

Assessing Network Rail's delivery of Network Availability in CP6

SNC-Lavalin Transport Consulting & Advisory 25/05/18

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Network Rail's delivery of Network Availability in CP6

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Introduction to Project



Project Remit

Background

The objective of the Network Availability measure is to encourage Network Rail to reduce the levels of disruption to passenger and freight customers caused by planned engineering work. Its intention is to:

- **provide a balance to the amount of engineering work related disruption Network Rail needs with the requirements of the users of train services; and**
- **incentivise Network Rail to maximise productivity during the time they have to do work.**

What does the project set out to achieve:

Network Rail is giving Network Availability a lower priority in CP6 than its customers might want. We would like to the consultant to give their professional advice on whether ORR should use the EWIs (or a suitable qualitative alternative), and should these measures be Regulatory Outputs (i.e. mandatory for Network Rail to deliver), Indicators or Enablers (i.e. not mandatory for Network Rail to deliver).

This will be based on:

- **An assessment of the suitability of the EWIs as measures of Network Availability.**
- **Whether there is another, more qualitative, approach to assessing Network Rail's delivery of**

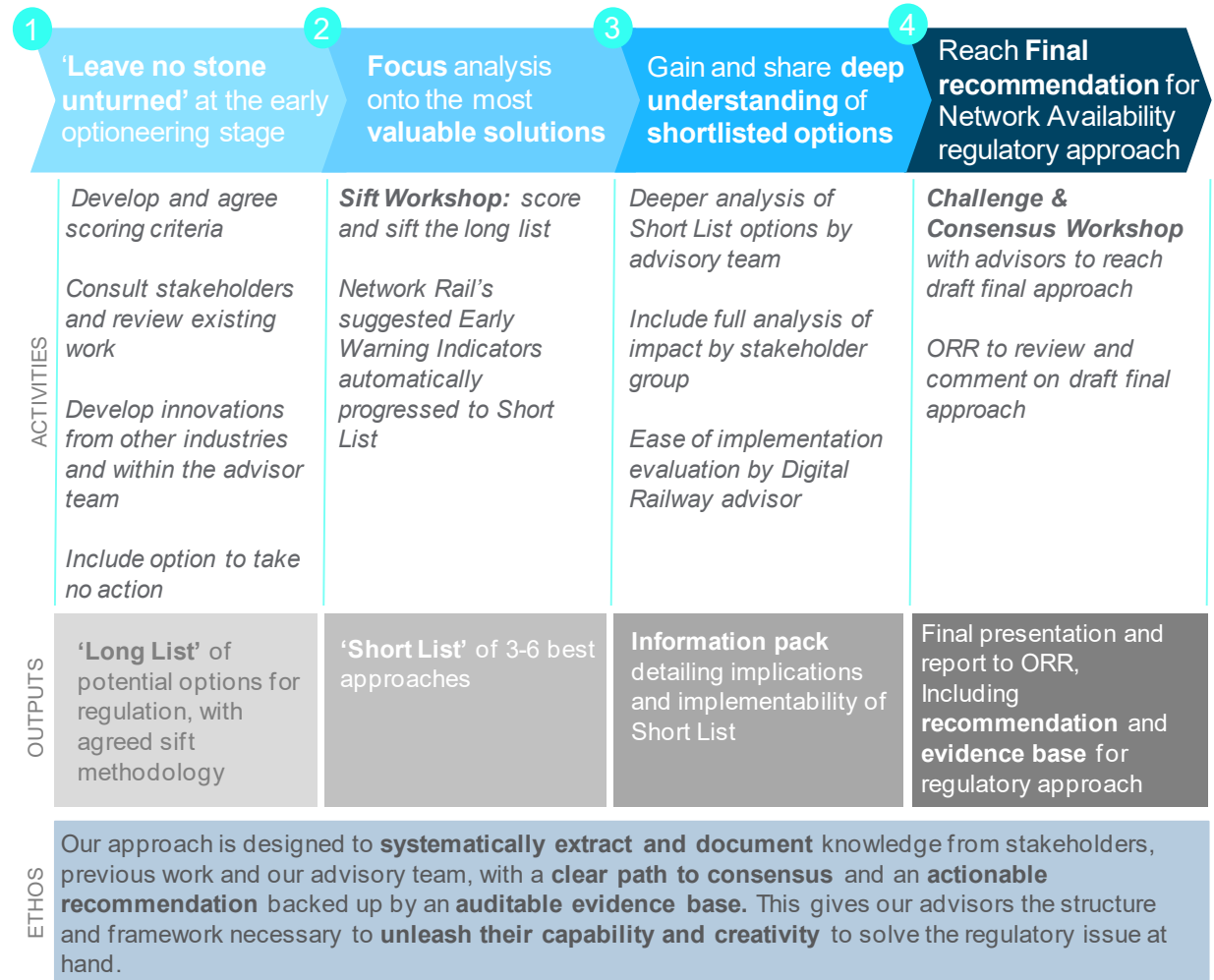
Network Availability.

- **The views of Network Rail and its TOC and FOC customers on this issue.**
- **This will inform what ORR will say in the Draft Determination about Network Availability.**



Project methodology

- The project inception took place on 16/02/18 and final deliverables were submitted 22/05/18.
- The project team was made up of consultants from SNC-Lavalin Transport Consulting & Advisory, supported by the Railway Consultancy.
- The approach to the project, shown in the diagram to the right, was based around two workshops, with supporting stakeholder engagement and research work streams.



/ Problem / Opportunity Statement

- In order to clarify the objectives of the study and help drive a measure of success, the following problem / opportunity statement was formulated.

“To meet its duty as an economic regulator, ORR has sought to measure the efficiency of Network Rail in its delivery of a) reliable performance and b) network availability.

The concept of measuring and monitoring Possession Disruption goes back to CP4 and yet has neither caught the imagination of the industry nor drives its behaviours in spite of widespread belief in the utility of measuring the issue. Indeed with the latest index deemed “broken” there is a need to reappraise the metric.

With ever bigger and longer running possessions being used to create economically efficient and timely delivered programmes there is a risk that Train Operators, their customers and local economies will take an ever higher burden from the impact of possessions. In such a context the measurement of possession disruption seems urgent and necessary.”



Current State of Play



/ Current State of Play – NR rebuttal of PDI

“The principal measures of the availability of the network to run trains are the Possession Disruption Indices for passenger (PDI-P) and freight (PDI-F). Following franchise changes in 2015, the Network Availability Reporting System (NARS) was unable to report PDI-P figures between April 2015 and February 2016. Throughout CP5 train service codes have been divided amongst service groups and subsequent weightings been re-distributed, adversely affecting the figures produced.

PDI-P ended 2016/17 at 1.25 per cent, significantly higher than expected when the original forecasts for CP5 were made. However, service group changes resulting from changes to franchises mean that this outturn is unreliable, not representative of our performance and not comparable with the regulatory targets that were set by the ORR before the start of the control period.

We do not believe that PDI metrics are now a reliable indicator of network availability. Furthermore, PDI measures are not used by our business to inform possession planning decisions and we are further aware that PDI is not a measure that is valued by the industry. Following discussions with the ORR, we will continue to report PDI data until the end of CP5 for regulatory purposes, recognising that there are fundamental weaknesses in the measure.

We have introduced two early warning indicators which we will monitor and publicly report (via our Annual Return), these are:

- i) level of access disputes raised and*
- ii) additional information relating to the notification discount factor.*

These measures will more accurately monitor and track our ability to effectively plan possessions in line with industry processes and the impact they have on both industry and end users.”



Network Availability in CP5 (April 2014 to March 2019)

In **CP5 the regulated outputs** for network availability are the Possession Disruption Index (PDI) for passengers (PDI-P) and freight (PDI-F). This is a measure that was originally introduced for CP4. Network Rail has identified a number of issues with PDI, such as the formula being incorrect not inflexible enough to take account of service group changes in new franchises, so that results in it not informing Network Rail's decision making.

It will continue to be reported in CP5, however Network Rail have advised ORR that it will miss the end of Control Period regulatory target.

In light of PDI's drawbacks, Network Rail **has formally requested to replace the monitoring of network availability in CP5** with a suite of indicators currently known as **Early Warning Indicators (EWIs) in CP6**. The current proposed EWIs are:

- **Access Disputes:** The number of formal access disputes raised with the Access Disputes Committee. Network Rail's proposal is that the level of disputes is a reflection of how well they are planning access, and were they to lose focus on the passenger or end freight customer, the number would increase.
- **Notification Discount Factor:** The number of possessions attracting various discount factors for early planning. The value of the discount is also being assessed to account for possessions of differing impacts. A decrease in the discount factor could indicate planning is not being carried out as far in advance.

EWI	Description	Reason proposed
Level of Access Disputes	Level of access disputes escalated to Access Disputes Committee (ADC) through the engineering access planning process, or after the Confirmed Period Possession Plan. This is a leading indicator.	To assess whether the access planning processes are working as they should. TOCs and FOCs are incentivised to look after the best interests of the end customers, and if Network Rail are getting the access plans wrong, and disadvantaging the end customer, they have the clear opportunity to dispute the access plans.
Notification Discount Factor	To encourage early notification of Restrictions of Use and better timetable planning, Network Rail is incentivised by notice periods which attract discounts on the Schedule 4 payment rates. This is a lagging indicator.	This information will provide reassurance that Network Rail is developing access plans in line with industry processes and that late change is not increasing over time.

/ Route level monitoring and regulation



Eight NR Geographical Routes

- Anglia
- London North Eastern and East Midlands
- London North Western
- Scotland
- South East
- Wales
- Wessex
- Western

NR Virtual Routes

- National Freight & Passenger Operator
- National System Operator

Following the recommendations of the Shaw Report, in CP6 decision making and accountability will be further devolved to the route level.

Past consultations have suggested there is an appetite for performance indicators to be disaggregated to the lowest reasonable level to give insight to impact on individual routes or operators.

Themes emerging for current state of play and previous work

Temporal / spatial granularity

- Control period
- Annual
- Periodic
- Weekly
- Real-time
- Latency to report
- National
- Route level
- Operator (TOC / FOC)
- Infrastructure element
- Meaningful weightings in aggregation



Actual vs Planned Availability

- Lost ultimate user time
- Services not run vs baseline timetable
- Possessions planned but not undertaken
- Freight delays & cancellations
- Vulnerability / criticality of parts of network
- Protect 'Red Lines' e.g. Do not close East and West Cost Main Lines concurrently
- Opportunity to set aspirational targets



Possession efficiency

- How much valuable work is undertaken in a possession
- Coordinate projects to share possessions where appropriate
- Balance cost of carrying out work with cost to operators and ultimate user
- Minimise possession overruns and Temporary Speed Restrictions
- Encourage appropriate amount of weekend or night-time working

Preferred Network Availability Assessment

- Effective benchmarking tool – compare business unit or customer performance
- Track performance over time or to target
- Intuitive for front-line staff
- Alignment with Schedule 4 and other measures or incentives
- Effective management tool
- Garner buy-in from stakeholders
- Hold third party (highways agencies, developers, utilities) to account
- Avoid perverse incentives or 'gaming' of metrics



Mitigations & customer service

- Early notification to operators
- Operator collaboration in planning process
- Quality of diversion, avoid bus replacement
- Advance warning to ultimate users (who may want to book travel far in advance)
- Real-time communication to unaware travellers during journey

Customer Views on Network Availability

Comments from TOCs I

Issue raised

Quote

Access Planning has, in some instances, been less well resourced and coordinated since the responsibility was devolved to the Route level. This may have led to greater than necessary service disruption in some cases.

"[NR] still has a lot of work to do to improve its internal processes, including coordinating between projects, in order to allow it to engage with operators in a more constructive manner."

"There is a disconnect (following devolution) between access planning (Routes) and Capacity Planning (System Operator) who do not present a joined up approach as things stand."

Works are not always planned optimally in the sense that some chances to share access in a given possession are missed.

"[NR] is furthermore inconsistent in seizing the opportunity of possession access to undertake multiple work banks concurrently."

Works contractors are appointed after access is planned with operators. Therefore, as the contractors fully scope and plan their work, significant costs are incurred as disruption, re-planning, or contract variations.

"We've seen an increase in late disruptive requests and I don't believe these are going to go away."

"[NR] in general does not let contracts for the work in time to allow a robust delivery plan to be developed and put in place."

It is felt that sometimes single-line working opportunities are missed as NR is unwilling to resource.

"[NR] makes no secret of the fact that it would rather take all line blocks and periodically puts pressure on [the TOC] to do away with the established SLW access pattern."

Comments from TOCs II

Issue raised

Maintenance and Renewals are seen to be better planned than major projects and Enhancements, reflecting the greater experience of engineers in delivering Maintenance and Renewals.

Several operators monitor the Notification Factor; however there is a suspicion that NR partly circumvents Schedule 4 Early Notification Discount Factors by booking possessions early, then cancelling or amending them closer to the time.

TOCs value the T-12 informed passenger deadline.

The impact of possessions has a differential impact on TOCs, with some heavily affected by possession volumes and overruns in CP5 while others are able to mitigate the impact more effectively due to the specific parts of the network that they operate upon.

Quote

“In particular, the access planning of major projects continues to be done in an uncontrolled manner.”

“Finally a problem worth noting (we have raised this with ORR in previous consultation responses) is that the Notification Discount Factors in Schedule 4 encourage Network Rail to book possessions early when they are ‘cheaper’, then either cancel or amend the possession times later (and sometimes very late).”

“It is critical that Network Rail remains incentivised to have a 100% success rate in avoiding late notice changes to possessions beyond the T-12 informed traveller date.”

From SNC-Lavalin discussions with Transport Scotland.



Comments from FOCs I

Issue raised

There are concerns that NR is more focused on its TOC customers than its FOC customers, especially in the context of alliancing, where the Alliance is focused on the relationship between the Route business and the dominant local TOC. There are also general fears of degrading coordination between devolved access planning teams.

Some possessions are booked by NR as a nice-to-have rather than to make room for specific work. This can take the form of overnight possessions out of passenger service hours. These issues, although usually resolved when raised, block the operation and growth of rail freight services.

As many freight services run overnight, the late hand back of overnight possessions can be very disruptive to FOC operations.

Quote

“Late notice notifications of taking very disruptive possessions are being more common and devolution seems to have been a cause of this. In short, Routes think they can just get away with planning at such short notice and just do so. These are, very much, not in the spirit of the Network Rail Licence Conditions.”

“We are concerned that the de-confliction process is becoming less effective in a post devolution scenario and have noticed an increase in the number of conflicting possessions.”

“Whilst we were able to...agree a change to this, it was felt that these blocks were there as a ‘useful to have’ rather than being essential for ongoing maintenance and renewals.”

“It is almost as if it is now acceptable to not plan possessions properly and have an expectation of an overrun. Such “extended” possession times badly affect freight operating companies’ ability to run, along with their reputation.”



Comments from FOCs II

Issue raised

Diversions routes are crucial for FOCs to provide the level of reliability that their customers expect. Diversions that pass through multiple Routes are often not coordinated. There are also issues with the provision of W9/W10 freight gauge clearance.

FOCs are often impacted by Late Changes to possessions. These burden the FOC with re-planning services and checking the proposed diversion.

There is overall a good level of confidence in the Access Dispute Committee process, although there are some issues including the affordability of legal representation for FOCs, and the lack of time to challenge disruptive (very) Late Changes.

Quote

“When gauge dependent traffic requires diversion due to disruptive possessions, DBC UK does not experience a consistent and ‘joined-up’ approach from Network Rail in providing the necessary documentation to allow such traffic to use the diversionary routes”.

“We currently see circa 100-150 late notice change requests per week which is a highly excessive amount and generates considerable workload as each request has to be looked at to ensure what is being requested does not negatively impact ours or our customers operations.”

“Whilst not perfect it essentially allows for a relatively independent resolution to access disputes which weigh up both NR’s and operators views and reasoning.”

“The Access Disputes Committee is very effective where there is a failure in process but less so where it is expected to make a decision about whether a proposed possession should occur or not or the length/location of a possession.”



/ Issues raised by Transport Focus

Issue raised

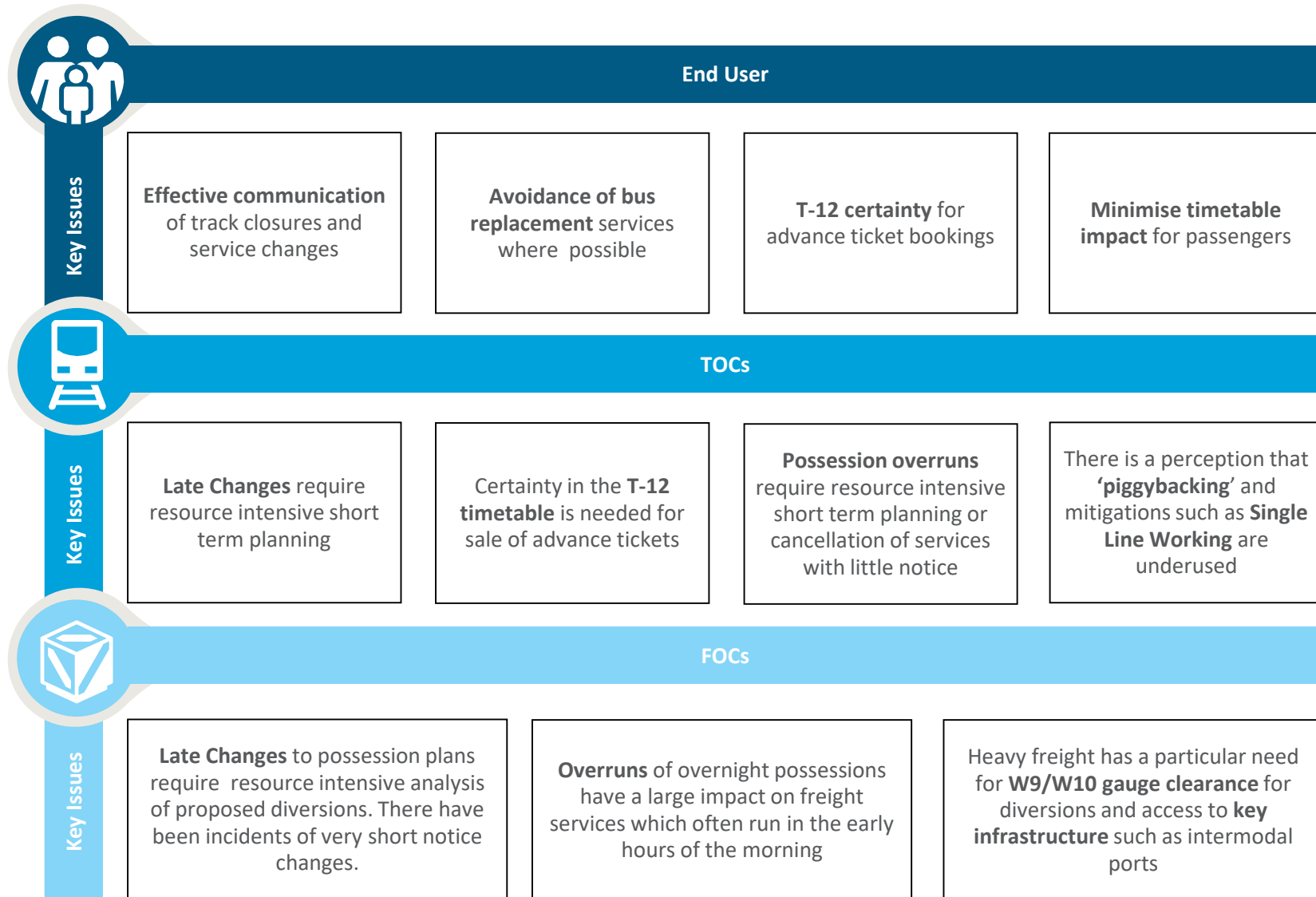
Passengers want the minimum timetable impact, and to minimise the time spent on bus replacement services.

It would be possible to categorise sections of track, in order to focus attention on possessions that affect the most important areas of the network.

There should be a default assumption that the two routes for accessing e.g. Southend or Cambridge should not be closed simultaneously.

For large multi-million pound projects, a relatively small budget could be set aside to investigate less disruptive ways of delivering the work.

Summary of customer needs

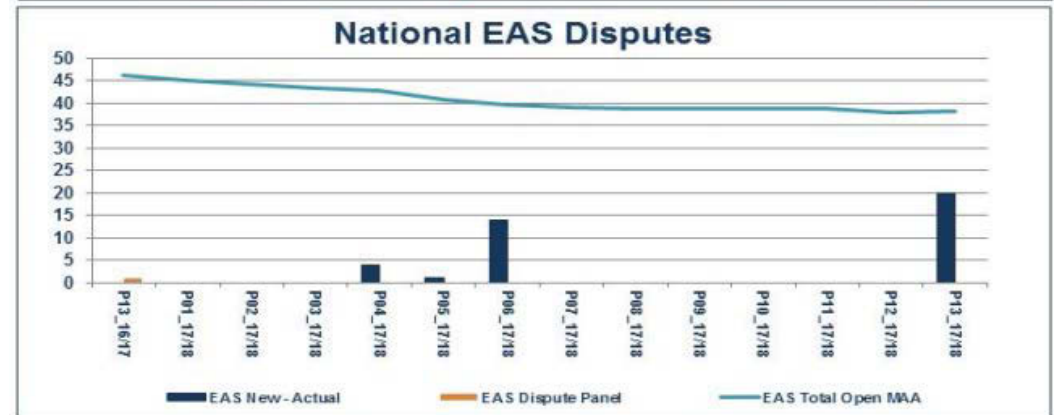
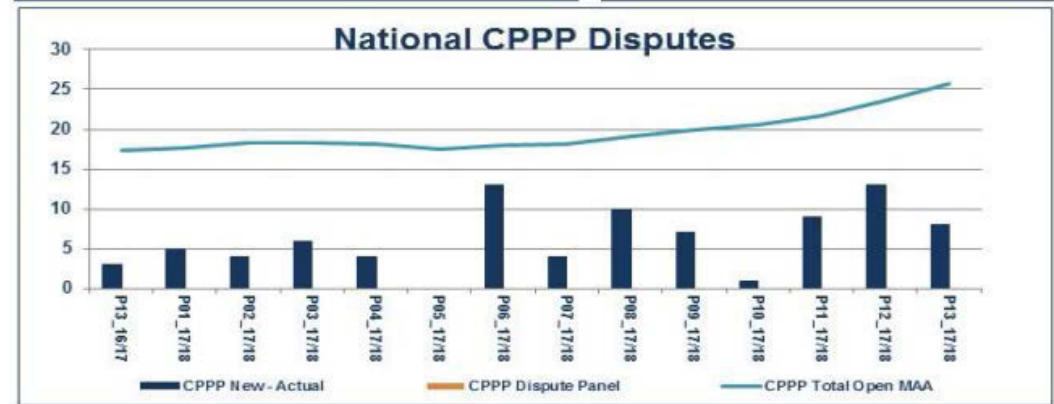


Evaluation of NR Early Warning Indicators (EWIs)

Count of Access Disputes

- Description:** This metric tallies the access disputes escalated to the Access Disputes Committee (ADC) during the access planning process, or after the Confirmed Period Possession Plan.
- The aim of this metric is to assess the possession planning process. It assumes TOCs and FOCs are incentivised to act in the best interest of the ultimate user, and will escalate disputes if and only if they feel NR's access planning process is not aligned to the needs of ultimate users.

	P13_17/18		Control period : CP5			
	P13_16/17		Min	Av.	Max	
CPPP Total Open MAA	26	↓	17	14.92	17.75	25.77
CPPP New - Actual	8	↓	3	0.00	4.73	13.00
CPPP Dispute Panel	0	→	0	0.00	0.00	0.00
EAS Total Open MAA	38	↑	46	37.92	43.28	50.38
EAS New - Actual	20	↓	0	0.00	3.29	21.00
EAS Dispute Panel	0	→	0	0.00	0.03	1.00



Excerpt from NR's Possession Indicator Report

/ Count of Access Disputes

- **Analysis:** From engagement with NR we understand that there are many categories of Access Dispute. Some in particular, such as FOC disputes based on unavailability of critical infrastructure, be that access to a freight interchange or lack of gauge cleared diversionary routes, are valuable for understanding if operators are satisfied with the planning process.
- As disputes can be raised early in the possession planning process, they are a leading indicator of planning problems that can be consulted before the day of disruption, in contrast with many of the backward looking or ‘rear-view mirror’ metrics explored here.
- However, we understand that operators often strategically raise disputes to ‘cover themselves’ in case they want to negotiate access at a later date, inflating the number of true disputes. Meanwhile, others see use of the Access Dispute Committee as a last resort, and may be dissatisfied with a possession but not lodge a dispute, masking the number of true disputes. Conversely, a high count of access disputes may represent NR pushing back at unreasonable demands from TOCs.
- We therefore **discard** Count of Access Disputes for CP6 because it is too subjective and therefore not suitable for trend analysis or Route-level benchmarking, while recognising that it has an important role in NR’s own management of its processes.

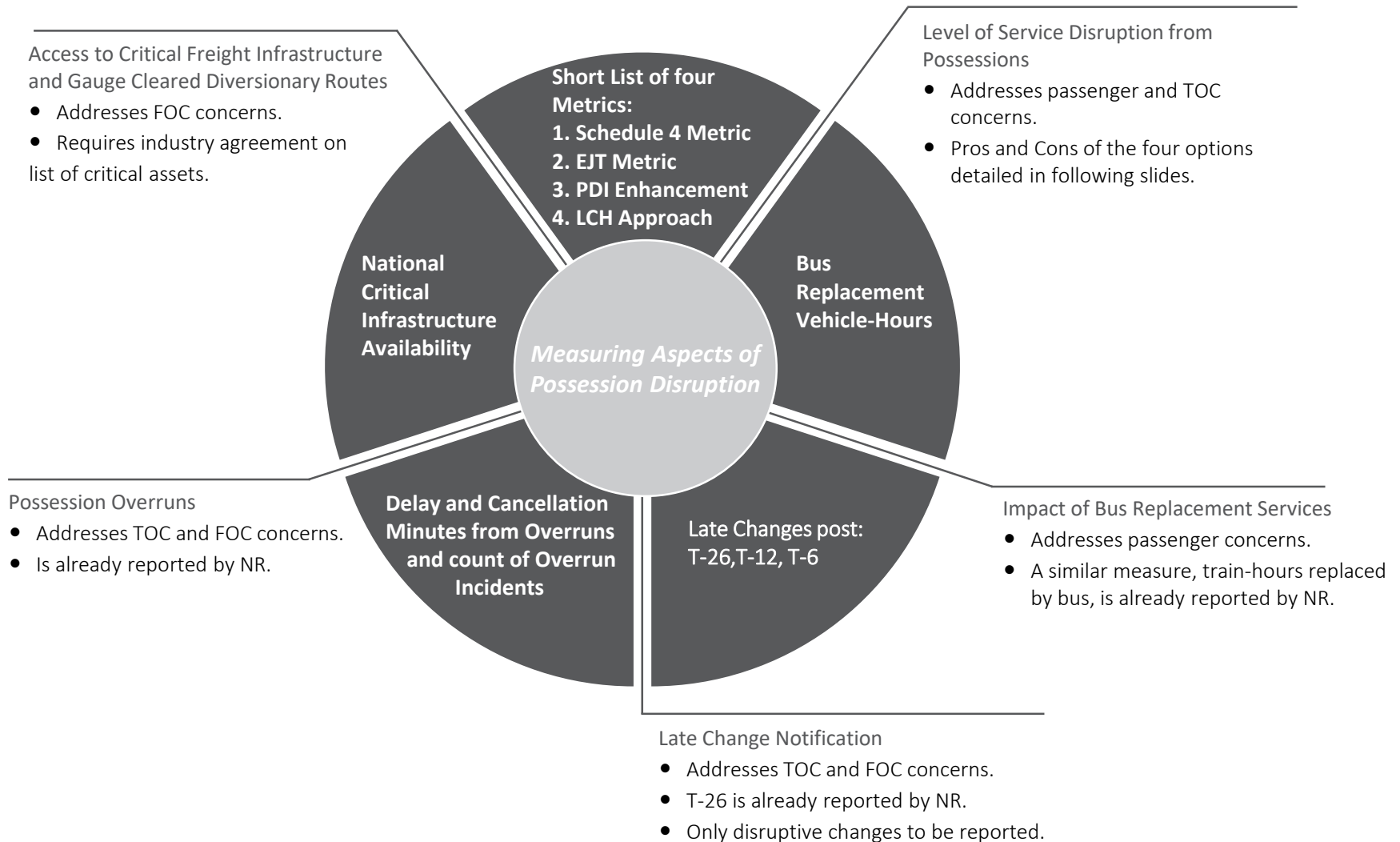
/ Notification Discount Factor

- **Description:** This metric is the average Schedule 4 Notification Discount Factor over all possessions occurring in a period. It is our understanding that an unweighted average is being proposed.
- In order to assist timetable planning, NR is incentivised via discounts to Schedule 4 payments if they give notice within specified periods. The earlier notification is given, the greater the discount factor applied. While these discount factors do not directly measure possession disruption, they give some indication of the quality of communication to end users.
- **Analysis:** Our review of stakeholder needs suggested that operators are particularly impacted by the resource requirements of re-planning services in response to late changes. However, as it uses a commercial indicator from Schedule 4, and a more easily understood and comprehensive alternative is available in the form of Late Notification Changes, we **discard** the Notification Discount Factor as an option for CP6.



Developing an Alternative Approach for CP6

A suite of measures to address a range of stakeholder concerns



Short List of Disruption Impact Measures

1 S4 Measure

- Simply report on periodic Schedule 4 payments
- Represents the 'path of least resistance'
- Does not give the extra incentives that operators feel is required
- Could be sensitive to publically report disruption as a monetary figure outside the context of the Track Access Agreements.

3 PDI v2

- A 'fixed' re- implementation of PDI
- This would be reported at a Route level
- Delay would be expressed as passenger-minutes of delay per train-km

2 Excess Planned Journey Time

- Comparison of excess journey time + cancellation minutes from Corresponding Day Time Table to Plan of Day.
- Expressed as a percentage or absolute disruption level
- Could be expressed at a Route level via Monitoring Point owner

4 'Dutch' Lost Customer Hour Approach

- The most challenging option to implement, both in terms of organisational acceptance and technical complexity
- The concept has a proven track record of driving a change in culture
- While a PDI v2 would be a lagging indicator, by modelling impact of closures, a LCH system would also be a useful disruption forecasting / costing tool



Option 1 : a Schedule 4 based measure

1 S4 Measure

Definition:	Level of Schedule 4 payments
Unit:	£ GBP
Timeframe:	Periodic
Route-level to national level aggregation:	Sum of payments for each route

Strengths

- Already an accepted industry measure.
- A potential path of least resistance.
- If TOC revenue is a good proxy for passenger experience, it is a sophisticated measure that captures many elements of lost revenue.

Weaknesses

- As an existing metric, it fails to sufficiently incentivise good possession planning as reported by operators.
- It does not effectively incentivise balancing works cost against the wider economic costs of possession disruption.
- As a nominal GBP measure it is not independent of inflation.
- Payment rates are reset periodically, hindering trend analysis.
- Quoting the impact of Network Availability as a monetary quantity could be perceived as 'fining' Network Rail for taking necessary possessions in their day-to-day operations.



Schedule 4: Current Principles

Schedule 4 payments compensate franchised passenger operators for the following:

Loss of future revenue	Replacement bus cost	Change in costs from a change in train mileage	Costs related to cancelled / late amended possessions
<ul style="list-style-type: none"> Revenue is lost as passengers are deterred from travel Compensation based on Schedule 8 payments and the Notification Factor 	<ul style="list-style-type: none"> To recover costs incurred running bus replacement services Cost recovery per bus-mile varies by location 	<ul style="list-style-type: none"> Recovery or payment of costs incurred or costs saved by a TOC due to 	<ul style="list-style-type: none"> Cost compensation where actual costs exceed £5,000

on the notification and degree of disruption (with the possibility of compensation for actual losses for severe disruption) and higher payments made for late notice possessions.

CP5 criteria for possession types and compensation rates (2012-13 prices) for each tier before and after T-12 are as follows:

Notification occurs before T-12	Notification occurs after T-12
Category 1 - £300 per service	Service variation £596 per service
Category 2 - £800 per service	Late notice cancellation - £1,566
Category 3 – actual costs / losses and liquidated damages	Category 3 – actual costs / losses and liquidated damages

/ Schedule 4 Formulae

Delay and Cancellation Payment

$$= \sum ((WACM + NREJT) \times BF \times NRPR \times NF)$$

WACM + NREJT is essentially the average disruption minutes for each train in a service group on a day. E.g. a service group with two trains where one is 10 minutes delayed by possession and the other is unaffected would have a value of 5 minutes

BF is a Busyness Factor which weights each day of the year as busier or less busy than a typical day

NRPR is the Network Rail Payment Rate from Schedule 8 of the Track Access Agreements

NF is the Notification Factor (or notification discount factor)

$$\text{Cost compensation} = \sum (RRBC + TMC)$$

RRBC is the Rail Replacement Bus Cost

TMC is the Train Mileage Cost, which might be a net loss of gain for the TOC

There are additional parts to the calculation of Schedule 4 payments which are not listed here.

Option 2: Developing S4 to form a simple EJT metric

2 Excess Planned Journey Time Definition

Definition:	Relative / absolute increase in the Corresponding Day Timetable total journey time
Unit:	Relative / absolute increase in journey time over CDTT total journey time
Timeframe:	Periodic / weekly
Route-level to national level aggregation:	Dependant on Service Group Weighting (SGW)

Strengths

- Should capture all planned, but no unplanned, disruption on the Network.
- Relative increases in journey time / cancellation minutes can be used to benchmark disruption levels across routes.
- Absolute increases in journey time / cancellation minutes can be used to track total disruption over time.

Weaknesses

- Does not capture negative experience of bus replacement.
- Does not capture early notification.
- Does not capture overruns.



/ Excess Planned Journey Time Details

We can measure the absolute disruption minutes:

Absolute Extended Journey Time Metric

$$= \sum ((\text{WACM} + \text{NREJT}) \times \text{SGW})$$

Alternatively we can express the delay as a percentage increase on the CDTT journey time for each service group.

Relative Extended Journey Time Metric

$$= \sum \left(\frac{(\text{WACM} + \text{NREJT})}{\text{AJT}} \times \text{SGW} \right)$$

WACM + NREJT is essentially the average disruption minutes for each train in a service group on a day. E.g. a service group with two trains where one is 10 minutes delayed by possession and the other is unaffected would have a value of 5 minutes.

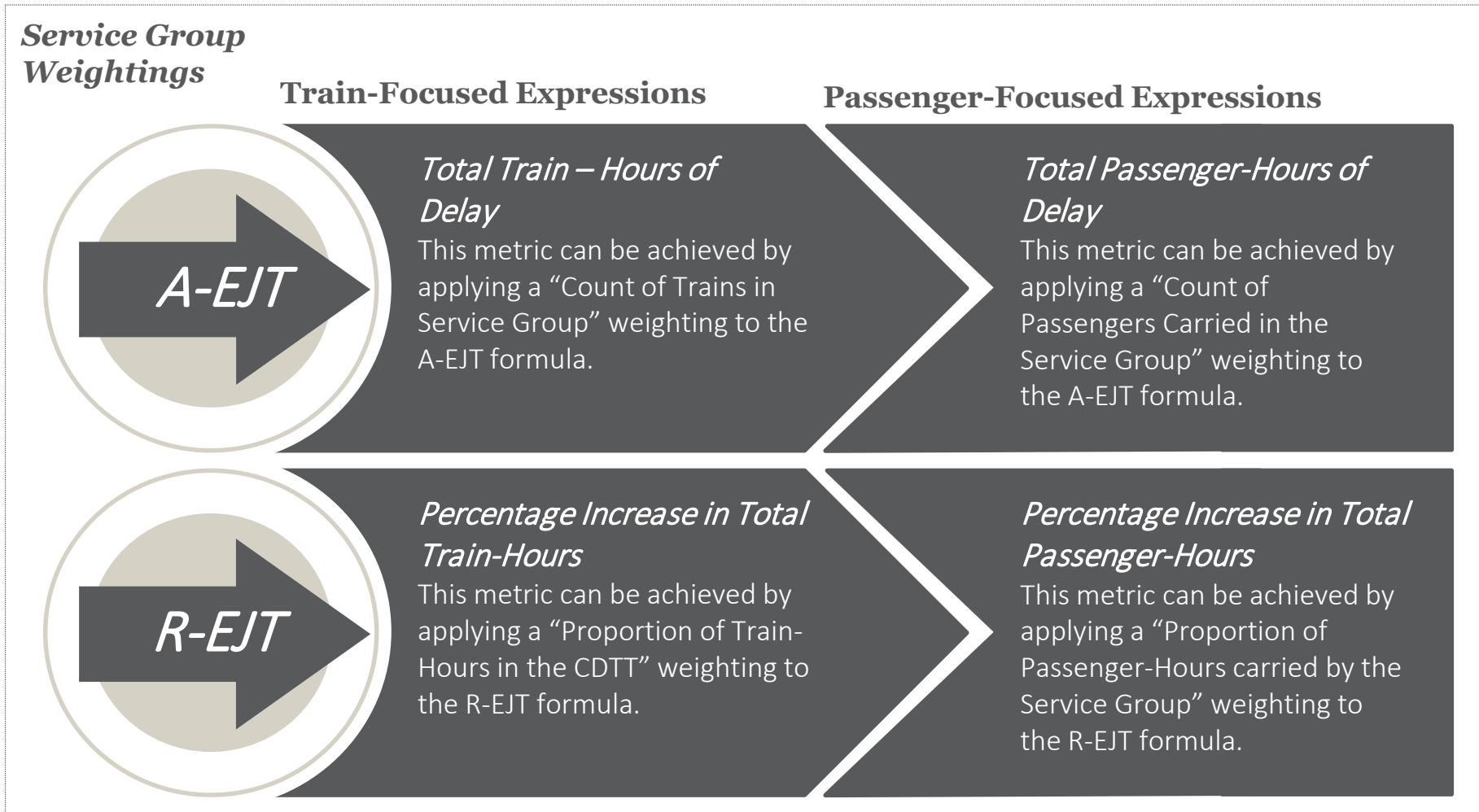
AJT is the Average Journey Time for the service group in the CDTT.

SGW is a Service Group Weighting which could, *for example*, be:

- Number of trains in the service group
- Scheduled train-hours in the service group
- Typical passenger loadings (as used in the calculation of **NRPR**)



There are several options for Service Group Weightings that yield metrics with intuitive interpretations



Option 3: There is a possibility to fix and rebrand PDI

3 PDI v2 Definition

Definition:	An updated PDI, expressed in delay-minutes and disaggregated to Route level
Unit:	Delay minutes per train-km
Timeframe:	Periodic
Route-level to national level aggregation:	Mean average, weighted by scheduled train-km in each Route

Strengths

- It may be possible to make use of the existing NARS work.
- Is sophisticated enough to capture the customer experience well given current data sources.

Weaknesses

- Possibly would retain 'toxic' connotations of PDI.
- May not be independent of service group changes.
- Does not reflect that passengers do not (dis)value all delay minutes equally.
- Would need a re-branding exercise.
- Stakeholders have strongly hinted that the money to rebuild NARS is not available.



‘Fixed’ PDI Input Factors

$$EPJwVT = \frac{\sum_{SG} \left[\sum_d \{ (NREJT_{SG,d} + WACM_{SG,d}) \cdot BF_{SG,d} \cdot PASS_{SG,d} \cdot ToDW \} \right]}{\sum_{SG} PT_{SG}}$$

The equation reflects the additional journey time for passengers, divided by scheduled train kilometers. The inputs are:

Inputs into NARS that are collected as part of the Schedule 4 database:

1. Extended journey time (**NREJT**) for the service group (**SG**), by day (**D**).
2. Weighted average of cancellation minutes (**WACM**) for service group, by day.
3. Busyness factor (**BF**) measuring the frequency of services, for service group, by day.

The **NREJT** and **WACM** are calculated by comparing the timetable that ran on the day with three earlier timetables, the Working Timetable (WTT) and the Corresponding Day Timetable (CDTT). The WTT is the bi-annual timetable from May – December and December – May and is published following negotiation of the EAS. The CDTT is a reference timetable free of any restriction of use. Therefore, the disruptions caused on the day of travel include ‘baked in’ possessions that would have been in the WTT but not in the CDTT, and any possessions from the short-term planning process.

Automatically fed inputs into NARS from other parts of the business:

- Average passenger train kilometers scheduled by service group (**PT**).

Constant variables built into NARS, namely weightings:

- **PASS** is the daily average number of passenger journeys per day for the relevant service group.
- **Time of Day Weighting (ToDW)** is a pre-determined fraction representing the percentage of passenger journeys for the relevant Service Group during the time of day (average values for each hour of the day) and day of week.

Option 4: The 'LCH' or 'Dutch' approach is appealing if complex

4 'Dutch' Lost Customer Hour Approach Definition

Definition:	Track modelled disruption due to unavailability of all relevant network assets
Unit:	Lost Customer Hours
Timeframe:	Periodic / weekly
Route-level to national level aggregation:	Sum of Lost Customer Hours for each Route

Strengths

- Proven international record.
- Proven ability to change organisational focus as in LUL.
- Effectively captures customer experience by acknowledging the various values for different types of customer (dis)benefit.
- GJT for all OD pairs on the national network is already calculated.

Weaknesses

- Requires expenditure and time on modelling work to set up.
- Would require work to adjust methodology to specifics of National Rail network, and account for greater heterogeneity.
- Attribution of LCH to Routes may be non-trivial.
- Passenger impact of potential bus replacement services would need modelling work to understand.
- Data requirements may be spread across industry organisations.
- LENNON data not as granular as Oyster taps.



/ Supplementary Metrics

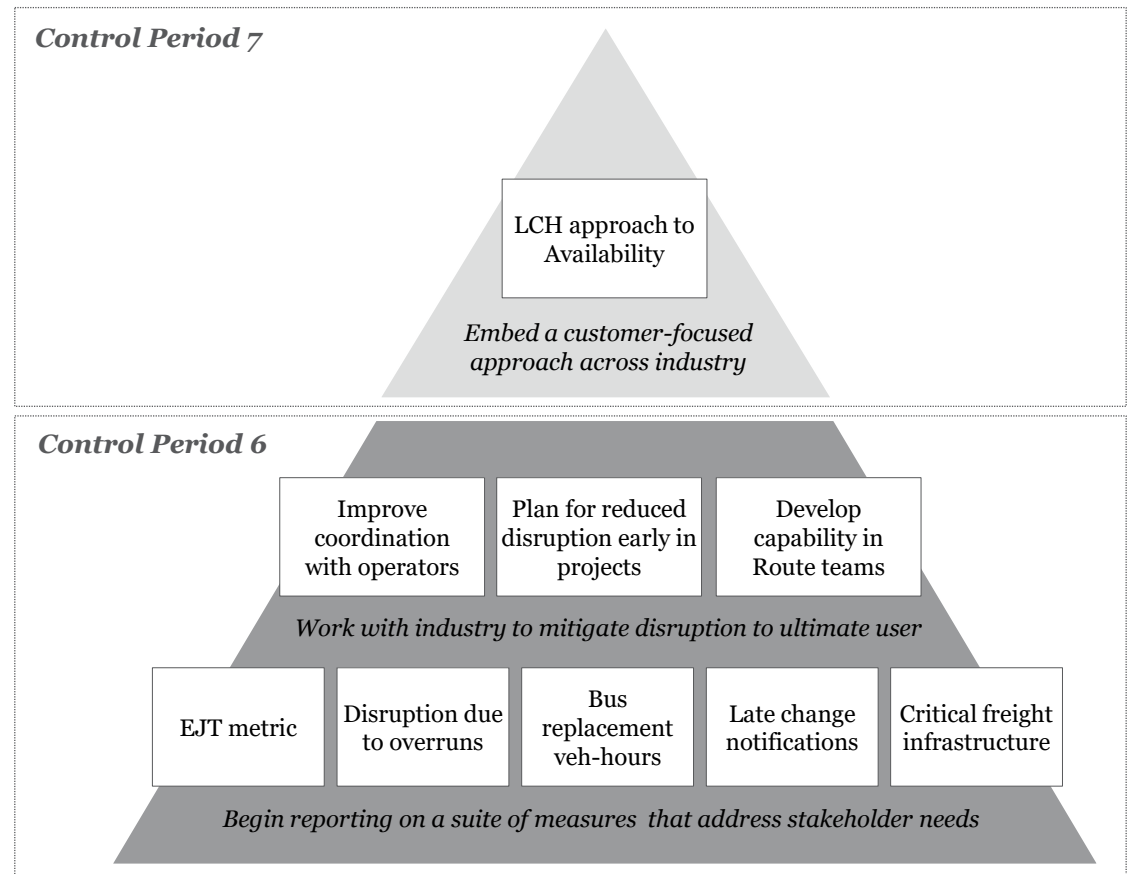
- **Bus Vehicle Hours:** Passengers dislike interchange and travel on bus replacement services, and direct oversight should be given to the amount of bus replacement services operated.
- **T-12 and T-4 Comparison:** If possible, a metric similar to Extended Planned Journey Time should be calculated for the T-12 and T-4 timetables. T-12 is important for all passenger operators and end users as it is when advance ticket bookings become possible.
- **Count of, and Delay / Cancellation Minutes from Possession Overruns:** This metric is already published by Network Rail, and is of interest to all operators on the network as well as end users.
- **Late Changes to Possessions:** This metric is already published by Network Rail, and is of interest to all operators on the network as well as end users.
- **National Critical infrastructure Availability:** FOCs require unrestricted access to key ports and interchanges. If possible, these particular routes should be identified and monitored.

Next Steps



Next steps

- Based on the analysis in the report, our recommendation for a measure of the level of possession disruption on the railway network is to develop the EJT metric, by carrying out a cost-benefit evaluation of reporting A-EJT and R-EJT in with a train-focused vs passenger-focused.
- In the longer term, the industry should consider the feasibility of moving to a Lost Customer Hours approach.
- Network Availability should be monitored above and beyond the Schedule 4 mechanism, which is not alone sufficient to balance possession disruption against the impact on passengers or the wider economy.
- Network Availability should be monitored above and beyond the Schedule 4 mechanism, which is not alone sufficient to balance possession disruption against the impact on passengers or the wider economy.



Recommended suite of measures for further investigation

- The suite of measures should comprise:
 - **The A-EJT and R-EJT metric:** if feasible, a passenger-focused approach should be adopted, using the passenger-focused service group weightings presented in Figure 6. Alternatively, the train-focused metrics could be used, which have less demanding data requirements.
 - **Delay and Cancellation Minutes due to Possession Overrun metric:** NR should continue to report this existing metric.
 - **A Bus Vehicle-Hours metric:** Train-hours replaced with bus service are already reported. If possible, the more passenger-focused Bus Vehicle-Hours should be reported.
 - **Disruptive Late Changes post T-26, T-12 and T-6:** Late changes post T-26 are already reported by NR. Changes post T-12 and T-6 should be reported as these very late changes are disruptive to operators and ultimate users.
 - **Critical Freight Infrastructure:** If industry can agree on a list of critical infrastructure for freight, the count and average duration of incidents of non-availability should be reported.

Values that guide us

Our values keep us anchored and on track. They speak to how we run our business, how we express ourselves as a group, and how we engage with our stakeholders and inspire their trust.

Teamwork & excellence

We're innovative, collaborative, competent and visionary.

Customer focus

Our business exists to serve and add long-term value to our customers' organizations.

Strong investor return

We seek to reward our investors' trust by delivering competitive returns.

Health & safety, security and environment

We have a responsibility to protect everyone who comes into contact with our organization.

Ethics & compliance

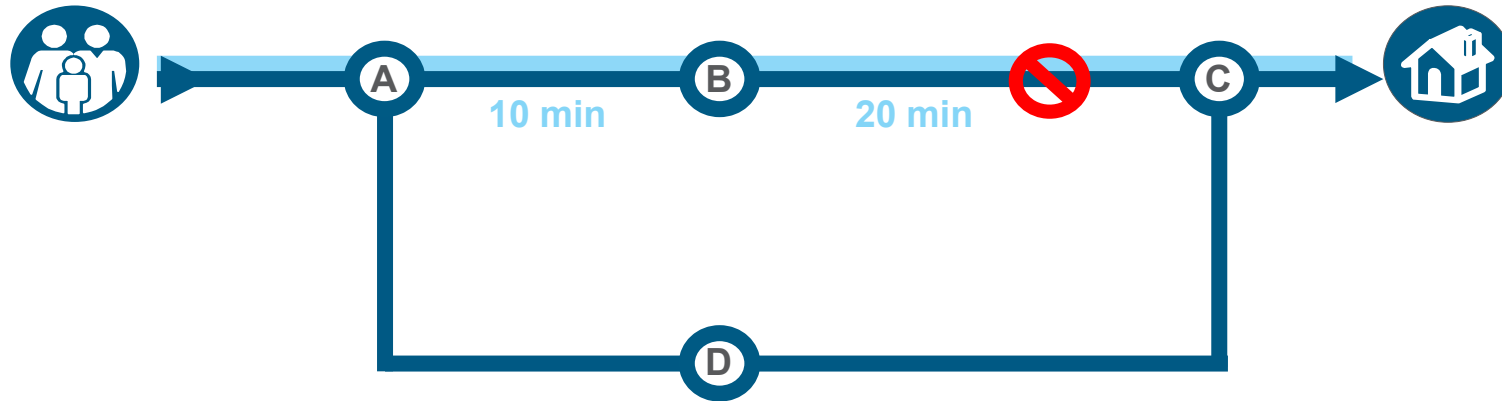
We're committed to making ethical decisions.

Respect

We consistently demonstrate respect for all our stakeholders.

Appendix A – Analysis of Possession Disruption Types






There are at least six types of possession disruption

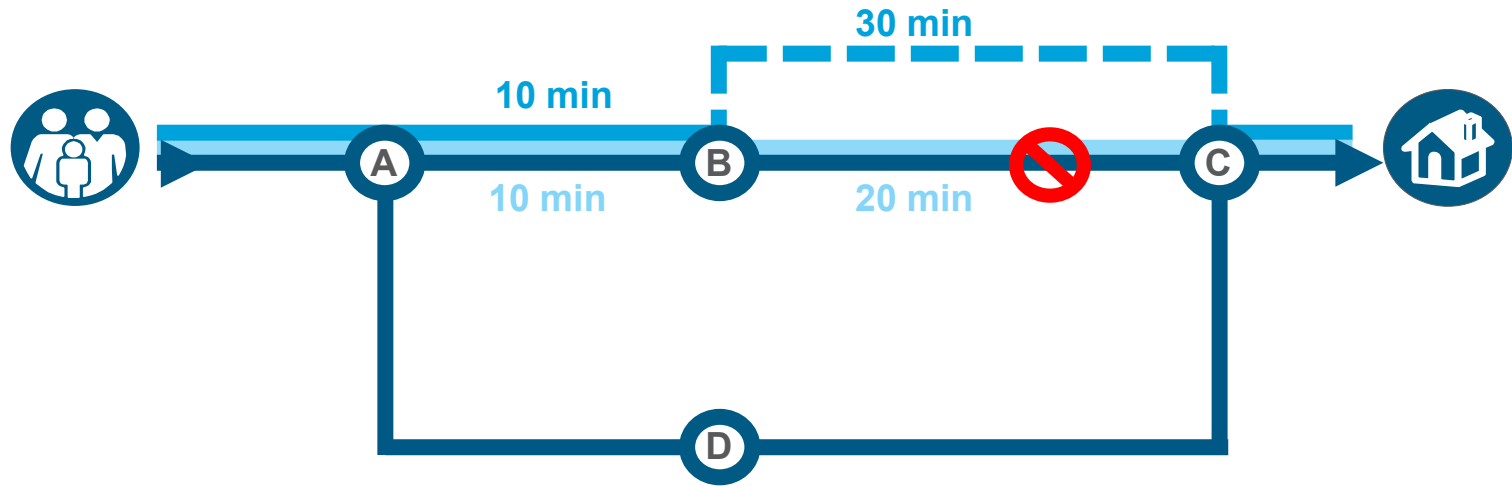


Disruption Type	Description
Type 1: Bus diversion with extended journey time	Train scheduled to service A-B-C. Bus replacement operates between B-C, increasing journey time by 10 minutes.
Type 2: Rail diversion with missed station	Train scheduled to service A-B-C. Train is re-routed via D, skipping stop at B. There is no extension of journey time from A to C.
Type 3: Rail diversion with interchange	Train scheduled to service A-B-C. Train is re-routed to D, skipping stop at B. Passengers change to connecting service to C onward. There is no extension of journey time from A to C.
Type 4: Rail diversion with extended journey time	Train scheduled to service A-B-C. Train is re-routed via D, skipping stop at B. There is a 10 min extension of journey time from A to C.
Type 5: Customer chooses not to travel	Train scheduled to service A-B-C. Train is re-routed via D, skipping stop at B. There is a 20 min extension of journey time from A to C. Many passengers are deterred from travelling.
Type 6: Customer unable to travel	Train scheduled to service A-B-C. Train terminates at B, and no feasible alternative arrangements for B-C are provided (This is relatively uncommon on the UK railways).

Bus diversion with extended journey time (Type 1)

Key

-  Route under possession disruption
-  Bus replacement service
-  Route in CDTT
-  Track And stations
-  Possession location








Train scheduled to service A-B-C. Bus replacement operates between B-C, increasing journey time by 10 minutes.

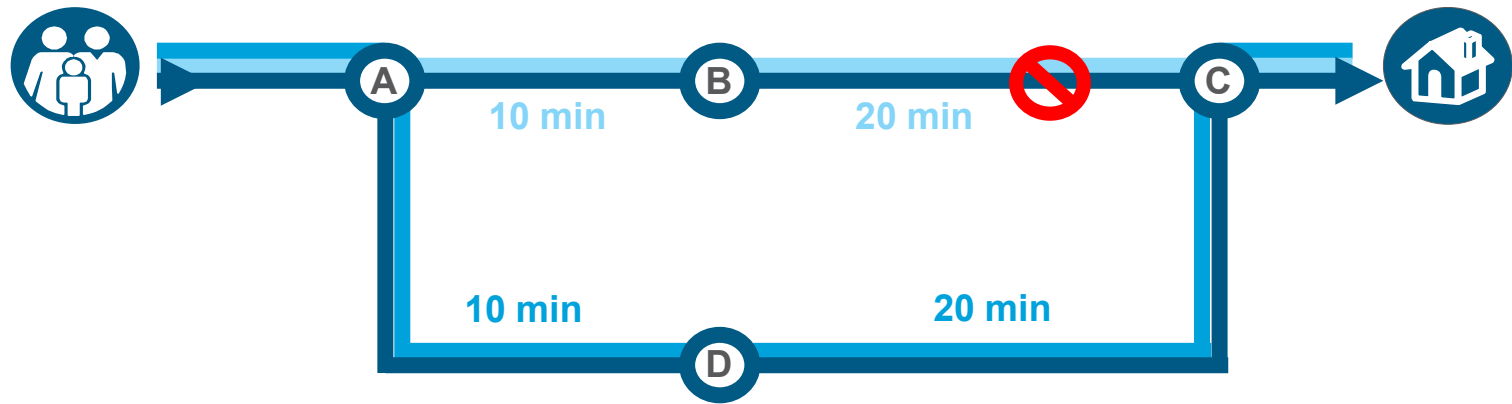
Option	Impact Captured?	Note
1. Schedule 4	Yes	EJT, interchange / bus penalty captured (Train-Bus-Train Pattern)
2. EJT Metric	Partial	Excess journey time captured, but not interchange / bus penalty
3. PDI v2	Partial	Excess journey time captured, but not interchange / bus penalty
4. LCH Approach	Yes	All impacts would be modelled



Rail diversion with missed station (Type 2)

Key

-  Route under possession disruption
-  Bus replacement service
-  Route in CDTT
-  Track and stations
-  Possession location








Train scheduled to service A-B-C. Train is re-routed via D, skipping stop at B. There is no extension of journey time from A to C.

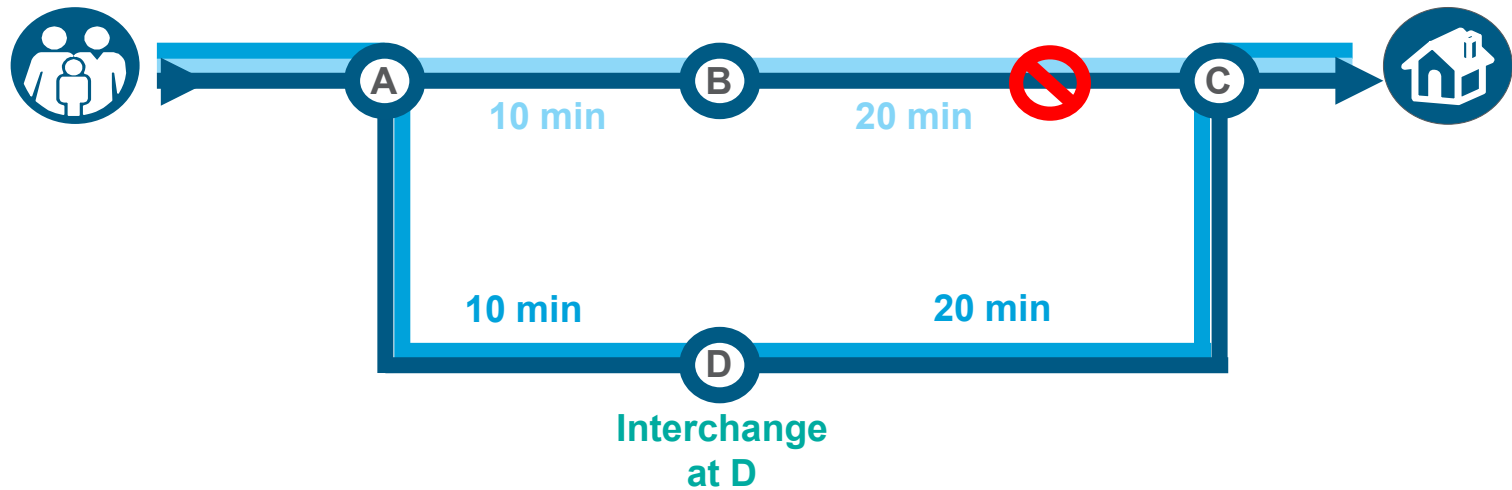
Option	Impact Captured?	Note
1. Schedule 4	Yes	Cancellation at B captured via Cancellation Minutes
2. EJT Metric	Yes	Cancellation at B captured via Cancellation Minutes
3. PDI v2	Yes	Cancellation at B captured via Cancellation Minutes
4. LCH Approach	Yes	All impacts would be modelled



Rail diversion with interchange (Type 3)

Key

-  Route under possession disruption
-  Bus replacement service
-  Route in CDTT
-  Track and stations
-  Possession location








Train scheduled to service A-B-C. Train is re-routed to D, skipping stop at B. Passengers change to connecting service to C onward. There is no extension of journey time from A to C.

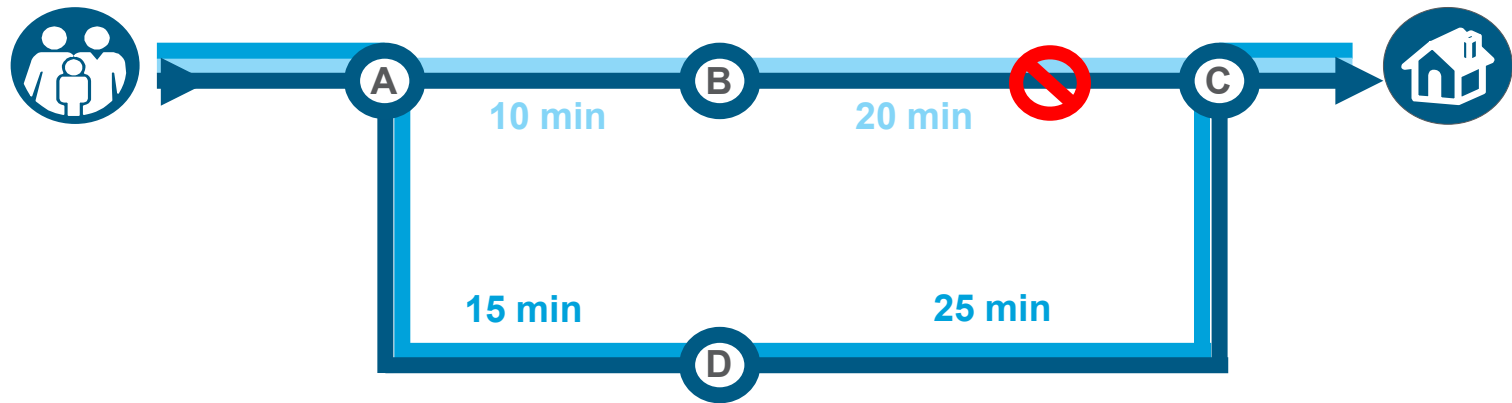
Option	Impact Captured?	Note
1. Schedule 4	Partial	Cancellation at B captured, but not interchange penalty at D
2. EJT Metric	Partial	Cancellation at B captured, but not interchange penalty at D
3. PDI v2	Partial	Cancellation at B captured, but not interchange penalty at D
4. LCH Approach	Yes	All impacts would be modelled



Rail diversion with extended journey time (Type 4)

Key

-  Route under possession disruption
-  Bus replacement service
-  Route in CDTT
-  Track and stations
-  Possession location








Train scheduled to service A-B-C. Train is re-routed via D, skipping stop at B. There is a 10 min extension of journey time from A to C.

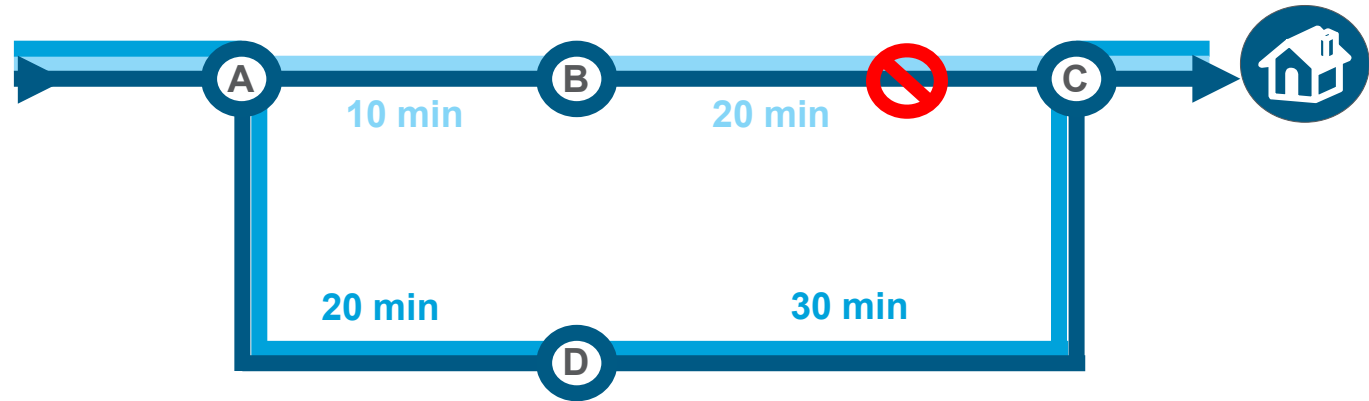
Option	Impact Captured?	Note
1. Schedule 4	Yes	Cancellation at B and extended journey time to C captured
2. EJT Metric	Yes	Cancellation at B and extended journey time to C captured
3. PDI v2	Yes	Cancellation at B and extended journey time to C captured
4. LCH Approach	Yes	All impacts would be modelled



Customer chooses not to travel (Type 5)

Key

-  Route under possession disruption
-  Bus replacement service
-  Route in CDTT
-  Track and stations
-  Possession location








Train scheduled to service A-B-C. Train is re-routed via D, skipping stop at B. There is a 20 min extension of journey time from A to C. *Many passengers are deterred from travelling.*

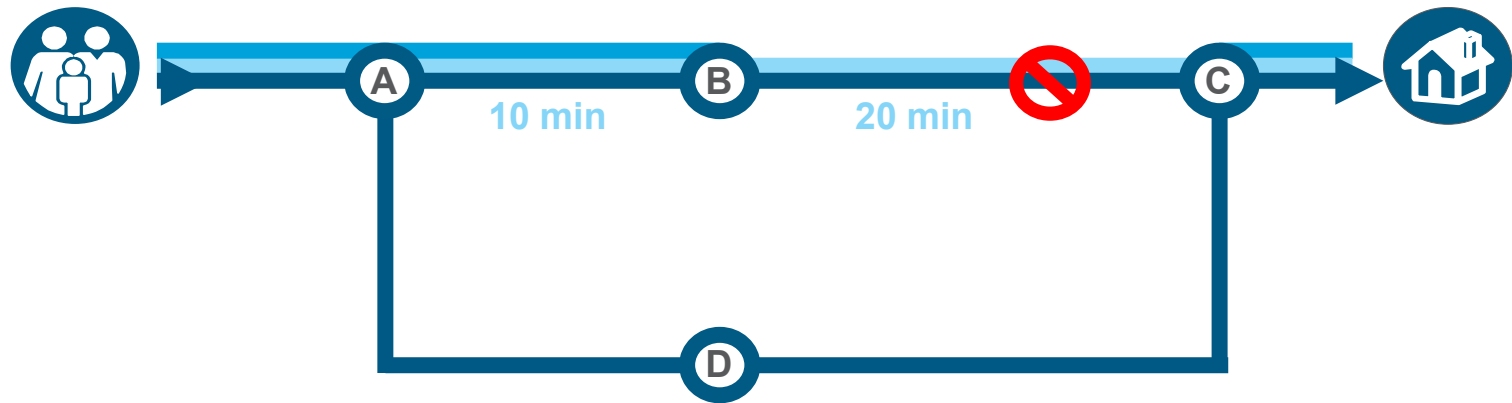
Option	Impact Captured?	Note
1. Schedule 4	No	Does not capture non-linear threshold for non-travel
2. EJT Metric	No	Does not capture non-linear threshold for non-travel
3. PDI v2	No	Does not capture non-linear threshold for non-travel
4. LCH Approach	Yes	GJT elasticity thresholds could be modelled



Customer unable to travel (Type 6)

Key

-  Route under possession disruption
-  Bus replacement service
-  Route in CDTT
-  Track and stations
-  Possession location



Train scheduled to service A-B-C. Train terminates at B, and no feasible alternative arrangements for B-C are provided (This is relatively uncommon on the UK railways).

Option	Impact Captured?	Note
1. Schedule 4	No	No allowance for non-provision of alternative route
2. EJT Metric	No	No allowance for non-provision of alternative route
3. PDI v2	No	No allowance for non-provision of alternative route
4. LCH Approach	Yes	Penalties for non-provision of alternative routes could be included



Overview of results

Metric	Type 1: Bus diversion with extended journey time	Type 2: Rail diversion with missed station	Type 3: Rail diversion with interchange	Type 4: Rail diversion with extended journey time	Type 5: Customer chooses not to travel	Type 6: Customer unable to travel
1. Schedule 4	Yes	Yes	Partial	Yes	No	No
2. EJT Metric	Partial	Yes	Partial	Yes	No	No
3. PDI v2	Partial	Yes	Partial	Yes	No	No
4. LCH Approach	Yes	Yes	Yes	Yes	Yes	Yes

The LCH approach can be configured to capture any disruption type, but its implementation is costly. Schedule 4 has complex caveats to capture the impact of bus transfer, but has drawbacks as a regulatory measure due to reliance on bilaterally negotiated commercially sensitive payment rates. The EJT Metric and PDI have a similar performance, as they both draw on the same elements of Schedule 4: NREJT and WACM. However, the EJT Metric is significantly less costly if it can be computed without a refresh of the Network Availability Reporting System (NARS) on which it relies.

Appendix B – View from DfT

/ View from DfT – received 18/05/18

- DfT agrees that measuring the disruption caused by possessions could be valuable, and that measures could support discussions between Network Rail and operators on how well the impact on both passengers and freight is managed - so long as measures were not focused on to the exclusion of other factors in possession planning and management.
- Disruption is inevitable, and Network Rail and operators should work together to plan the best overall strategy for efficiently delivering necessary work, and within that strategy consider and manage the impact on users. This could include reviewing opportunities to undertake works for part of the traffic day when rail usage is light.
- For passengers, ideally a measure of extended journey time would be passenger-based rather than train-based, given the variation in service utilisation. Disruption to freight users will also be important to consider, including the need to make diversionary routes available. In the longer-term, we agree that developing a 'lost customer hours' measure could be helpful, and could support thinking about the impact on users from all disruption (planned or unplanned).
- There are several issues relevant to how possessions impact on users which will have to be considered alongside the measures suggested. For example, the quality and timeliness of communications, the practical ability of alternative routes to absorb displaced passengers, the quality of replacement services (e.g. bus comfort and facilities), and whether users choose not to use replacement services at all.
- We also want to avoid the creation of perverse incentives in disruption measures. For example, we would not want minimising 'bus vehicle hours' to incentivise making replacement buses less frequent. And we would not want to incentivise shorter possessions in circumstances where longer, well-managed and publicised possessions are the best overall strategy.
- Ultimately we want well planned possessions, with good activity levels during them, with users supported by good publicity and appropriate levels of alternative services. We would like to see a regulatory approach which takes account of the various responsibilities of Network Rail and train operators in delivering those objectives, and how effectively they work together in doing so, and which is supported by but not driven by individual metrics.