Periodic Review 2013:

Traction Electricity and Electrification Asset Usage Charges in CP5 – Conclusions of Network Rail's Consultation

February 2013

CONTENTS

2 EXECUTIVE SUMMARY

During CP4[1] the structure of the electricity charging framework has changed considerably, largely due to the introduction of on-train metering in 2010. Working closely and collaborating with the industry, we have carried out a substantial programme of work to facilitate metered billing and to better understand our electricity network, in particular transmission losses. Much of this work has been 'leading edge' and incredibly complex. As an industry we believe significant progress has been made.

In late 2012, we consulted on a framework for charging for electricity in CP5[2]. This was part of the work programme to revisit all track access charges at each regulatory review. The current review is PR13 (Periodic Review 2013), which ORR will be concluding on in October 2013. PR13 will inform charges for CP5, which are due to come in to force on 1 April 2014. We issued further documents and reports for consultation in November 2012 (DC losses) and January 2013 (updated losses reports). This document sets out our conclusions on those consultations, and forms our final proposal to ORR. We would like to thank all the stakeholders who responded to this consultation.

Ultimately, all decisions with regards to charges for CP5 are subject to ORR's approval.

The list, below, sets out some of our key conclusions:

- retain the current modelled consumption rates and regenerative braking discounts;
- continue to charge for losses as a mark-up on consumption, net of regenerated energy;
- levy a single losses mark-up on the AC network, fixed over CP5
    - 3.85% (or 4.70% on consumption net of regenerative braking, for operators using it)[3];
- levy separate losses mark-ups on the two DC networks, each being fixed over CP5;
    - 17.01% for the South England area (or 20.01% on consumption net of regenerative braking, for operators using it)[3];
    - 11.56% in Merseyside (or 13.60% on consumption net of regenerative braking, for operators using it) [3];
- freight operators to be charged on the basis of actual electricity prices (consistent with passenger operators), for both metered and modelled usage; and

[1] Control Period 4, this is the period from 1 April 2009 – 31 March 2014

[2] Control Period 5, this is the period from 1 April 2014 – 31 March 2019

[3] An alternative could be to charge the losses mark-up to gross consumption in our Track Access Billing System (TABS).

- the Electrification Asset Usage Charge to be calculated on the basis of long-run average maintenance and renewals costs using updated variability assumptions.

We consider that this package of arrangements will provide the industry with certainty and stability for CP5, in a way which is equitable to both metered and non-metered electricity users.

Appended to this document are the proposed price lists associated with modelled consumption rates, regenerative braking discounts, losses mark-ups and Electrification Asset Usage Charges.

3 INTRODUCTION & BACKGROUND

3.1 Purpose and Structure

The purpose of this document is to conclude on Network Rail's September 2012 consultation on the development and structure of the EAUCs (Electrification Asset Usage Charges) and EC4T (Electric Current for Traction) framework for CP5.

In addition to this consultation we also consulted on DC losses and regenerative braking in November 2012 and updated AC and DC losses reports in January 2013. This document summarises and concludes on the responses received in relation to these additional reports, as well.

Appended to this document are our proposed price lists for the following:

- modelled EC4T consumption rates for passenger and freight electric trains;
- regenerative braking discounts for modelled EC4T users;
- losses mark-ups for metered usage on both the AC and DC networks (with and without the adjustment for the fact that regenerative braking is billed by way of net consumption of power); and
- EAUCs for both passenger and freight on both the AC and DC networks.

This document, and the proposed price lists, form our final proposal to ORR on traction electricity charging for CP5.

The main document sets out our key conclusions. Annex A sets out our responses to other specific and more detailed points raised in response to our consultations. Annex B sets out a summary of all the responses we received by each consultation question. Annex C sets out our proposed price lists.

3.2 Background

On the GB network, around 50% of all rail traffic is electrically powered. Traction electricity charges recover the costs of electricity supplied by us to passenger and freight operators, for their use of traction electricity - also known as EC4T. In 2010/11 we recovered £223 million through traction electricity charges income.

EAUCs recover the 'wear and tear' costs associated with electrification assets, namely on the overhead lines on the AC network and the third rail on the DC network. The charge is designed to recover the costs that vary with traffic. In 2010/11 we recovered £8 million through EAUC income.

In our September 2012 consultation document, we consulted on the following key areas for CP5:

- modelled consumption rates;
- regenerative braking discounts;
- electrical losses mark-ups for metered operators;

- the EC4T contractual framework; and
- EAUC.

As noted above, we also consulted on the DC losses report that we published on November 2012. Subsequent to the publication of these two consultations, ORR commissioned a review of the losses studies by the independent reporter AMCL (Asset Management Consulting Ltd)[4]. Further to this review, we updated both the AC and DC losses report in early January 2013.

Although we make conclusions and proposals in this document, ultimately it is a matter for ORR to determine on any charges as part of PR13.

[4] AMCL, (Dec 2012), 'EC4T Transmission Losses (AC & DC) Estimate Review'

4 FINAL MAIN CONCLUSIONS

4.1 Modelled Consumption Rates

After consulting on options for modelled consumption rates for CP5, and considering the responses received from our stakeholders, our key conclusions on modelled EC4T consumption rates are:

- To retain current modelled passenger and freight traction electricity consumption rates;
- to retain the current uplifts to the consumption rates for multiple units;
- to make metered billing mandatory for all new electric rolling stock; and
- not to roll over the Transitional Risk Sharing Mechanism (TRSM) for CP5.

Modelled passenger and freight consumption rates

We consulted on the option to leave all passenger and freight EC4T consumption rates unchanged for CP5. Almost all respondents agreed with this proposal on the grounds of simplicity and that we are unlikely to have time to carry out a full recalibration in time for CP5. On this basis we conclude that our final proposal is to retain the current EC4T modelled consumption rates. These are set out in the proposed price lists in Annex C.

Uplifts for multiple units

Currently we apply separate uplift factors to consumption rates for each additional multiple unit used. All respondents agreed with our proposal to continue using the current uplift factors for electric multiple units, and on this basis we can conclude that our final proposal is to retain them.

Mandatory on-train metering

While on-train metering itself does not automatically lead to a reduction in consumption, the information it provides can help operators to better understand where savings can be made, and to enjoy the savings alone[5]. We support the view that making on-train metering mandatory in franchise agreements would be the most effective way to increase metering, however, we consider this to be largely a matter for franchising authorities. Regarding existing franchises we suggest that franchised operators discuss their exposure[6] to changes made to charges, through PR13, with their franchising authority.

We welcome the suggestion that all new rolling stock and traction packages should be fitted with metering equipment. We consider that we should treat all such vehicles as being billed based on metered consumption. If the operators of the new rolling stock choose not to opt for metered billing, we suggest that their modelled

[5] This is because, in CP4, metered operators do not participate in the volume wash-up (except where 90% of the consumption in an ESTA is metered).

[6] Schedule 9 of the franchise agreements (or, in older agreements, clause 18.1) sets out the agreement for TOCs to be held neutral to the financial impact of changes in Network Rail's access charges.

consumption is uplifted by 10%. This would have the same effect as ORR's proposal that an uplift of 10% be applied to unmetered consumption.

Incentive uplift

At ORR's request we consulted on the option to apply a 10% uplift to all modelled consumption (including non-traction usage) to incentivise the use of metering. We understand that ORR will shortly be consulting further on this issue.

Our proposal drew on the evidence gathered from the OTM incentive charge, where the 10% uplift has appeared to positively encourage operators to provide good metered data.

ATOC suggested a multi-party dialogue, involving DfT and ORR before the 10% uplift is considered any further. We would support further discussion of this at the monthly TESG meeting, at which all of those bodies are represented.

We also consulted on the option to pay the proceeds of any incentive uplift back to the industry in the same way as is done for the current OTM incentive charge (infill). We are currently proposing, to ORR, that the proceeds of the OTM incentive charge are paid back to just metered operators[7]. Currently, they are paid back to both metered and non-metered operators. We propose that the same approach be taken to any modelled uplift, should it be introduced.

In principle, we are open to the various suggestions on how to use the proceeds from a modelled charge uplift (metering overheads, power supply facilities and investment in energy efficiency and metered billing). We consider that introducing an incentive uplift may have merit, subject to a pragmatic arrangement for dealing with the proceeds of the charge through the billing system. We will reserve our final position with regards to this until ORR has consulted further on this option. Ultimately, any decision on a new approach is, of course, for ORR to determine.

Transitional risk sharing mechanism

In CP4 we introduced the Transitional Risk Sharing Mechanism (TRSM). As the name suggests, we saw this as a temporary mechanism to offer a level of protection to non-metered operators who were concerned about the impact of on-train metering on their modelled EC4T bills. As consulted on in September 2012, we do not propose to roll this over for CP5. This is because, now that on-train metering has been in operation for several years, the initial fears of significant resulting increases in modelled bills have not materialised.

Volume wash-up

In our consultation, we did not make any proposals regarding the volume wash-up. However, we understand that ORR will shortly be publishing a consultation setting out some proposals in this area.

Currently, where more than 90% of consumption in an ESTA is metered, metered and non-metered operators both participate in the volume wash-up. In response to our consultations, respondents suggested that this arrangement should not continue

[7] The progress of this proposal can be accessed on our On-Train Metering webpage here: http://www.networkrail.co.uk/aspx/12873.aspx

in CP5. We will reserve our position with regards to this until ORR has consulted, but we continue to see merit in this arrangement.

In August 2012, ORR consulted on allocating the year-end volume wash-up between unmetered services and Network Rail to reflect the respective abilities to manage the risk[8] - we are broadly content with this sort of approach, subject to the detail of ORR's proposal. ORR is yet to expand on this - we understand it will be doing so in February 2013. We consider that ORR should take care not to create perverse incentives in its risk sharing arrangements. For example, we have carried out some basic modelling of risk sharing scenarios, which suggest that under certain 'risk sharing' arrangements, Network Rail could be financially better off by discouraging greater on-train metering. Similarly, any increase in risk may reduce incentives for us to accommodate more electric services altogether, as we would not face this type of risk for non-electric services. Of course this would conflict with our stated aim to increase the extent of on-train metering. We would be happy to share our analysis with ORR and the industry, as part of ORR's further consultation.

We would welcome working with ORR and the industry on developing a mechanism for CP5 which encourages more electric services and on-train metering.

In addition, ORR has discussed setting "*a mark-up based on a challenging but achievable level of losses*" to encourage Network Rail to seek ways to invest to reduce transmission losses. Our engineering studies have shown that there is unlikely to be a positive business case for making investments to reduce transmission losses especially on the AC network. On the DC network we are already rolling out polymeric insulators. This is the sole initiative that has been identified to reduce transmission losses which can be justified on a whole-life cost basis.

4.2 Regenerative Braking

After consulting on options for reflecting regenerative braking in EC4T bills in CP5, and considering stakeholder responses, our key conclusions on regenerative braking are:

- to retain current regenerative braking discounts for modelled usage;
- to include provisions for auditing the use of regenerative braking;
- not to apply a separate losses factor for metered regenerated energy (but to study this issue further during CP5 so that for CP6 we are potentially able to do so); and
- to adjust the gross losses mark-ups to reflect average regenerated energy, where it is used, for metered billing.

Regenerative braking discounts for modelled usage

The majority of respondents considered that regenerative braking discounts for modelled usage should be retained for CP5. The main argument for this is that business cases for installing this functionality were made on the basis of such discounts. Making changes to discount rates would, therefore, appear to be unfair to those operators making long term investments. Therefore, we have concluded that

[8] ORR, PR13 consultation on financial issues for Network Rail in CP5, paragraph 3.55

the discounts should be retained in CP5. The final discounts we propose are set out in Annex C.

Auditing regenerative braking

Responses to this proposal were mixed. We consider that the rules and procedures for regenerative braking audits should be similar to those for metering equipment and could be set out in the new Traction Electricity Rules (which would apply to all electric train operators). The term 'correctly used', refers to whether the functionality is being used consistent with billing discounts. It is not intended to restrict the operation of regenerative braking.

Depending on the outcome of an audit, we consider that the discount itself would not change. If the functionality is found to be switched off, an argument could be made that the discount could be withdrawn for that operator, subject to ORR approval. We would welcome ORR's views on this matter.

Regenerative braking losses factor (metered usage)

We proposed a regenerative braking factor for AC power for losses of 1%. This was a pragmatic proposal, and fairly simplistic. On reflection, at this time, we do not feel that we have sufficient evidence to quantify this robustly. Engineering judgement suggests that, in reality, it is likely to be higher than 1% - however we proposed this as a starting point.

Due to the significant amount of additional analysis required to make this factor more accurate, we propose to delay the introduction of this approach to the start of CP6. This is also the decision taken with regards to regenerated DC energy (discussed in Section 4.4).

Instead we propose to continue to adjust the gross losses mark-up (set out in the relevant losses reports) consistent with the modelled regenerative braking discount so that it reflects regenerated energy on average. The analysis we have carried out for the AC and DC losses reports, is based on 'gross' consumption. Where regenerative braking is used on metered trains, the losses mark-ups proposed in the reports will need to be adjusted to reflect the fact that this analysis does not take account of regenerative braking. This is because we propose continuing to bill on the basis of a losses mark-up applied on electricity consumption net of regenerated energy for CP4 and CP5. We propose to calculate this based on the current average regenerative braking discounts which are used for modelled bills, which are:

- 15% for DC; and
- 18% for AC (based on an average of the three discounts used currently: 16%, 18% and 20% depending on service frequency).

A worked example for the adjustment is set out in Table 1 below:

Table 1: worked example for adjustment to losses mark-up for regenerative braking

Traction network	Adjusted losses mark-up
DC (South England area)	$\frac{17.01\%}{(1-15\%)} = 20.01\%$
DC (Merseyside)	$\frac{11.56\%}{(1-15\%)} = 13.60\%$
AC (all)	$\frac{3.85\%}{(1-18\%)} = 4.70\%$

We consider this approach to be the most pragmatic and therefore most appropriate for CP5. We propose to further consider this complex issue as part of the wider review of charging during CP5 for CP6.

An alternative approach would be to change the way that the losses mark-up is charged in our Track Access Billing System (TABS). From CP5 onwards, the losses mark-up could be applied to gross rather than net power consumption. In considering such a change, the impact on the EC4T contractual arrangements and the cost of changes to TABS would need to be borne in mind.

4.3 Electrical Losses (AC)

After consulting on options for charging for losses in metered EC4T bills in CP5, and considering stakeholder responses, our key conclusions on AC losses are:

- to apply an AC losses mark-up of 3.85% (or 4.70% on consumption net of regenerative braking, for operators using it)[9];
- to keep this fixed throughout CP5; and
- not to disaggregate the AC losses mark-up by ESTA.

AC losses mark-up for CP5

Our latest AC losses report[10] estimates that an appropriate mark-up to apply to gross consumption on the AC network is 3.85% (on consumption less regenerated energy, this mark-up translates to 4.70%). This analysis has been reviewed by the independent reporter (AMCL), commissioned by ORR. We received mixed views on the final mark-up proposed, some considered that estimating losses to two decimal places may be misleading with any estimate being unlikely to be accurate to that level. We consider that there is a difference between the error bounds and the central figure of an estimate. Whilst recognising that the 3.85% figure is subject to uncertainty, it is the best central estimate that the industry has. Therefore, we continue to propose a mark-up to two decimal places to aid clear auditing of the analysis carried out to date.

[9] An alternative could be to charge the losses mark-up to gross consumption in our Track Access Billing System (TABS).

[10] As proposed in the updated AC losses report published in January 2013, accessible here: http://www.networkrail.co.uk/publications/delivery-plans/control-period-5/periodic-review-2013/pr13-closed-consultations/

We are keen to reduce electrical losses where it is economically viable to do so. We already have requirements in our electrical asset policies to increase energy efficiency where appropriate. We also have a programme underway to meter all of Network Rail's sites, which draw from the traction supply for non-traction uses. We are aiming for almost all of our consumption from the EC4T network to be metered by the end of CP4.

Fixed mark-ups for CP5

In our consultation, we suggested reopening the losses mark-up after two years of CP5 to reflect emerging information. We had mixed responses to this. Our rationale was that the losses mark-up should reflect a longer term view of what losses are. As discussed in our report, we estimated that losses would increase by around 1% during CP5 due to the planned electrification expansion programme. However, we have reconsidered this proposal in light of the commercial concerns of operators to this proposal. We now consider it more appropriate to fix the losses mark-ups for the whole of CP5 to allow train operators certainty and stability to plan their operations, and in particular, assess their business cases for moving to metered billing.

Disaggregation of losses by ESTA

As required by ORR, the AC losses report estimated losses by ESTA. This indicative analysis illustrated the relationship between electrical demand (MWh/STK) and losses on the basis of the demand and track length in each ESTA to create a national weighted average loss. However, we do not have sufficient confidence regarding the 'repeatability' of this work due to the variability of losses and asset types. This issue was also identified by the report carried out by the independent reporter (AMCL)[11], commissioned by ORR. Therefore, we do not consider that the estimates of losses by ESTA are sufficiently robust for billing purposes. For these reasons, we did not propose levying losses mark-ups by ESTA, for CP5. We continue to hold this view.

Some operators have concerns about how losses are charged for in CP4. London Midland is proposing to disaggregate AC losses mark-ups by ESTA in CP4. We have responded to that consultation separately[12]. In our response to London Midland's proposal we also explain our views on the implications of the proposal on ESTA boundary changes which may be necessary between now and the end of CP5.

4.4 Electrical Losses (DC)

After consulting on options for charging for losses in metered EC4T bills in CP5, and considering stakeholder responses, our key conclusions on DC losses are:

- to apply a DC losses mark-up of 17.01% for the South England ESTA (or 20.01% on consumption net of regenerative braking, for operators using it)[13];
- to apply a DC losses mark-up of 11.56% in Merseyside (or 13.60% on consumption net of regenerative braking, for operators using); and

[11] AMCL, (Dec 2012), 'EC4T Transmission Losses (AC & DC) Estimate Review'

[12] Our response to London Midland's proposal is accessible here: http://www.networkrail.co.uk/aspx/12873.aspx

[13] An alternative could be to charge the losses mark-up to gross consumption in our Track Access Billing System (TABS).

- to keep these fixed throughout CP5.

DC losses mark-ups in CP5

We have quantified what we consider to be the actual losses on the DC network and the mark-up that should apply to gross consumption to recover the costs associated with the losses. Losses on the DC network are higher than those on the AC network due to the underlying physics of power transmission at lower voltages and consequentially higher currents.

We support incentives for operators to move to metering - however we do not consider it appropriate for us to set losses mark-ups below the actual level which would penalise Network Rail unfairly. One stakeholder suggested compensation for DC operators, as it believes they have been overcharged – however we do not propose to apply any of our analysis retrospectively. This area is a complex and difficult one, technically. As new information comes to light this should be, in due course, reflected in charges. It is important to remember that Network Rail has not benefitted financially from higher losses mark-ups. This is because the volume wash-up spreads costs to all non-metered operators.

As for AC, we propose to levy an adjusted mark-up for metered operators which use regenerative braking, using an average figure of 15% (which is consistent with the modelled discounts offered). This is to recognise that metered operators are billed based on their power consumption net of regenerated energy. This translates to a losses mark-up of 20.01% on the South England DC network, and 13.60% on the Merseyside DC network.

Fixed losses mark-ups for CP5

We consulted on the option to reopen the losses mark-up during CP5 to reflect emerging information. We received mixed responses on this issue. On reflection, we consider that the losses mark-up (like all other track access charges) should be fixed for CP5. We consider that this will provide the industry with more stability and certainty, particularly whilst they build business cases for moving to metered billing.

4.5 Electricity Prices

After consulting on options for levying electricity prices in CP5, and considering stakeholder responses, our key conclusions on prices are:

- for freight operators to be charged on the basis of actual electricity prices for both metered and modelled usage; and

- to adjust the way the EC4T delivery charge is levied to make it more cost reflective.

Freight prices

We proposed that all freight traction electricity charges should be based on actual electricity costs faced by Network Rail from the start of CP5. Some respondents wanted to know how this would affect both the certainty and level of transaction costs

faced by freight operators. Currently, freight EC4T rates change according to MLUI[14]. Therefore, we cannot give any indication on how costs will change because we are unable to predict how the MLUI will move. However, we can show freight operators what their costs might be using historic consumption and forecasts of future market prices. The new purchasing contract will allow operators to fix 1MW blocks of power (approx 0.25% of the total traction volume). This will allow freight operators to fix their own rates.

In terms of cost certainty, if passenger operators have fixed energy rates, they will have certainty over 95% of their rates before a financial year starts and could know at least 90% of their costs 2-10 years in advance (if they choose to fix their energy rates in advance). A large part of cost uncertainty is caused by the modelled consumption rates and the volume wash-up, and less so by the electricity prices. Therefore, if operators moved to metered billing, we estimate this could provide around 98% certainty on their electricity bills.

DBS requested further information about the direct price setting arrangements and how they will affect freight operators. We will be making the price-setting guidelines document available to parties upon request, and it is our understanding that any operator is eligible to join the ATOC Scheme Council. The power supply agreement for October 2014 onwards is likely to be different as it will be based on MW blocks of power rather than percentages of power, as is currently the case.

Freightliner enquired whether the modelled rate for non-metered operators, for CP5, would be based on a flat rate, or would be based on a weighted average, based on factors such as where and when the trains operate. We can confirm that the modelled rate will be a flat rate.

EC4T delivery charges

Respondents sought clarification regarding the setup of the new traction electricity contract. In particular, they enquired as to whether the distribution charge is applied to the peak charge for consumption only, as opposed to being spread out over the year. Our traction electricity contract with the energy provider specifies that distribution charges are passed through from the distribution companies to us. Distribution charges are regulated by Ofgem[15]. In April 2012, a revised charging regime was introduced which meant that, in most cases, we are charged;

- a fixed amount;
- a capacity related amount; and
- a peak unit rate (this is included in the winter weekday peak time slot).

Respondents requested further clarification on our proposal to change the way we levy EC4T delivery charges. The disaggregated charging approach we proposed would mean that we would collect the transmission charge throughout the year - we consider that this would more closely reflect the way in which this cost is charged to us.

[14] The Moderately Large Users' Index is published quarterly by Department of Energy and Climate Change, accessible here: http://www.decc.gov.uk/en/content/cms/statistics/publications/prices/prices.aspx.

[15] Office of Gas and Electricity Markets

We understand that freight operators consume a lower level of energy in the winter weekday periods, relative to other times, and as a result the proposed approach may result in freight operators paying what appears to be a higher charge for this than before, as they would pay the charge based on all energy consumed throughout the year. Conversely, passenger operators will pay what may appear to be a lower charge, because their consumption is usually higher than usual during winter weekday period, because of their service patterns. This imbalance would be corrected through the annual volume wash-up process.

4.6 EC4T Contractual Framework

After consulting on options for reforming the contractual arrangements for charging for EC4T in CP5, and considering stakeholder responses, our key conclusions on the contractual framework are:

- to widen the EC4T Metering Rules document and rename it the 'Traction Electricity Rules'; and

- to modify the cost wash-up drafting to allow it be more accurate and reflect direct price-setting.

EC4T Metering Rules transfer to new 'Traction Electricity Rules'

In our consultation, we proposed to reform and widen the EC4T Metering Rules to provide improved clarity and add flexibility to the regime. The wash-up provisions are multi-lateral arrangements, and so any individual changes to them through a change to Schedule 7 for an individual operator are unenforceable without identical changes being made in all other electric operators' contracts. By moving these provisions to a set of common rules, there would be flexibility to amend them as appropriate through the change provisions already in the EC4T Metering Rules. Some respondents asked whether the new rules would be moved to the Network Code. We think it would be appropriate to retain a stand alone document, given the specialist commercial arrangements contained within them.

Currently, ESTA descriptions are set out in Appendix 7B to Schedule 7 of the model track access agreement. Some respondents were concerned about 'hardwiring' ESTA descriptions in documents which limit flexibility. We too share this concern. However, the charging formulae depend on ESTAs or 'geographic areas'. Given that the EC4T Metering Rules include provisions for change which can be proposed by any party and subject to full consultation and voting, changes to ESTA boundaries could also be subject to these arrangements. This is what we have concluded should be the case for CP5.

Cost wash-up

We consulted on the modification of the cost wash-up drafting to allow it to be more accurate and reflect direct price-setting arrangements. Most stakeholders supported the modification. We can, therefore, conclude that this is our final proposal.

We would be happy to explain to individual operators how their rates are calculated from the prices they have fixed. We would be happy to have bilateral sessions to discuss this.

4.7 Electrification Asset Usage Charge

After consulting on the charging approach for EAUCs in CP5, and considering stakeholder responses, our key conclusions on charging approach to use for EAUC in CP5 are:

- to use the cost activities we suggested in our consultation;
- to use the variability assumptions we proposed in our consultation; and
- to use a 35 year average of annual costs.

Cost activities

We received general support for the cost categories we proposed as being variable in the September 2012 consultation document. For this reason, we conclude that we consider these to be appropriate.

Percentage Variability

We received general support for the variability assumptions we had proposed for each of the cost categories. For this reason we are now concluding that the variability percentages proposed are appropriate for calculating the EAUC rates for CP5.

Proposed charge rates for CP5

Table 2, below, sets out the EAUCs we are proposing for CP5. We have also included the CP4 rates for comparison.

Table 2: Proposed CP5 EAUC rates (12/13 prices)

	DC 'third rail' network (pence per electrified vehicle mile)	AC 'OLE' network (pence per electrified vehicle mile)	DC 'third rail' network (£/kgtm)	AC 'OLE' network (£/kgtm)
	Passenger		Freight	
CP5	2.08	1.96	0.2300	0.3662
CP4	0.46	1.18	0.0615	0.1154
% difference	348%	66%	274%	217%

As shown in Table 2, the proposed rates are significantly higher than the CP4 rates. The reasons for this increase are a combination of the following three factors:

- **A longer-run average annual cost being used** – we consulted on using this approach to charging4.7 EAUC consistent with Variable Usage Charges, to take a whole life cycle cost approach. Our preliminary analysis suggests that this change in approach accounts for around 20% of the average total change in rates.
- **Updated variability assumptions** – as we consulted on in September 2012, we have updated our variability assumptions, and as a result these are now calculated at a more granular level. This has caused most of the change in the rates, primarily increasing variable maintenance costs from approximately 5% to 16%, but reducing variable renewals costs from around 40% to 30%;

- **Increased unit costs** – there is also the general effect of increased unit costs since 2008, which is when the CP4 rates were last calculated. This effect causes the remaining difference in the rates.

We consider that these charges are more reflective of actual costs, and would allow us to recover the costs using a smoother long-run approach.

35 year annual average approach

We proposed using a 35 year annual average approach to costs instead of the current 5 year approach. This is consistent with the way we calculate the Variable Usage Charge and with the general aim of taking a whole life cycle cost approach.

We will be commencing a period of mid-life refurbishment on OLE (AC electrification system) which starts in CP5. This is forecast to 'ramp up' in CP6 and then increase through to CP9. Because the CP4 EAUC rates did not take a long run approach, it did not reflect this significant programme of renewal.

Similarly, levels of expenditure on the conductor rail system (DC electrification) to maintain outputs, also rise over time due to age/condition profile of the assets.

Modelled forecasts continue to be improved to take account of changes in electrification strategy, delivery optimisation (due to access constraints or alignment with other work such as enhancement schemes) and improved asset degradation modelling.

Therefore, by taking a 35-year approach we are more able to take account of these factors. We consider that this approach will lead to charges being smoother and avoids 'lumpy' prices, and ultimately even larger increases in the future. We consider that smoothing over 35 years is consistent with the long-life of these assets. It will also give greater certainty of charges for train operators. This approach is also consistent with how other variable charges are calculated.

4.8 Stakeholder Engagement

We will continue to provide monthly updates at the Traction Electricity Steering Group (TESG).

We are fully supportive of TESG as a forum to discuss any issues relating to the EC4T charging framework. We consider that TESG has provided an effective and collaborative forum to discuss traction electricity issues, over the last couple of years. Similarly we are open to having specific meetings with individual stakeholders upon request.

5 SUMMARY AND NEXT STEPS

In summary, we consider that these updated proposals provide a reasonable set of arrangements for fairer and more robust electricity charging for CP5 onwards. They should allow a stable set of arrangements for the period to March 2019, and allow train operators to plan with certainty. There has been considerable change in traction electricity charging in the rail industry in the last few years, and for many issues a pragmatic approach has been taken. We continue to support on-train metering, as well as metering of our own usage of EC4T, since information can support the industry in looking for efficiency saving where possible.

This document sets out Network Rail's final set of proposals for Traction Electricity and Electrification Asset Usage Charges for CP5 (see Annex C). We look forward to receiving ORR's Draft and Final Determinations in respect to Traction Electricity and Electrification Asset Usage Charging.

We will be publishing a consolidated set of proposed CP5 price lists by the end of March 2013 for all access charges that Network Rail has been asked to develop.

If you wish to discuss any of the issues raised in this document, please contact Ekta Sareen at Ekta.Sareen@networkrail.co.uk.

ANNEX A: RESPONSES TO DETAILED SPECIFIC ISSUES RAISED IN CONSULTATION

This annex sets out our responses to detailed specific issues raised in response to our consultation.

Modelled Consumption Rates

TRATIM rates

The TRATIM[16] system was used to model consumption rates for non-metered operators. We can confirm that the TRATIM modelled rates do not include an allowance for losses.

Freight

We support the incentivisation of meter fitting by all train operators including freight. We understand that there are some technical issues with some dual voltage freight stock and we are keen to work with our freight customers to devise a reasonable solution. Currently, our billing system is not able to correctly bill dual voltage trains which only meter one traction type. The billing system could be upgraded to include this functionality - however this is likely to be quite costly, and would take several months to complete. We are keen for any investment in the billing system to represent good value for money.

Regarding the re-continuation of the 2008 work that was done to look at the origins of the freight consumption rates, as noted by ATOC - we have already proposed not to review the consumption rates for TOCs, and therefore we believe that this should also apply to freight operators.

Quasi-metering

We agree that careful consideration needs to be given to quasi-metering. This topic was not covered in the scope of our consultation. We expect that the working group, which has been set up to consider this, will reach some sensible conclusions in due course.

Funding for metering

A portion of the S&E (Safety and Environment) fund from CP3 was rolled over to CP4 to support the introduction of on-train metering. We agreed for this funding to be made available per train set opted in for metered billing[17]. The last opportunity to claim this fund will be 1 April 2014. SSWT (Stagecoach South West Trains) suggested that the fund is rolled over to CP5. This is a matter for ORR to decide.

Currently, £7.5 m of the S&E funding remains unused. We are considering proposing a more generous arrangement for the use of the fund for the last opt-in (1 April 2014). We will be writing to the industry in the next few weeks.

[16] This model has now been decommissioned

[17] The policy for the use of the fund can be accessed here: http://www.networkrail.co.uk/uploadedFiles/networkrailcouk/Contents/Improvements/On_Train_Metering/SandEFundOTM.pdf

Electrical Losses (AC)

Specific issues raised about losses reports

In response to Go-Ahead's question about further trials, at present we do not plan to undertake further studies or trials on both AC and DC transmission losses. We would, however, consider further opportunities with the TOCs as they arise.

In response to Freightliner's question, the term 'commercial losses' refers to the error (or tolerance) of the measuring equipment itself. We have not considered this error in our calculations. Currently, the maximum tolerances allowed by industry standards are +/-1.5% for AC meters and +/-2.0% for DC meters. There are provisions for auditing of on-train meters, which any party to the EC4T Metering Rules can invoke, if it feels it is necessary.

Freightliner queried the uplift applied to modelled data. During the first stage of the losses studies we experienced difficulty in aligning train measured data with the infrastructure data due to sampling rates. However, further work in the second stage of our studies showed that the modelling is more robust, secure and commercially viable.

Freightliner has requested further clarification and information of the mathematical link between the figures in the columns in Table 1 of the report, specifically in regards to the final two columns. For clarification, fixed losses are set and high and low values are used by the column I^2R energy loss range. The mean is then taken across both low and high values.

To clarify, where we refer to "*section 5.3*" in the final paragraph of Section 6 - Conclusions, this should read "section 4.3."

Stakeholders suggested that boosters should be replaced with auto transformers, and that further work should be carried out to lower the impedance of parts of the network and therefore reduce losses. We are committed to increasing energy efficiency where economically viable. However, any decisions on the implementation of these systems will be based on whole life cycle costs, and therefore must consider a range of requirement, of which energy efficiency is one.

Both First Group and TfL noted concerns over the exclusion of stabling loads from the AC losses report. We do not consider that the exclusion of stabling loads from the AC losses report has caused the analysis to be limited or weak, as we modelled the infrastructure and found that its ability to control the stabling loads is limited - we consider that this effect is within the control of the train operator. If all electric trains were metered, the need to meter depots on the supply side may be reviewed. This is based on our assumption that all depots are usually energised via the adjacent Network Rail electrification network which has its supply point metered.

Our AC and DC losses reports have been reviewed by the independent reporter commissioned by ORR[18]. The key recommendations raised have been incorporated into revised reports, issued in January 2013. In summary the key recommendations were mainly on the fixed loss calculations which identified two minor errors in the methodology, they were:

[18] AMCL, (Dec 2012), 'EC4T Transmission Losses (AC & DC) Estimate Review'

- the calculations and assumptions on the component value of (kWh) losses used with the spreadsheets; and

- the methodology for summating % kWh loss per Grid Supply Point (GSP) within an ESTA.

In general the independent reporter acknowledged the complexity of the issue both on the AC and DC electrification networks and considered the work done to date as a starting point with the continuous review of data and assumptions via the release of the annual losses report.

Electrical Losses (DC)

ATOC enquired whether there would be static losses associated with insulator leakage during periods of regenerative energy injections. On the DC system, regenerated energy is only used to supply other motoring trains or to reduce transmission losses. Insulator leakage on the third rail depends on the weather conditions and insulator condition, which we have estimated to be an average of 2% of power supplied. Depending on weather conditions, this leakage can be close to zero.

SSWT did not believe that the Isle of Wight should be used as part of the modelling exercise to determine fixed losses in the Western region because it thought it was not representative of the rest of the Wessex region. Losses have been calculated across the ESTA U network, within which we operate a service on the Isle of Wight. Those losses need to be included in order to give a true representation of the DC ESTA U network losses. We do not propose to exclude sections of ESTA U on the basis of losses being high. The purpose of the DC losses study was to estimate a national average of DC losses for that ESTA.

ATOC did not accept the derived efficiency target from combining the projected traffic increase during CP5, whilst maintaining the current DC loss levels during the whole of CP5. It believed that real network efficiencies should be delivered. In response to this we would note that the study is a starting point. The study demonstrated that the train length has a significant impact on the value of losses. Thus noting that train lengths are planned to increase over CP5, we deemed that it was appropriate that losses could potentially increase as a result of this. We do, however, believe it is important that losses are minimised as much as possible – thus we have proposed to cap the losses mark-up in CP5. We will also provide annual reports on this issue in a transparent manner.

We have noted ATOC's suggestion to reorganise ESTAs so that they are exclusively DC or exclusively AC, for a losses and charging viewpoint. We note that changing the historical configuration of ESTAs and their boundaries will be a complex process. Network Rail has started to review the CP5 HLOS and the effects the CP5 electrification program will have on the existing ESTA structure[19].

Some respondents wanted further information regarding the evidence underpinning the assumption that the ratio of installed polymeric against ceramic insulators is 50%. We have based this assumption on historical data. We have also noted with the development of technology, the industry is now moving towards a more robust and lighter polymeric insulator – which was also included in our analysis.

[19] Our response to London Midland's consultation on disaggregating losses explains this in more detail, accessible here: http://www.networkrail.co.uk/aspx/12873.aspx

In response to our consultation, we received several questions regarding why Network Rail has assumed the North London and ECML South DC networks to be similar to the South England DC networks, rather than the Merseyside DC network. With regards to this question, we have assumed these networks to be similar in structure because they have similar infrastructure to ESTA U. Specifically, their service patterns are similar to the rural areas of ESTA U. Thus we consider it appropriate that the national average of ESTA U is extrapolated to ESTA P, R & T.

ATOC wanted Network Rail to clarify whether the losses figures presented in the reports were from the view point of the infrastructure or train operator. It also wanted us to clarify whether we had taken in to account Mersey PTE's aspirations to procure a new fleet and run more trains during CP5, and the characteristics that drive the level of losses in Merseyside. In response to this, all our calculations are based from the infrastructure's perspective. There are several factors that affect the level of the losses factor on the Merseyside network, namely; service patterns, service type, length of rolling stock and the rail infrastructure.

ATOC also requested clarification regarding the average losses figure mentioned on page 15 of the losses report. In regards to this; the "1% average" losses increase relates to the loss incurred on the infrastructure.

ATOC also wanted clarification regarding 4.1.2, on whether the losses figures took in to account actual line voltages seen and do they take into account the late CP4/early CP5 plans to raise all line voltages to 750Vdc nominal – which it believed could increase the losses. We can confirm that the modelling took into account the increase in voltage from 650V to 750V in the Inner London areas.

Regarding the extrapolation of DC Variable (I^2R) losses, ATOC enquired as to whether Network Rail would complete the Wessex model and whether the results would be available to them. In Section 4.1 of the DC losses report, the I^2R losses have been extrapolated based on the Sussex, Kent and Inner London models. The Inner London model includes a heavily loaded portion of the Wessex route. During the development of the DC Wessex Strategy, further modelling works will be completed. When the results become available, they will be incorporated into the annual losses reports.

The traction model that was used to determine the level of resistive losses in ESTA U, was recalibrated during the first stage of the project using the Dorking to Horsham trial. The results varied considerably and therefore the project carried out a series of modelling tool comparisons with Entorac, Motts, Birmingham University and Atkins. The majority of the modelling tool comparisons were within +/- 2%.

We held a workshop on 14 January 2013 to discuss the details around the DC losses study, which also addressed many of the issues raised by consultees in response to the report.

ATOC suggested that Network Rail should adopt and publish a transparent policy statement about its procurement and deployment on new build, renewals and maintenance of polymeric insulators and autotransformers. It considered that we should be required to publish KPIs on this annually. We are fully committed to being as open and transparent as possible, and consistent with this we have agreed to release updated losses reports on an annual basis.

SSWT suggested that; In the event that partial metering for billing purposes is permitted in CP5, the exemption from the consumption wash up for metered

operators should also apply to those operators that are partially metering their fleet. We consider that all estimated data should remain in the wash-up, including data extrapolated from metered data for quasi-metering purposes.

ATOC stated that challenging efficiency targets is not acceptable. It suggested that efficiency targets should be proposed and set for the whole of CP5 at a level equal to or better than losses incurred on ESTAs O, P and R today. We consider that the percentage mark-ups we have estimated in our DC report are appropriate for charging purposes.

Electrification Asset Usage Charges

Mileage v kWh consumption

In response to our consultation it was suggested that the EAU charge should be levied based on kWh consumption (consistent with traction electricity charges) instead of mileage. This suggestion was also raised as part of PR08, however it was agreed that the EAU charge recovers the cost of 'wear and tear' on electrification assets and engineering judgement deems this to be a function of usage (i.e. mileage) rather than consumption.

Cost recovery

TfL requested assurance that EAU income is used to fund improvements in reliability and performance. We would like to clarify, that the EAUC recovers variable maintenance and renewals costs associated with electrification assets only as identified for CP5 and beyond. EAUC income is not used for projects to specially improve reliability or performance. The impact of CP5 enhancement schemes has been taken into account in renewal forecasts. As other enhancement schemes are developed (e.g. DC to AC conversion) the renewals forecasts can be updated and will, in any event, be updated as part of CP6 development activities.

We can confirm that any overhead line equipment (OLE) that is not directly associated with the contact wire does not vary with traffic, and therefore these costs have not been included in our estimate.

Programme of renewals activity on electrification systems

Freightliner was concerned that EAU costs appeared to have doubled as a result of the longer-run average being used, which would suggest a period of near comatosis for renewal activity in CP4 against the latest 35 year average. We do not agree with this point. On AC OLE electrification, we are forecasting to spend circa £253m which is made up, largely of the GE OLE renewal and also reliability improvements to meet the end-CP4 output targets. This follows on from work on the West Coast Main Line in CP2/CP3 and other OLE renewal works in CP3. On DC electrification, expenditure for CP3 and CP4 remain broadly similar but it should be noted that this has been suppressed by historic enhancement investments due to programmes such as the Southern Power Supply Upgrade and Thameslink.

At IIP we considered that the earlier OLE families (notably Mark 1 and Mark 3) were entering a period (due to age and condition) where some form of mid-life intervention would likely be required over the coming control periods in order to maintain the challenging output targets in CP5 and beyond. Whole-life cost modelling has confirmed and identified a range of intervention options from full mid-life refurbishment through to defect management to apply to the OLE portfolio. The

interventions use route and asset criticality to determine when and what to do, such that our higher criticality routes are prioritised. This, along with a re-assessment of unit costs, when applied to our OLE portfolio (given its age/condition, criticality and category) has led to the volumes and costs that have been forecast. This is not about a recovery situation it is about investing in OLE assets at or about their mid-life to re-set condition so that overall outputs are maintained. The work on the OLE network is required to commence in CP5 and will ramp up in CP6.

Accurate estimates of long-run costs

Concerns were raised as to our ability to accurately estimate our long-run (35-year) costs - we can confirm that we used our Whole Life Cycle Cost (WLCC) models to estimate these. The WLCC models were reviewed by the Independent Reporter for asset management, which was content that appropriate methodologies had been used and that we had implemented 'good practice'. The WLCC models have also been used to inform our asset policies for CP5. The WLCC models identify certain interventions (consistent with the HLOS), which are applied to our relevant asset portfolios to identify activity volumes and costs out to CP11. The interventions are prioritised by asset type and route criticality such that investment is prioritised on higher criticality routes.

The asset inventory data (asset volumes, asset type, asset location/category and asset age) that has been used as part of the portfolio modelling exercise has also been reviewed by an Independent Reporter to ensure its fitness for purpose. The results for OLE were very positive but the results for conductor rail identified some data inconsistencies. However, these are in the process of being resolved and the dataset used for modelling has been updated to make use of train borne measurement (conductor rail type, location, length and wear) rather than rely on historic data sets. The portfolio modelling tool will also be assessed by an Independent Reporter to ensure its computational accuracy and that the outputs produced by the model are fit for purpose.

We are fully committed to improving our capability to model long-term asset interventions using detailed asset condition data and asset degradation relationships. In the mean time, we believe that the use of intermediate parameters such as asset age/condition and asset utilisation/type serve to provide a robust view of intervention volumes and costs over the medium-term for these long lived assets.

The forecasts do not, at this stage, take account of the impact of the proposed conversion from DC to AC electrification in the South East but they do take account of other enhancement schemes such as the new electrification programme and the power supply upgrades on the West Coast Main Line and East Coast Main Line.

Where appropriate, we are open to have our analysis and models open to further scrutiny by both the ORR and other independent reporters.

To clarify, we are using an annual average cost based on 35-years, therefore we are not proposing to recover costs ahead of time, it simply reflects that we take a steady-state outlook on estimating annual costs similar to the way in which we quantify variable usage costs. We do not expect to have 'surplus funds' as a result of a 35-year average being taken to estimate costs.

ANNEX B: SUMMARY OF RESPONSES RECEIVED

We received ten responses to our September 2012 consultation document on 'Traction Electricity and Electrification Asset Usage Charges' in CP5. In addition, we received eight responses to our supplementary consultation on DC losses, published in November 2012.

Table 3, below, summarises the respondents to each consultation.

Table 3: Summary of respondents

September 2012 consultation (EC4T and EAUC)	November 2012 consultation (DC losses)
The Association of Train Operating Companies (ATOC)	The Association of Train Operating Companies (ATOC)
DB Schenker (DBS)	First Group
Direct Rail Services (DRS)	Go Ahead
First Group	Passenger focus
Freightliner	Porterbrook
Go Ahead	South Western Trains (SSWT)
Porterbrook	Transport for London (TfL)
South Western Trains (SSWT)	Transport Scotland
Transport for London (TfL)	
Transport Scotland.	

We have summarised the responses to the consultations, which are set out below.

Modelled Consumption Rates

Question (A): Do you agree with our proposal to leave all modelled passenger and freight EC4T consumption rates unchanged for CP5?

We received six specific responses to question (A), from; ATOC, DBS, Freightliner, Go Ahead, SSWT and TfL.

DBS and ATOC highlighted their preference to more closely align modelled and actual EC4T consumption rates. DBS believed this would reduce financial uncertainties for freight operators but acknowledged that it would be difficult to achieve. Furthermore, ATOC noted that any re-calibration of EC4T consumption rates would not be ready for CP5.

Notwithstanding the issues raised, ATOC and DBS agreed with all the other respondents to retain the approach and methodology, as used in CP4, to calculate the modelled EC4T consumption rates for CP5.

Question (B): Do you have any other suggestions to make about modelled consumption rates in CP5?

We received four specific responses to question (B), from; Go Ahead, Freightliner, SSWT and TfL.

Go-ahead believed that there was an opportunity to adjust consumption rates, using metered data, to develop a quasi-metered system.

Freightliner requested clarification regarding the TRATIM system, which is used to model consumption rates for non-metered operators. Specifically; it wanted to know whether the TRATIM system did or didn't include distribution losses in the model rates applied.

Other respondents highlighted the need for Network Rail to put emphasis on more cost-effective techniques for billing metered trains. Another respondent highlighted the importance of clearly differentiating between AC and DC power consumption characteristics when modelling consumption rates – as the underlying assumptions made by the modeller can be sensitive to the derived modelled consumption rates.

Question (C): Do you agree that it is appropriate to continue using the current uplift factors for electric multiple units?

We received five specific responses to question (C), from; Go Ahead, SSWT, TfL, DBS and ATOC. All respondents agreed with Network Rail's proposal to continue using the current uplift factors for electric multiple units (EMU).

Question (D): Do you agree that it is suitable to continue using the agreed methodology for calculating new modelled EC4T consumption rates, during CP5?

We received five specific responses to question (D), from; Go Ahead, SSWT, TfL, DBS and ATOC. All respondents agreed with Network Rail's proposed approach to continue using the agreed methodology for calculating new modelled EC4T consumption rates, during CP5.

Question (E): Do you have any views on our suggestion to uplift modelled consumption rates by 10%, consistent with the surcharge applied for missing metered data?

We received seven specific responses to question (E), from; Porterbrook, Go-ahead, SSWT, Freightliner, TfL, DBS and ATOC.

All the respondents objected to the proposed approach to uplift modelled consumption rates by 10%. Although the positions of the respondents were the same, there were some differing rationales for their stated positions - these are summarised below.

Many respondents believed that the decision to move from modelled to metered billing should be based on the individual business cases. They believed that considerations should be given to cases where metered billing would not be financially or practically appropriate. There was a general consensus from operators that Network Rail should be offering incentives, rather than penalties, for companies moving to metered billing.

Subject to value for money and affordability considerations, TfL suggested making metered billing obligatory when new franchises or concessions are introduced. It believed this would ensure that existing contractual arrangements are not distorted. Similarly, SSWT and ATOC suggested that rather than imposing the proposed 10% uplift on modelled rates, longer and more flexible franchise contracts would enable TOCs to develop a better commercial business case for metering. We consider this a matter for DfT and TOCs.

Freightliner believed that the proposed approach implied a material gain (of 10%) in consumption efficiency from using metered rates – for which it saw no evidence for. It

further enquired as to if Network Rail had calculated whether the proposed 10% uplift would be sufficient enough to generate a business case for TOCs to move to metered consumption rates. It suggested that the 10% uplift, with a subsequent rebate assumed elasticity for behavioural change – which it believed the consultation document did not comprehensively explain.

SSWT wanted clarification on which elements of the changes to EC4T charges new and existing franchised TOCs might be exposed to - or whether the intention is for TOCs to be exposed to all changes. It believed that there should be a broader multi-party dialogue involving DfT, ORR and Network Rail before any of proposals noted in question (E) were taken forward. SSWT also noted that there were no proposals designed to enable TOCs to produce a positive business case for switching to metering in the DC area.

TfL noted that the proposed approach in question (E) was unhelpful and possibly unfair because of the costs and constraints associated with metering DC trains. It further suggested that Network Rail should explore separately, the incentivisation of meter fitting by freight operators. TfL also noted that the consultation document did not make clear how dual voltage trains would be treated. It believed that this also required further considerations, whereby any proposals should be practical and cost efficient.

DBS suggested that, if the proposed 10% uplift on modelled consumption rates is applied, then the uplift should also apply to consumers other than freight and passenger operators who use EC4T for traction or non-traction purposes where no metered data is provided.

DBS also noted that the proposed approach could result in perverse outcomes, such as incentivising operators who have a choice of traction types to increase their use of 'less environmentally friendly' diesel traction. It also noted that penalising an operator in cases where it has failed to provide data that it is obliged to provide is of a different magnitude to penalising an operator for not moving to the use of metered electricity for valid and justifiable reasons.

ATOC stated that, for the proposal to be fully effective, it would require the removal of Schedule 9/18.1 protection from all franchises. It further highlighted the uncertainty of when new franchises will be awarded without schedule 9/18.1 protection.

Question (F): Do you have any views on the use of the proceeds from an uplift to modelled consumption rates?

We received six specific responses to question (F), from; Porterbrook, Go-ahead, SSWT, Freightliner, TfL and DBS.

Go-ahead believed that the proceeds from the 10% uplift on modelled consumption rates should be returned to operators – as otherwise, it thought that it would present operators with a significant increase in costs. This view was also held by SSWT.

SSWT suggested that the proposal to re-distribute funds to all TOCs pro rata to volume would create a cross-subsidy from unmetered to metered trains – which it believed would not be appropriate. This view was also held by DBS, who further added that the proposed approach could result in metered operators receiving 'windfalls' that they would otherwise not be entitled to. DBS believed that by excluding metered operators from the annual volume 'washup' process, non-metered

operators would pay for their electricity consumption in full, irrespective of whether or not their consumption is deemed 'efficient'.

DBS also stated that, Network Rail's conscious decision to levy charges for electricity above its procurement costs may bring it under the auspices of Ofgem.

Freightliner agreed with the proposed approach to exclude the proposed uplift from the volume wash-up and suggested that Network Rail should re-distribute the funds from the uplift to metered operators only. Alternatively, it suggested that it would support the proceeds from the fund to be allocated against the additional overhead faced by operators in delivering meter readings to Network Rail.

TfL believed that the proposed approach is likely to reduce the incentive to move to metered operations. It believed that operators using modelled consumption rates would receive at least some of the cost of the surcharge back through the rebate described. A similar view was also expressed by Freightliner.

TfL instead suggested that the proceeds should be reinvested in the power supply facilities used by those parties subjected to the surcharge and believed that any investment should be focused on improving energy efficiency and the accuracy of billing.

Question (G): Do you have any views on applying the uplift to modelled consumption rates to new vehicles only?

We received four specific responses to question (G), from; Porterbrook, Go-ahead, TfL and DBS.

Both Porterbrook and Go-ahead objected to the proposal to apply the uplift to modelled consumption rates to new vehicles only. Go-ahead in particular believed that, it would not be 'worthwhile', considering the limited number of new unit type additions.

Contrary to the above positions, TfL declared the proposed approach set out in question (G) as reasonable. However, this view was subject to the cost of fitting meters to new rolling stock to be both affordable and value for money.

DBS suggested that, as an alternative to the proposed approach in question (G); there could be a mandatory requirement for all new electric traction to be fitted with appropriate metering equipment as standard.

Regenerative Braking

Question (H): Do you have any views on whether regenerative braking discounts for modelled usage should remain in CP5 or CP6?

We received seven responses to question (H), from; Porterbrook, Go-ahead, SSWT, Freightliner, TfL, DBS and ATOC.

Porterbrook, Go-ahead, SSWT, ATOC and TfL considered that the regenerative braking discount for modelled trains should be retained for CP5 and CP6. The majority of the respondents believed that the removal of the discount could incentivise TOCs to switch off or move away from the regenerative braking system.

ATOC highlighted the need for Network Rail to guard against a situation whereby, the fitments of further regenerative braking systems become more complicated, due to the uncertainty about the discount.

Porterbrook stated that their analysis showed that the 15-20% gross regenerated energy was correct. Similar analysis by Go-ahead showed that the regenerative braking discount was on average higher than the 15% regulated regenerative braking discount.

SSWT highlighted the fact that it had already invested in regenerative braking. Thus it deemed it unreasonable to remove the regenerative braking discount before SSWT could deliver the savings that drove its business case to modify its trains.

ATOC also suggested the improvement of the metering of the HV distribution and DC network, in order to provide improved data at a local level on where electricity is being used – which it believes could be used in the wash-up.

DBS was of the view that the regenerative braking discount should be removed from the start of CP6 – by which time it thought most operators would be metered. Freightliner also considered that the discount should be removed until there was better evidence available, or allow the discount for metered operators only to help incentivise more metered billing in the industry.

Question (I): Do you have any views regarding provisions to allow us to verify that regenerative braking is being used correctly?

We received four responses to question (I), from Go-ahead, TfL, DBS and ATOC.

Both Go-ahead and DBS thought it reasonable for Network Rail to verify that the regenerative braking systems were being used correctly. DBS's view was subject to the rules and procedures surrounding the proposed audits to be agreed and made transparent. Go-ahead stated that, if the audits uncover that the discount is too small, there should be provisions to allow the increase of the discount. It further added that there must be incentives to ensure Network Rail's infrastructure is receptive to regeneration on the AC and DC networks at all times and in all locations.

In relation to Question (I), Go-ahead suggested that the term 'correctly used' needed clarification. It stressed that this should not be used as a way to restrict the operation of regenerative braking.

Contrary to the above views, ATOC opposed the use of a contractual mechanism to audit the use of regenerative braking. TfL stated that operators were already incentivised to keep the regenerative braking functioning wherever it is available, and that it would be unlikely that the audits will uncover many false claims of using regenerative braking when it is not in use.

TfL noted the importance of Network Rail's role in the amount of regenerative energy that is produced. It believed that it was inappropriate to assume from a charging perspective, that regeneration is solely within the control of the operator.

Question (J): Do you agree with our proposal to apply a regenerative braking losses factor of 0.9899 (based on losses estimate of 1%) to metered AC regenerated energy?

We received four responses to question (J), from; Go-ahead, TfL, DBS and ATOC.

Go-ahead believed that an average loss factor would be inappropriate, as it believed losses would be highly variable on factors such as geography and unit types. It therefore suggested that if there was to be a quantification of the regenerative braking losses factor, then it should be implemented individually in each ESTA, taking into account traffic patterns and energy being returned to National Grid.

TfL considered that the losses factor for regenerated energy is only meaningful for electricity that is exported back to the National Grid. It thought that a further study should be undertaken to refine the regenerative braking losses factor, with a view to keep it under review during CP5.

DBS believed that there was no evidence to reasonably support the proposed approach set out in question (J). ATOC expressed that it was broadly comfortable with the principle of reflecting losses associated with regenerated energy. It however, like DBS, believed that the proposed estimate was very general and stated that proposals needed to be supported by a sound evidence base.

Question (K): Do you have any views on reopening the regenerative braking losses factor for AC after two years during CP5 to reflect emerging information, capped at no less than 0.9744 (losses estimate of 2.5%)?

We received four responses to question (K) from Porterbrook, Go-ahead, TfL, and DBS.

Porterbrook believed that the proposed approach set out in question (K) would result in uncertainly when producing business cases, therefore it objected to the proposed approach. Go-ahead also objected to the above proposal. It believed that, if a regenerative braking loss factor was adopted, then it should be fixed for the control period. It also suggested that if more information emerges during CP5 then it should be analysed for possible implementation in CP6.

TfL supported the proposed approach set out in question (K), however, only where further analysis shows that the losses factor is too low. DBS stated no objections to the proposed approach.

Question (L): Do you have any views on the other options for charging for metered regenerated energy?

We received one response from Go-ahead regarding question (L).

Go-ahead deemed it reasonable to calculate the regenerative braking losses factor on the basis of each operator's route geography, timetable and unit characteristics. It remained concerned about an 'AC approach' being adopted on the DC network.

Electrical Losses (AC)

Question (M): Do you support the work that we have carried out to quantify AC system losses?

We received two responses to question (M) from Go-ahead and Freightliner.

Go-ahead expressed its support for the work outlined in question (M), but not necessarily with the proposed outcomes of the work.

Freightliner recognised the work that was done and acknowledged the difficulty in forming any firm conclusions given the number of influencing factors on transmission losses.

Question (N): Do you support further validation of the 4.82% likely to be proposed for CP5?

We received three responses to question (N) from Go-ahead, TfL, and DBS.

Go-ahead supported further validation of the AC losses mark-up, particularly in respect to geographic disaggregation of losses by ESTA. TfL expressed support, on the basis that the loss factor of 4.82% does not increase during CP5, as this would increase the energy costs borne by the industry. DBS stated that it does not support further validation work.

Question (O): Do you have any views on reopening the losses mark-up after two years during CP5 to reflect emerging information?

We received five responses to question (O) from Porterbrook, Go-ahead, TfL, Freightliner and DBS.

Porterbrook and Go-ahead did not support reopening the losses mark-up as it may result in uncertainty when producing business cases.

Go-ahead suggested setting a lower losses target, which it believed would incentivise Network Rail to improve the losses through infrastructure improvements and also metering of non-traction electricity. Go-ahead stated that it would be more sensible to make any adjustments for over or under-recovery of losses at the next periodic review. It suggested that the cost of DC losses should rest with the infrastructure manager in order to incentivise it to invest. Go-ahead considered that there was a significant mis-match between the incentives faced by TOCs and those faced by Network Rail.

In its view, it outlined three options which could improve Network Rails incentives:

(a) Network Rail bears all transmission loss costs on the DC network.

(b) Setting a cap on the transmission loss costs recovered by Network Rail.

(c) Setting a targeted improvement in transmission losses.

TfL stated that the losses mark-up could be reopened during CP5, provided that the reopening causes the losses mark-up to be reduced.

Freightliner stated that the implementation of any revised losses mark-up, should be given sufficient lead time for affected parties to reasonably accommodate the change.

DBS stated that, if the proposed value of AC system losses of 4.82% for CP5 is likely to require further validation, then it suggested that the AC system losses value should be set at the current CP4 level of 5% for the whole of CP5. It considered that this would avoid further work becoming necessary for CP5 so that Network Rail could concentrate its efforts on carrying out analysis to support a full review for implementation from the start of CP6.

Question (P): Do you have any views on not geographically disaggregating the AC losses mark-up?

We received four responses to question (P) from Go-ahead, TfL, DBS and ATOC.

DBS supported Network Rail's proposal not to geographically disaggregate the AC losses mark-up. This view was also shared by TfL, who believed that changes in ESTA boundaries and in electric traction traffic levels within current routes (as electrification is extended) during CP5, may alter the differentials between ESTAs – thus making it unwise to geographically disaggregate the charge based on the current network and operations.

Go-ahead considered that the average 4.82% is too high on some lines, and the overcharge is not claimed back through the wash–up process, since the total metered usage in those ESTAs are below 90%.

ATOC objected to a single AC mark-up, on the grounds that the industry should seek a solution which ensures that TOCs pay, as far as possible, for the true level of losses they incur in its specific areas. It believed that the use of a national average might result, for example, in TOCs in southern AC ESTAs effectively subsidising TOCs operating further north or vice versa.

ATOC believed that ESTA boundaries could change during CP5 and therefore, it suggested that Network Rail needed to formulate a clear and workable proposal about how boundaries and associated losses might be treated through a simple management process from year to year. It further added that, due to the difficulty in amending schedule 7, it would not support 'hardwiring' ESTA descriptions in to schedule 7.

Question (Q): Do you have any comments on the AC losses report published alongside this consultation?

We received three responses to question (Q) from Go-ahead, Freightliner, and TfL.

Go-ahead thought that the AC losses report, published alongside the consultation was helpful in describing the current position, but it felt that it did not provide justification to support the proposed changes.

TfL considered that stabling loads should have been included in the analysis. It believed that Network Rail should give consideration to separately metering (on the supply side) and billing large stabling sites, particularly where the trains themselves remain unmetered to ensure that power consumption costs are properly covered.

Freightliner broadly agreed with Network Rail's proposed approach and believed that there is no material gain from geographically disaggregating the losses. They raised some specific questions about the losses report which are addressed in Annex A.

Freightliner also highlight that the national average is a straight mean of the losses mark-up for each ranking. It suggested that, instead, it should be weighted for the size or number of the Electricity Supply Tariff Areas (ESTAs) in each ranking and the MWH per STK. Freightliner are concerned that the proposed approach could mean that a small under-utilised ESTA (having a high fixed % loss) would have as much effect on the national average figure as a whole group of heavily used ESTAs each with a much lower % loss.

Electricity Prices

Question (R): Do you support our proposal to adjust the way the EC4T delivery charge is levied?

We received four responses to question (R) from Go-ahead, Freightliner, DBS and ATOC.

Freightliner expressed concern that ESTA boundaries may possibly change during CP5 as the power sourcing points change. It believed the impact will be changes in delivery charges liable between power stations and Network Rail ESTA boundaries. Freightliner hopes that the changes regarding the ESTA boundaries are implemented at a change in control period or an equally infrequent point in time.

Freightliner stated that in its experience of buying non-traction electricity, it has found that the distribution charge is applied to the peak charge for consumption only. Freightliner enquired as to whether this would be the case under the traction contract. It further added that it would support proposals to have a blended average for the year to avoid the traditional November 'leap' in distribution charges.

Finally, Freightliner sought clarification as to whether it was Network Rail's proposal that the non-metered users should move from a modelled rate to an actual charge, it also asked whether this actual charge would be a weighted average based on the planned timings of services.

Go-ahead and DBS supported the proposed approach set out in relation to question (R). In particular, Go-ahead's support was on the basis that metered operators were not penalised and that there was enough incentives for Network Rail to negotiate the best commercial deal with Distributor operators.

ATOC opposed the proposal to allocate transmission costs to metered operators according to their actual consumption in the half-hour periods. It stated that, whilst it supported the principle of cost-reflectivity, this particular change would introduce a disproportionate amount of complexity and variability into the bills that TOCs pay. ATOC believed that under the proposed system, the benefit of any action that a TOC takes to reduce peak demand would be ameliorated by other factors such as the peak demand of other TOCs and on factors such as local weather conditions affecting demand at that ESTA in the triad half-hours.

Question (S): Do you support our proposal for all freight traction electricity charges to be based on actual electricity costs faced by Network Rail from the start of CP5?

We received seven responses to question (S) from Porterbrook, Go-ahead, SSWT, Freightliner, TfL, DBS and ATOC.

Go-ahead, ATOC, Porterbrook, TfL and SSWT supported the proposed approach outlined in question (S).

ATOC in particular, noted the 2008 work leading up to the CP4 pricing system, which indicated that the origins of freight consumption rates were not always clear. It noted that the work found that the rates may not necessarily reflect today's trailing loads, speeds or usage patterns. It therefore suggested there could be a case for looking at this again. It did however note that information on this point is limited and, as with the earlier discussion on consumption rates, there is unlikely to be time to do this between now and the start of CP5.

ATOC however, took this opportunity to seek assurance from Network Rail that any positive or negative changes from actual prices that may or do occur, is borne by Network Rail, and is not charged back to passenger operators, under the cost wash-up arrangements.

ATOC highlighted the opportunity whereby, if FOCs did move to an 'actual price' scheme, then FOCs may wish to join the ATOC EC4T Scheme to set prices for their volumes. It stated that ATOC have made provisions for the possibility of FOCs to join the ATOC scheme in the Scheme's rules. Alternatively, it stated that FOCs could instead set prices directly via Network Rail.

Freightliner objected to the proposed approach outlined in question (S). It stated that FOCs should face the actual price but currently remain unable to individually set / fix a price for their consumption, as even the larger FOCs don't have sufficient volume to hit the 5% minimum tranche of all railway consumption demand by the scheme. It believed that FOCs were in a relatively weak position to determine the fixing point within a potential consortium. It noted the conflicting economic pressures between TOCs and FOCs or indeed the lost opportunity for a competitive advantage over other FOCs, which it believed made the self-determined price scheme unrealistic. Freightliner accepted that there was an overall industry incentive to fix at the lowest possible level albeit the risk profile between operators can be materially different. Freightliner further stated that once real charges were applied, FOCs should have an ability to fix prices independently and so enter the cost wash-up on an equal footing, otherwise it believed that the application of real charges would become an imposed and uncontrolled price

DBS also opposed Network Rail's proposal and believed that the current regime should remain. It suggested that it would support proposals that allowed freight operators to 'opt-in' for on-train metering; their prices for metered usage will be based on Network Rail's actual costs, to be consistent with passenger pricing arrangements. DBS stated that FOCs currently pay for their EC4T consumption based on three national commodity dependent rates. Apart from the annual price variation mechanism (which is based on the MLUI index) and the annual volume 'washup' process, DBS believed that this charging mechanism would provide a reasonable degree of certainty, which is simple to administer and reduces bureaucracy and transaction costs. It therefore believed that, under the current Network Rail proposal, these factors (which it stated were crucial for freight operators) would be significantly diminished as the national based charging mechanism would be replaced by a system based on many different rates by season, time of day and geographic area. Furthermore, DBS stated that the current proposal would also require freight operators to be included in the annual cost 'washup' process, thereby introducing further cash flow uncertainty. DBS considered that the proposed approach was complex and that although it could be easily applied to the relatively fixed timetables of passenger operators, it would be more complex and bureaucratic for freight. DBS also considered that there was limited information as to how Network Rail's proposal is intended to operate in practice and what would the likely impact be on freight operators in terms of overall charges, cash flow, complexity, transaction costs and certainty. It stated that, without further information in regards to the above, it would not be able to evaluate Network Rail's proposal in any detail.

EC4T Contractual Framework

Question (T): Do you support the reform of the EC4T Metering Rules to be widened and renamed the traction electricity rules?

We received six responses to question (T) from Porterbrook, Go-ahead, Freightliner, TfL, DBS and ATOC.

Porterbrook objected to the proposed approach set out in question (T). Go-ahead did not have any strong opinions on the stated proposal, it questioned the value of the proposal and wondered whether introducing a new document adds an unnecessary complexity.

Freightliner agrees that the Schedule 7 content should be replaced with the Metering Rules. It however noted that FOCs operate over a number of ESTAs for a single journey, which is significantly greater than individual TOC operators, and as such they believed that the wash-ups would be challenging from a process perspective. Freightliner stated that it agreed that the volume and cost wash-ups should be performed at the ESTA level with actual prices against consumption for metered operators (cost wash-up only) and an appropriately weighted version for non-metered operators (for both volume and cost wash-up). It however expressed concern regarding the provisions Network Rail has outlined for adjusting ESTA boundaries and the frequency/ timing of such changes outside of the Periodic Review process.

DBS supports the principle of the outlined approach. However, it stated that before it could give further consideration or support for the proposal, it would need to be provided with more detail as to how the new 'multilateral' Traction Electricity Rules would operate in practice, particularly in terms of governance and change processes. It also expressed a willingness to understand where in the industry contractual framework any new Traction Electricity Rules would sit.

TfL supported the proposed approach set out in question (T). It believed that this would ensure that the rules governing the consumption of traction electricity would be fully aligned with agreed arrangements for metering which would be made transparent.

ATOC supported the proposal, it considered that the Traction Electricity Rules to cover factors such as ESTA definitions and operations of wash ups would allow much greater flexibility and avoid the need to go through lengthy contractual processes. It however noted that it was important to ensure that any 'rules' document must not dilute existing contractual protections for TOCs or any of the obligations placed on Network Rail.

Question (U): Are there any other areas which you consider should be included in the new traction electricity rules document?

We received three responses to question (U) from Go-ahead, TfL and DBS.

Go-ahead suggested that the rules should permit 'quasi-metering', i.e. where a sufficient proportion of a given fleet is metered the option for metered billing should be extended to the whole fleet. It further highlighted a study conducted by Birmingham University for the Traction Electricity Steering Group, which should that; provided 20% of a fleet was metered the overall consumption would be measured with 98% accuracy. It therefore believed that such an approach provided sufficient

accuracy for billing and would offer an economic and efficient approach to fitting meters where the business case is otherwise weak.

TfL suggested that separate metering of depot and stabling sites should be provided for - particularly where the rolling stock itself is unmetered. It believed that this would incentivise the efficient use of electricity by parked trains and thought that this was not properly reflected by the current modelled tariffs. It further stated that the changes to the existing billing process and the associated supply of information should be borne by Network Rail, as it deemed Network Rail as the power provider.

Finally, DBS stated that if new Traction Electricity Rules were introduced, it believed that it was essential that the document applied to all users of traction electricity (for traction and non-traction purposes) as it thought that a set of rules applying to some consumers and not others would not, in DB Schenker's view, be either fair or equitable.

Question (V): Do you support the modification of the cost wash-up drafting to allow it to be more accurate and reflect direct price-setting arrangements?

Go-ahead supported the proposed approach set out in question (V). It however believed that clarification and agreement was needed of the elements that ensure that prices fixed by TOC's for various months are translated back against the Network Rail billing process.

DB Schenker stated that it needed to understand more about the direct price setting arrangements enjoyed by passenger operators and how these may apply to and affect freight operators, particularly if the proposals result in further uncertainty, increased complexity and transaction costs.

ATOC stated that, through the EC4T Scheme Council, TOCs have already supported in principle the proposals to modify the cost wash up to reflect T&D costs and direct price setting. ATOC stated that it is planning to address some of these issues (such as the direct price setting) for the 2012/13 wash up via a simple Schedule 7 amendment rather than wait for CP5.

Question (Z): Do you have any views or suggestions about our approach to stakeholder engagement?

We received five responses to question (Z) from Go-ahead, Freightliner, TfL, DBS and ATOC.

Go-ahead stated that Network Rail's engagement with stakeholders through the TESG has been very good and would like this level of engagement to continue. It has requested that Network Rail considers whether it should specify further trials on both the AC and DC network to confirm the transmission loss cost data.

Freightliner stated that it was willing to discuss this response in more detail if it would prove helpful to the process. It commended Network Rail on its engagement to date with the industry on this topic.

TfL welcomed the opportunity to be more closely involved in the process of setting electricity charges. It stated that this was particularly important to TfL because the 'concession model' operated by TfL means that the risks surrounding electricity prices are partially retained by TfL for its national rail concessions and fully retained for London Underground. TfL also thought that it was important to be involved in this

exercise, as it needed to represent the interests of Crossrail, until a Crossrail operator is appointed.

DBS acknowledged that Network Rail had recognised the need to continue its engagement with stakeholders to help ensure that the industry was fully informed on the progress being made in this area. Its preference is to receive more information and updates, other than the dates and milestones outlined in the consultation document. DBS believed that, from the issues and proposals contained in the consultation document, more work was needed to be done to develop and provide further detail on the proposals so that Network Rail could receive wide industry support. It suggested that the issues should be taken forward under the auspices of the industry Traction Electricity Steering Group with perhaps separate meetings with freight operators to discuss issues directly relevant to them.

ATOC suggested that it may be sensible to arrange a multi-way discussion involving ORR, funders, Freight Operators, Network Rail and passenger operators, to review how the proposals outlined in the consultation document might work in the round and to discuss how effective they will be in addressing the problems Network Rail have identified.

Electrification Asset Usage Charge

Question (W): Do you have any views on the cost activities we have included in our EAU cost estimates?

We received four responses to question (W) from Porterbrook, TfL, DBS and ATOC.

Porterbrook suggested that the EAU should be rolled in to the cost per kWh. It believed that this approach would be fairer, as part of the cost would be governed by the maximum demand in the system – thus it was concluded by Porterbrook that; those who consume the most kWh should pay more per mile.

TfL suggested that, given the damaging effect individual power supply failures can have on train services, it believed that assurance should be given to ensure that spending is targeted on projects that will improve reliability and performance.

DBS believed that the cost activities included in Network Rail's EAU cost estimates appeared to be comprehensive. However, ATOC stated that there was limited detail as to why Electricity Asset Usage costs were proposed to increase so much.

Question (X): Do you have any views on the variability assumption we have used in our EAU cost estimates?

We received two responses to question (X) from Porterbrook and DBS.

Porterbrook referenced its approach to question (W) as its desired approach to question (X). DBS similarly had no specific evidence to challenge the variability assumptions used by Network Rail in its EAU cost estimates. However, it stated that it would not expect any overhead line equipment (OHLE) that is not directly associated with the contact wire (e.g. the head span structures) to have any variability with traffic.

Question (Y): Do you have any views on our proposal to use long-run cost estimates over 35 years instead of 5 years?

We received five responses to question (Y),from Go-ahead, SSWT, Freightliner, TfL and DBS.

Go-ahead supported, in principle, the use of a long-run asset costs, however expressed concern over Network Rail's ability to accurately determine what the 35 year long run costs would be. It stated that it was essential to recognise that improved asset knowledge or changed incentives will have impacts on short-run costs and that this needed to be recognised at each periodic review.

Many respondents, including, ATOC, SSWT and DBS expressed concern at Network Rail's proposal to calculate the cost estimate through a long-run average approach. They thought that this approach would result in EAU costs increasing significantly. Both ATOC and SSWT believed that this change should be justified more fully by Network Rail and be subject to detailed ORR scrutiny. It also added that the proposed approach should only be introduced to the extent that Network Rail can justify what will happen to any surplus funds that it will collect, but not spend during CP5.

Freightliner expressed support for the application of the charge on a distance metric, rather then consumption. However, similar to the above view, it believed that the proposed approach would result in more than a doubling of the EAUC. Freightliner stated that the order of magnitude suggested that the CP4 assessment was for a period of near comatosis for renewal activity against the latest 35 year average. Therefore, it enquired as to whether the change was due to a recovery or expectation of additional infrastructure renewal over the coming 35 years, or purely down to a significant reallocation of cost from fixed to variable. It believed that the consultation provided no direct evidence to the proposed change.

TfL considered that the proposed approach set out by Network Rail was sensible, as it would ensure that a whole life view of the asset is used to inform its maintenance and renewal costs. It further added that the approach would ensure that costs were more consistent over time, thus reducing the risk that operators are exposed to sudden increases in charges when major renewals activity is required. It however suggested that assurances should be given that any upgrades and renewals proposed should deliver value for money, with an aim to maintain and improve performance. In addition to this, it believed assurance was also needed to ensure the longer run estimates would remain sufficiently flexible to accommodate upgrade works that could emerge at a later date.

DBS believed that the proposal to adopt a long-run average cost approach was reasonable. It suggested that the financial effects of this on operators should be phased in across CP5 rather than implemented in full from its commencement.

SUMMARY OF RESPONSES TO THE DC LOSSES CONSULTATION (NOVEMBER 2012)

Electrical Losses (DC)

ATOC, SSWT, Go-ahead and TfL were content with the proposal to reduce the DC losses factor to 15.57%[20] for the South England region during CP5. Go-ahead further suggested that Network Rail should progressively reduce this losses factor to 10% by end of CP5. This view was also shared by ATOC.

[20] This figure was updated in the latest DC losses report published in Janruary 2012, accessible here: http://www.networkrail.co.uk/WorkArea/DownloadAsset.aspx?id=30064784498

SSWT did not consider that the Isle of Wight should be used as part of the modelling exercise to determine fixed losses in the Wessex Region. It also wanted to know how much real train running data was used by Network Rail to calibrate the traction model that was used to determine the level of resistive losses in ESTA U. In addition it enquired as to whether the grant provided through the Safety & Environment Fund would be rolled forward to CP5.

ATOC made the following comments:

- It did not accept the derived efficiency target from combining the projected traffic increase during CP5, whilst maintaining the current DC loss levels during the whole.

- It requested some specific clarification aroun the DC metering accuracy.

- It suggested that ESTAs should be reorganised and metered so that they are exclusively DC or AC from a losses and charging viewpoint. It further added that this reorganisation would not necessarily have to mean that they would also be technically disaggregated from a grid feeding viewpoint.

- If regenerated energy is injected into the 3rd rail, then locally the third rail voltage could rise above its normal off-load level and certainly will rise above its normal on-load level – it wanted clarification as to whether this meant that the static losses associated with insulator leakage would rise during periods of regenerative energy injection.

- It would like to see the evidence which supports the assumption that the ratio of installed polymeric against ceramic insulators is 50%.

- It asked why we have assumed the North London and ECML South DC networks to be similar to the South England DC networks, rather than the Merseyside DC network. It also wanted to know the exact features of the Merseyside network that enable it to deliver lower losses today, then the South England DC network.

- It asked whether Network Rail would complete the Wessex model and whether the results would be available to them.

- It requested clarification on whether the losses figures presented are from the point of view of the infrastructure or train operator.

- It requested clarification on whether we had taken account of Mersey PTE aspirations to procure a new fleet and run more 6 (9) car trains during CP5.

- It requested clarification on whether the losses figures took in to account actual line voltages seen and do they take into account the late CP4/early CP5 plans to raise all line voltages to 750Vdc nominal – which it believed could increase the losses.

- It requested clarification as to whether the “1% increase” in losses referred to 1% or 1 percentage point.

Regenerative Braking (DC)

Question (A) Do you have any further views on our Sep 2012 proposal to retain the 15% regenerative braking discount for modelled DC usage?

SWT, TfL, FCC and ATOC all agreed with our proposal to retain the 15% regenerative braking discount for modelled DC usage.

Question (B): Do you agree with our proposal to continue using the current approach to reflecting regenerated energy in metered DC charges? (i.e. apply total losses mark-up to net energy consumption)

Go-Ahead, Porterbrook, TfL, SWT, FCC and ATOC agreed with our proposal to continue using the current approach to reflecting regenerated energy in metered DC charges.

Further to the views outlined by the respondents, we intend to continue using the current approach to reflect regenerated energy in metered DC charges during CP5.

Question (C): Do you have any views on the consideration of a separate losses factor for metered regenerated energy in CP6?

TfL supported the consideration of a separate losses factor for metered regenerated energy in CP6. ATOC believed that further work should be done during CP5 to form the basis of any proposal for CP6 or that there should not be a separate regenerated power losses factor.

Question (D): Do you have any other views on our approach to reflecting regenerated energy in metered DC charges?

Go-ahead and Porterbrook believed that there should be strong incentives for Network Rail to reduce transmission losses and to incentivise the industry to fit regenerative traction equipment.

SSWT, Go-ahead and ATOC believed that there should be a discontinuation in CP5 of the current approach whereby metered operators in ESTAs with 90% metered consumption per year revert back into the volume wash-up. They believed that the continuation of this policy in CP5 would create a disincentive to Network Rail to improve its network efficiency and also create a disincentive for TOCs for switching to metered consumption rates. Go-ahead suggested that the transmission losses charges should be capped for both metered and non-metered operators. It also expressed support for quasi-metering, which it considered (compared to a full metering) would be both cost and time efficient, whilst delivering the required levels of accuracy.

SUMMARY OF RESPONSES TO THE UPDATED AC & DC LOSSES REPORT

SSWT responded to our updated AC and DC losses report and suggested the following points:

- If a net mark up is applied to DC and AC losses for regenerative brake enabled trains – then this should only apply to trains that have regenerative

braking. Similarly, it suggested that the gross mark-up level of 17% should be applied to metered trains that do not have regenerative braking capability.

- SSWT suggested that; in the event that partial metering for billing purposes is permitted in CP5, the exemption from the consumption wash up for metered operators should also apply to those operators that are partially metering their fleet.

First Group stated that there may generally be an increase in the percentage of losses, with further electrification of the railway. However, it did acknowledge that, increased traffic could increase losses.

It further stated that it would expect Network Rail to reduce the losses and would, for example; expect, where economical, for Network Rail to consider using auto transformers, where boosters are currently used.

Similar to TfL and ATOC, First Group expressed concerned over the exclusion of stabling loads in the analysis. It noted that; in its estimate, losses would increase by +20% if stabling loads were included in any model.

First Group does not see how the 3.85% can be justified, especially with three figure accuracy. It suggested that this suggested that the work is accurate to three decimal places – which it believed was not true. It further stated that Network Rail need to decide between 4% and 5% - and even then, deemed that it would be an educated guess. It believed that the 5% would be more appropriate according to its analysis.

Southeastern stated that it would like to see more work done to recognise and compensate operators for the overcharging that it believes is happening on the DC metered stock. . It stated that, it would like to see the data collected for these reports, and used by Network Rail to inform and identify asset procurement, maintenance, repair, renewal and enhancement policies that result in traction energy reduction in the industry.

ATOC noted that the weighted national average losses figure that Network Rail proposed was an improvement, compared to the average losses figure that was previously proposed. It however stated that it does not support the concept of a single national average loss and thus the proposed national average mark-up figure. It however proposed using an average loses figure and resulting average mark-up figure per ESTA or ESTA group (as amended during CP5) similar to that shown in Table 2 of our losses report.

Similar to concerns expressed by First Group, ATOC stated that assigning 3 significant figures to the averages (for both AC and DC) for billing purposes, gives a false sense of accuracy. It stated that the averages should be calculated using 3 significant figures, but suggested that the final billing mark-up should be rounded down to 2 significant figures.

Whilst acknowledging that the regenerative energy fraction varies according to service type, weather and other factors, ATOC suggested that a constant regenerative energy fraction should be assumed and used in billing calculations for each train/service type, independent of factors such as weather.

ATOC also suggested that Network Rail should adopt and publish a transparent policy statement about its procurement and deployment on new build, renewals and

maintenance of polymeric insulators, autotransformers etc and be required to publish KPIs on this annually.

ATOC stated that the announced electrification expansion programme should not lead to an increased losses fraction. It stated that the new networks should be designed, delivered and managed such that they deliver current ESTA O, P, & R loss levels or below at their year 20+ projected traffic volumes

ATOC stated that the concept of maintaining average losses at their current estimated levels for the whole of CP5, whilst traffic volumes increase is seen as a fair. It however stated that challenging efficiency targets is not acceptable. It suggested that efficiency targets should be proposed and set for the whole of CP5 at a level equal to or better than losses incurred on ESTAs O, P and R today.

In regards to the current system, whereby metered operators rejoin the volume washup arrangements once metered consumption in any single ESTA goes over 90% in any year – ATOC suggested that this should not be continued for both the DC and AC ESTAs. This was also noted by SSWT. It believed that this concept would act to protect Network Rail from any financial risks associated with errors in our losses calculations and thus remove any incentive to improve network efficiency.

It also added that clarity should be given for operators interested in quasi (partial) fleet metering by extending the same washup opt out regime to them, so long as they meet industry agreed rules for quasi metering.

ANNEX C: PROPOSED PRICE LISTS

Table 4: Proposed Passenger EC4T consumption rates for CP5 (modelled)

Passenger operator name	Service Code	Service Group	Vehicle Type	Rate
East Coast Main Line Rail	21700001	HB01	91/1	51.60
East Coast Main Line Rail	21700001	HB01	90/0	51.06
East Coast Main Line Rail	21700001	HB01	91/0	51.60
East Coast Main Line Rail	21701001	HB05	91/1	51.60
East Coast Main Line Rail	21701001	HB05	91/0	51.60
East Coast Main Line Rail	21702001	HB02	91/1	55.22
East Coast Main Line Rail	21702001	HB02	91/0	55.22
East Coast Main Line Rail	21702001	HB02	90/0	54.64
East Coast Main Line Rail	21702001	HB02	89/0	55.22
East Coast Main Line Rail	21703001	HB04	91/1	55.22
East Coast Main Line Rail	21703001	HB04	90/0	54.64
East Coast Main Line Rail	21703001	HB04	91/0	55.22
East Coast Main Line Rail	21704001	HB99	91/1	53.41
East Coast Main Line Rail	21704001	HB99	90/0	52.85
East Coast Main Line Rail	21704001	HB99	91/0	53.41
Eurostar	24638004	GA01	373	52.89
Eurostar	81001009	GA01	373	52.89
Eurostar	81002009	GA01	373	52.89
Eurostar	81003109	GA01	373	52.89
Eurostar	81004009	GA01	373	52.89
First Capital Connect	21713000	EG04	313	13.16
First Capital Connect	21714000	EG04	313	14.04
First Capital Connect	21716000	EG05	317	14.33
First Capital Connect	21717000	EG05	317	11.29
First Capital Connect	21960000	EG99	317	12.74
First Capital Connect	21961000	EG05	365	10.11
First Capital Connect	21962000	EG05	365	12.86
First Capital Connect	21963000	EG04	313	13.16
First Capital Connect	21964000	EG04	313	14.04
First Capital Connect	21965000	EG05	317	14.33
First Capital Connect	21967000	EG05	317	11.29
First Capital Connect	22709000	EG06	319	12.80
First Capital Connect	22710000	EG01	377	16.32
First Capital Connect	22710001	EG01	319	12.80
First Capital Connect	22710002	EG01	377	16.32
First Capital Connect	22711000	EG02	319	11.79
First Capital Connect	22711000	EG02	377	16.32
First Capital Connect	22711000	EG02	313	14.19
First Capital Connect	22718002	EG99	377	16.32
First Capital Connect	24207000	EG01	319	16.07
First Capital Connect	24207001	EG01	319	12.80
First Capital Connect	24207003	EG99	319	16.07
First Capital Connect	24612000	EG02	319	11.79
First Capital Connect	24662000	EG03	319	16.07
First Capital Connect	24662001	EG03	319	15.11
First Capital Connect	25961000	EG05	365	12.25
First Capital Connect	25962000	EG05	365	12.25

Table 4: Proposed Passenger EC4T consumption rates for CP5 (modelled)

Passenger operator name	Service Code	Service Group	Vehicle Type	Rate
Greater Anglia	21770002	EB04	86/2	52.03
Greater Anglia	21770002	EB04	322	12.30
Greater Anglia	21781002	EB04	86/2	52.03
Greater Anglia	21781002	EB04	322	12.30
Greater Anglia	21890002	EB99	86/2	52.73
Greater Anglia	21890002	EB99	322	12.46
Greater Anglia	21890102	EB99	86/2	52.73
Greater Anglia	21890102	EB99	322	12.46
Greater Anglia	21896002	EB05	86/2	52.73
Greater Anglia	21910000	EB07	315	14.53
Greater Anglia	21911000	EB06	379	11.54
Greater Anglia	21911000	EB06	322	9.42
Greater Anglia	21912000	EB07	315	16.49
Greater Anglia	21912000	EB07	379	20.01
Greater Anglia	21913000	EB06	379	18.74
Greater Anglia	21913000	EB06	317	13.74
Greater Anglia	21916400	EB99	317	12.74
Greater Anglia	21916401	EB99	317	12.74
Greater Anglia	21920000	EB07	379	20.95
Greater Anglia	21920000	EB07	315	13.06
Greater Anglia	21939001	EB03	321	12.33
Greater Anglia	21939001	EB03	360	15.65
Greater Anglia	21940001	EB01	321	12.48
Greater Anglia	21940001	EB01	315	14.73
Greater Anglia	21943001	EB02	321	14.24
Greater Anglia	21943001	EB02	315	16.79
Greater Anglia	21945001	EB99	315	14.70
Greater Anglia	21945001	EB99	321	12.46
Greater Anglia	21945101	EB99	321	12.46
Greater Anglia	25910000	EB07	379	11.90
Greater Anglia	25911000	EB06	379	11.80
Greater Anglia	25911000	EB06	322	9.42
Greater Anglia	25912000	EB07	379	19.89
Greater Anglia	25913000	EB06	379	18.77
Greater Anglia	25915000	EB06	379	15.21
Greater Anglia	25915000	EB06	365	12.86
Greater Anglia	25915000	EB06	317	11.58
Greater Anglia	25920000	EB07	379	21.02
Greater Anglia	25939001	EB03	360	15.65
Greater Anglia	25939001	EB03	321	12.33
Greater Anglia	25940001	EB01	315	14.73
Greater Anglia	25943001	EB01	321	14.24
Greater Anglia	25943001	EB01	315	16.79
LUL Bakerloo	24680004	XC01	LUL	10.00
LUL Bakerloo	24680004	XC01	LU4	17.13
LUL District (Richmond)	24682004	XE02	LUL	10.00
LUL District (Richmond)	24682004	XE02	LU5	13.10
LUL District (Wimbledon)	24681004	XB01	LUL	10.00
London Midland	12256320	EJ03	323	16.49

Table 4: Proposed Passenger EC4T consumption rates for CP5 (modelled)

Passenger operator name	Service Code	Service Group	Vehicle Type	Rate
London Midland	12257320	EJ01	323	13.19
London Midland	12259320	EJ03	323	13.19
London Midland	12259320	EJ03	350	23.41
London Midland	12263310	EJ03	323	15.02
London Midland	12263810	EJ03	350	19.22
London Midland	12263810	EJ03	323	15.22
London Midland	12271310	EJ03	323	15.22
London Midland	12272320	EJ03	323	15.22
London Midland	12272820	EJ03	323	15.22
London Midland	22209000	EJ05	321	12.27
London Midland	22209000	EJ05	350	17.37
London Midland	22209001	EJ99	350	17.37
London Midland	22213000	EJ06	321	17.67
London Midland	22213000	EJ06	350	19.22
London Midland	22259000	EJ03	350	14.05
London Midland	22259000	EJ03	323	13.19
London Midland	22272000	EJ03	323	15.22
London Midland	22300000	EJ04	350	13.60
London Overground Rail Operations Ltd	22204000	EK01	378	13.25
London Overground Rail Operations Ltd	22206000	EK03	378	17.62
London Overground Rail Operations Ltd	22214000	EK01	378	13.25
London Overground Rail Operations Ltd	22215000	EK03	378	17.62
London Overground Rail Operations Ltd	22215001	EK03	378	17.62
London Overground Rail Operations Ltd	22215002	EK99	378	17.62
London Overground Rail Operations Ltd	22215003	EK03	378	17.62
London Overground Rail Operations Ltd	22215004	EK03	378	17.62
London Overground Rail Operations Ltd	22216000	EK02	378	17.62
London Overground Rail Operations Ltd	22216001	EK99	378	13.25
London Overground Rail Operations Ltd	22218000	EK03	378	17.62
Merseyrail	12301012	HE01	507	12.76
Merseyrail	12301012	HE01	508	12.76
Merseyrail	12302012	HE01	508	12.76
Merseyrail	12302012	HE01	507	12.76
Merseyrail	12303012	HE01	508	12.76
Merseyrail	12303012	HE01	507	12.76
Merseyrail	12304212	HE01	508	12.76
Merseyrail	12304212	HE01	507	12.76
Merseyrail	12305012	HE02	507	14.73
Merseyrail	12305012	HE02	508	14.73
Merseyrail	12306212	HE02	507	14.73
Merseyrail	12306212	HE02	508	14.73
Merseyrail	22304003	HE01	508	12.76
Merseyrail	22304003	HE01	507	12.76
Merseyrail	22306003	HE02	508	14.73
Merseyrail	22306003	HE02	507	14.73
Merseyrail	22902203	HE99	508	12.76
Merseyrail	22903203	HE02	508	14.73
Northern Rail	11818620	ED05	333	19.41
Northern Rail	11818620	ED05	321	10.56

Table 4: Proposed Passenger EC4T consumption rates for CP5 (modelled)

Passenger operator name	Service Code	Service Group	Vehicle Type	Rate
Northern Rail	11819020	ED05	321	11.96
Northern Rail	11819020	ED05	333	21.98
Northern Rail	11820820	ED05	321	13.53
Northern Rail	11820820	ED05	333	26.27
Northern Rail	11821020	ED05	321	14.28
Northern Rail	11821020	ED05	333	26.09
Northern Rail	11824820	ED05	321	15.41
Northern Rail	11824820	ED05	333	22.12
Northern Rail	11870820	ED05	333	21.62
Northern Rail	11870820	ED05	321	11.36
Northern Rail	12228110	ED10	323	15.22
Northern Rail	12230110	ED10	323	19.77
Northern Rail	12231820	ED10	323	14.30
Northern Rail	12232820	ED10	323	15.10
Northern Rail	12233820	ED10	323	15.10
Northern Rail	12974820	ED99	323	15.22
Northern Rail	12974820	ED99	322	12.46
Northern Rail	22231000	ED10	323	15.22
Northern Rail	22232000	ED10	323	15.10
ScotRail	13560015	HA06	380	22.48
ScotRail	13560015	HA06	320	13.20
ScotRail	13560015	HA06	314	12.62
ScotRail	13560015	HA06	334	18.42
ScotRail	13560015	HA06	318	15.45
ScotRail	13562015	HA06	314	12.32
ScotRail	13562015	HA06	318	17.07
ScotRail	13562015	HA06	334	18.11
ScotRail	13563015	HA06	314	7.76
ScotRail	13563015	HA06	334	17.46
ScotRail	13563015	HA06	318	14.77
ScotRail	13569815	HA06	380	20.37
ScotRail	13569815	HA06	314	8.05
ScotRail	13569815	HA06	318	11.15
ScotRail	13569815	HA06	334	12.47
ScotRail	13571015	HA06	334	12.50
ScotRail	13571015	HA06	318	13.35
ScotRail	13571015	HA06	380	21.42
ScotRail	13571015	HA06	314	9.43
ScotRail	13573015	HA06	334	12.84
ScotRail	13573015	HA06	380	18.69
ScotRail	13573015	HA06	318	12.22
ScotRail	13573015	HA06	314	8.82
ScotRail	23551003	HA11	87/0	37.30
ScotRail	23551003	HA11	86/2	37.30
ScotRail	23551003	HA11	90/0	37.30
ScotRail	23552003	HA11	90/0	37.30
ScotRail	23552003	HA11	87/0	37.30
ScotRail	23552003	HA11	86/2	37.30
ScotRail	23553003	HA11	90/0	37.30

Table 4: Proposed Passenger EC4T consumption rates for CP5 (modelled)

Passenger operator name	Service Code	Service Group	Vehicle Type	Rate
ScotRail	23553003	HA11	87/0	37.30
ScotRail	23553003	HA11	86/2	37.30
ScotRail	23564903	HA07	314	10.52
ScotRail	23564903	HA07	318	13.88
ScotRail	23584003	HA02	334	12.76
ScotRail	23584003	HA02	380	23.78
ScotRail	23584003	HA02	90/0	37.30
ScotRail	23584003	HA02	314	8.16
ScotRail	23584003	HA02	318	12.86
ScotRail	23971103	HA99	320	10.63
ScotRail	23971103	HA99	314	9.93
ScotRail	23971103	HA99	318	13.75
ScotRail	23971403	HA99	318	13.75
ScotRail	23971403	HA99	314	9.93
ScotRail	23971403	HA99	320	10.63
ScotRail	23971403	HA99	334	15.30
South West Trains	24620104	HY08	442	14.53
South West Trains	24620104	HY08	450	12.44
South West Trains	24620104	HY08	444	16.92
South West Trains	24620204	HY08	442	14.53
South West Trains	24620204	HY08	450	13.68
South West Trains	24620204	HY08	444	17.58
South West Trains	24621104	HY07	442	12.96
South West Trains	24621104	HY07	444	16.55
South West Trains	24621104	HY07	450	12.20
South West Trains	24621204	HY07	442	14.14
South West Trains	24621204	HY07	444	19.47
South West Trains	24621204	HY07	450	14.07
South West Trains	24621304	HY07	442	17.97
South West Trains	24621304	HY07	450	16.29
South West Trains	24628206	HY02	450	12.68
South West Trains	24629104	HY08	450	14.39
South West Trains	24629104	HY08	442	10.63
South West Trains	24629204	HY08	444	16.90
South West Trains	24629204	HY08	450	14.24
South West Trains	24629204	HY08	458	13.12
South West Trains	24629304	HY08	450	19.40
South West Trains	24631104	HY02	450	19.32
South West Trains	24631204	HY02	450	14.59
South West Trains	24632104	HY04	450	13.35
South West Trains	24632204	HY04	450	14.00
South West Trains	24632204	HY04	458	12.86
South West Trains	24671105	HY05	455	15.78
South West Trains	24671105	HY05	450	17.83
South West Trains	24671205	HY05	455	15.78
South West Trains	24671205	HY05	450	19.88
South West Trains	24671305	HY05	455	15.78
South West Trains	24671305	HY05	450	20.66
South West Trains	24671405	HY05	455	15.78

Table 4: Proposed Passenger EC4T consumption rates for CP5 (modelled)

Passenger operator name	Service Code	Service Group	Vehicle Type	Rate
South West Trains	24671405	HY05	450	20.72
South West Trains	24671505	HY05	455	15.78
South West Trains	24671505	HY05	450	20.72
South West Trains	24671605	HY05	455	15.78
South West Trains	24671605	HY05	450	21.87
South West Trains	24672104	HY06	450	16.57
South West Trains	24672104	HY06	455	11.88
South West Trains	24672204	HY06	450	16.69
South West Trains	24672404	HY06	450	18.07
South West Trains	24673105	HY01	450	20.09
South West Trains	24673105	HY01	455	15.29
South West Trains	24673205	HY01	450	20.03
South West Trains	24673205	HY01	455	15.29
South West Trains	24673305	HY01	455	15.29
South West Trains	24673305	HY01	450	17.16
South West Trains	24673405	HY01	450	20.71
South West Trains	24673405	HY01	455	15.29
South West Trains	24673505	HY01	455	15.29
South West Trains	24673505	HY01	450	18.11
South West Trains	24673605	HY01	455	15.29
South West Trains	24673605	HY01	450	17.27
South West Trains	24673605	HY01	458	12.43
South West Trains	24673705	HY01	455	15.29
South West Trains	24673705	HY01	450	18.67
South West Trains	24673905	HY01	455	12.17
South West Trains	24673905	HY01	450	18.30
South West Trains	24676004	HY99	458	13.57
South West Trains	24676004	HY99	455	16.69
South West Trains	24676004	HY99	442	14.90
Southeastern	24462000	HU99	465	17.04
Southeastern	24601000	HU04	375	13.47
Southeastern	24601000	HU04	508	8.79
Southeastern	24601004	HU01	375	14.66
Southeastern	24601004	HU01	508	8.79
Southeastern	24602000	HU04	375	11.88
Southeastern	24602004	HU01	375	13.55
Southeastern	24602004	HU01	508	8.79
Southeastern	24604000	HU04	375	12.17
Southeastern	24604000	HU04	465	14.79
Southeastern	24604000	HU04	365	12.03
Southeastern	24604004	HU01	465	14.79
Southeastern	24604004	HU01	508	9.18
Southeastern	24604004	HU01	365	12.03
Southeastern	24604004	HU01	375	12.51
Southeastern	24605000	HU04	375	11.86
Southeastern	24605004	HU01	465	14.21
Southeastern	24605004	HU01	375	12.82
Southeastern	24606000	HU04	375	12.57
Southeastern	24606000	HU04	365	10.09

Table 4: Proposed Passenger EC4T consumption rates for CP5 (modelled)

Passenger operator name	Service Code	Service Group	Vehicle Type	Rate
Southeastern	24606004	HU01	465	14.04
Southeastern	24606004	HU01	375	12.88
Southeastern	24606004	HU01	365	10.09
Southeastern	24607006	HU03	375	18.41
Southeastern	24607006	HU03	508	16.07
Southeastern	24608006	HU03	375	19.46
Southeastern	24608006	HU03	508	14.00
Southeastern	24609006	HU03	508	10.83
Southeastern	24609006	HU03	375	15.17
Southeastern	24650000	HU05	465	15.25
Southeastern	24650000	HU05	375	19.50
Southeastern	24650005	HU02	466	7.93
Southeastern	24650005	HU02	375	19.08
Southeastern	24650005	HU02	465	15.25
Southeastern	24652000	HU05	375	20.89
Southeastern	24652000	HU05	465	15.22
Southeastern	24652005	HU02	465	15.22
Southeastern	24652005	HU02	375	20.89
Southeastern	24653000	HU05	376	24.96
Southeastern	24653000	HU05	465	20.67
Southeastern	24653005	HU02	466	10.75
Southeastern	24653005	HU02	376	24.96
Southeastern	24653005	HU02	465	20.67
Southeastern	24655000	HU05	376	22.91
Southeastern	24655000	HU05	465	17.04
Southeastern	24655000	HU05	375	17.89
Southeastern	24655005	HU02	508	11.87
Southeastern	24655005	HU02	465	17.04
Southeastern	24655005	HU02	466	8.86
Southeastern	24655005	HU02	376	22.91
Southeastern	24655005	HU02	375	17.89
Southeastern	24656000	HU05	465	15.22
Southeastern	24656000	HU05	375	19.42
Southeastern	24656000	HU05	376	24.84
Southeastern	24656005	HU02	375	19.42
Southeastern	24656005	HU02	466	7.91
Southeastern	24656005	HU02	376	24.84
Southeastern	24656005	HU02	465	15.22
Southeastern	24657000	HU05	465	15.25
Southeastern	24657000	HU05	376	23.90
Southeastern	24657005	HU02	376	23.17
Southeastern	24657005	HU02	466	7.93
Southeastern	24657005	HU02	465	15.25
Southeastern	24658000	HU05	465	15.25
Southeastern	24658000	HU05	375	13.38
Southeastern	24658000	HU05	376	17.25
Southeastern	24658005	HU02	466	7.93
Southeastern	24658005	HU02	465	15.25
Southeastern	24658005	HU02	375	13.38

Table 4: Proposed Passenger EC4T consumption rates for CP5 (modelled)

Passenger operator name	Service Code	Service Group	Vehicle Type	Rate
Southeastern	24658005	HU02	376	17.25
Southeastern	24659000	HU05	376	24.37
Southeastern	24659000	HU05	465	15.25
Southeastern	24659005	HU02	376	24.37
Southeastern	24659005	HU02	466	7.93
Southeastern	24659005	HU02	465	15.25
Southern	24610000	HW05	377	17.75
Southern	24610004	HW04	377	17.75
Southern	24614006	HW01	375	13.84
Southern	24614006	HW01	377	18.22
Southern	24615006	HW01	377	21.87
Southern	24615006	HW01	375	18.02
Southern	24618000	HW02	377	13.62
Southern	24618004	HW03	377	13.60
Southern	24660004	HW99	455	16.69
Southern	24660004	HW99	319	16.07
Southern	24661000	HW05	319	18.85
Southern	24661000	HW05	455	15.88
Southern	24661000	HW05	377	20.63
Southern	24661000	HW05	456	8.26
Southern	24661005	HW04	319	18.85
Southern	24661005	HW04	456	8.26
Southern	24661005	HW04	377	20.63
Southern	24661005	HW04	455	15.88
Southern	24663000	HW02	375	9.17
Southern	24663000	HW02	319	12.22
Southern	24663000	HW02	377	11.41
Southern	24663004	HW03	375	9.17
Southern	24663004	HW03	455	12.69
Southern	24663004	HW03	319	12.22
Southern	24663004	HW03	377	11.41
Southern	24664000	HW02	377	15.71
Southern	24664000	HW02	375	11.43
Southern	24664004	HW03	377	15.71
Southern	24664004	HW03	319	12.22
Southern	24664004	HW03	455	12.69
Southern	24664004	HW03	375	11.43
Southern	24665000	HW02	377	14.81
Southern	24665004	HW03	377	14.81
Southern	24666000	HW02	377	13.38
Southern	24666004	HW03	377	13.38
Southern	24667000	HW02	319	20.94
Southern	24667000	HW02	377	17.96
Southern	24667004	HW03	455	21.75
Southern	24667004	HW03	319	20.94
Southern	24667004	HW03	377	18.92
Southern	24668000	HW05	456	11.00
Southern	24668000	HW05	455	21.14
Southern	24668000	HW05	377	25.21

Table 4: Proposed Passenger EC4T consumption rates for CP5 (modelled)

Passenger operator name	Service Code	Service Group	Vehicle Type	Rate
Southern	24668005	HW04	455	21.14
Southern	24668005	HW04	377	25.21
Southern	24668005	HW04	456	11.00
Southern	24669000	HW05	377	24.19
Southern	24669005	HW04	455	19.90
Southern	24669005	HW04	456	10.35
Southern	24669005	HW04	377	24.19
Southern	24674005	HW06	377	14.17
Southern	24674005	HW06	319	16.07
Southern	24683000	HW05	377	23.51
Southern	24683000	HW05	455	24.35
Southern	24683005	HW04	319	19.34
Southern	24683005	HW04	377	23.51
Southern	24683005	HW04	456	12.66
Southern	24683005	HW04	455	24.35
Southern	24684000	HW05	377	23.81
Southern	24684000	HW05	456	9.03
Southern	24684000	HW05	455	17.37
Southern	24684005	HW04	455	17.37
Southern	24684005	HW04	377	23.81
Southern	24684005	HW04	319	16.73
Southern	24684005	HW04	456	9.03
Southern	24685000	HW05	319	16.30
Southern	24685000	HW05	455	19.88
Southern	24685000	HW05	377	25.03
Southern	24685005	HW04	377	25.03
Southern	24685005	HW04	456	10.34
Southern	24685005	HW04	319	16.30
Southern	24685005	HW04	455	19.88
Southern	24686000	HW05	377	23.38
Southern	24686000	HW05	455	21.89
Southern	24686005	HW04	455	21.89
Southern	24686005	HW04	456	11.38
Southern	24686005	HW04	377	23.38
Southern	24687000	HW05	455	15.36
Southern	24687000	HW05	319	14.79
Southern	24687000	HW05	377	22.50
Southern	24687005	HW04	456	7.99
Southern	24687005	HW04	455	15.36
Southern	24687005	HW04	377	22.50
Southern	24687005	HW04	319	14.79
Southern	24688000	HW05	377	18.22
Southern	24688000	HW05	455	12.17
Southern	24688005	HW04	456	6.33
Southern	24688005	HW04	377	18.22
Southern	24688005	HW04	455	12.17
Virgin Trains	22100001	HF01	390	31.35
Virgin Trains	22100001	HF01	90/0	55.96
Virgin Trains	22100001	HF01	87/0	55.96

Table 4: Proposed Passenger EC4T consumption rates for CP5 (modelled)

Passenger operator name	Service Code	Service Group	Vehicle Type	Rate
Virgin Trains	22100001	HF01	86/1	55.96
Virgin Trains	22103001	HF06	87/0	55.96
Virgin Trains	22103001	HF06	90/0	55.96
Virgin Trains	22103001	HF06	390	30.75
Virgin Trains	22103001	HF06	86/2	55.96
Virgin Trains	22104001	HF02	87/0	55.96
Virgin Trains	22104001	HF02	86/2	55.96
Virgin Trains	22104001	HF02	90/0	55.96
Virgin Trains	22108001	HF03	87/0	55.96
Virgin Trains	22108001	HF03	90/0	55.96
Virgin Trains	22108001	HF03	390	27.43
Virgin Trains	22108001	HF03	86/2	55.96
Virgin Trains	22109001	HF04	90/0	55.96
Virgin Trains	22109001	HF04	87/0	55.96
Virgin Trains	22109001	HF04	86/2	55.96
Virgin Trains	22109001	HF04	390	28.06
Virgin Trains	22112001	HF06	87/0	55.96
Virgin Trains	22112001	HF06	86/2	55.96
Virgin Trains	22112001	HF06	390	28.25
Virgin Trains	22112001	HF06	90/0	55.96
c2c	21936004	HT01	317	13.71
c2c	21936004	HT01	357	16.88
c2c	24936004	HT01	317	14.50
c2c	24936004	HT01	357	16.31
c2c	26936004	HT01	317	13.71
c2c	27936004	HT01	317	12.58
c2c	27936004	HT01	357	14.67
c2c	28936004	HT01	317	12.58
c2c	29936004	HT01	317	12.47

Table 4: Proposed Freight EC4T consumption rates for CP5 (modelled)

Freight operator name	Service group code	Rate
Advenza	4703	46.38
Advenza	4707	25.27
Balfour Beatty	6935	25.27
Balfour Beatty	6939	25.27
Colas	4951	25.27
Colas	4952	25.27
Colas	4953	25.27
Colas	4957	53.61
Colas	4958	53.61
Colas	4963	53.61
Colas	6938	25.27
Colas	9984	25.27
DB Schenker	0300	46.38
DB Schenker	0302	53.61
DB Schenker	0303	53.61
DB Schenker	1203	25.27
DB Schenker	1213	25.51
DB Schenker	1601	25.27
DB Schenker	1609	25.27
DB Schenker	2005	25.27
DB Schenker	2307	25.27
DB Schenker	2314	25.27
DB Schenker	2323	25.53
DB Schenker	3002	25.51
DB Schenker	3012	25.27
DB Schenker	3013	25.27
DB Schenker	3601	25.27
DB Schenker	3602	25.27
DB Schenker	3604	25.27
DB Schenker	3608	25.27
DB Schenker	4050	25.03
DB Schenker	4068	24.95
DB Schenker	4075	38.76
DB Schenker	4176	25.27
DB Schenker	4252	25.27
DB Schenker	4269	25.27
DB Schenker	4273	38.82
DB Schenker	4303	25.27
DB Schenker	5101	38.26
DB Schenker	5202	38.36
DB Schenker	5206	25.27
DB Schenker	5207	38.00
DB Schenker	5212	25.54
DB Schenker	6050	24.92
DB Schenker	6090	38.21
DB Schenker	6101	38.82
DB Schenker	6102	38.81
DB Schenker	6103	38.82
DB Schenker	6104	38.82

Table 4: Proposed Freight EC4T consumption rates for CP5 (modelled)

Freight operator name	Service group code	Rate
DB Schenker	6105	25.27
DB Schenker	6106	25.27
DB Schenker	7162	25.15
DB Schenker	7901	25.27
DB Schenker	7902	25.27
DB Schenker	7904	25.27
DB Schenker	9985	38.82
Devon and Cornwall Railways	6605	53.61
Devon and Cornwall Railways	6606	53.61
Direct Rail Services	1900	53.61
Direct Rail Services	6690	25.27
Direct Rail Services	9986	25.27
Europorte Channel	5501	38.00
Europorte Channel	5502	38.00
Europorte Channel	5503	38.00
Fastline Track Renewals	6937	25.27
Freightliner	5102	36.89
Freightliner	6060	36.99
Freightliner Heavy Haul	6065	25.27
Freightliner Heavy Haul	6205	53.61
Freightliner Heavy Haul	7060	25.27
GB Railfreight	4600	36.24
GB Railfreight	4601	38.00
GB Railfreight	4602	25.27
GB Railfreight	4603	36.24
GB Railfreight	4605	36.24
GB Railfreight	4607	25.27
GB Railfreight	4627	36.24
GB Railfreight	4629	53.61
GB Railfreight	4636	25.27
GB Railfreight	4637	38.00
GB Railfreight	4642	25.27
GB Railfreight	4643	25.27
GB Railfreight	4644	25.27
GB Railfreight	7610	25.27
GB Railfreight	7611	25.27
Harsco Rail	6936	25.27
Jarvis Yellow Plant	7180	25.27
SERCO	6944	25.27
SERCO	7500	25.27
SERCO	7600	25.27

Table 5: Proposed Regenerative Braking Discounts for CP5 (modelled)

Type of infrastructure / service frequency	Discount
AC, long distance (more than 10 miles between stations)	16%
AC, regional and outer suburban (less than or equal to 10 miles per station)	18%
AC, local and commuter (less than or equal to 2.1 miles between stations)	20%
DC (all)	15%

Table 6: Proposed Losses Mark-ups for CP5 (metered)

Traction network	Losses mark-up (%) GROSS	Losses mark-up (%) NET
AC (all)	3.85	4.70
DC (South England)	17.01	20.01
DC (Merseyside)	11.56	13.60

Table 7: Proposed CP5 EAUC rates (12/13 prices)

	DC 'third rail' network (pence per electrified vehicle mile)	AC 'OLE' network (pence per electrified vehicle mile)	DC 'third rail' network (£/kgtm)	AC 'OLE' network (£/kgtm)
	Passenger		**Freight**	
CP5	2.08	1.96	0.2300	0.3662