Periodic Review 2013: Consultation on the allocation of the Variable Usage Charge

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Issues in this consultation

1. Allocating vertical track variable usage costs
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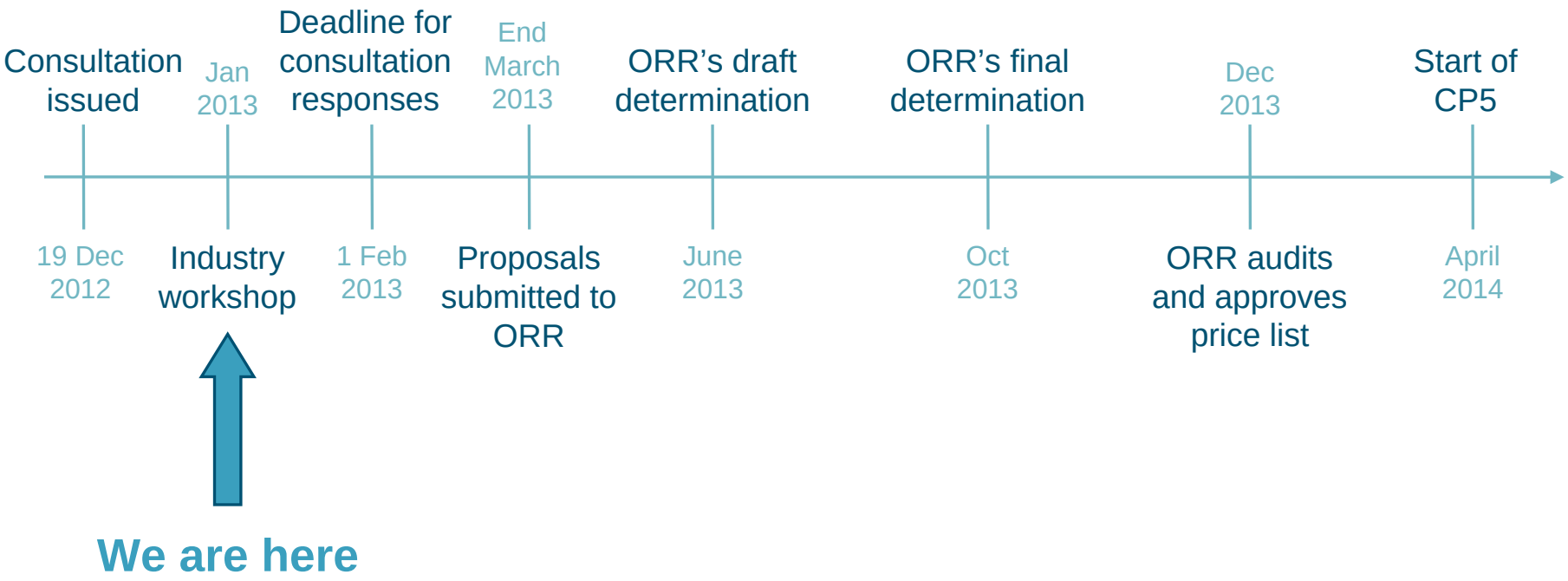
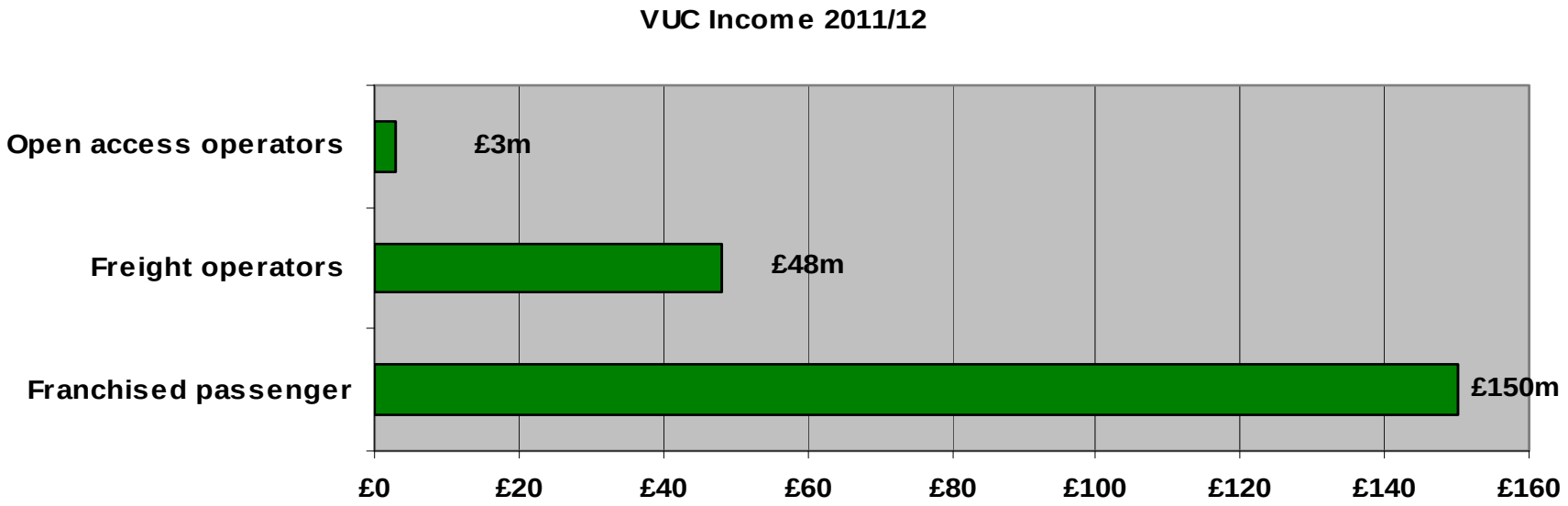
4. Vehicle characteristics that inform VUC rates
5. Temporary default rates
6. Rates for modified vehicles
7. Next steps

The process – where are we?



Introduction

- The Variable Usage Charge (VUC) is designed to recover Network Rail's operating, maintenance and renewal costs that vary with traffic.
- The primary purpose of this consultation is to seek views on the methodology for allocating the VUC between individual vehicle classes in Control Period 5 (CP5).
- Consistent with our approach in CP4, the proposed allocation methodology aims to apportion variable usage costs in a cost reflective way.



Allocating vertical track variable usage costs (1)

- Vertical track costs make up approximately 67% of total variable usage costs.

Review of VUC allocation methodology:

- In CP4 vertical track costs were apportioned using the following 'equivalent track damage' equation. Equivalent track damage is a measure of 'track friendliness'. Hence more 'track friendly' vehicles will attract a lower share of total variable usage costs.

$$\text{Equivalent Track Damage} = Ct * A^{0.49} * S^{0.64} * U^{0.19} \text{ (per tonne.mile)} * GTM$$

where:

Ct = 0.89 for loco-hauled passenger stock and multiple units, and 1 for all other vehicles

A = axle load (tonnes)
S = vehicle operating speed (miles/hour)
U = un-sprung mass (kg/axle)
GTM = Gross Tonne Miles

Allocating vertical track variable usage costs (2)

- We commissioned Serco to review the current equivalent track damage equation. It used the Vehicle Track Interaction Strategic Model (VTISM) to assess how vertical track damage varies with the existing CP4 variables:

Axle load | **Un-sprung mass** | **Operating speed**

- It modelled 48 scenarios with varying axle load, operating speed and un-sprung mass and then performed regression analysis to fit a relationship to these runs. It proposed the following equation to represent track damage as a function of the three variables:

$$\textbf{Relative damage (per axle.mile)} = 0.473.e^{0.133\mathbf{A}} + 0.015.\mathbf{S}.\mathbf{U} - 0.009.\mathbf{S} - 0.284.\mathbf{U} - 0.442$$

- In order to enable comparison with the CP4 equivalent track damage formula, Serco also derived the below power formula. However, this has a less good fit to the VTISM data and Serco recommended using the above equation.

$$\textbf{VTISM power formula} = \mathbf{A}^{1.71} * \mathbf{S}^{0.27} * \mathbf{U}^{0.31} \textbf{ (per tonne.mile) * GTM}$$

Allocating Vertical track variable usage costs (3)

Impact

Relative damage (per axle.mile) = $0.473.e^{0.133\mathbf{A}} + 0.015.\mathbf{S}.\mathbf{U} - 0.009.\mathbf{S} - 0.284.\mathbf{U} - 0.442$

- The revised proposed formula indicates that track damage is more sensitive to axle load and un-sprung mass and less sensitive to vehicle speed than was previously used in CP4. Hence, vehicles with a high axle load or un-sprung mass (e.g. laden freight wagons) would attract a greater share of costs than in CP4 and vehicles with a high operating speed would attract a smaller share, all other things being equal (shown on the next slide).

Network Rail's view

- Whilst Network Rail has no reason to doubt the quality of the work underpinning the Serco analysis we fully accept that freight operators may consider that they require more time to probe and better understand the underlying analysis.

- We, therefore, consider that deferring this work into the charges review that the industry has committed to carry out during the early stages of CP5, to inform charges in CP6, should be considered as an option. We would particularly welcome stakeholders' views on this issue.

Allocating Vertical track variable usage costs (4) (Indicative)

Generic vehicle	Axle load (tonnes)	Operating speed (mph)	Un-sprung mass (kg)	Damage index (relative to Average Vehicle)		
				CP4 Power formula	VTISM Hybrid formula	VTISM Power formula
Average vehicle	12.5	50	2,000	1.00	1.00	1.00
Mark 3 coach	9.2	78	1,260	1.05	0.85	0.79
Freight wagon 4 axle - empty	5.5	41	1,380	0.55	0.56	0.47
Freight wagon 4 axle - laden	19	35	1,380	0.91	1.43	1.09
Freight wagon 2 axle - empty	9	41	1,820	0.74	0.74	0.73
Freight wagon 2 axle - laden	21	32	1,820	0.95	1.73	1.24
High speed multiple unit - motor	14.1	81	1,835	1.42	1.27	1.21
High speed multiple unit - trailer	13.6	81	1,699	1.38	1.20	1.15
Multiple unit - motor	12.9	55	1,931	1.07	1.05	1.04
Multiple unit - trailer	10.2	55	1,548	0.92	0.84	0.82
Locomotive	17.5	37	2,200	0.99	1.32	1.20

Allocating Horizontal track variable usage costs (1)

- Horizontal track variable usage costs make up approximately 19% of total variable usage costs.
- The existing approach to allocating costs allocates each vehicle to a ‘curving class’ depending on its mass and suspension characteristics. These factors have the biggest impact on the tangential forces generated in the contact patch

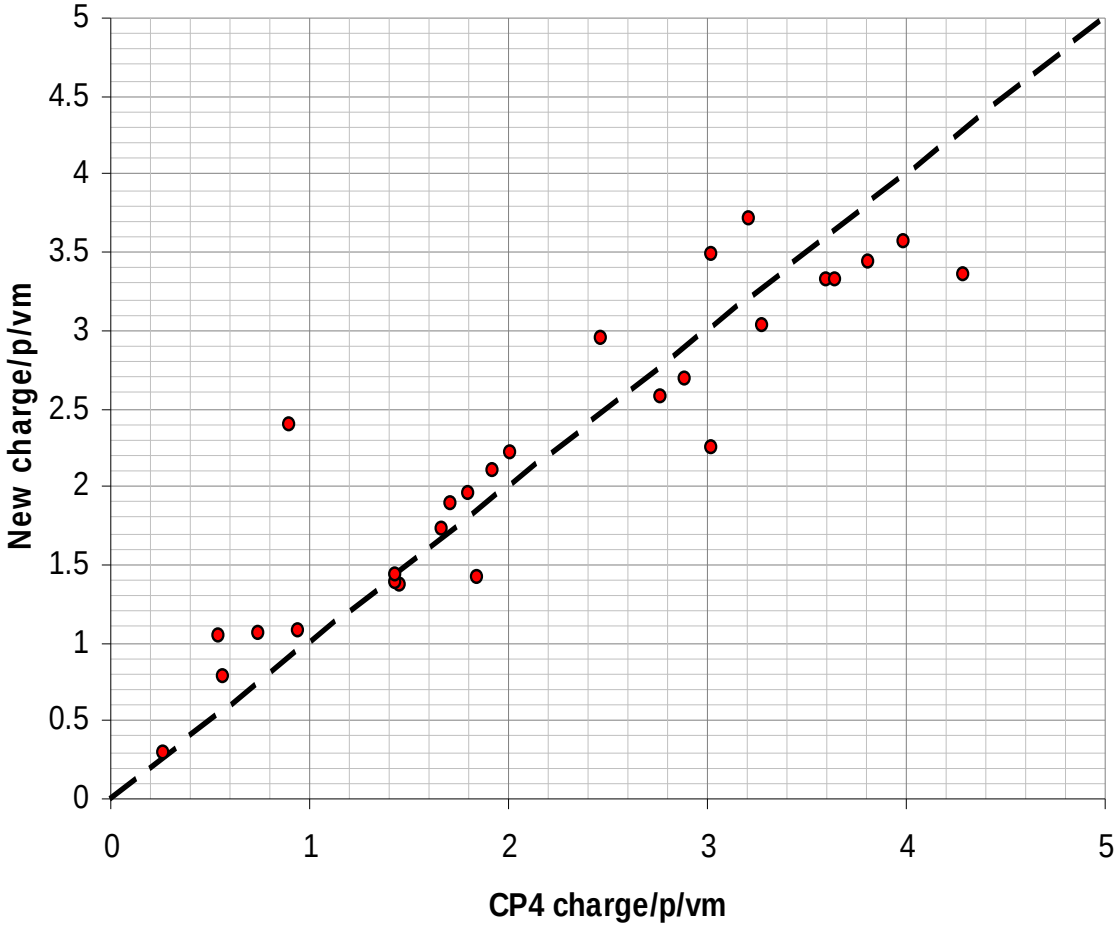
Review of Horizontal VUC allocation methodology

- We have reviewed the existing approach to apportioning horizontal track costs and defining the individual vehicle curving classes.
- We propose, for CP5, modifying the existing methodology to incorporate the following 4 refinements:
  1. Introduce an updated damage calculation methodology, comprised of separate components for rail grinding, RCF and wear,
  2. Use a coefficient of friction on the flange of 0.1 to reflect better lubrication,
  3. Include sample track alignment variations to allow better modelling of dynamic behaviour, and
  4. Include the tangential forces for the trailing wheelset of a bogie in the calculation
- We believe these refinements would improve the accuracy of the apportionment of horizontal track variable usage costs.

Allocating horizontal track variable usage costs (2)

- Initial analysis suggests that the proposed changes would generally not result in a significant change in the surface damage costs allocated to each vehicle (see graph)

- However, Network Rail does not have access to validated vehicle dynamics models of many freight vehicles. As part of this consultation we are requesting that freight vehicle owners / operators assist us by providing access to better models of freight vehicles so that new and more reliable definitions of the curving classes can be generated for CP5.



Allocating non-track (civils and signalling) variable usage costs (1)

Civils variable usage costs (9% of total variable usage costs)

- In CP4, metallic underbridge and embankment costs were apportioned between vehicles using the following equivalent structures damage equation (a measure of 'track friendliness'):

Equivalent Structures Damage = $Ct.A^{3.83}.S^{1.52}$ (per tonne.mile).GTM

Where: Ct is a constant: 1.20 for two-axle freight wagons, and 1 for all other vehicles, A is the axle load (tonnes), S is the operating speed (miles/hour), GTM is the Gross Tonne Miles

Signalling variable usage costs (5% of total variable usage costs)

- In CP4, signalling variable usage costs were apportioned on the same basis as track variable usage costs.

Allocating Non-track (civils and signalling) variable usage costs: NR's proposal (2)

- Serco reviewed the existing methodologies for allocating civils and signalling, variable usage costs. Its recommendations are summarised, below:
- **Metallic underbridge**: the existing civils equation should be used, however, consistent with Euronorm standards, a modified axle load exponent of 4 should be used, rather than 4.83.
- **Other civils (embankments, culverts and masonry underbridge)**: The existing civils equation should not be used because the relevant axle load and speed exponents cannot yet be defined. Instead, the revised equivalent track damage equation should be used.
- **Signalling:** The revised equivalent track damage equation should be used to apportion the 50% of signalling variable usage costs estimated to be load related and the remaining 50% of costs (i.e. those not load related) should be apportioned based on vehicle mileage.

Summary:

- Subject to the revised equivalent track damage equation being implemented in CP5, NR proposes accepting Serco's recommendations in respect of apportioning civils and signalling variable usage costs.

Vehicle characteristics that inform the level of VUC rates

- Variable usage costs are apportioned between individual vehicle classes based on the relevant vehicle characteristics. The more accurate the vehicle characteristics used in the CP5 VUC model the more accurate the cost allocation.

Network Rail's view

- We propose that, as an industry, we should make reasonable endeavours to set CP5 VUC rates based on a robust list of vehicle characteristics and then, following the commencement of the control period, VUC rates for existing vehicles (not subject to vehicle modification) should be 'locked down'.

- We would really welcome feedback on the list of vehicle characteristics attached to the consultation document by the close of this consultation.

- We would also welcome your views on our proposed approach to estimating vehicle operating speed in CP5.

Temporary default rates applied when a 'correct' rate cannot be calculated

- At present, a single 'average' default rate applies to freight vehicles for which the necessary vehicle characteristic information has not been provided to enable a 'correct' VUC rate to be calculated. There is currently no default rate for passenger vehicles.

- Operators, therefore, generally face a weak incentive to provide the necessary vehicle characteristic information, resulting in Network Rail not recovering its full wear and tear costs.

- For CP5 we propose introducing a default rate 'bands' for freight and passenger vehicles and that the default rate for each of these bands is based on the highest relevant rate on the CP5 price list.

- We also propose that following the calculation of a 'correct' rate that default rate charges are refunded and all journeys are re-charged at the 'correct' ORR approved rate.

Passenger default bands	Freight default bands
Locomotive	locomotive
multiple unit (motor)	wagon (laden)
multiple unit (trailer)	wagon (unladen)
coach	

Rates for modified vehicles

- Based on our experience in CP4, it is not uncommon for individual vehicles, subclasses or entire fleets to undergo modification or re-fitment during the control period.

- In CP4, to facilitate the accurate charging of individual vehicles that have been modified to be more ‘track friendly’, we incorporated additional functionality into our Track Access Billing System to bill the VUC at an individual vehicle level, in addition to vehicle class level.

Network Rail’s view

- We propose that for CP5 that this functionality is utilised to charge operators an appropriate, ORR approved, VUC rate where vehicles are modified mid-control period resulting in a different VUC rate becoming appropriate. The amended charge rate would take the form of a bilaterally agreed amendment, subject to normal process including consultation and ORR approval.

Next steps

- We would welcome responses to this consultation by close of business **1 February 2013**
- Responses, and any queries, should be submitted to: **Ben.Worley@networkrail.co.uk**

Future milestones

Principal milestones	
1 February 2013	This consultation closes
By 31 March 2013	Conclude on consultation and publish draft price list
12 June 2013	ORR Draft Determination
31 October 2013	ORR Final Determination
By 31 December 2013	Final pricelists made available
1 April 2014	Implement new variable usage charge