loaded or empty) operated by freight operating companies (FOCs), excluding services operated on behalf of Network Rail (e.g. sandite, ballast and engineering trains) and any passenger charter services.

Circumstances where trains are not included within FDM are:

- any train cancelled for commercial reasons;
- light engine trains (Class 0 trains);
- any planned or scheduled cancellation;
- very short term planning (VSTP) schedules, where train moves are arranged through the Control Office, rather than timetable planners.

Relevance

The degree to which the statistical product meets the user needs in both coverage and content.

PPM, CaSL and FDM data are key performance measures and Network Rail are held to account to these measures by regulatory targets. In CP5 there are no regulatory targets for delay minutes or right time.

Performance data published on our data portal are used by a range of individuals for planning, analysis, decision making and data validation.

More detailed information on users of ORR statistics and meeting the needs of users is available on our [user engagement webpage](#).

Accuracy and reliability

The proximity between an estimate and the unknown true value.

Public Performance Measure

PPM measures the performance of individual trains against their planned timetable. These plans, technically called 'plan of the day' as agreed by the operator and Network Rail at 22:00 the night before, are usually the same as the published timetable with amendments reflecting pre-published engineering works; however, they may differ from their published timetable. Differences may exist for example when an operator and Network Rail agree to move to an emergency timetable⁴ in bad weather. In this case, provided the cancelled services are removed from the railway systems before the 22:00 deadline the prior day, these trains will be excluded from the PPM recording. This also requires authorisation from the Department for Transport

Trains which complete their journey as planned are measured for punctuality at their final destination. A train's performance is generally recorded by an automated monitoring system which logs performance using the signalling equipment. At termini, an allowance (known as berthing offset) is often added to the time recorded by the signalling equipment to allow for the time taken for the train to stop at the platform.

The total number of trains planned includes any services which are wholly or partially cancelled so these are included in the final PPM calculations.

Most cancellations are captured by the automated monitoring system; however, trains still need to be 'entered' as cancelled so they appear accurately on information systems. Failure to do this may require manual editing by the TOCs.

Delay minutes

Delay minutes data are subject to change after the resolution of incident disputes between train/freight operating companies and Network Rail over who is responsible for the delay and the affected operators. Based on this, delay minutes can be re-attributed between Network Rail and train/freight operating companies.

⁴ An emergency timetable aims to minimise the effects of extended disruption and provide a structured return to the working timetable after the network has been restored to normal use.

Data validation, estimates, and coverage

PPM, CaSL and FDM data are provided by Network Rail thirteen times a year and the only estimates made for this output are those used to [convert periodic data into quarterly data](#). No imputed or manually edited data are required in the production of these statistics.

The latest periodic data for PPM, CaSL and FDM from Network Rail should always be treated as provisional. Data can be refreshed when TOCs provide updated cancellations data as they finalise their data. Network Rail provides us with the final figures one period later, once they have received the final cancellations data from the TOCs.

The coverage of performance data can vary over time based on the TOCs operational at the time. For example, the non-franchised operator Wrexham and Shropshire ceased operations in January 2011. Figures prior to this date include this operator. Sufficient notes have been added to the relevant reports to highlight such cases.

Performance data are supplied by Network Rail and stored in a secure data warehouse maintained by ORR. The data supplied is subject to an extensive quality assurance process, including a suite of validation checks to ensure the data meets the required specification and is in line with previous trends. Any arising issues are flagged with Network Rail who must confirm the anomalies or correct the data and re-submit.

Explanations from Network Rail regarding data anomalies are included within our commentary to clarify the data and trends.

These data are then prepared for publication. The process includes quality assuring the tables and charts produced and providing supporting commentary regarding the key trends, methodology and quality measures. These reports are subject to peer review.

The final stage of the quality assurance process is a sign off by the statistics Head of Profession confirming the data and outputs meet the quality standards and are fit for publication.

Independent reporter's assessment of accuracy and reliability of data

Arup (in partnership with Winder Phillips Associates) was appointed as independent reporter by ORR and Network Rail in 2009 to review Network Rail's data and provide us with assurance of the accuracy and reliability of their information.

PPM and delay minutes data each received very high confidence grades of A1 for both 2009/10 and 2010/11. The confidence grade for CaSL improved from B2 in 2009/10 to A2 in 2010/11. The latest [independent reporter review](#) took place in 2012/13 with PPM and CaSL remaining at A1 and

A2 respectively. For further details about the reliability and accuracy confidence grades or assessment, please visit our [website](#).

Timeliness and punctuality

Timeliness refers to the time gap between publication and the reference period. Punctuality refers to the gap between planned and actual publication dates.

Periodic PPM, FDM and CaSL data are typically available on the ORR data portal within 20 days of the period ending. Quarterly PPM, FDM and CaSL data are, on average, published 47 days after the quarter ends.

More detailed information on timeliness and effectiveness of the statistical output is available on our [user engagement webpage](#).

Accessibility and clarity

Accessibility is the ease with which users are able to access the data, also reflecting the format in which the data are available and the availability of supporting information. Clarity refers to the quality and sufficiency of the metadata, illustrations and accompanying advice.

All data tables can be accessed on the [Data Portal](#) free of charge.

Periodic data on the number of delay minutes due to possession overruns can also be accessed on the data portal. It is Network Rail's duty to maintain, renew and enhance the network whilst at the same time providing an operational railway. This requires good possession planning to reduce any disruption to the network. We use the possession disruption indices for passenger and freight (PDI-P and PDI-F) as the principal measures to indicate this.

Network Rail publishes PPM, PPM (MAA), PPM by TOC, disaggregated PPM, CaSL, CaSL (MAA), right time and delay minutes data on the [Network Rail website](#).

The procedures and policy used to ensure sound confidentiality, security and transparent practices.

ORR is fully compliant with the Statistics and Registration Service Act 2008 and principle 4 of the Code of Practice for Official Statistics.

The disaggregated PPM data are a newer dataset used for reporting at sub-operator level. This dataset supports the Government's transparency agenda for ensuring as much information as possible is provided for customers and stakeholders to be able to make informed decisions. We worked with industry stakeholders to agree to the publication of this data.

More information is available on our [user engagement webpage](#).

Coherence and comparability

Coherence is the degree to which data that are derived from different sources or methods, but refer to the same topic, are similar. Comparability is the degree to which data can be compared over time and domain.

The PPM, FDM, right time and CaSL datasets are all based on data from Network Rail's TRUST (train running system on total operations processing system (TOPS)). This system records trains running compared with the public timetable. Train cancellations data may come from either Network Rail or the TOC. These data are processed through Network Rail's systems to produce PPM, CaSL, right time and delay minutes data.

Despite the performance datasets being captured by the same source (TRUST), they are not always comparable. This is due to the level of disaggregation published for each performance metric (for example, comparing annual right time data against periodic CaSL data).

Performance figures on the data portal may differ slightly from the numbers published by ORR in the Network Rail Monitor as the two publications cover slightly different time periods. The ORR data portal publishes quarterly data using calendar months whilst the Network Rail Monitor uses periodic data.

The main reason for this is the different audiences. The Monitor is mainly used by the industry and is therefore based on periodic data, the industry's standard reporting measure. Furthermore, the different scope of the two publications allows for different patterns and trends in the data to be identified.

The disaggregated sub-operator PPM data relies on system generated cancellations at individual train level, which are then aggregated to sub-operator level. The actual number of cancellations is supplied by TOCs at end of each period and is typically at operator level and not sub-operator level. Consequently, any aggregation of the disaggregated figures will differ slightly from the numbers published at operator level each period.

PPM, CaSL and FDM data which are published every period, the latest period should always be treated as provisional. Network Rail provides ORR with the final figures one period later, once they have received the final cancellations data and further attribution from the TOCs.

Delay minutes data are also subject to change because of the potential for re-attribution of delay minutes. The initial attribution is made by Network Rail but if it is against a train or freight operator then the operator can refine the cause code and responsible manager code or dispute responsibility for the delay. The overwhelming majority of attribution details are finalised within eight days of an incident occurring.

Length of Comparable Time Series

Measure	Time Series	Data Portal Table
Active Time Series		
Quarterly PPM and CaSL	1997-98 Q1	Table 3.42 – PPM (MAA) by Sector Table 3.43 – PPM by Sector Table 3.44 – PPM by TOC Table 3.5 – CaSL (MAA) by Sector Table 3.6 – CaSL by Sector Table 3.7 – CaSL by TOC
Periodic PPM, Right Time and CaSL by TOC and Sub-Operator	2010-11 P1	Table 3.9 – Disaggregated PPM, Right Time and CaSL – ALL TOCs See the Passenger and Freight Performance page for individual TOCs
Quarterly FDM	2012-13 Q4	Table 3.41 - FDM
Discontinued Time Series		
Quarterly FPM	2005-06 Q1 to 2014-15 Q4	Table 3.50 - FPM



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