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)

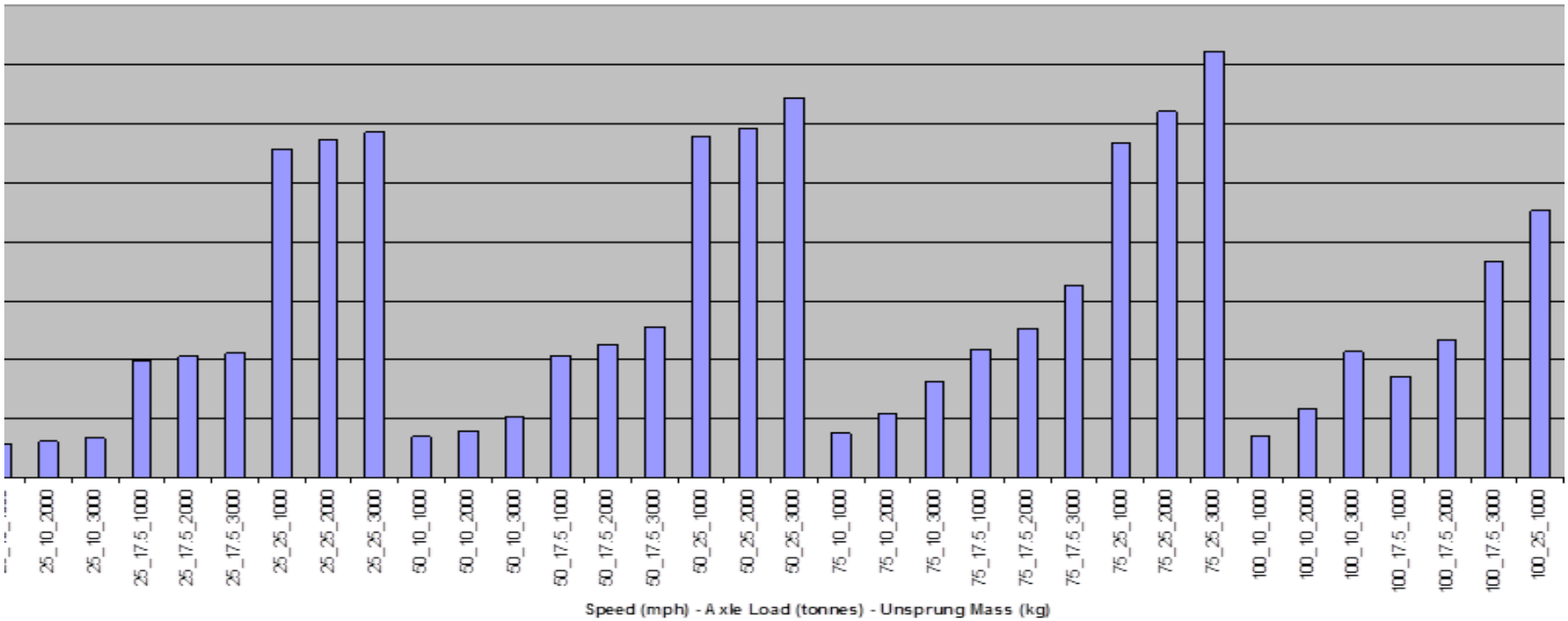
- For example, track damage score is calculated as follows:

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

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)

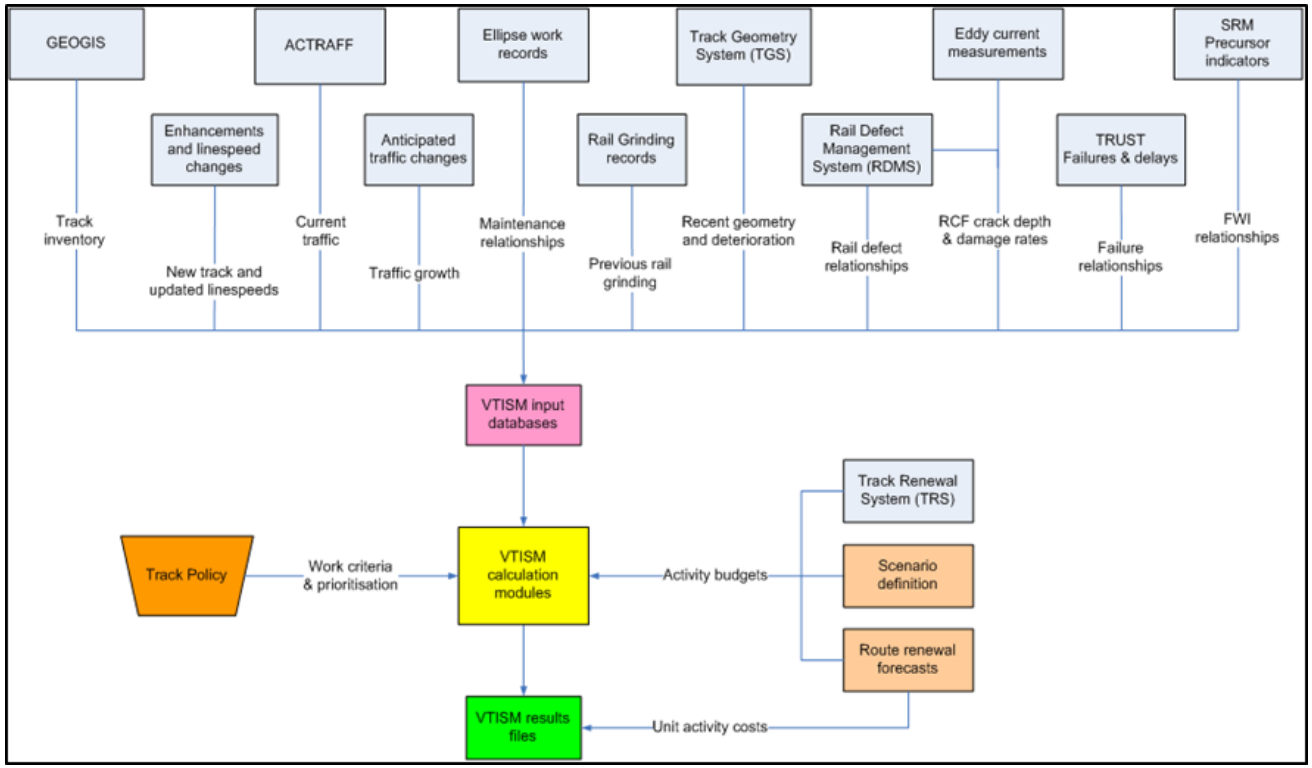
- The graph below illustrates the relative differences between rolling stock types/operating conditions



- 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)?

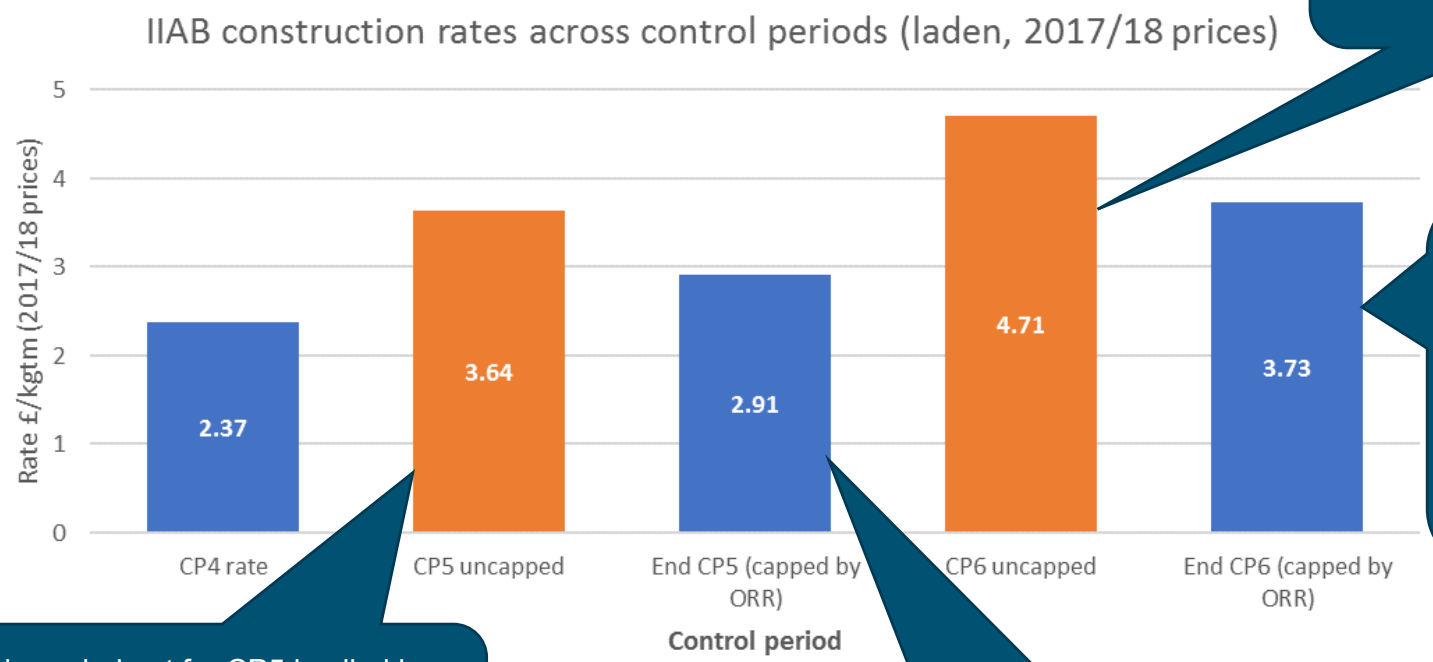


- VTISM is an engineering model, owned by Network Rail and RSSB, which uses engineering science to predict track degradation and the remedial effects of heavy maintenance and renewal
- It is a collection of databases and calculation modules, controlled by a master database (see picture, above)
- It was 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)

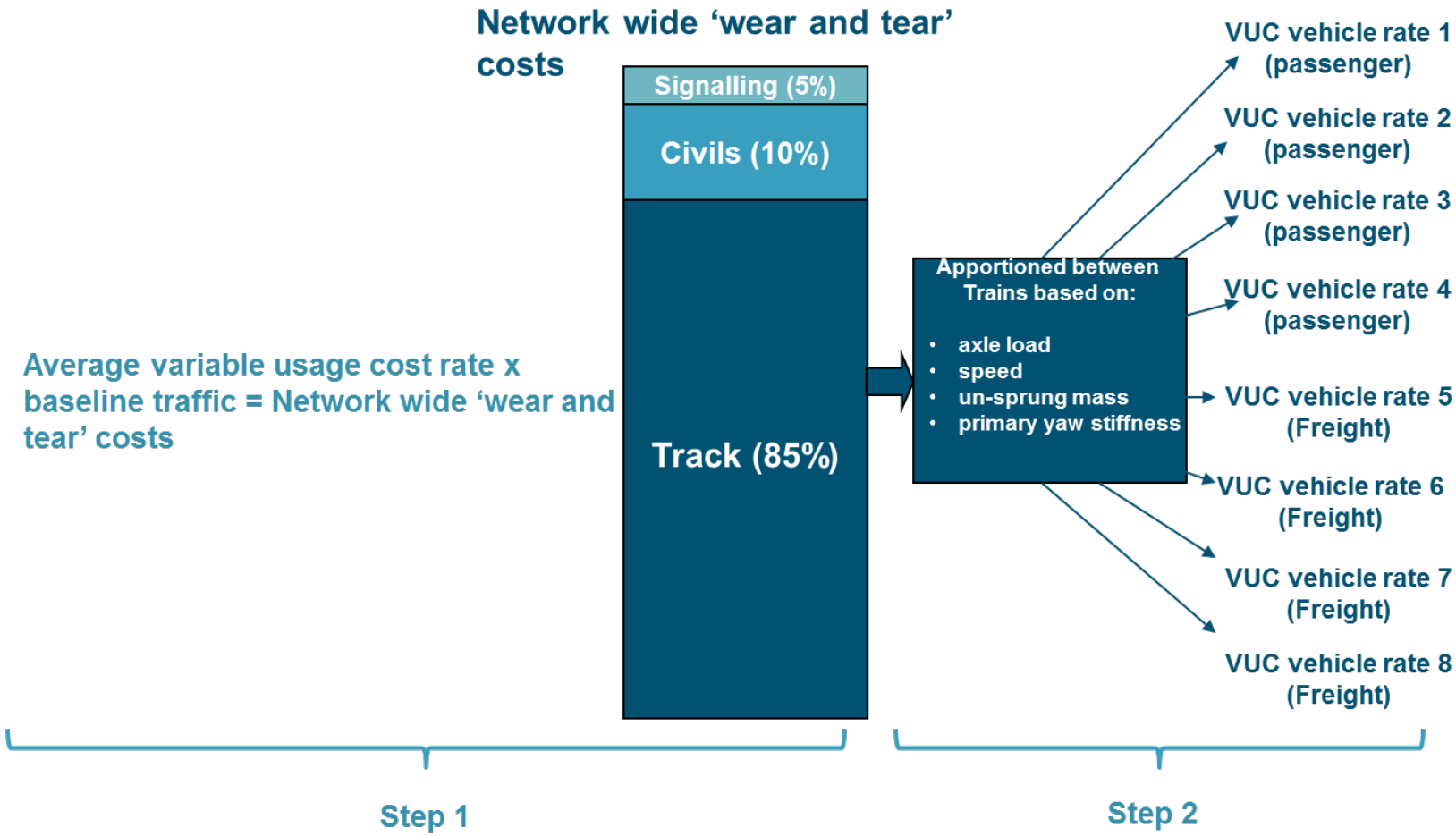
For CP6 ORR again capped and phased-in the increase in freight charges at a level at which it considered the market could afford (28% for this wagon)

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?

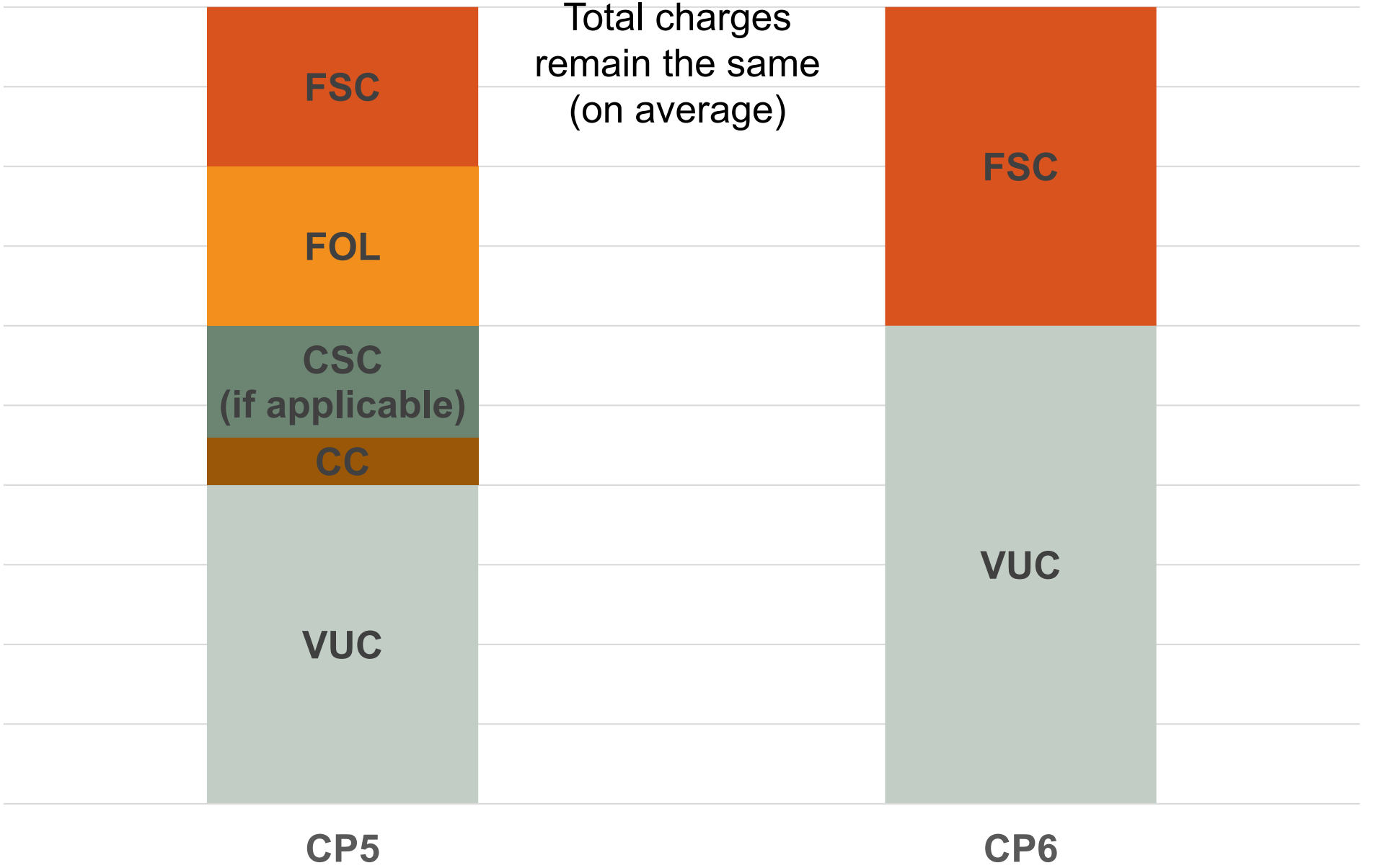
Average NR vehicle engineering rate			Average chargeable rate by commodity		
Commodity	Rate		Commodity	Rate	Variance to NR Engineering rate (%)
Engineering	2.49		Domestic Intermodal	1.62	(35%)
			Biomass	2.12	(15%)
			Petroleum	1.85	(26%)
			Construction Materials	2.61	5%
			Coal ESI	2.42	(3%)
			Steel	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?