Freight customer event follow up discussion on VUC

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Purpose of the slides

- Following the ORR's Freight Customer Event of 21st November 2018, FOCs (i.e. construction industry mainly through the MPA letter of 11th March 2019) requested a separate session to discuss:
  - The process ORR adopts to determine charges.
  - The accuracy of ORR's communications re: average increases for CP6 freight charges.
  - Effect of the changes in the VUC and other charges from CP5 to CP6 specifically relating to construction traffic.
  - Treatment of Network Rail's own engineering services in the cost models and how the network damage cost that they create is recovered across the rail sector.
  - Mechanism of converting cost recovery to tariff charging, in particular how incentives to invest / use track friendly technology is captured and applied.
  - To understand how the 'market can bear' assessment and capping is attributed.
- The purpose of these slides is to provide clarifications on the above issues

Contents

Introduction

- ORR has a statutory duty to undertake Periodic Reviews (PR) of Network Rail every five years .
- During a PR process we determine
  - what Network Rail should deliver in respect of its role in operating, maintaining and renewing the network; and
  - how the funding available should be best used to support this
- We also set out how we will regulate it over the next five years i.e. Control Period .
- This feeds through into:
  - the service that passengers and freight customers receive and, together with taxpayers, ultimately pay for; and
  - the track access charges to train operators

PR Process: Who does what?

The process

Secretary of State (for England & Wales) and the **Scottish Ministers** each provide ORR with:

High level output specification (HLOS)
What they want to be achieved by railway activities during the control period

Statement of funds available (SoFA)
Public resources likely to be available to achieve the HLOS

ORR then:

- Undertakes the review to seek to achieve the HLOS; and
- Checks that the funding in the SoFA is consistent with the HLOS

Over a 2-3 year period, ORR develops its policy framework for the periodic review

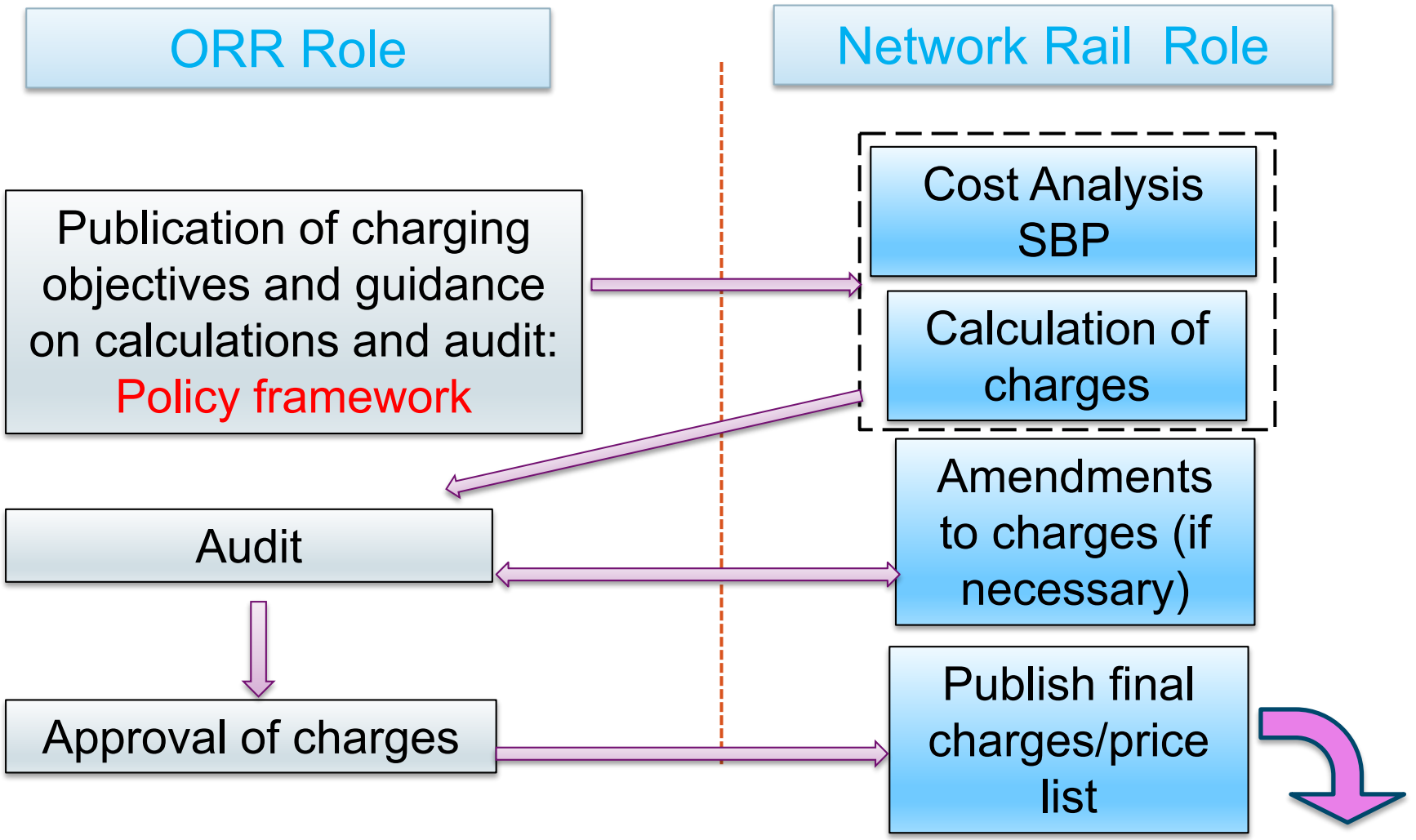
Produces its 'strategic business plans' setting out how it would deliver the HLOS requirements and how much this would cost

Determines whether Network Rail's SBP would deliver the HLOS and whether there are sufficient funds available for this

NR Net Revenue Requirement=Government Grant +Track Access Charges

ORR's determination

Determining charges – ORR vs. NR Roles



Network Rail charging price lists for CP6:
https://www.networkrail.co.uk/running-the-railway/long-term-planning/periodic-review-2018-pr18/

Variable Usage Charges (VUC)

What is VUC?

- The VUC recovers operating, maintenance and renewal costs that vary with traffic - Direct costs
  - Track 85%: track maintenance and renewal
    - 70% of costs related to vertical rail forces; and
    - 30% of costs relate to horizontal rail forces
  - Civil 10%: under bridges, embankments, etc.
  - Signalling 5%
- For any vehicle type, VUC is determined by its “track friendliness”
- Track friendliness is determined by:
  - Axle load
  - Operating speed
  - Un-sprung mass
  - Bogie primary yaw stiffness (indicative of its curving ability)

VUC Policy: PR08 vs PR13 vs PR18

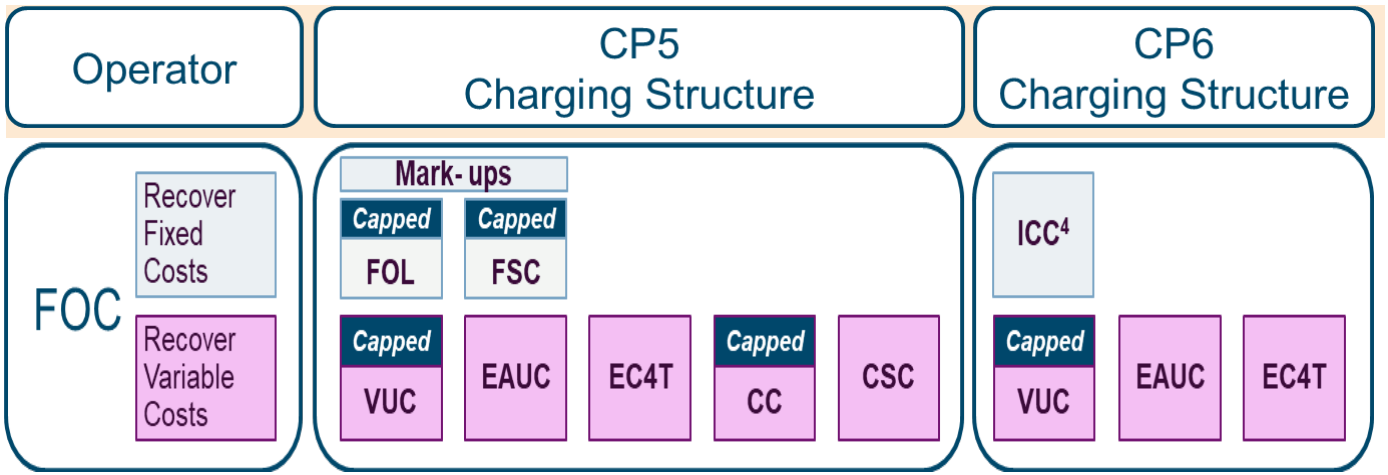
- Our PR13 policy on freight VUC
  - In PR13, we capped the average freight VUC rate increase at 10% from CP4. This cap was phased-in over CP5.
  - This cap prevented VUC significant increases (e.g. construction materials rate increased only by 19% instead of the possible 46%). See PR13 FD p.577
  - In PR13, we applied an 18.9% efficiency overlay to the VUC, from the first year of CP5.These savings have not been achieved
  - Network Rail has become less efficient compared to CP4. This has led to an increase in the costs used to calculate the VUC.
  - In PR18 we have undertaken minor recalibration of the VTISM
- With no mitigation, unwinding PR13 cap combined with Network Rail's inefficiency and VUC recalibration, average uncapped freight VUC would increase by 38% in PR18
  - Construction would increase by 58% (see slide 19 below)

PR18 Final Determination on Track Access Charges

CP6 charging framework

Charging framework's aim:

- Simplification
- Stability



[4] Infrastructure cost charge (ICC)- As per MCB Analysis

- Infra costs going up by CPI for ESI coal, iron ore and spent nuclear fuel
- Biomass to pay Infra Cost Charge from 2021

Variable charges - headlines

- Legal framework
  - Costs directly incurred (e.g. VUC) must be recovered from operators
  - Charges can be capped and phased-in over a finite period of time
- But
  - CP5 capping catching-up with us
  - NR variable costs have continued to increase
- Capacity charge and coal spillage charge will be scrapped **= saving**

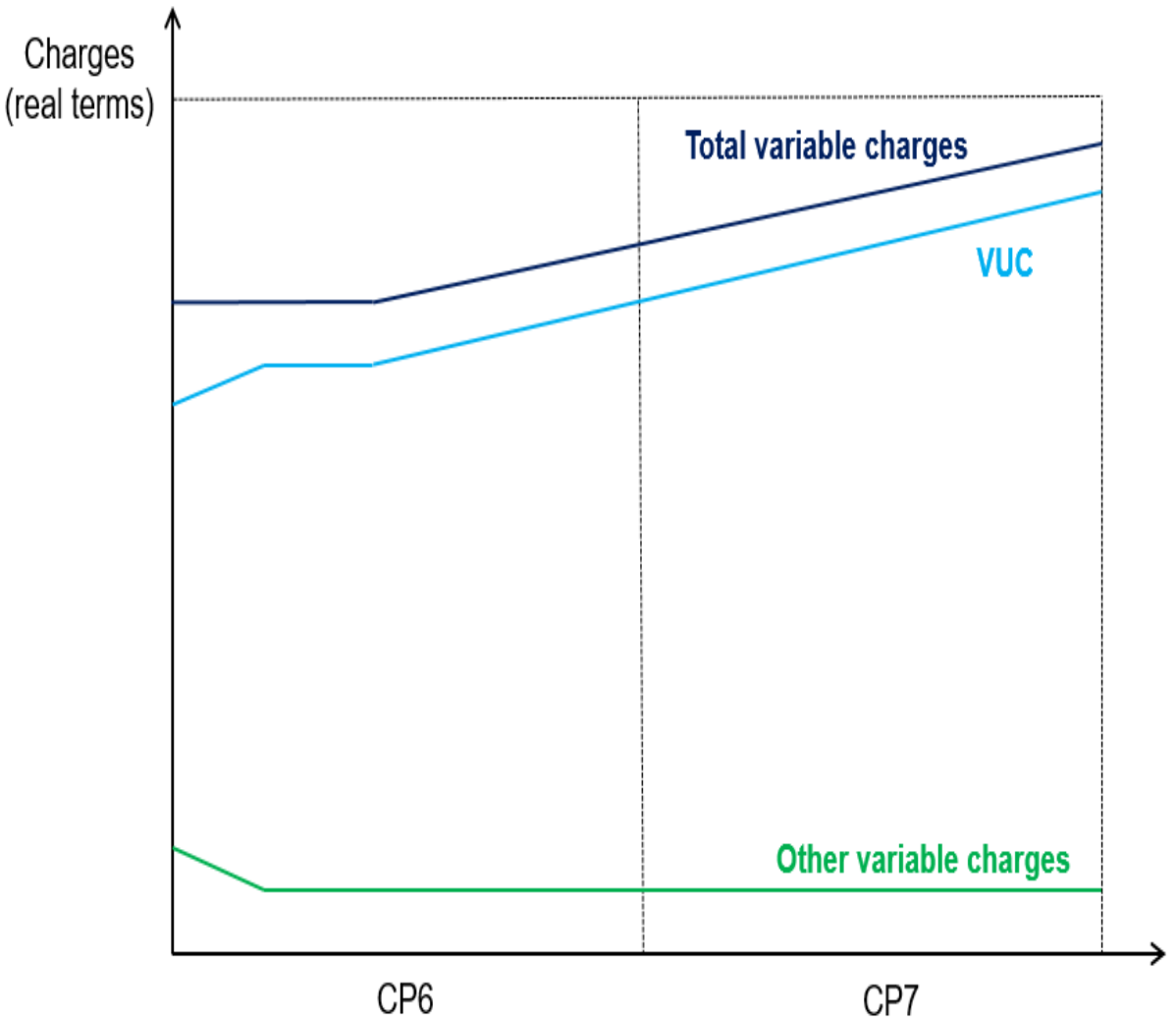
- Forecast **average** increase in **total variable charges** relative to the final year of CP5 for freight (PR18 FD, Table 9.1): **Not just construction**!

Operator type	Uncapped increase from close CP5 to CP6	Capped increase averaged across CP6	Capped increase from close CP5 to final year of CP6
Freight	26%	4%	10%

Variable charges – headlines (2)

- CP6 capping/phasing-in mean that:
  - 2019-2021: Total variable charges will only increase by CPI inflation
  - Apart from VUC that will be changing following the transition profile, others will be held constant.
  - Capped increase from close CP5 to final year of CP6 will be CPI+10%
  - Average annual increase years 3-5 of CP6 is CPI+ 3.2%
  - Change from RPI to CPI further expected to save 5% by end of CP6.

Transition profile to full cost recovery



- Capped operators will benefit from a two-year adjustment period during which there will be no increase in their total variable charges in real terms (shown in dark blue).
- The transition to uncapped levels is then based on a steady straight-line 'glide path' to the end of CP7.
- This means that the VUC for capped operators will also include phasing-in to adjust for the changes to other variable charges (including the removal of the capacity charge).

Freight Variable Charges in numbers

£m		CP6					CP7				
Period ending	Mar-19	Mar-20	Mar-21	Mar-22	Mar-23	Mar-24	Mar-25	Mar-26	Mar-27	Mar-28	Mar-29
Year	0	1	2	3	4	5	6	7	8	9	10
VUC Uncapped		63.63	63.63	63.63	63.63	63.63	63.63	63.63	63.63	63.63	63.63
VUC (capped and phased in)	46.07	48.98	48.98	50.81	52.64	54.47	56.30	58.13	59.97	61.80	63.63
change yoy (%)	3.8%	6.3%	0.0%	3.7%	3.6%	3.5%	3.4%	3.3%	3.1%	3.1%	3.0%
CC	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EAUC	0.48	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Coal Spillage	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EC4T	6.24	6.36	6.36	6.36	6.36	6.36	6.36	6.36	6.36	6.36	6.36
Other variable charges	9.91	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Total variable freight charges	55.98	55.98	55.98	57.81	59.64	61.47	63.30	65.14	66.97	68.80	70.63
change YoY (%)	3.1%	0.0%	0.0%	3.3%	3.2%	3.1%	3.0%	2.9%	2.8%	2.7%	2.7%
CP % change cumulative	9.0%	0.0%	0.0%	3.3%	6.5%	9.8%	13.1%	16.3%	19.6%	22.9%	26.2%
Total uncapped VC (including CC+CSC)		73.53	73.53	73.53	73.53	73.53	73.53	73.53	73.53	73.53	73.53
TVC increase capped to uncapped (YR0 VS YR10)		(70.63-55.98)/55.98				26%					
TVC increase at end CP6 (YR0 vs YR5)		(61.47-55.98)/55.98				10%					
Average annual increase YRS 3-5 of CP6		(3.3%+3.2%+3.1%)/3				3.2%					
Average TVC increase over CP6		(0%+0%+3.3%+6.5%+9.8%)/5				4.0%					
VUC increase capped to uncapped (YR0 vs YR10)		(63.63-46.07)/46.07				38%					
VUC Average increase in CP6		(6.3%+0.0%+3.7%+3.6%+3.5%)/5				3.4%					

VUC rates variability by commodity segment

Individual VUC Rates' variations

- There is considerable variation in the changes of the individual vehicle and (for freight) commodity rates around the average figures presented reflecting
  - the different vehicle characteristics; and
  - the variation in CP5 capping arrangements.
- We analysed the potential impact of the proposed increases in variable charges in CP6 across the various freight commodity segments.
  - The implied impact of the higher charges on traffic in CP6 was calculated based on each commodity segment's elasticity (MDST, 2012) and compared to the forecast traffic growth for that commodity segment (MDST, 2017).
  - The increase in total variable charges is not expected to result in a material contraction of any of the freight commodity segments; and
  - Our capping/phasing-in transition profile acts to moderate the rate of increase in rates to uncapped levels.

VUC rates by commodity

	Average rates by commodity based on forecast 18/19 traffic (£/kgtm) in 17/18 prices									Growth relative to 18/19 rates				
Freight Traffic Commodity	2018/19 (kgtm)	Uncapped CP6 rate (£/kgtm)	18/19	19/20	20/21	21/22	22/23	23/24	18/19 discount vs. uncapped rate	2019/20 change (%)	2020/21 change (%)	2021/22 change (%)	2022/23 change (%)	2023/24 change (%)
Construction Materials	4,801,077.79	4.11	2.60	2.81	2.81	2.97	3.13	3.29	**58%**	8%	8%	14%	20%	27%
European Conventional	285,022.05	2.99	2.42	2.51	2.51	2.57	2.63	2.69	24%	3%	3%	6%	8%	11%
Steel	1,722,598.20	3.50	2.43	2.62	2.62	2.73	2.84	2.95	44%	8%	8%	12%	17%	21%
Iron Ore	147,123.11	4.59	2.98	3.21	3.21	3.39	3.56	3.73	54%	8%	8%	14%	19%	25%
European Automotive	2,690.06	3.67	2.84	3.05	3.05	3.13	3.21	3.28	29%	8%	8%	10%	13%	16%
Industrial Minerals	419,924.57	3.99	2.68	2.89	2.89	3.02	3.16	3.30	49%	8%	8%	13%	18%	23%
Coal ESI	120,405.24	3.84	2.42	2.60	2.60	2.76	2.91	3.07	59%	7%	7%	14%	20%	27%
Domestic Automotive	416,039.95	2.12	1.97	1.94	1.94	1.97	1.99	2.01	8%	-1%	-1%	0%	1%	2%
Biomass	1,227,268.07	3.74	2.30	2.48	2.48	2.64	2.79	2.95	63%	8%	8%	15%	22%	28%
Chemicals	1,126.60	3.43	2.68	2.77	2.77	2.86	2.94	3.02	28%	4%	4%	7%	10%	13%
European Intermodal	123,723.84	2.01	1.96	1.84	1.84	1.86	1.89	1.91	2%	-6%	-6%	-5%	-4%	-3%
Domestic Intermodal	10,437,628.	2.01	1.66	1.75	1.75	1.78	1.81	1.85	21%	5%	5%	7%	9%	11%
Total/Average	24,895,868	2.56	1.85	1.97	1.97	2.04	2.11	2.19	**38%**	6%	6%	10%	14%	18%

VUC for construction in summary

- In 18/19, construction gets a greater discount than the freight average (58% vs. 38%)

	CP6 uncapped	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
Average Rate (£/kgtm)	4.11	2.60	2.81	2.81	2.97	3.13	3.29
VUC revenue (£m)	19.73	12.50	13.47	13.47	14.25	15.03	15.82
Increase vs 18/19 (end CP5)	58% (discount)		8%	8%	14%	20%	27%
YoY increase			8%	0%	6%	5%	5%
CC not paid (Gain to FOCs)			0.57	0.57	0.57	0.57	0.57

- But we analyzed the impact of possible modal shift due to higher prices
  - According to MDST (2012,P.2), doubling construction's VUC may lead to a 14.8% reduction in its traffic but likelihood of moving traffic to road is not very high (=medium).
  - MDST (2017) forecast for construction traffic growth from 16/17 to 23/24 is 33%
  - Our analysis (not discussed here) showed that construction traffic growth forecast is 30% (net of possible CP6 modal shift) for same period.

Incentives to invest in track-friendly wagons

Incentives to invest in track-friendly wagons

- The VUC aims to be cost-reflective –
- Therefore, if operators run more ‘track friendly’ wagons they will pay lower VUCs
- By ‘track friendly’ we mean factors like;
  - lower un-sprung mass,
  - lower axle load and
  - TF25 bogies, rather than three-piece bogies
- In simple terms, each wagon type is given a ‘damage score’ which its VUC is based on
- The damage score is based on engineering equations derived through engineering modelling, including using the Vehicle Track Interaction Strategic Model (VTISM)

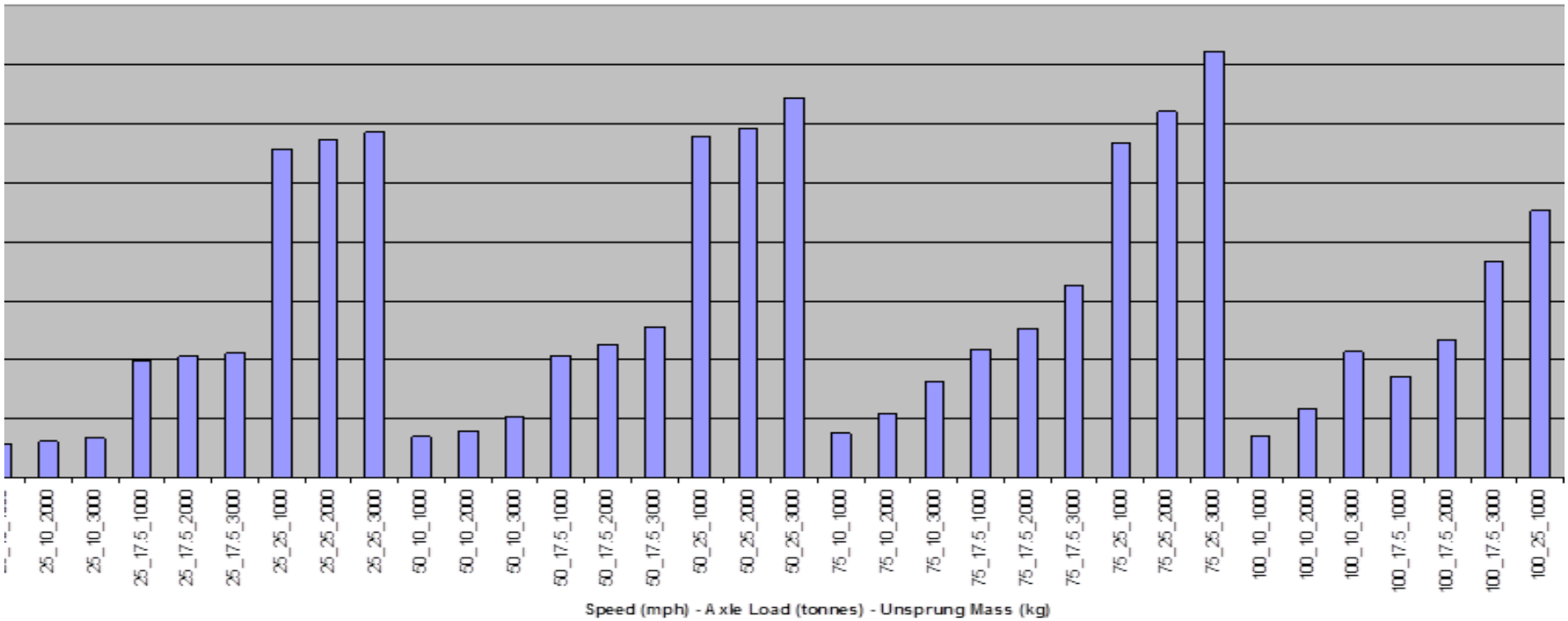
- For example, track damage score is calculated as follows:

$$Track\ damage\ score = Ct * \left(0.473 * e^{0.133A} + 0.015 * S * U - 0.009 * S - 0.284 * U - 0.442\right) * \frac{vehicle\ miles * axles}{1000}$$

Ct = freight suspension factor A= axle-load (tonnes) S= operating speed (mph) U= un-sprung mass (tonnes/axle)

Incentives to invest in track-friendly wagons (2)

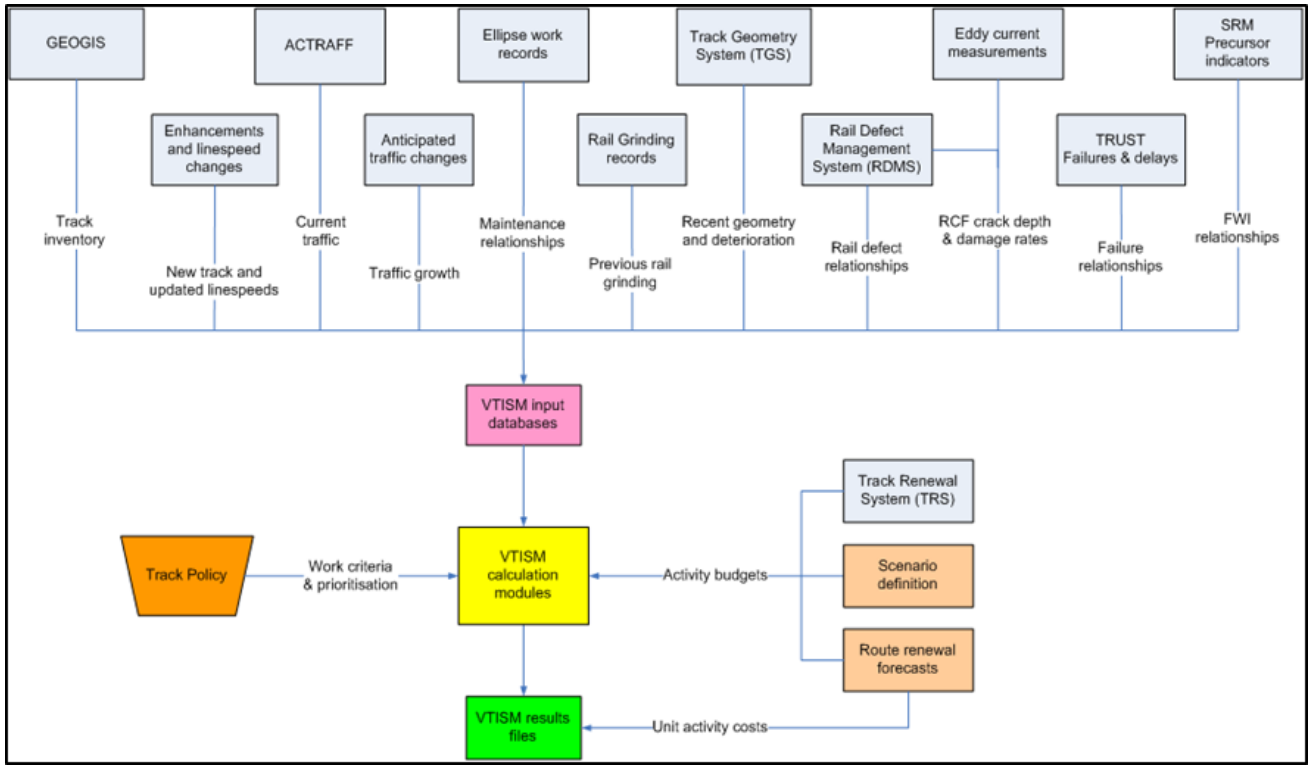
- The graph below illustrates the relative differences between rolling stock types/operating conditions



- If a vehicle has a lower axle-load, for example, it will get a receive a lower ‘damage score’
- We understand that the VUCs that a wagon will pay are a relevant consideration when an operator, or freight customer, is purchasing new wagons?
- Below, are examples what we believe to be older wagons being replaced by new more ‘track friendly’ wagons

Old wagon	Old charge (2019/20 rates and prices)	New wagon	New charge (2019/20 rates and prices)	Reduction in charge
JNAC (construction)	£3.7275/kgtm	JNAT (construction)	£3.0882/kgtm	£0.6396/kgtm (-17%)
PCAC (construction)	£4.1823/kgtm	IIAB (construction)	£3.2968/kgtm	£0.8855/kgtm (-21%)

What is the Vehicle Track Interaction Strategic Model (VTISM)?

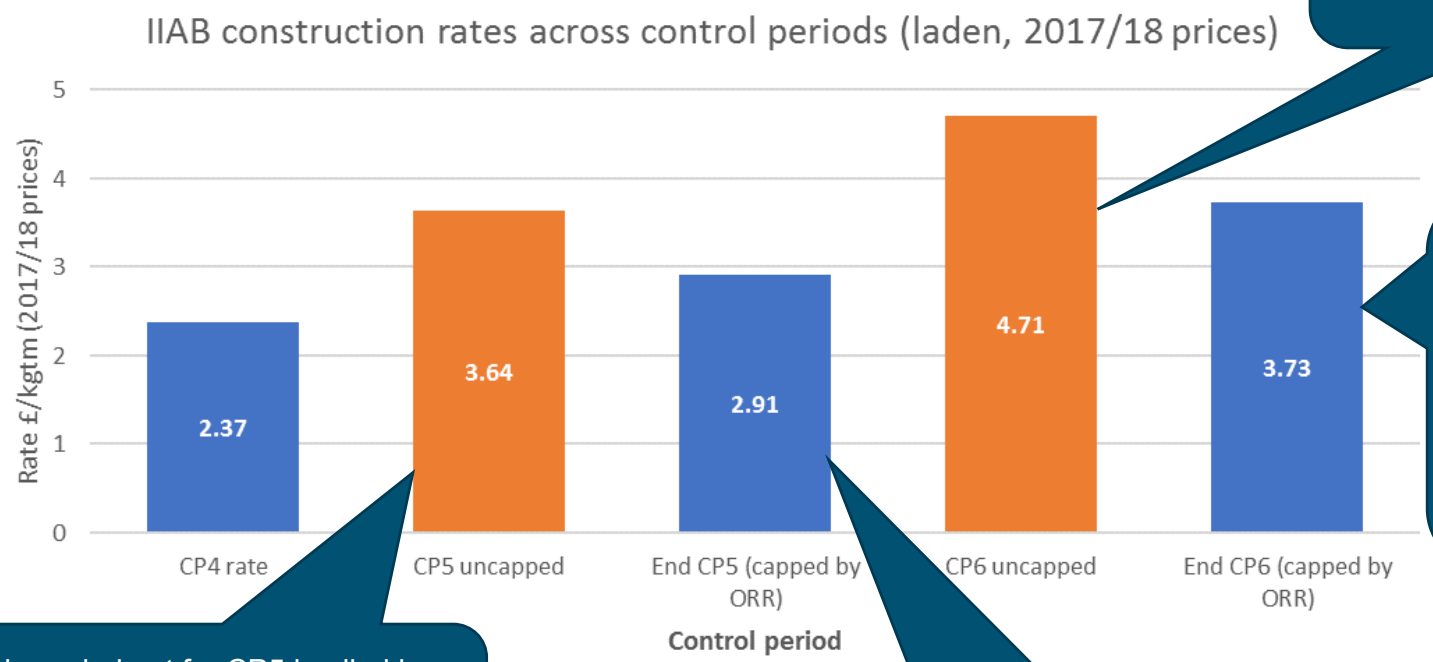


- VTISM is an engineering model, owned by Network Rail and RSSB, which uses engineering science to predict track degradation and the remedial effects of heavy maintenance and renewal
- It is a collection of databases and calculation modules, controlled by a master database (see picture, above)
- It was first released in 2006, following a significant industry-led research programme
- VTISM is used by Network Rail primarily to forecast the future track maintenance and renewal volumes
- However, it is also used by Network Rail in the calculation of VUCs – it used to estimate the average cost per mile of an ‘additional train’ and the relationship between factors such as axle-load and track ‘wear and tear’

IIAB wagon example

Change in IIAB construction rates between CP4 and CP6 (laden, 2017/18 prices)

- The graph, below, illustrates for the IIAB wagon the change in the construction VUC rate since CP4
- It also shows the impact of ORR's decision to cap the increase in charges for CP5 and CP6
- All values are in constant 2017/18 prices



Our VUC costs increased by c. 30% between CP5 and CP6 (increase from 3.64 to 4.71 in example)

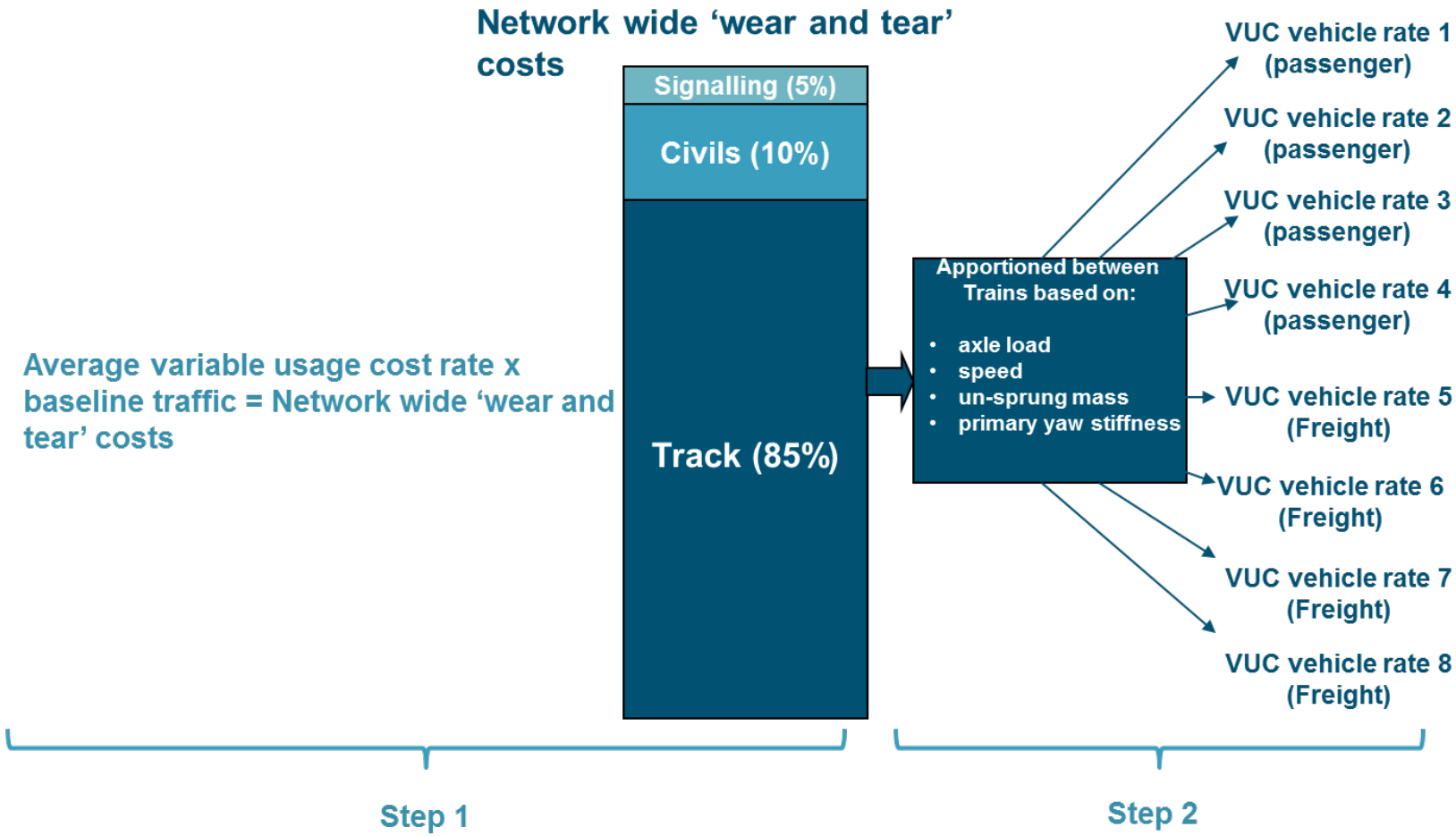
For CP6 ORR again capped and phased-in the increase in freight charges at a level at which it considered the market could afford (28% for this wagon)

Research carried out for CP5 implied in a significant increase in VUC rates for heavy axle-load vehicles, including laden construction wagons (54% for this wagon)

For CP5 ORR capped and phased-in the increase in freight charges at a level at which it considered the market could afford (23% for this wagon)

Treatment of Network Rail engineering services

Engineering traffic in VUC calculation (1)



- Engineering traffic is included in step 1 of the VUC calculation – estimating an average VUC rate
- This average rate is primarily derived using the engineering model VTISM, by modelling different traffic scenarios (explained further on the next slide)
- This average rate informs both passenger and freight VUC rates (it does not only affect freight)
- Engineering traffic only comprises approximately 3% of total tonnage

Engineering traffic in VUC calculation (2)

- To calculate the average VUC rate we run two modelling scenarios using VTISM (illustrative example, below):
  1. A 'baseline' traffic scenario assuming starting CP6 traffic levels
  2. A 'baseline +5%' traffic scenario
- Both scenarios include c.3% engineering traffic

Simplified illustrative example (with engineering)	Baseline	Baseline +5% traffic	Change
Passenger and freight 1,000 gross tonne miles (kgtm)	200m	210m	10m
Maintenance and renewal (M&R) costs	£1,000m	£1,020m	£20m

- We then divide the change in cost by the change in traffic to calculate an average VUC rate:

$$£2\ per\ kgtm\ average\ rate = \frac{£20m\ increase\ in\ M\&R\ costs}{10m\ increase\ in\ kgtm}$$

- If engineering traffic were to be excluded it would result in lower traffic and lower costs
- Therefore, likely to only have a negligible affect on the average VUC rate (illustrative example, below):

Simplified illustrative example (without engineering)	Baseline	Baseline +5% traffic	Change
Passenger and freight 1,000 gross tonne miles (kgtm)	194m	203.7m	9.7m
Maintenance and renewal (M&R) costs	£970m	£989.4m	£19.4m

$$£2\ per\ kgtm\ average\ rate = \frac{£19.4m\ increase\ in\ M\&R\ costs}{9.7m\ increase\ in\ kgtm}$$

PR18 independent reporter review findings

- During PR18 freight colleagues raised concerns about the treatment of engineering traffic in the VUC calculation
- In particular, freight colleagues were concerned that:
  - costs associated with engineering traffic were 'washed across' freight traffic only; and
  - engineering wagons were some of the least 'track friendly' on the network
- ORR and Network Rail decide to ask the independent reporter, Arup, for advice on this issue (amongst other things)
- Arup's report is available on our website here
- Following review, Arup concluded the following:

  "Arup's view is that the calculation process and decision to include the cost of engineering trains in the cost of track maintenance and renewals is reasonable given the fact that engineering work cannot be undertaken without the use and support of engineering trains.

  Analysis also indicates that they are not excessively damaging to the track when compared to other freight traffic."
- After weighing up the evidence, including the consultant's advice, ORR decided to retain engineering traffic in the VUC calculation for CP6

How does engineering traffic compare to other commodities?

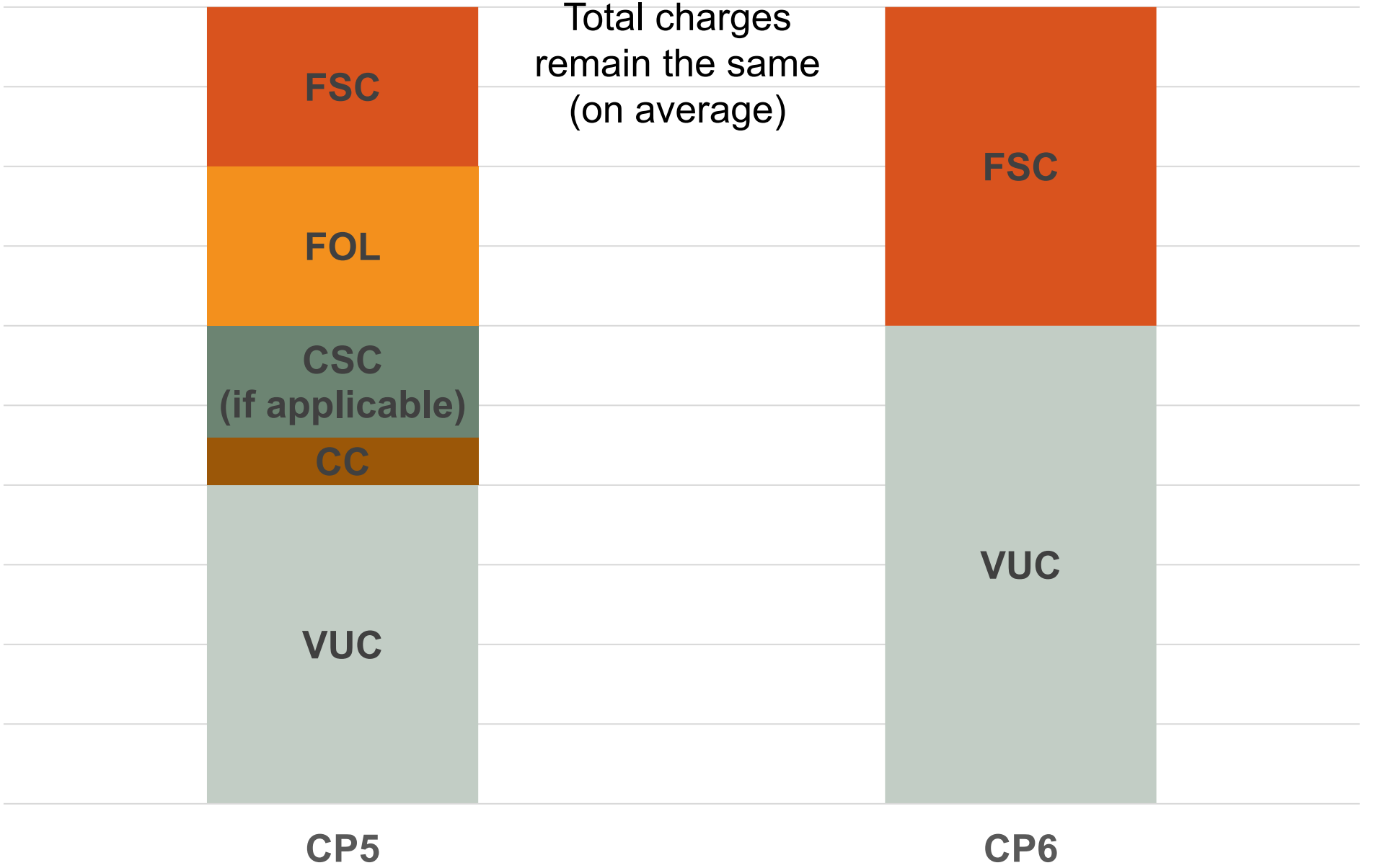
Average NR vehicle engineering rate			Average chargeable rate by commodity		
Commodity	Rate		Commodity	Rate	Variance to NR Engineering rate (%)
Engineering	2.49		Domestic Intermodal	1.62	(35%)
			Biomass	2.12	(15%)
			Petroleum	1.85	(26%)
			Construction Materials	2.61	5%
			Coal ESI	2.42	(3%)
			Steel	2.43	(2%)
			Domestic Waste	2.42	(3%)
			European Intermodal	1.96	(21%)
			Coal Other	2.82	13%
			Iron Ore	2.98	20%
			European Conventional	2.42	(3%)
			Industrial Minerals	2.55	2%
			Domestic Automotive	2.02	(19%)
			Royal Mail	1.78	(29%)
			Enterprise	2.40	(4%)
			Other	2.67	7%
			Chemicals	2.65	6%
			European Automotive	2.79	12%
			Total	2.04	(18%)

Infrastructure cost charge (ICC)

The infrastructure cost charge

- ICCs are intended to recover a proportion of Network Rail's fixed costs. This type of charge is known as a mark-up which, under European and domestic legislation, may only be levied on market segments **that can bear them.**
- Freight market is segmented by commodity carried.
- A freight market segment can bear a charge if the increase in charges does not have a significant affect on the amount of the commodity moved by rail.
- In CP5, ICCs (previously called mark-ups) were levied on freight services carrying:
  - Electricity supply industry (ESI) coal;
  - Iron ore; and
  - Spent nuclear fuel.
- In CP6 we determined that those same freight services could still bear an ICC, but only at the current level (i.e. total charges would remain unchanged for those three commodities.)
- We also determined that ESI biomass could afford to pay an ICC.
- We determined that other commodities could not bear to pay the ICC.

Calculating the ICC



Thank You
Any Question?