HIGH LEVEL REVIEW OF TRACK ACCESS CHARGES AND OPTIONS FOR CP5

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A report for ORR

ORIGINAL

Submitted by:

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CONTENTS

1. SUMMARY

The Office of Rail Regulation (ORR) has asked CEPA to undertake a high level review of options for track access charges. This is an initial project to consider potential changes to track access charges that could be implemented for Control Period 5 (CP5). The aim of the project is to identify options that may represent an improvement on the current track access charges with respect to ORR duties, in particular so that Network Rail is more responsive to the needs of train operators and that it, train operators and others are incentivised to make the best use of existing capacity and develop the network while driving down whole industry costs. We have undertaken an initial high level and largely qualitative evaluation of options. Detailed work to consider the potential advantages and disadvantages of any identified options would need to be undertaken subsequently.

1.1. Approach

The key output for this project is to identify potential options for changing the track access charges in the UK rail industry which have reasonable prospects of leading to benefits compared to any costs that arise (i.e. the advantages outweigh the disadvantages). When considering any options for changing the charging structure we have always been mindful that the counter-factual is the continuation of the current system of track access charges and industry structure, and in evaluating options it is about determining those that are likely to be an improvement compared to this counter-factual.

We have considered options for changing the charging structure which would both complement the current charging structure and lead only to incremental change, and options that would replace substantial aspects of the current structure. In reaching our conclusions we have been mindful to consider the costs and timescales for implementing options, having regard to the changes that would need to be made to the existing structure.

To ensure that the range of options we are considering is as comprehensive as possible we have reviewed the previous options ORR has considered for changing track access charges, approaches to track access charges in other countries (particularly in Europe) and approaches to access charges in other regulated sectors, to identify a "long list" of possible options to consider. We have then evaluated the long list of options against a set of criteria we have developed that include many of the factors within ORR's objectives for track access charges, but also incorporate some of the additional factors covered by ORR's Section 4 duties, and the principles of Better Regulation. These criteria are, in no particular order:

1. - No undue discrimination – Differences in the charges levied to different users should be on an objective basis, which will generally reflect differences in the costs that users cause to be incurred, and may reflect different market conditions.
2. - Practicality – Charging structures should be capable of implementation, taking account of the information available to implement the charging structure.
3. - Cost reflectivity – Charges should reflect as far as possible the costs incurred in providing the services used.

4. - Revenue recovery – Network Rail should have a reasonable ability to recover its allowed revenue, although not more than its allowed revenue.

5. - Optimise network use – Charges should encourage the efficient and economic use of the current network.

6. - Promotion of network growth – Charges should provide signals about the costs and potential benefits of expanding and developing the capacity of the network.

7. - Effect on customers – For the assessment of this criterion we consider a relatively broad definition of customers, to include passengers, freight users and train operators, although our primary focus is on final customers of the rail network. This criterion seeks to identify the impact on customers and whether particular customers are likely to benefit from the changes. The main focus is on assessing the distributional impacts between different customer groups, given that changes in track access charges will not generally affect the total amount of revenue to be recovered by Network Rail.

8. - Promote competition – Encourage more effective competition in the rail industry, and particularly with regard to passenger and freight operations.

9. - Simplicity – Is the proposed charging structure reasonably understandable, recognising that inherently any charging structure for track access charges will contain a degree of complexity, particularly to ensure cost reflectivity.

When evaluating the long list of options we applied a relatively simple tick based approach, and then identified seven options that appeared to have the strongest possibility of leading to net benefits compared to the current approach. However, we did not rigidly give equal weight to all the criteria, and in particular, we were cautious about deciding to further evaluate options that did not score reasonably well on practicality. During our identification and evaluation of the options, particularly at the long list stage, we have sought not to be overly influenced by some of the institutional characteristics of the rail sector that may affect the ability to implement some of the options. Instead we have considered these factors more when evaluating the short listed options and drawing conclusions as to the way forward.

We have then reviewed the short list of options in more detail against the criteria, and with particular regard to the issues that would arise when implementing the options in the rail sector. This includes the potential impact on particular operators and passengers, how the options would interact with the current charges, and other challenges to implementation, including the Clause 18 provisions in the franchise agreements – discussed further below. When thinking about operators it is important to realise that the three distinct groups – franchised passenger services provided by Train Operating Companies (TOCs), open access passenger services and freight services – may be affected in quite different ways by different options – this is in part because of the very different starting points.

1.2. Industry constraints

We have deliberately not been initially constrained in the options we have considered by potential practical difficulties for implementing options in the rail sector, but instead considered these challenges in the later evaluation of the options. For example, the Clause 18 provisions in the franchise agreements limit the potential for changes to track access charges to affect the behaviour of most TOCs within their existing franchise period, and this needs to be considered when deciding whether options are likely to lead to net benefits. Clause 18 means that any core franchised services are unaffected by changes in the track access charges regime for the life of the franchise. Any additional services provided by the TOC are not exempt from the impact of changes to track access charges.

It is also important to bear in mind that the freight operators and open access passenger operators have developed business models based on the current structure of track access charges, so any significant changes to the charges they faced could have major implications for their business models (either positive or negative). We have also recognised that any changes to the track access charges need to be consistent with the provisions of the relevant EC Directives, and in particular, EC Directive 2001/14.[1]

1.3. Short listed options

On the basis of our evaluation against the criteria set out above we short listed six options for further consideration, which were:

- A regional[2] LRIC approach.
- An average cost approach, with a view to simplification of charges.
- A regional SRIC approach.
- Scarcity charges.
- Cost benefit sharing.
- Track occupancy charge.

These six options can, at a high level, be put into two groups. The first two options, regional LRIC, and an average cost approach, are relatively radical changes compared to the current structure of track access charges, and would involve major changes to the current structure of track access charges. Network Rail's Infrastructure Cost Model (ICM) would help in allowing these options to be considered and developed further, and we understand that Network Rail has undertaken some work that would help with introducing a regional SRIC based approach. Nevertheless, these options have the potential to substantially change the structure of charges, with substantial incentive and distributional impacts.

[1] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2001:075:0029:0046:EN:PDF

[2] For this option and the SRIC option, we use the word regional as a "catch-all" expression for options that disaggregate the charge on a sub-national basis. This can include regions of the country and different types of routes, e.g. primary, secondary and tertiary.

Regional SRIC, a scarcity charge and cost benefit sharing, are more incremental change options, and could be introduced with relatively limited change to the current structure of track access charges. Assuming that the intention was to keep Network Rail's overall revenue recovered fixed at the current level, then some adjustments would need to be made to current charges to introduce the scarcity charge, but given the aim of the cost benefit sharing is to expose Network Rail to a greater risk with regard to train operator's revenues, this option would not necessarily involve keeping Network Rail's revenue recovered fixed.

The last option, adopting the track occupancy charge based on the High Speed One approach could be seen as falling between a more incremental and a more fundamental change option. It could be introduced as a relatively incremental change to the current structure, but it would still involve relatively significant changes to the incentives for different train operators.

Table 1.1 summarises our evaluation of each of the short listed options.

Table 1.1: Summary of high-level options for rail access charges

Option	Description	Counterfactual	Evaluation
Average Cost (AC)	This option would involve the determination of track access charges based on the allocation of Network Rail's present accounting costs, averaged across users and cost drivers of the GB rail network.	Track access charges are to a certain degree already based on a hybrid of SRIC and AC (particularly through the use of train miles to allocate the fixed charge). This option would involve the extension of these principles to simplify the existing charging structure.	▪ The key attraction of an AC approach is the simplicity of its implementation and low administrative burden it imposes on network users. ▪ Although charges based on AC have some virtue in fairness, because they share existing costs among operators in proportion to their contribution to present costs, charges based on AC principles have poor efficiency properties. ▪ An AC approach could be applied to a smaller or larger proportion of total costs, which would determine the amount of the remaining fixed charge. ▪ An AC approach would have substantial implications for users' incentives without any major benefits in terms of improved efficiency.
Regional LRIC	A critical part of the analysis and the estimation of marginal/incremental costs is the need to take account of the fact that outputs and inputs vary in cost to a different extent over different time periods. LRIC is the additional or incremental costs that would be incurred over the longer term to accommodate the requirements of the rail network user. It includes the possibility of capacity changes to the network and so (theoretically) provides incentives for the optimal development and long term use of the rail network.	At present, track access charges are based on SRIC to provide incentives for the efficient use of the existing network. Currently investment planning/long term development of the rail network is treated separately from the structure of charges as part of the Network Rail's price control framework.	▪ The perceived advantages of LRIC include: - it is a valid measure of the long-run impact on Network Rail of increasing demand; and - provides signals to operators regarding the costs of alleviating scarce capacity. ▪ The current regulatory framework does not explicitly encourage Network Rail to consider transparently the interactions between charging, cost drivers and their business plans at price reviews. LRIC charging would complement planning processes and the investment framework in the existing price control. ▪ Depending on the definition of long run cost, lumpy investment characteristic of rail could result in volatile LRIC measures and there are practical issues associated with specifying enhancements and allocating costs to different users

Option	Description	Counterfactual	Evaluation
			of network. ▪ In general, this is a difficult option to implement (as the experience in other regulated sectors illustrates) and so the objective of promoting efficient development of the network would need to be the priority to outweigh LRIC's limitations.
Regional SRIC	A regional SRIC basis for setting access charges would involve route or area based costing with an allocation / apportionment of costs between vehicles operating on that route/geographic area in proportion to their use and their vehicle characteristics.	The current variable usage charge is based on national average usage costs, and leads to the charge for a certain class of vehicle being the same regardless of whether, for example, it runs on a major main line, a branch line in Scotland or a freight only line.	▪ The benefits of a regionally disaggregated SRIC charge principally relate to the consequences of 'price signals' provided by such a charge. ▪ The role of price signals (and the ability of rail network users to respond to them) is therefore central to the evaluation and options for de-averaging SRICs. ▪ The differentiation of SRIC charges by route capability and characteristics are only likely to be appropriate where there are material differences in the costs involved. ▪ There is also a balance to strike between improving the accuracy of the price signals set by the variable SRIC component of the two-part tariff, with the additional complexity that geographically differentiated charges would imply. ▪ A regional SRIC basis for setting access charges will increase cost reflectivity but by design, will also increase the complexity of the variable usage charge.
Scarcity Charges	Scarcity costs arise where the presence of a train prevents another train from operating or requires it to take an inferior path. Scarcity charges are levied when a train path is reserved and reflect the opportunity costs of alternative uses of that path. A scarcity charge could range from a	Planning processes in the rail industry such as ORR's Track Access Policy, Route Utilisation Strategies (RUSs) and the Network Code currently guide industry decision making regarding the level, type and pattern of traffic on the GB rail network.	▪ A reservation charge was consulted on as part of PR08 but not implemented. Although it may have benefits in theory, in practice there are complexities and constraints on its effective implementation. ▪ A more fully-fledged scarcity charge would provide explicit price/ financial incentives to train operators to economise on their use of scarce network capacity.

Option	Description	Counterfactual	Evaluation
	simple flat rate reservation charge (paid when a path is reserved) through to a fully-fledged scarcity charge (where train operators would be charged the full economic value of reserving a path).		▪ The key issue is whether there is a stated objective to create more of a "market" for capacity and access rights (price mechanism approach) or whether existing industry processes are considered sufficient to achieve an effective use of capacity on particular routes and train paths (planning mechanism approach).
Cost-Benefit Sharing	Track user incentive mechanisms could be structured to directly expose Network Rail to movements in user revenues. Current charges indirectly reflect revenues collected through a levy on vehicle miles, but are insensitive to both the number of passengers using each train and their willingness to pay.	Franchise provisions are such that TOCs are not currently exposed to full revenue risk. Thin margins, relatively unchanging costs and volatile revenues make companies susceptible to failure when demand is below that forecast. In order to reduce this risk, DfT "share" and "support" deviations from companies' franchise bidlines.	▪ Adopting this approach would mark a fundamental change in the regulation of rail operators and Network Rail, and therefore its consequences should be considered closely. ▪ Network Rail is not incentivised to target investment towards projects that would result in higher revenue per km and therefore releasing the greatest value to the system as a whole. If Network Rail was exposed to some of this upside through revenue sharing and/or additional output incentives it might become more pro-active in targeting these investments. ▪ Revenue sharing would bring operators' costs closer into line with their revenues. These factors would make operator margins less variable enabling companies to potentially reduce the implicit risk premium built into their price.
Track occupancy charge	The structure of charges for High Speed 1 (HS1) (the high speed railway between St Pancras in London and the Channel Tunnel) is set in terms of track occupancy (i.e. time spent on the HS1 through line) by way of a maximum charge per minute per train service.	Network Rail's structure of track access charges is based on a two-part tariff. Cost apportionment for the variable element of Network Rail's forward looking efficient costs is calculated based on vehicle type share of total 'equivalent' gross tonne miles. Cost	▪ Track occupancy charging could represent a simpler charging framework for different types of train operator. However, Network Rail's network is significantly more complicated than the single HS1 rail route with a much greater variety of train services offered on different routes and lines.[3] ▪ More fundamentally, a track occupancy charging framework is unlikely to reflect the costs which different users impose as a

[3] For example, a number of routes are timetabled for stopping services, which under a pure track occupancy framework would incur significantly higher charges than non-stopping services. If (as for HS1) charges for stopping services were reduced by the incremental time it takes for a time to stop at a station then this may significantly increase the complexity and the administration of the charging regime when the primary objective in the first place is to simplify charges relative to the existing approach.

Option	Description	Counterfactual	Evaluation
	A similar approach could be adopted by Network Rail for its network, whereby charges and cost apportionment would be calculated on the basis of timetabled paths and scheduled journey times of timetabled services in minutes.	apportionment for the fixed charge is based on similar principles, whereby the fixed charge is allocated between train operating companies based on relative vehicle miles by each operator.	result of network use. Although occupation of the network provides an approach for apportioning costs incurred by Network Rail in total, minutes per train service is unlikely to be the primary driver of forward looking efficient costs either on a short run or long run basis.

1.4. Conclusions

1.4.1. Options for fundamental change

Of the three options for more fundamental changes are (charges that equal average cost, regional LRIC or a track occupancy charge), we consider that regional LRIC has the greatest potential to lead to longer term benefits through more efficient allocation of network capacity, and in particular, the development of future network capacity because of the better signals provided to operators and funders. However, it is also the most complex and hardest of the options to implement in practice. We discuss further below some of the particular issues with implementing LRIC, and some variants on a full LRIC approach that might nevertheless lead to some of benefits being realised.

The average cost option is relatively simple to implement compared to the other fundamental change options, but its incentive properties, particularly for the longer term development of the network, but also to some degree for the allocation of existing capacity, are likely to be poor. The track occupancy charge option would have more significant implementation issues given the degree of change compared to the current structure, and furthermore, it would not provide strong signals for the efficient use and development of the network.

The introduction of a full LRIC approach is potentially very complex and would require a large amount of work on the part of funders, Network Rail, ORR, and other stakeholders. However, it has the potential through the information it transmits about the costs of expanding network capacity to send very valuable signals to network users and funders about the costs of network expansion, which could better inform expansion decisions. The complexity of LRIC is probably the key reason why it has not been implemented more widely in the regulated sectors, although the energy sector has made extensive use of LRIC, and often at a highly disaggregated level, which does at least show that it can in theory be implemented at a highly granular level.

There are a number of important issues that have to be considered when deciding whether and how to implement LRIC:

- What charges do the users pay, and in particular, do they pay the prevailing LRIC, which will be high before expansion and low after expansion, or do they pay the costs of expansion over the useful life of the assets after they have been built?
- How do the LRIC signals feed through into Network Rail's decisions about which investments to make and when?
- Given the Government's role in developing the High Level Output Statement (HLOS), what role would LRIC play alongside the HLOS?

If rail operators pay the prevailing LRIC there is a risk that charges are very volatile. In particular, just prior to a capacity expansion being undertaken the LRIC may be very high, and users' willingness to pay would be a strong signal that the investment should be undertaken. However, once the investment has been undertaken the LRIC could be quite low for a period unless the users paid the prevailing costs of the expansion for the useful life of the assets. We generally consider that where an investment is triggered by a willingness to pay on the part of a TOC or freight operator then they should pay the additional costs for the useful life of the asset as they are deriving the benefits. It is more difficult where the decision to invest is made by requirements specified by a funder, although in practice where this funder is tendering for a significant proportion of the services any concern falls away.

There is likely to be a process of trial and error to determine in what way and at what level of disaggregation to specify the increments to capacity for the estimates of LRIC. The potential volatility of LRIC can be mitigated in two main ways that mean the approach can better be described as LRAIC. First, LRIC estimates can be calculated over relatively large regional areas and the costs recovered in a similar way. Second, the costs can be recovered over the useful economic life of the assets, which will help address potential volatility. It would also be appropriate for users in the future to contribute to the costs of the capacity enhancement where they derive benefits from using the assets that have been funded by other users. This will be a more important issue the greater the level of granularity at which LRIC is estimated, and therefore the more specific users pay for particular enhancements.

It is beyond the scope of this review to consider precisely how Network Rail's price control would be adapted to complement the LRIC approach. However, in principle it would seem appropriate that the investments undertaken by Network Rail should follow from the LRIC signals, where the TOCs, freight operators or funders signal a willingness to pay. This is effectively the approach in the gas transmission sector where user willingness to pay is a basis for National Grid's investment decisions and returns under the price control. In the rail industry, where substantial externalities and social benefits are used to justify government support, the approach may be more complex to implement.

It is possible that the LRIC approach could be implemented as an additional approach to the HLOS requirements. For example, TOCs and freight operators could choose to pay the charges implied by LRIC on an incremental basis for specific assets they require over and above the developments included in the HLOS. This would be similar to the current approach being used for a development in the Chiltern Railways area, but the use of LRIC would provide signals over time to train operators and freight users for capacity expansion.

1.4.2. Incremental change options

There are potential advantages and disadvantages for all of the incremental change options, and substantial further work would be required to implement the options.

In terms of a way forward:

- The regional SRIC option would only relate to a relatively small proportion of network costs, and would not impact the FTACs. In principle greater geographic cost reflectivity through the regional SRIC approach would send better signals about the wear and tear of the track. Given Network Rail has already done some work on these issues it appears to be an area where further research could usefully be undertaken with a view to seeing whether a more cost reflective approach could be developed without substantially increasing the complexity of the charging structure. This option should be pursued irrespective of whether other options are pursued.
- The scarcity charge option has the greatest potential to have an impact if it also affects franchised TOCs. If they are not included it is likely to have only a marginal effect on open access and freight operators. Although we have not done sufficient analysis to reach a definitive conclusion, we expect this means that a scarcity charge only effectively covering open access and freight operators may not lead to benefits that outweigh costs, but ORR could consider this in more detail. If the Government is prepared to consider less tightly specified service requirements in franchise agreements then this might be a good time to consider a wider application of scarcity charges.
- The cost benefit sharing option would be best pursued through co-operation with the DfT and Transport Scotland (TS) as and when new franchises are tendered. This option has the potential to lead to improvements in the incentives for Network Rail to promote better use of the network and more co-operation with train operators, and we would recommend that it is pursued further. If ORR wishes to pursue this option it would be helpful to first discuss the issues with the DfT/TS to understand their enthusiasm for aligning this approach with the provisions of new franchises, although it could also be introduced for open access and freight operators without close working with the DfT / TS.

While a scarcity charge could be implemented as an incremental change to the existing structure of charges, it could also provide signals and be related to the introduction of LRIC based charges, which we discussed above.

1.5. Overall conclusions

Of the six options identified as requiring further consideration we believe there are four which may offer improvements for the sector if applied to some, or all, of the operator groups using the rail network. Three of the options are incremental changes and one involves a fundamental change. They are:

- a regional SRIC which could allow a simplification of the current charging structure;
- a scarcity charge based on the opportunity cost for paths or routes at times of congestion;

- cost benefit sharing between train operators and Network Rail; and
- a LRIC based approach.

At this stage we do not recommend that ORR furthers pursues the average cost option.

Although we have some reservations about the track occupancy charge, until substantially more work is undertaken to consider how it would work across the whole network it is difficult to fully evaluate the potential of this option. ORR could consider further work to allow a more robust evaluation of this option.

To establish whether some or all the changes should be employed requires further analysis. This should involve the detailed definition of a specific application of the approach and then an assessment of the advantages and disadvantages of that specific approach. This should allow the establishment of whether all operator groups or just specific targeted groups should be subject to a revised track access regime. Further detailed modelling of the approach and a determination of the implementation issues also need to be undertaken before any change can be considered.

2. INTRODUCTION

2.1. Purpose of the project

This report sets out the analysis and conclusions of CEPA's high level review of track access charges and options for Control Period 5 (CP5 – 2014 to 2019). The Office of Rail Regulation (ORR) would like to identify the key issues and options for track access charges in CP5 so that Network Rail is more responsive to the needs of train (passenger and freight) operators and that it, train operators and others are incentivised to make the best use of existing capacity and develop the network efficiently.

ORR identified a number of specific issues that needed to be considered in the review, including:

- Increasing the value of the variable charge, for example through moving to (or towards a) long run incremental cost (LRIC) based charges or through a mark-up;
- Increasing the proportion of charges levied on a "train path" basis, for example through the introduction of scarcity or path reservation charges;
- Whether incentives would be improved if charges were simplified, and the wider implications on cost reflectivity;
- The impact of possible changes to Network Rail's risk profile (e.g. through increasing the level of the variable usage charge through a mark-up, Network Rail would under-recover its costs within the control period from a reduction in traffic but, conversely, would over-recover for growth in traffic above periodic review assumptions);
- The impact of changes to charges on train operators' incentives to use the network;
- The impact of franchise agreement protections on changes to charges (Schedule 9A/ Clause 18.1);
- The impact on the viability of different options on different sections of the rail industry, in particular open access freight and passenger operators;
- Consistency of amendments to the charging structure with EC Directive 2001/14;
- Relevant experience of different charging structures in other regulated industries in the UK; and
- Relevant experience of different rail charging structures elsewhere in Europe.

When evaluating options the report focuses on a qualitative review of the advantages and disadvantages of different options, rather than detailed quantitative analysis, which would be required at the next stage of considering options.

2.2. Approach to the project

The key output for this project is to identify potential options for changing the track access charges in the UK rail industry which have reasonable prospects of leading to improvements compared to the status quo (i.e. the advantages outweigh the disadvantages). As this is an initial strategic and high level review of options for changing the charging structure, we have not worked up any option in full detail, but instead focused on identifying those options which, on the basis of a qualitative analysis, perform well with respect to a number of relevant critiera. When considering any options for changing the charging structure we have always been mindful that the counter-factual is the continuation of the current system of track access charges and associated industry structure, and in evaluating options it is about determining those that perform well when compared to this counter-factual.

We are very aware that train operators and funders have made decisions (such as about the types of vehicles to purchase) and developed business models, in the context of the current structure of track access charges. Therefore, we need to be particularly mindful of the impact that major changes to track access charges could have on the financial position of train operators, particularly open access passenger and freight operators who are fully exposed to the financial consequences of changes to track access charges.

While our analysis is primarily qualitative, we have attempted at a very high level, to consider possible quantitative impacts for some of the options that we consider in detail in Section 6. These quantitative estimates are intended to aid consideration of the potential value of implementing the options, but it is important to recognise that the analysis is based on relatively high level assumptions.

We have considered options for changing the charging structure which would both complement the current charging structure and lead only to incremental changes, and options that would replace substantial aspects of the current structure. In reaching our conclusions we have been mindful to consider the costs and timescales for implementing options, and had regard to the changes that would need to be made to the existing structure. For example, ORR may want to consider whether some options would best be introduced on a phased basis as train operators' franchises came up for renewal. As we discuss later in the report, some of the options that we have considered would probably work best when combined as packages rather than considered as standalone options.

We have adopted an approach for the project based on developing a long list of a wide range of options for changing the charging structure, drawn from reviewing previous options considered in the rail sector, academic and other literature, considering options used in other countries and approaches used in other regulated sectors. We have then used criteria that we developed based on ORR's objectives for track access charges, its Section 4 duties and wider principles of Better Regulation, to evaluate the long list to identify a short list of options for further consideration. Our criteria are very similar to ORR's charging objectives, but incorporate a few additional factors.

We have then reviewed the short list of options in more detail against the criteria, and with particular regard to the issues that would arise when implementing the options in the rail sector. This includes the potential impact on particular operators and customers, how the options would interact with the current charges, and other challenges to implementation, including the Clause 18.1 provisions in the franchise agreements.[4] We have then considered how the short list of options could be combined to form packages that potentially represent a coherent overall approach to changing track access charges.

We have deliberately not been initially constrained in the options we have considered by potential practical difficulties for implementing options in the rail sector, but instead considered these challenges in the later evaluation of the options. For example, the Clause 18.1 provisions in the franchise agreements potentially severely limit the potential for changes to track access charges to affect the behaviour of most TOCs within their existing franchise period, and this needs to be considered when deciding whether options are likely to lead to net benefits. As discussed in Section 6, for a number of the options we have developed, the likely impact would be much greater if a number of the institutional features were changed. We have also been mindful that the freight operators and open access passenger operators have developed business models based on the current structure of track access charges, so any significant changes to the charges they faced could have major implications for their business models (either positive or negative).[5]

However, we have recognised that any changes to the track access charges need to be consistent with the provisions of the relevant EC Directives, and in particular, EC Directive 2001/14.[6]

In addition to working with ORR, we have also been assisted during the project by a Steering Group that has members from ORR, Network Rail, the Association of Training Operating Companies (ATOC) and rail freight operators. The steering group has had an opportunity to comment on the analysis in this report as it has been developed.

2.3. Structure of the report

The remainder of the report includes the following sections:

- Section 2 sets out the background and context for this project, including a summary of the current structure of track access charges and a discussion of some of the rail specific factors that need to be considered in any review of track access charges.

[4] Clause 18.1 of the franchise agreements means that franchise TOCs are held financially neutral within the period of their franchise, to any changes in track access charges, if they only run the core services specified at the time the franchise is let. However, TOCs are exposed to changes in track access charges if they run additional services or agree with the DfT / TS changes to the core services under the franchise agreement.

[5] Given that freight and open access passenger operators currently only pay variable track access charges, many of the options that we consider, which would change the recovery of the fixed costs would adversely affect freight and open access passenger operators.

[6] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2001:075:0029:0046:EN:PDF

- Section 3 explains the framework that is used to assess the changes to the charging structures, including explaining how our criteria are closely linked to ORR's charging objectives.
- Section 4 sets out the long list of options for changing the charging structure that we are considering for this project, including the sources for these examples, such as approaches in other regulated sectors and for track access charges in other countries.
- Section 5 sets out our evaluation of the long list of options using the criteria in Section 3, and explains which options we consider for more detailed evaluation in the short list of options.
- Section 6 is our detailed evaluation of the short list of options, including explaining how these options would interact with the existing structure of track access charges and whether some of the options could be combined into effective packages of options.
- Section 7 summarises the conclusion of the report.

Annex 1 provides more detail about the current structure of track access charges. Annex 2 explains in more detail the economic concepts and principles underlying the long list of charging options explained in Section 5. Annex 3 provides more detail about examples of charging structures that we have drawn on from other sectors. Annex 4 summarises some of the literature we have reviewed for this project.

3. BACKGROUND AND CONTEXT

3.1. Introduction

This section summarises the current structure of track access charges, considers options raised in ORR's previous review of track access charges (particularly the issues considered for CP4 through the 2008 periodic review (PR08)) and discusses the key contractual and contextual issues in the rail sector that affect the consideration of options for changing track access charges.

3.2. Current structure of track access charges

The current structure of track access charges was established at PR08. Franchised passenger operators pay a fixed track access charge (FTACs) as well as variable track access charges. Freight and open access operators pay variable track access charges and, where applicable, the freight-only line charge and coal spillage charges. The key features of the current structure of track access charges are illustrated in Figure 3.1 below.

The establishment of the existing charging systems for track use is based on a large body of academic and industry research of railway infrastructure costs and their variability according to different cost drivers. This work was started by ORR and the rail industry during the 2000 periodic review (PR2000), extended as part of ORR's Structure of Charges and Costs review in 2005 (SoCR05) and recently updated as part of PR08.

The estimation of marginal rail infrastructure costs can be characterised into two groups: bottom-up approaches and top-down approaches:

- bottom-up approaches rely on engineering models and judgment to determine the different components of marginal rail infrastructure costs; and
- top-down approaches use data on costs of maintaining and/or renewing the rail infrastructure and estimate what proportion of these costs are variable with traffic.[7]

In Great Britain (GB) marginal (variable) infrastructure costs are currently estimated using a combination of top-down and bottom-up engineering approaches. The top-down approaches used, have involved cost allocation methods which allocate constituent parts of total cost to common cost drivers. Bottom-up engineering methods are then used to determine the variability of these categories with the cost driver and to allocate costs to different types of vehicle and user of the GB rail network. These approaches are important in determining the incentives with regard to the types of trains that are operated and how they are operated, e.g. to minimise the use of rail damage.

[7] Wheat, P.E.; Smith, A.S.J. 'Assessing the marginal infrastructure wear and tear costs for Great Britain's railway network', European Transport Conference September 2006

Figure 3.1: Existing structure of track access charges

Charge	User					Estimated annual CP4 income (£millions)	Recovers	Unit of charge
	TOC	Open Access	Freight for coal services	Freight for spent nuclear fuel	Other freight			
Variable usage charge	Yes					183	Maintenance and renewals costs that vary with traffic	Per vehicle mile (or by weight for freight)
Capacity charge						155	Costs to Network Rail from increased network traffic	Per actual train mile operated
Electrification asset usage charge	All running electrically powered services					7	Maintenance and renewals costs of electrification assets that vary with traffic	Per kWh
Traction electricity charge						181	Costs Network Rail faces in providing electricity for traction purposes to train operators	Per kWh
Coal spillage charge			Yes			2	Costs from coal spillage	Uplift on charges for vehicles carrying coal
Freight only line charge			Yes			4	Fixed costs associated with freight-only lines	Uplift on variable charges
Fixed track access charge	Yes					869	Remaining income required to meet Network Rail's total revenue commitment	Allocated between operators by vehicle mileage

Source: CEPA / ORR

Fixed costs are allocated to individual TOCs using a range of traffic metrics at a number of different levels of geographical disaggregation. At a very high level this can be summarised as being based on the percentage of train miles that a TOC represents as a proportion of total train miles within a particular geographic area.[8] The residual "common costs" (for example HQ functions) are then allocated to all TOCs. Network Rail also receives a network grant direct from government in lieu of fixed track access charges (c. £3.3bn in CP4 per annum).

The analysis and allocation of variable elements of rail infrastructure cost is dependent on the information and data available on the drivers of those costs. For example, at PR2000 relatively limited information was available on the distribution of costs by route. As a consequence variable elements of cost were identified at the national average traffic density, with the distribution and allocation of variable costs differentiated by vehicle type. However, as cost data and information has become more granular and more detailed on cost driver causation, academic work and industry research has been able to propose a wider variety of cost allocation and estimation approaches.

It is important to note that the fixed charge element of track access charges accounts for the majority of income raised through track access charges (62%), with the variable usage charge (13%), traction electricity charge (13%) and capacity charge (11%) each accounting for a much smaller proportion of the total revenue raised from charges. To provide further context, we can note that track access charges account for 27% of Network Rail's total income compared to the 65% accounted for through the network grant.[9]

3.3. Previous reviews of track access charges by ORR

In 2005, ORR launched the review of Network Rail's Structure of Charges and Costs (SoCR05). There were two main aspects to the review:

- *Network Rail responsibility* – ORR intended Network Rail to take greater responsibility for developing the charging methodology and calculating the charges, than had previously been the case. Network Rail should be required to develop charging proposals that adhere to ORR's charging objectives and take account of ORR's guidance.
- *New access charges* - ORR discussed options for possible new access charges allowed under EC Directive 2001/14/EC. The options included:
    - Scarcity/reservation charges; and
    - Environmental charges.

[8] FTACs have previously been allocated using estimates of avoidable costs, but this proved difficult to implement in practice, even if it had strong theoretical and incentive properties.

[9] All the figures are taken from ORR's presentation at the workshop on 20 April 2010.

The consultation documents for CP4 also noted that while the structure of charges play an important role in informing decisions on the level, type and pattern of rail services, there is also a range of industry processes that influence these decisions, including:

- the development of **Route Utilisation Strategies**, designed to support efficient allocation of use and development of the rail network; and
- reform of the **Network Code** to provide greater transparency in the joint industry planning processes to improve relationships between the different industry parties.

We discuss the two main aspects of previous track access charges reviews in turn below.

3.3.1. Cost causation and Network Rail's development of the Infrastructure Cost Model

As part of the review, ORR commissioned a number of consultant reports to undertake an analysis of fixed and variable costs of the GB rail network. This included a report by Booz Allen Hamilton (BAH) and Transportation Technology Center Inc (TTCI) on the key drivers of variable costs by asset category, and a report by AEA Technology (AEA) on fixed costs. BAH noted that there had been a major increase and alteration in the cost base of Network Rail (from a situation in which operations, maintenance and renewals spend was projected below £3bn p.a., to one in which spend exceeded £5bn p.a) and that additional information on the distribution of traffic and usage related costs had become available. For example, greater activity based maintenance costing, rail surface damage modelling and electrification asset usage data had become available providing a more granular assessment of components of variable rail infrastructure costs.

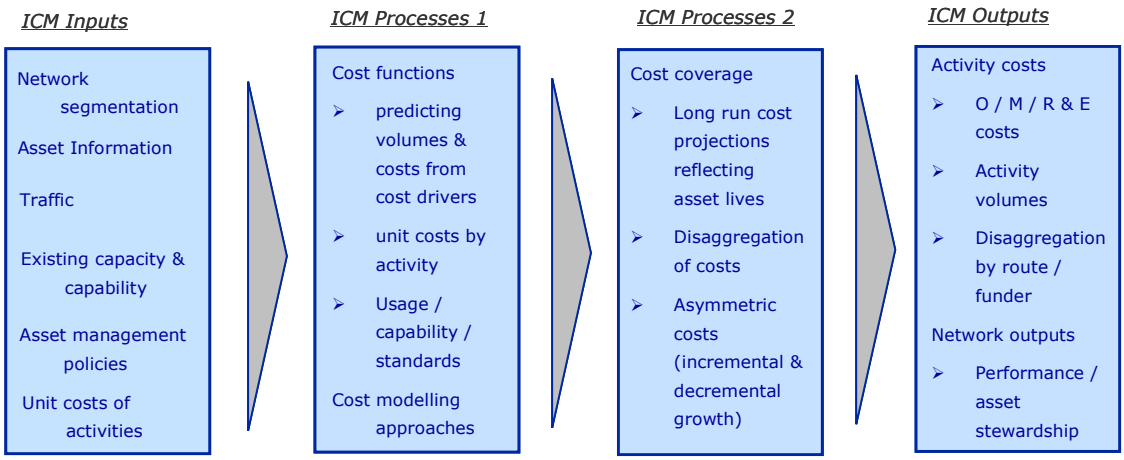
In CP3, Network Rail recovered its costs using a cost allocation model which spread total costs to individual TOCs using a range of traffic metrics at a number of different levels of geographical disaggregation. The residual "common costs" (for example HQ functions) were then allocated to all TOCs. AEA investigated the feasibility of developing an "avoidable cost" approach to the allocation and recovery of fixed costs.

At the time of the SoCR05, Network Rail was also in the process of developing the Infrastructure Cost Model (ICM). Network Rail envisaged that the model would comprise the following components:

- a detailed analysis of the costs of operating, maintaining and renewing the "baseline" infrastructure;
- functionality to estimate the infrastructure costs associated with incremental and decremental changes in network capacity; and
- calculations that transparently allocate the total cost of any given scenario between operators and funders.

The key priorities of the ICM were to develop reliable, granular information on costs and what causes them, and a better understanding of industry outputs.[10] The ICM was therefore being developed to include greater bottom-up and route-based costing and the functionality to allocate fixed infrastructure charges according to different principles and metrics such as avoidable costs, long run incremental cost and traffic metrics (for example, vehicle miles). Figure 3.2 illustrates some of the inputs, processes and outputs of the ICM.

Figure 3.2: Network Rail Infrastructure Cost Model



Source: CEPA analysis of Network Rail presentation

Since the SoCR05 review, TTCI (under the contract of Network Rail) has continued to develop the methodology for calculating variable usage charges for track access. This work (building on the methodology developed for PR2000 and the SoCC05 review) has accounted for greater information on variable usage costs arising from tangential forces between the wheel and the rail, and led to the final set of proposed variable usage charges for CP4.

We also understand that Network Rail has continued the development of the ICM and the capability of the model has been used to explore variations in marginal costs between key strategic route categories, although this has not yet been practically applied to develop the cost reflectivity of track access charges.

3.3.2. Options for changing charges and better aligning incentives

In the final determination for Network Rail's CP4 access charges ORR stated that:

"Earlier in PR08 we consulted on the possible introduction of scarcity charges, reservation charges and environmental charges. In the June 2006 consultation on the structure of track access and station long term charges, we said we thought that it would be wrong to do further work on the introduction of a scarcity charge at that time given the complexity likely

[10] Network Rail presentation, Seminar on the Structure of Costs and Charges Review at the City University, 2005, http://www.rail-reg.gov.uk/upload/pdf/nr-socc-presentation.pdf

to be involved and because it was important to allow sufficient time for the route utilisation strategies to be developed nationwide.

In our policy statement on our sustainable development and environmental duties we stated that 'we do not intend to implement an environmental charge at the start of CP4 or during CP4 unless an equivalent charge is implemented for other transport modes, but we undertook extensive work on the pros and cons of implementing a reservation charge. Following our work and consultation with the industry we said that there was insufficient evidence that a reservation charge would produce net benefits and we would therefore not introduce a reservation charge in CP4."

Therefore, in broad terms ORR had held off decisions on significant changes to track access charges in CP4. Although it does not generate much additional revenue or costs for freight operators, the introduction of the freight only line charge is the first occasion on which freight operators have paid any costs in addition to variable charges. This also illustrates the ability to introduce such a mark-up under the EC Directive for freight operators.

In PR08 ORR considered options for explicitly linking Network Rail's revenues with those of passenger and freight operators, and or passenger/ gross freight tonne miles. The purpose was to align Network Rail's incentives more closely with those of TOCs making them more responsive to their needs. These options are relevant for this review given the impact they can have on Network Rail and TOC's incentives.

ORR considered three options:

- Network Rail sharing directly in some measure of growth in operator revenues;
- providing Network Rail with financial incentives that are linked to measures of volume growth but do not involve direct revenue sharing (similar to the volume incentive in place for CP3); and
- incentivising Network Rail and its partners to seek innovative ways to accommodate demand growth by "fine-tuning" the regulatory settlement and delivery of high-level output specifications in light of emerging information.

Within the existing structure of the design of franchise agreements in GB, ORR set out options for addressing the misalignment in incentives between franchised TOCs and Network Rail.

ORR identified two options (informed by a study by NERA):

- introducing some form of benefit sharing mechanism, whereby Network Rail and train operators (passenger and freight) would share any Network Rail cost savings achieved as a result of operator engagement; and
- amending franchise agreements so that TOCs are no longer held financially neutral to Network Rail's cost base; either by removing protection in its entirety, or by making changes to access charges subject to cap and collar arrangements.

On the basis of NERA's analysis, ORR concluded that exposing TOCs fully or via the cap and collar mechanism to changes in access charges would transfer an inappropriate amount of uncontrollable risk to franchisees, which would not provide value for money to government or taxpayers. ORR concluded that the most productive way forward would be to introduce a benefit sharing mechanism. No proposals were included that would have resulted in Network Rail sharing in the risk of growth in the passenger business as a whole. ORR did implement a volume and efficiency *benefit* sharing mechanism as part of CP4.

3.4. Key contractual relationships in the rail sector and their impact on incentives

There are three main types of train operators in Great Britain:

- Franchised TOCs – These are companies that have been awarded a franchise contract by the Department for Transport (DfT) or Transport Scotland to provide specified passenger train services in particular geographic areas or for particular routes. Operators may receive a subsidy, or pay a surplus, as specified in their franchise agreement.
- Open access passenger operators – Companies that choose to operate train services under a track access agreement with Network Rail. Government does not specify any aspect of the services offered by open access passenger operators and do not pay subsidy to these operators. The operators effectively use spare capacity on the network that is not used by franchised TOCs.
- Freight operators – They have a similar contractual position to the open access passenger operators, although there are some dedicated freight lines that they use, and for which specific charges are levied.

As discussed above, only the franchised TOCs contribute to the fixed costs through paying FTACs. Therefore, open access passenger operators and freight operators are paying what can broadly be described as the short run marginal or variable costs of using the network.

There are two elements of the franchise arrangements that are particularly important when considering options for changes to track access charges:

- The DfT and generally other commissioners of train services, specify in substantial detail the services that each franchise operator will be required to provide, and variations or additions to these requirements have to be agreed by the DfT or other commissioners of services. This limits the incentives for franchised TOCs to respond to incentives created by changing the structure of track access charges. However, the franchiser's decisions about which trains to require under a franchise agreement may be affected by changes in the structure of track access charges to the extent that such changes affect the costs of running particular services.
- Clause 18 of the franchise agreements means that franchised TOCs are financially neutral to any changes to track access charges during the period of a franchise, which

can be many years into the future. This again limits the incentives (substantially) for franchised TOCs to respond to changes in the structure of track access charges.

These factors mean that franchised TOCs are largely immune from the impact of changes in track access charges. At the margin the track access charges provide incentives for franchised TOCs to consider running additional trains. The DfT / Transport Scotland is exposed to changes in track access charges in a number of ways:

- Changes to the operations of open access operators could affect the revenues of franchised TOCs, and therefore, the amount of subsidy required; and
- Changes in track access charges would be reflected for franchised TOCs when franchises are re-let, although this approach does not necessarily lead to an overall increase in the DfT's / TS's exposure, but instead is a rebalancing between franchisees. At this point the DfT / TS would need to consider the implications for the services specified in the franchise tender given the structure of track access charges.

It is also important to note that the link between costs, track access charges and fares for customers is often very limited and tenuous. This means that passengers are often not exposed to the cost impact of their choices.

A final important aspect of the incentive regime in the rail sector to consider is the Company Limited by Guarantee (CLG) status of Network Rail. CEPA has previously considered these issues in a report for ORR.[11] A key point to note from this report is that the ultimate risk for the financial performance and outcomes of Network Rail rest with taxpayers as the Government currently guarantees a large proportion of the debt issued by Network Rail. Conversely, although the Government underwrites a large proportion of Network Rail's debt, it does not have a direct say in the operation of the company. Therefore, the incentives for Network Rail are a combination of reputational incentives for senior management and the incentive arrangements in place for the senior management and staff.

3.5. Summary

The existing structure of track access charges is based on a large body of industry research of railway infrastructure costs and focuses on recovering the efficient costs caused by use of the existing infrastructure. There are substantial constraints in the contractual structure of the rail industry that limit the impact of changes to track access charges on the behaviour of market participants, although open access passenger and freight operators do not face these constraints in the same way as franchised TOCs. The institutional context of Great Britain's rail sector, for example the network grant which Network Rail receives directly from government and the role of DfT and Transport Scotland in specifying services offered by

[11] http://www.rail-reg.gov.uk/upload/pdf/incentivesGBrailind-cambepa.pdf

franchised TOCs, also imposes constraints on the structure and options for track access charges.

4. FRAMEWORK FOR EVALUATING OPTIONS TO CHANGE THE CHARGING STRUCTURE

4.1. Introduction

In order to have a broadly objective and consistent approach to evaluating the options for changing the charging structure, we have developed a set of criteria against which each option can be evaluated. The criteria are being used to identify options that have a reasonable potential to lead to an improvement compared to the current structure of track access charges.

The criteria we have developed are primarily based on ORR's charging objectives, but also take account of ORR's statutory duties under Section 4 of the Railways Act 1993, and the principles of Better Regulation. We explain in this section any differences in substance or emphasis between our criteria and ORR's charging objectives.

4.2. ORR's objectives for track access charges and statutory duties

As part of PR08 ORR consulted on and established a set of objectives for track access charges, against which it would consider any future changes. These are:

1. - Promote the objectives of ORR's duties under Section 4 of the Railways Act 1993 and be consistent with the wider objectives of funder;
2. - Incentivise Network Rail, train operators, train manufacturers, rolling stock companies (RoSCOs) and funders to ensure the efficient utilisation and development of the network and the optimisation of the whole industry costs;
3. - Not discriminate between users of the network;
4. - Be practical, cost effective, comprehensible and objective in operation;
5. - Be consistent with relevant legislation, including the EU Directive 2001/14/EC;
6. - Reflect the efficient costs caused by use of the infrastructure (both to Network Rail or otherwise); and
7. - Ensure the charges enable Network Rail to recover, but not to over recover, its allowed revenue requirement.

Although ORR does not have a hierarchy for these objectives, we have numbered them from 1 to 7 for ease of reference in the remainder of this section and the rest of the report. In broad terms all but the fifth objective requires some degree of subjective judgement about whether it is met, and while the EC Directive also requires a degree of interpretation, at its extreme (i.e. if a legal interpretation was sought) it is a binding constraint.

We have not listed all of ORR's Section 4 statutory duties given that there are a significant number of them, they are non-hierarchical and in many cases ORR's track access charging

objectives capture the Section 4 duties.[12] Perhaps the biggest issue factor that arises from considering the Section 4 duties is specific reference to the general interests of passengers and also the promotion of competition where it is in the interests of users of rail services.

4.2.1. The Better Regulation principles

The Better Regulation Executive has five principles of good regulation.[13] In summary, the five principles are that good regulation should be:

- Proportionate: Regulators should only intervene when necessary. Remedies should be appropriate to the risk posed, and costs identified and minimised.
- Accountable: Regulators must be able to justify decisions, and be subject to public scrutiny.
- Consistent: Government rules and standards must be joined up and implemented fairly.
- Transparent: Regulators should be open, and keep regulations simple and user friendly.
- Targeted: Regulation should be focused on the problem, and minimise side effects.

Government has increasingly sought to ensure that regulators have regard to these principles when making decisions.

4.3. Criteria

For the purposes of our criteria we have adopted the third, fourth, sixth and seventh of ORR's charging objectives, but for future reference in this report shortened the name of the objective. These are reflected in the first four of our criteria listed below. We have then split the second of ORR's objectives into two criteria that focus on incentives for the efficient utilisation of the current network and the longer term development of the network. These are shown as the fifth and sixth objectives in our list below. We consider it is helpful for the purposes of analysing options to change the charging structure to make a distinction between efficient utilisation of the network in the short term, and longer term efficient development of the network, not least because many of the options for changing the charging structure will be focused more on one or other of these objectives.

We have then drawn on ORR's wider Section 4 duties to include a specific objective regarding the effect on customers and a further objective about the promotion of competition. Finally, drawing on a combination of the fourth of ORR's charging objectives

[12] ORR's website sets out the full list of duties at http://www.rail-reg.gov.uk/server/show/nav.94

[13] http://archive.cabinetoffice.gov.uk/brc/publications/principlesentry.html

and the Better Regulation principles we have added a criterion about the simplicity of charges.

Our criteria are listed in turn below, together with a short discussion of how we assess each of the criteria. It is important to note that the order of the criteria does not reflect the relative importance of each criterion, and we discuss further below the weighting to be attached to each criterion when undertaking our assessment:

1. - No undue discrimination – Differences in the charges levied to different users should be on an objective basis, which will generally reflect differences in the costs that users cause to be incurred, and may reflect different market conditions.
2. - Practicality – Charging structures should be capable of implementation, taking account of the information available to implement the charging structure.
3. - Cost reflectivity – Charges should reflect as far as possible the costs incurred in providing the services used.
4. - Revenue recovery – Network Rail should have a reasonable ability to recover its allowed revenue, although not more than its allowed revenue.
5. - Optimise network use – Charges should encourage the efficient and economic use of the current network.
6. - Promotion of network growth – Charges should provide signals about the costs and potential benefits of expanding and developing the capacity of the network.
7. - Effect on customers – For the assessment of this criterion we consider a relatively broad definition of customers, to include passengers, freight users and train operators, although our primary focus is on final customers of the rail network. This criterion seeks to identify the impact on customers and whether particular customers are likely to benefit from the changes. The main focus is on assessing the distributional impacts between different customer groups, given that changes in track access charges will not generally affect the total amount of revenue to be recovered by Network Rail.
8. - Promote competition – Encourage more competition in the rail industry, and particularly with regard to passenger and freight operations.
9. - Simplicity – Is the proposed charging structure reasonably understandable, recognising that inherently any charging structure for track access charges will contain a degree of complexity, particularly to ensure cost reflectivity.

Overall our criteria are very similar to ORR's charging objectives, but we have supplemented them with specific reference to the interests of customers (widely defined) and factors related to the Better Regulation principles. As with ORR's charging objectives, our criteria combine factors that are explicitly objectives for the charging structure (such as promotion

of network growth) and potential constraints on the structure of charges (such as practicality and simplicity).

We are also aware that there is an overall constraint to ensure that any changes to the charging structure are consistent with the EC Directive in the fifth of ORR's charging objectives. For this report we have considered this in Section 6 when we review the short list of options, although we have had in mind whether any options that are put on the short list would be likely to breach the EC Directive.

4.4. Applying the criteria

When assessing the long list of options in the next section against the criteria, we have used a fairly simplistic "tick" based approach to evaluating each option against the criteria. However, for some options it is difficult, without further consideration and developing more detail about the options, to robustly evaluate the option, so we have inserted a question mark in those cases. The effect on customers criterion is particularly subjective for evaluation and depends on the weight attached to different customers groups. For the purposes of considering which options should be in the short list we have broadly adopted an approach based on equal weight for each criterion, but not necessarily applied this rigidly in every case given the difficulty of making a robust assessment in all cases. We have also noted that some options score well overall, but very poorly on practicality, and that signals that the approach would be very difficult to implement effectively in the rail sector.

Finally, we have given each option a traffic light marking, of "red" for options we are not pursuing further because they have almost no prospect of leading to net benefits compared to the current approach, "orange" for those we are not pursuing further, but which have some useful aspects although not sufficient to outweigh the disadvantages, and "green" for those options where we consider that the net benefits are more likely to outweigh net costs, we are including these in our short list.

5. OPTIONS FOR CHANGING THE CHARGING STRUCTURE

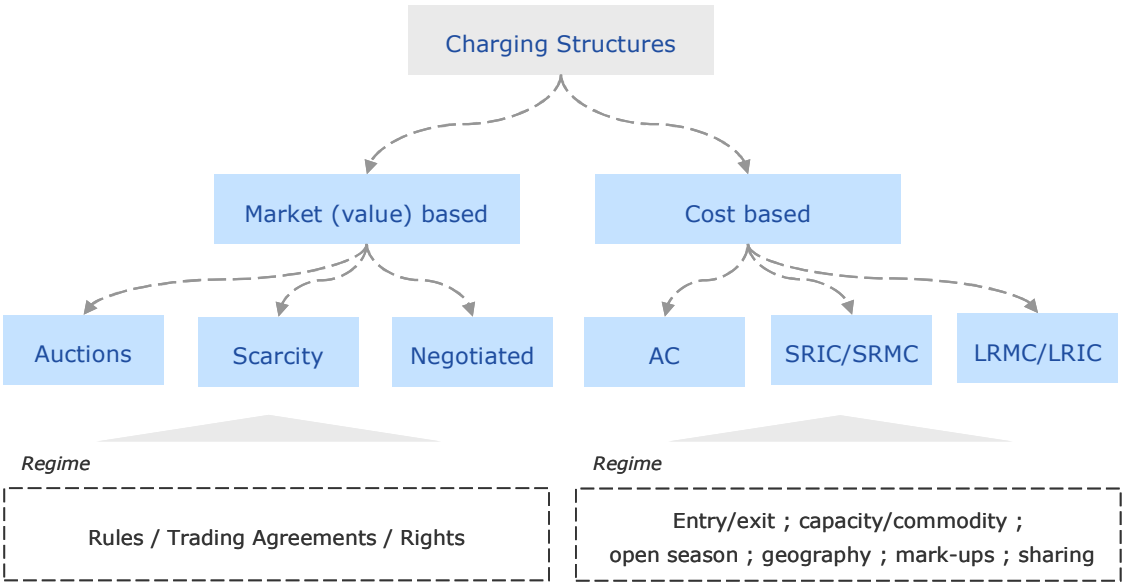
5.1. Introduction

This section sets out the long list of options that we have developed to consider whether there might be a case for changing the current track access charges in the rail sector. We discuss the approach to developing the options and then briefly describe each of the options in turn below.

5.2. Approach to developing options

The next section provides an initial view of a long-list of options for amending track access charges in the next control period (CP5). The analysis highlights two basic types of option, with a series of alternative approaches within each broad type. These are: market (value) based approaches or cost (analytical) approaches. Within each of these there are various sub-options – as shown in Figure 5.1. The acronyms for different charging approaches are explained in Annex 2.

Figure 5.1: Market (value) vs cost charging approaches



Source: CEPA analysis

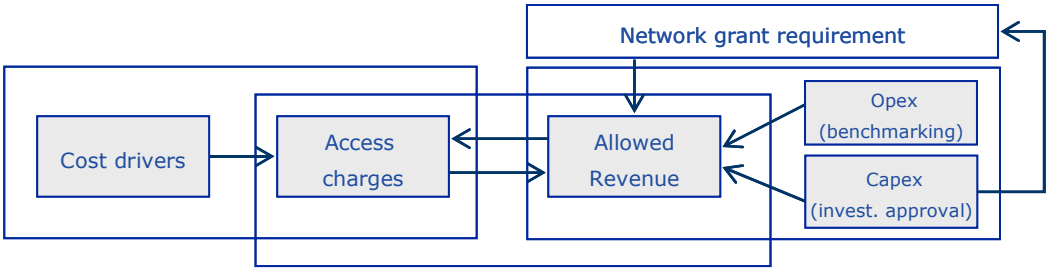
There are many practical difficulties that are likely to make market (value) based approaches difficult to implement in a rail network charging structure, including the complicated way that slots and routes are put together to produce a variety of types of services, and the fact that the value of a particular slot for a particular use depends on how other slots are being

used.[14] However, market (value) based approaches also have strong incentive properties and have been successfully implemented in other regulated industries in the UK (e.g. gas transmission).[15]

A cost based approach is already in place for Network Rail's existing structure of track access charges. There are various options available depending on the underlying cost of the charge (Average Cost; Short Run Incremental Cost, Long Run Incremental Cost) the proposed principles for cost allocation (geography, routes, cost drivers) and the basis of the regime (open seasons; entry-exit, sharing).

The price control framework is also important to the structure of track access charges. There is no guarantee (in fact it is almost certain they will not) that efficient track access charges will match Network Rail's allowed revenue under its price control, and some further adjustments of charges are therefore likely to be needed to reconcile the two. Figure 5.2 illustrates some of the pressures acting on the setting of access charges in the GB rail industry.

Figure 5.2: Price control factors influencing track access charges



Source: CEPA (adapted diagram from Jamasb et al.)[16]

Network Rail's existing "cost-based" approach to track access charges is a bottom-up approach that follows the main cost drivers identified by industry research and cost modelling. The price control is essentially a "top-down" review of whole network costs and investment plans creating a potential mismatch between the two approaches. This mismatch is essentially addressed by the fixed charge that allows for the recovery of the difference between Network Rail's revenue allowance and the variable and bottom-up track access charges.

While economic theory (based on Ramsey pricing rules) is clear on how best to adjust efficient prices to ensure overall revenue objective (levy mark-ups to the least price responsive group of the rail network through a fixed charge) there are significant practical issues with its implementation, as well as issues of fairness and equity to consider. Other

[14] Johnson D. & Nash C., 'Scoping study for scarcity charges – Final report for the ORR', March 2006

[15] http://marketinformation.natgrid.co.uk/Gas/CapacityReports.aspx

[16] Jamasb J., Neuhoff K., Newbery D., & Pollitt M., 'Long-term Framework for Electricity Distribution Access Charges – Report Prepared for and Commissioned by Ofgem', March 2005

regulators have had significant concerns about whether the use of Ramsey pricing would constitute undue discrimination. The rail industry applies a form of Ramsey pricing through the two part (fixed and variable) charges, where the franchised TOCs (backed by government support and with the least price sensitive customers) pay the fixed charge, but freight and open access passenger operators do not contribute to any significant extent to the fixed charges (the exception is the freight only line charge).

5.3. The long list of options

Table 5.1 below presents CEPA's proposed long-list of options for amending access charges in the next control period (CP5). We have characterised each option depending on whether it is cost or value based and whether there is a geographic element to the approach. We have also identified examples where the approach has been implemented, whether that be in other sectors or other countries for rail track access charges.

The list is intentionally long to ensure the full "envelope" of options is considered in our initial evaluation. The options in the table are not mutually exclusive, and indeed combinations of the options exist in other sectors. For example, the GB gas transmission sector combines an entry-exit regime with the use of auctions and LRIC.

While we recognise that there are a range of constraints (such as Clause 18 provisions in TOC franchise agreements) that may limit, in some cases significantly, the ability to introduce a number of the changes to charging structures that are included in this long list, we will take account of those constraints at a later stage of the project. We did not want the constraints to unduly limit the range of option considered at this stage of the project.

We have included the capacity / commodity split from the energy sector as a distinct option from the current structure of track access charges in the rail sector. While there are a lot of parallels with the current structure of charges, we consider that the way the capacity: commodity split is implemented in the energy sector has some subtle but potentially important differences compared to the current approach in the rail sector.[17] In particular, it is very explicit that the capacity element of the charge is intended to recover the costs associated with providing capacity (generally the peak capacity), while the commodity charge is only intended to recover costs truly variable with throughput.

[17] http://www.nationalgrid.com/NR/rdonlyres/7356AF37-B8EA-4532-918B-8A25F3D314A9/39294/chargingtransmethOctober2009v60.pdf is an example of National Grid's capacity: commodity split for gas transmission charges.

Table 5.1: Summary of high-level options for rail access charges

Option	Description	High-level nature	Geographic?	Examples
Average cost with a fixed charge or mark-up to ensure revenue recovery	Average network cost allocated to network user. Fixed charge or mark-up to ensure cost recovery	Cost based	No	GB Post[18]
LRIC (network wide basis)	LRIC of providing network allocated to user. Mark-ups if LRIC not used for price control	Cost based	No	Telecoms
Negotiated agreements	Access agreed between the user and the infrastructure provider. Regulator role in disputes	Cost / value based	Dependent on negotiated terms	Water[19] (previously GB rail)
Auctions	Auction scarce slots on network (a form of scarcity/reservation charge)	Value based	Depending on auction rights	GB gas entry charges Bookings on interconnectors
Open season / financial commitments	Market test demand for new and existing capacity (potentially aligned with franchising)	Cost/ value based	Yes	UK offshore gas / oil regime US interstate pipelines
Market ("merchant) based charging of investments	User makes long term commitment to capacity use or upgrade	Cost based	No	Gas interconnectors
Entry-exit regime	Short and long term access agreements for entry/exit capacity	Cost based	Yes	GB gas transmission
Capacity /commodity regime	Costs are allocated on cost driver basis (capacity/commodity split determined by regulator)	Cost based	No (not a part of regime)	UK and Republic of Ireland gas transmission and distribution

[18] http://www.psc.gov.uk/postcomm/live/policy-and-consultations/consultations/access/ObservationsontheRMUKMagreement.pdf
[19] http://www.ofwat.gov.uk/competition/inset/

Option	Description	High-level nature	Geographic?	Examples
Regional LRIC with mark-ups	Locational (e.g. nodal) LRIC allocated to network user. Mark-ups to ensure cost recovery	Cost based	Yes	GB gas exit charges GB electricity transmission and distribution[20]
Scarcity / reservation charges	Range from simple flat rate reservation charge through to a fully-fledged scarcity charge[21]	Value based (economic value of reserving a path)	Yes	Rail infrastructure in Switzerland Rail infrastructure in France Bookings on interconnectors
Bookings charges (similar to reservation charges)	Penal system if user exceeds booked or reserved network capacity	Cost based (can sometimes be punitive)	No	GB gas transmission charges
Shallow / deep connection regime	Set boundary of recovery of costs from use of system charges or connections charges	Cost based	Yes	GB energy networks
SRMC with a fixed charge or mark-up to ensure revenue recovery	Users allocated SRMC costs that vary with traffic. Fixed charge or mark-ups to ensure cost recovery	Cost based	Could be localised or not	Examples of rail infrastructure charging in Europe
SRMC with a fixed charge or mark-up based on Ramsey pricing to ensure revenue recovery	Users allocated SRMC costs that vary with traffic. Fixed charge or mark-ups allocated by price elasticity	Cost based	Could be localised or not	Non-available
LRIC with a fixed charge or mark-ups based onRamsey pricing to ensure revenue recovery	Users allocated LRIC. Fixed charge or mark-ups allocated by price elasticity	Cost based	Could be localised or not	
Customer contributions	As part of a deep connection or	Cost based	Could be	GB energy networks

[20] http://www.ofgem.gov.uk/Networks/ElecDist/Policy/DistChrgs/Documents1/CDCM%20decision%20doc%20201109%20(2).pdf

[21] When evaluating this option we focus particularly on a scarcity charge based on an estimate of the opportunity cost of available train paths rather than a reservation charge.

Option	Description	High-level nature	Geographic?	Examples
	long term commitment charging regime		localised or not	
Cost-benefit sharing (similar features to a LRIC network based charge used as basis for setting price control)	TOCs bear greater share of the MC they impose on NR and NR shares in the MR earned by the TOCs arising from NR's actions.	Cost based	Could be localised or not	Examples of LRIC based price controls Electricity distributed generation charges
Environmental charges to provide incentives to minimise carbon emissions	A charge or charges are levied on network users to reflect the cost of the carbon emissions or other pollution (e.g. noise), that their activities cause.	Cost based	No	The inner London congestion charge
Avoidable costs	A calculation of the costs that would be avoided if facilities to run certain trains were not available are calculated, probably as a means to allocate fixed charges	Cost based	Yes	Previously used in some form in the rail sector
Track occupancy charge	The charge is based on the number of minutes the trains use the tracks	Cost based	Yes	No obvious parallel in other regulated sectors, but implemented for HS1

We provide more detail about the approaches in other sectors and countries in Annexes 3 and 4, but we briefly discuss some of the options not previously used or considered in the UK rail sector to provide more information to readers who may not be familiar with the approaches from other sectors or countries.

5.3.1. Average cost with mark-ups

Under this approach an estimate is made of the average costs of providing certain services to network users. A mark-up or fixed cost allocaiton is generally required to apportion some common or joint costs that cannot be readily allocated to the activities of particular network users. This approach may be based on efficient forward looking costs, but will not generally take account of the costs of network expansion, but will take account of the costs of using the existing network capacity. To implement this approach a set of services provided by Network Rail would be identified and costs allocated to those services based on a reasonable selection of cost drivers, with costs for which no obvious driver is available being allocated using a mark-up rule.

The approach to access charges for the UK post sector offered by Royal Mail, are broadly an example of this type of approach.

5.3.2. Long run incremental cost

The additional or incremental costs that would be incurred over the longer term to accommodate the requirements of the network user. Generally this approach requires a mark-up or down (which can be through the fixed charge) to ensure appropriate revenue recovery. This approach can be implemented on a national or locational basis, and the locational basis can be at various regional levels or for different characteristics of the network. There will be a trade-off between relative simplicity at a higher level of aggregation and better signals about the costs of capacity development for more localised developments. It would take some time, and probably an element of trial and error) to determine the best balance between these two factors when implementing this approach.

The UK telecoms sector and the UK energy sectors have implemented variants of this approach.

5.3.3. Negotiated agreements

These are bilateral agreements within the context of a regulatory backstop. Therefore, the outcome of the negotiation will depend on the framework within which the regulator acts as the backstop because the parties to the negotiation will take a view as to the outcome they would be likely to get if the regulator was to exercise its backstop role to specify an agreement.

The UK post and England and Wales water sectors are examples of this approach being implemented.

5.3.4. Market based charges for investments

The development of interconnectors and gas storage facilities in the energy sectors are good examples of this type of approach being implemented. Interconnectors are covered by European Directive requirements to offer non-discriminatory third party access, subject to the ability to seek derogations from these requirements. Generally charges for the use of these interconnectors are determined through some form of auction or market based arrangement.

5.3.5. Auctions

Auctions can take many forms, and are used in different contexts in regulated sectors. Where they are used to help determine access charges in Great Britain gas entry capacity activity, pay-as-bid auctions for capacity at different locations has been auctioned for different time periods, from the very long to the short term. The results of the long term auctions inform decisions by National Grid as to whether to invest in additional capacity in the network, and auction participants are making a long term commitment to pay charges when they are successful in the auctions.

5.3.6. Open season or financial commitments

This option has similarities to the auction approach, but has tended to be used more in continental Europe to consider options for expanding interconnection capacity on gas or electricity transmission networks. The network operator will seek expressions of interest or financial commitments from potential network users for different options to expand capacity, and will take account of these expressions of interest and financial commitments when deciding whether to expand capacity and by how much to expand capacity.

5.3.7. Capacity: commodity split

This can often be regarded as the energy sector equivalent of the fixed: variable split in the rail sector. However, it is arguable that there are some subtle differences in the two approaches. In particular, the capacity element of the charges in the gas sector is intended to reflect the costs required to provide the peak capacity requirement of customers (and is currently set at 90% of the total costs to be recovered), whereas the commodity element is the variable costs of shipping gas along the network.

5.3.8. Entry/ exit

This is the overall description of the approach to charging in the UK energy sector. Under this approach customers pay a charge for putting energy on to the network (entry) and taking it off the network (exit). The charges that customers pay do not vary depending on the

precise route that their energy in theory[22] takes through the network. Rail track access charges also do not depend on the precise route that trains take.

5.3.9. Shallow/ deep connection regime

This describes the approach that is taken to determining the proportion of the costs of a new connection the customer requesting the connection should pay. A shallow approach describes a situation where the customer only pays the direct costs of the connection, i.e. the costs of a pipe from their property to the mains, while a deep approach describes a situation where the customer also pays a contribution (or at the extreme all) to the costs of reinforcing the network upstream to accommodate their requirements.

This approach is currently used in the UK energy sector.

5.3.10. Customer contributions

This is related to the shallow/ deep connection approach, and describes a regime where customers make a contribution to deep connections. Where this approach is used in the energy sectors in the UK there is a relatively formulaic approach to calculating customer contributions.

5.3.11. Mark-ups based on Ramsey pricing

While the existence of mark-ups is common for network charging arrangements, the use of Ramsey pricing to set the mark-ups or allocate fixed costs, at least explicitly, is much less common. Ramsey pricing describes an approach where the proportion of the mark-up or fixed cost that is allocated to a product or service is inversely related to the elasticity of demand for the product or service. Therefore, the more elastic the demand for product the lower the proportion of the mark-up/ fixed cost that is allocated to the product or service, and vice versa.

There are a number of reasons why the approach has generally not been adopted explicitly in regulated sectors, including practicality, concerns about undue discrimination between customers and concerns about the potential impact on the development of competition. However, as noted above, at a relatively high level the rail sector in Great Britain adopts a form of Ramsey pricing to allocate the fixed costs, as the rail users who are considered to be the most price sensitive (freight operators and open access passenger operators) do not contribute to the recovery of the fixed charge, while less price sensitive franchised TOCs, backed up by government support, pay all of the fixed charges.

[22] If a shipper enters gas in Scotland for a customer in South Wales, the actual gas that the customer receives will almost certainly have been entered at a different point in the network.

6. EVALUATING THE OPTIONS

6.1. Introduction

This section sets out our evaluation of the long list of options in Section 5 against the criteria in Section 4. We explain which options have been chosen for more detailed evaluation later in this section. We then evaluate in more detail the short list of options, with a deeper consideration of how they could be implemented, and a wider assessment of the potential impact on customers. The final part of this section then considers whether the options could be combined to form a coherent package that may improve the track access charges.

6.2. Evaluating the long list of options

Table 6.1 evaluates the long list of options set out in Section 5 against the criteria set out in Section 4. As explained in Section 4, we have used a relatively simple tick box approach for evaluating each of the options. We have then used a traffic light system to identify options to consider further in the short list, which are the options with a green traffic light. Options that are identified as red and orange will not be considered further, although those with an orange have some intrinsic merit.

Table 6.1: High-level assessment of track access charging options

Options	Cost reflectivity	Revenue Recovery	No discrimin.	Promote comp.	Effect on customers	Simplicity	Optimise network	Promotion of growth	Practicality
Average cost with a mark-up or fixed charge to ensure revenue recovery GREEN	✓✓	✓✓✓	✓✓	✓✓	✓	✓✓✓	✓	✓✓	✓✓
	A simple cost model to implement but fails to provide strong incentives to optimise network use. Given the existing structure of track access charges are based on SRMC this approach would be quite a significant change with substantial implications for users incentives. The EC Directive allows for averaging of charges to avoid undue fluctuations.								
LRIC (network wide basis) ORANGE	✓✓✓	✓✓	✓✓	✓✓✓	✓✓	✓	✓✓	✓✓	✓
	Typically this approach to access charging is used in sectors subject to competition but where an operator is found to have "significant market power." For example, it has been used in telecoms and is being considered by the CAA for airport regulation in the UK. Its application provides lessons for the rail industry but more a price control issue than a method for structuring track access charges. LRIC at a network wide level is unlikely to provide appropriate signals for efficient network development.								
Negotiated agreements RED	✓✓	✓	✓✓	✓	✓✓	✓✓	✓	✓	✓✓✓
	Negotiated agreements were previously used in the rail industry for establishing track access charges. They were removed following concerns of complexity and transparency and objectives for improving the cost reflectivity and incentive properties of track access charging structures. There may also be concerns about undue discrimination, but as Network Rail does not have any incentives to favour one operator over another, this should not be a material concern.								
Auctions ORANGE	✓✓	✓	✓✓✓	✓✓✓	✓✓	✓	✓✓✓	✓✓	✓
	The most attractive "market" based approach in theory. Auctions would reveal the value of service/access items on which ORR/Network Rail has information asymmetry. Many practical difficulties as noted above, although auctioning could in theory be applied to the allocation of marginal slots (see Nash and Tyler 2006). The definition of the slots to be auctioned would require substantial work.								
Open season / financial commitments ORANGE	✓✓	✓	✓✓✓	✓✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
	Open season / financial commitment would allow different users of the rail network to express demands for capacity during regular allocation processes. Could potentially be aligned with franchising arrangements and more granular cost based approaches to charge setting.								
Market	✓✓✓	✓	✓✓	✓✓	✓✓	✓	✓✓	✓✓	✓

Options	Cost reflectivity	Revenue Recovery	No discrimin.	Promote comp.	Effect on customers	Simplicity	Optimise network	Promotion of growth	Practicality
("merchant) based charging RED	Unlikely to be implementable in the current rail industry structure.								
Entry-exit regime RED	✓✓	✓✓	✓✓	✓✓	?	✓	✓✓	✓✓	✓
	Difficult to envisage how this type of regime could be practically implemented in the rail industry in precisely the same form as in the energy sector. It would require complex and essentially arbitrary decisions of how route/path based capacity would be allocated. However, its implementation in the gas sector - in combination with a "cost based" approach to charge setting - provides interesting lessons for rail on how to develop a charging system around the characteristics of the commodity/user of the network and cost drivers. Although the current rail sector is not a pure entry-exit regime, it does have some parallels with this approach because there are not specific route based charges.								
Capacity /commodity regime RED	✓✓	✓✓✓	✓✓✓	✓✓	✓✓	✓✓	✓	✓	✓✓
	Quite similar to the current structure of track access charges, but with a more explicit focus on estimating the costs of providing the capacity to form that element of the charge. Given it is not that distinct from the current approach it is probably not worth substantial further consideration.								
Regional LRIC with a mark-up or fixed charge to ensure revenue recovery GREEN	✓✓✓	✓✓✓	✓✓	✓✓	?	✓	✓✓✓	✓✓✓	✓
	Lumpy investment characteristic of rail could result in volatile LRIC measures and there are practical issues associated with specifying enhancements and allocating to different users of network. Could potentially recover costs of enhancements (LRAIC) in a separate charge to operators who caused the enhancement (reallocation of fixed costs). A clear option for further consideration depending on development of Network Rail's ICM. A number of the potential concerns about volatility could be addressed through implementation at a regional level and smoothing of charges over the long useful lives of the assets.								
Scarcity / reservation charges GREEN	✓✓	✓	✓✓✓	✓✓	✓✓✓	✓✓	✓✓✓	✓✓	✓✓
	Practical issues include: defining when capacity is constrained, defining a "path" and allocating slots on an efficient basis. Permitted under European Directive 2001/14 (Article 12) and would provide incentives for train operators to make more efficient use of network capacity. Examples of use in France and Switzerland but complexity and practicality issues have prevented implementation in GB in the past. A strong option for further evaluation (possibly on a reservation path basis).								
Bookings charges (similar to reservation	✓✓	✓	✓✓✓	✓✓	✓✓	✓✓	✓✓	✓	✓✓
	Booking charges are used in GB gas transmission. Penal system incentivises operators to only use capacity they require. Could								

Options	Cost reflectivity	Revenue Recovery	No discrimin.	Promote comp.	Effect on customers	Simplicity	Optimise network	Promotion of growth	Practicality
charges) ORANGE	potentially be used to develop a reservation charging option in the rail industry. Another option that merits further consideration, potentially with other forms of scarcity charge.								
Shallow / deep boundary regime RED	✓✓	✓✓	✓✓	✓	✓✓	✓	✓✓	✓✓	✓
	Difficult to envisage how this would work given current rail industry structure, although the type of regime illustrates the different type of approach that can be taken to the allocation of localised cost and upgrade works. The application of the regime in the energy sector is more likely to provide "lessons learned" than a feasible option for rail.								
SRMC with a mark-up or fixed charge to ensure revenue recovery GREEN	✓✓	✓✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓	✓✓
	Building on the existing track access charging regime in GB. With the development of Network Rail's ICM is there potential for greater granularity of cost allocation by cost driver (path based charging etc.)? The base case option for relative evaluation of more complex structures and cost allocation approaches. Consider treatment of network grant in fixed charge component.								
SRMC with a mark-up or fixed charge based on Ramsey pricing to ensure revenue recovery RED	✓✓	✓✓✓	✓✓	✓✓	?	✓	✓✓✓	✓	✓
	Building on the existing track access charging regime in GB but with application of Ramsey principles to the allocation of fixed cost components to access charges. Although the use of Ramsey principles for allocating mark-up costs has strong theoretical principles there are significant practical issues with its implementation, as well as issues of fairness and equity to consider. The current structure of charges allocates the fixed charge at a very high level based on Ramsey pricing principles.								
LRIC with a mark-up or fixed charge based on Ramsey pricing to ensure revenue recovery ORANGE	✓✓	✓✓✓	✓✓	✓✓	✓	✓	✓✓✓	✓✓	✓
	As above but LRIC based charges. Strong incentive properties associated with this charging option. Role of network grant in ensuring revenue recovery also likely to raise interesting issues. Standard practical issues with implementing both LRIC and Ramsey principle mark-ups. The current structure of charges allocates the fixed charge at a very high level based on Ramsey pricing principles.								
Customer contributions RED	✓✓	✓✓	✓✓	✓✓	✓✓✓	✓	✓	✓✓	✓
	When applied to connection charging this approach only makes sense for service expansion. Difficult to envisage how this type of approach to charging would work without a significant change in the regulatory / industry framework. Not in our view a viable option for further consideration.								

Options	Cost reflectivity	Revenue Recovery	No discrimin.	Promote comp.	Effect on customers	Simplicity	Optimise network	Promotion of growth	Practicality
Cost-benefit sharing GREEN	✓✓	✓	✓✓✓	✓✓	✓✓✓	✓✓	✓✓	✓✓	✓✓
	Cost and revenue risk sharing arrangements are common practice in private sector transactions between parties whose businesses are closely inter-dependent – PPP examples of risk sharing exist in the transport sector. Would require careful consultation with stakeholders in Network Rail. ATOC proposal[23] provides a practical example of an option which could be implemented. However, this type of option appears to be closer to a change in the price control framework than purely an amendment to the structure of Network Rail's track access charges.								
Environmental charge GREEN	✓✓	✓✓	✓✓	✓	?	✓✓	✓✓	✓	✓✓
	This option would impose a charge on network users related to the amount of carbon emissions or other pollution they caused. The charge could be set based on the social cost of carbon used by the Government or the price arising from the EU ETS. It would be important to avoid double counting, i.e. activities that are already covered by an environmental charge, such as electricity that is already covered by the EU ETS at source.								
Avoidable costs ORANGE	✓✓✓	✓✓	✓✓	✓✓	?	✓	✓✓	✓✓	✓
	This approach would calculate the costs that would be avoided if particular train operations or routes were no longer undertaken. This calculation of avoidable costs can then be used to help determine the allocation of the fixed charges.								
Track occupancy charge GREEN	✓✓	✓✓	✓	✓✓	?	✓✓✓	✓	✓✓	✓✓✓
	This approach is relatively simple and also can be practically implemented. It would focus on charging on the basis of capacity (e.g. through a per minute or km charge) and is likely to work particularly well when the Government or another entity has largely or fully funded the infrastructure development costs, so the track access charges are only recovering the ongoing costs of using the network. This approach would provide poor signals or incentives for efficient use of the existing network or promoting network growth, as although a track occupancy charge (minutes or km used) approximates a capacity charge, such a charging framework does not account for opportunity costs of scarce rail network capacity or the short term costs of network use as in the current variable track usage charge.								

[23] ATOC's proposal is to create a stronger revenue incentive mechanism than the combined revenue and volume incentive found in CP4, whereby Network Rail would share in the risk of passenger growth (demand risk) for the industry as a whole.
http://www.atoc.org/clientfiles/File/publicationsdocuments/FutureFranchisesReport_AW.PDF

On the basis of the evaluation in Table 6.1 we have decided to further consider the following options:

- A regional[24] LRIC approach.
- An average cost approach, with a view to simplification of charges.
- A regional SRIC approach.
- Scarcity charges.
- Cost benefit sharing.
- Track occupancy charge.

These options do not correspond precisely to the options that received the highest number of ticks in the evaluation, partly because we have not given ticks to all the criteria, but also because we have placed slightly greater weight on some of the criteria, and in particular, we have generally been reluctant to consider further options that do not appear to be practicable. The steering group has also encouraged us to particularly consider options that have a strong potential to lead to improvements compared to the current situation, including simplifying charges, and to focus particularly on considering options that have not previously been examined in detail. As we discuss in the detailed evaluation of these options below, when you consider their implementation some of the options that have been rejected at this stage may have relevance to the detailed implementation of the six options identified for more detailed evaluation.

Of the six options selected, the first two can be broadly described as fundamental or radical change options, and would entail major changes to many of the existing aspects of track access charges. It is important to note that both of these options can be implemented in various different ways, which would have different impacts on incentives for train operators, but also affect the degree of complexity involved in the charging structure. In other words, both options can be introduced in a relatively simple way or a relatively complex way. The next four options can be broadly characterised as incremental change options, and their implementation would not necessarily require significant changes to the existing structure of track access charges, although in the case of the localised SRMC option this partly depends on how it is implemented. The final option (Track occupancy charge) probably falls somewhere between the two, as it could be seen as a very radical change if implemented across the whole network, but a more incremental option if implemented for new developments and expansions when the infrastructure costs have been largely funded by Government or another entity.

[24] For this option and the SRIC option, we use the word regional as a "catch-all" expression for options that disaggregate the charge on a sub-national basis. This can include regions of the country and different types of routes, e.g. primary, secondary and tertiary.

6.3. Detailed evaluation

We set out below in Boxes 6.1 to 6.7 our detailed evaluation of the six options. The evaluation template for each option explains at a high level how the option could be implemented, the existing approach/counterfactual of achieving the intended objective of the charge, considers a range of issues regarding the implementation of the approach, identifies the potential to change behaviour, considers the complementarity of the option with the existing approach and other options, the resources required to implement the option, and then draws together an evaluation of the option, including regard to our criteria and ORR's charging objectives.

As we are aware that there is an overall constraint to ensure that any changes to the charging structure are consistent with the EC Directive (2001/14/EC) as well as other rail industry and regulatory constraints, we have also included "hurdle" assessments of whether a given charging option would breach any of these legal or industry constraints. For each of these issues we have applied a simple pass or fail criterion.

Although we did not choose to short list the environmental charge option, we undertook a full evaluation of this option given the importance attached by policy-makers to achieving environmental objectives. This assessment is set out in Annex 5, and confirms our initial view that the potential inter-modal impacts of introducing this option are so significant that it should only be pursued if the Government was planning to introduce a more comprehensive set of environmental charges to cover other modes of transport on a consistent basis.

Box 6.1: Regional long run incremental cost[25]

Rail industry issues
The current structure of track access charges focuses on recovering the efficient costs caused by use of the existing rail infrastructure. Track access charges could alternatively be structured to provide incentives to train operators and funders to take into account the costs associated with future enhancements to the network when deciding to run additional services or when demand is expected to exceed capacity in the foreseeable future. This option focuses on using the track access charging structure to ensure the rail network is adapted and expanded in an efficient and optimal way over the longer term.
Description of rail access charge
A critical part of the analysis and the estimation of marginal/incremental costs is the need to take account of the fact that outputs and inputs have a time dimension. Long run incremental costs (LRIC) relate to expanding rail capacity or capability regardless of when it occurs (i.e. all costs are variable) whereas short run incremental costs (SRIC) relate to a specific time (or planning) horizon for which rail capacity and capability (and therefore certain elements of cost) are fixed. The use of a LRIC approach (as the basis for setting track access charges) has theoretical advantages to a SRIC approach as it includes the possibility of capacity changes to the network and so (theoretically) provides incentives for the optimal development and long term use of the rail network. In contrast, setting track access charges on the basis of SRIC, provides incentives only for efficient use of the existing rail network. One of the most important factors to consider with regard to the impact of an LRIC approach is how it would be applied in charges. Would railway users only pay the prevailing LRIC charges up to the point at which investment occurred, and then pay a re-calculated LRIC that would probably be much lower, or would they continue to fund the investment over the period for which they derive benefit from it? In practice it is likely to be appropriate to smooth charges by spreading the costs of enhancements over their useful life. It would also be important for ORR to consider how the use of LRIC would be incorporated in Network Rail's price control, in particular with regard to any obligations or incentives to invest in response to signals provided by operators willingness to pay prevailing LRICs. As we discuss further below, there would be a need for substantial further work to determine the best way to implement a LRIC approach, particularly with regard to the degree of granularity at which the incremental costs are calculated. This could be done at a relatively high level based on regions of the network or major routes, or it could be done at a very granular level. In practice, a balance needs to be found between sufficient granularity to provide meaningful cost signals and incentives, and not having excessive granularity that increases cost and complexity.
Counterfactual
A number of options exist for translating incremental cost analysis into a structure of charges, depending on the incentive properties that are required to be established. At present, track access charges are based on SRIC to provide incentives for the efficient use of the existing network. Currently investment planning/long term development of the rail network is treated separately from the structure of charges as part of the Network Rail's price control framework. Sponsors generate output requirements (HLOS) on the basis of detailed project and programme appraisal. There also exists a rebate mechanism for investors in large-scale track infrastructure

[25] For the purposes of the discussion in this box the terms Long Run Incremental Cost and Long Run Average Incremental Cost should be regarded as inter-changeable. In particular, we recognise that LRIC can be implemented with various forms of averaging to smooth charges and to ensure a reasonable level of aggregation for the estimates of increments to network capacity.

enhancements.[26] This mechanism helps to address one of the barriers to investment in network enhancements by enabling investors to recover a fair proportion of the costs incurred in funding an investment scheme where competitors benefit from use of the enhancement. Third parties investing in track enhancements to the rail network can apply to Network Rail for a rebate charge to be put in place. The charge (flat index-linked tariff per train service) is levied on operators that access and benefit from the particular enhancement and is payable to Network as a premium to the access charge.

Information requirements	**Cost drivers**
Estimates of LRIC require data on: ▪ existing network capacity and capability; ▪ asset information; ▪ traffic (demand); ▪ unit costs of activities; and ▪ usage/ capability standards. LRIC can be calculated on a network wide basis or on a localised basis. Both require technical analysis to determine the timing and allocation of efficient investment in the rail network.	The key drivers of LRIC are: ▪ Existing network capacity and capability; ▪ Expected demand growth; ▪ Expected network enhancements; and ▪ Enhancement investment costs. As for SRIC charging options, LRIC cost drivers (for example demand growth) can be geographically disaggregated, either by route, rail line or customer group.
Calculation principles	**Practical issues / considerations**
An analysis of LRIC includes a time dimension and requires consideration of time-streams of inputs, outputs and costs. This brings investment into the charge setting analysis, including expectations about: ▪ future costs; and ▪ demand for use of a service or asset. An analysis which relates LRIC to a specified output or "increment" of demand also needs to consider particular issues that are relevant to the nature of that output, such as location (for example rail network route) and the particular user of the service. The lumpy nature of rail investments requires a feasible change in capacity to be costed. Thus, the calculation of LRIC in the rail sector requires cost estimates of enhancements and investments and how these relate to particular types of rail user.	The lumpy nature of rail investments and the data requirements necessary to calculate LRIC creates a demanding analytical framework for setting access prices, although if LRIC is estimated at a relatively high regional level some of these costs can be mitigated. There are different definitions of long run cost to consider, all of which are appropriate depending on the desired objectives and intended price incentives. A LRIC charging structure will require development of long term programmes of investment and the effective increment identified, thereby allowing investment to be allocated over time and to particular rail network users. Since the locations, costs and specific outputs of future enhancements are unlikely to be known by Network Rail much beyond the current price control period LRIC charging will also invariably require the development and use of some form of complex forecasting or infrastructure charging model. The volatility of LRIC estimates is likely to create issues for reconciling track charges to Network Rail's annual required revenue targets,

[26] http://www.rail-reg.gov.uk/upload/pdf/cns-rebatemech-finconc.pdf

	although this concern can be addressed by smoothing the costs of enhancements over their useful economic life.
Ex-ante behavioural incentives	
LRIC is likely to be most appropriate in the rail sector in circumstances when demand is expected to exceed capacity in the foreseeable future and investment signals upon which decisions such as where to invest and how much are the primary objective for the industry. LRIC provides price signal incentives to network users of their long-run impact on Network Rail's costs of increasing demand. As with the current regime, capacity is priced cheaply when there is an excess of supply, thus discouraging the construction of further rail network capacity and incentivising use of network capacity where there exists excess supply. However, promoting cost-justified expansion and investments through LRIC charging is difficult because it requires that the final users are able to make it attractive to Network Rail by expressing both a long term demand and willingness to pay for that demand. Thus LRIC based charges (and the behavioural incentives which it creates) are likely to need to be linked within the overall price control framework of Network Rail which helps to guarantee willingness to pay for investments and enhancements. The charging structure then provides the mechanism for allocating LRIC to users of the network who cause those costs to be incurred.	
Complementarity with existing structure of charges	
Integrating SRIC and LRIC into a single charging structure is likely to be complex, and subject to a number of constraints. For example, what is the time period for differentiating between long run and short run costs? LRIC could in theory be levied separately from the existing SRIC charging structure, for example in relation to specific network enhancements on particular routes of the network where demand is expected to exceed capacity. This goes beyond a binary "invest: not invest" decision in the price control framework by helping to allocate future infrastructure costs to those parties responsible for imposing such costs. However, while this type of approach is attractive in theory, there would be fundamental implications for the split of revenue recovered from Network Rail's fixed and variable charges and, more generally, the interaction of Network Rail's structure of charges and price control framework. We understand that rail users are currently able to agree to fund enhancements to the network over and above those included in Network Rail's price control, which in turn is derived from the Government's High Level Outputs Statement (HLOS). The use of LRIC if paid by the users benefiting from the investment over its useful life can be seen as similar to this type of arrangement. The rebate mechanism (discussed above) allows third parties investing in track enhancements to the rail network to apply to Network Rail for a rebate charge to be put in place levied on operators that access and benefit from the particular enhancement. The rebate mechanism could potentially be used to complement a LRIC approach used to signal and fund particular network enhancements.	
Complementarity with other charging options	
A LRIC based charging structure would attempt to bring investment into charging structures and expectations about long term future costs and demand for the network. It therefore shares some of the properties of a cost-benefit sharing mechanism which also attempts to improve incentives to relieve network constraints and willingness to pay for specific network enhancements. In theory, a LRIC charging structure could be implemented in tandem with a scarcity charging regime, although there are complications in how the two might interact.	
Practical experience / international case-studies	
In utility regulation in the UK, it has become generally accepted that it is appropriate to use some	

form of LRIC based charging. The CAA, Ofwat and Ofgem have all adopted this approach in developing various types of charges. However, there is limited practical experience of LRIC based charges having been implemented in the rail sector in the UK or internationally due to the practical constraints and limitations noted above.	
Impact on stakeholders	
Franchised operators	▪ Accommodation of growth requires efficient investment and a proper Cost Benefit Analysis – link to the franchising system and funders' willingness to pay for enhancements and upgrades. ▪ LRIC pricing will increase the variable component of the charge – provides signals to funders in local areas but a limited effect on operator behaviour with Clause 18.1.
Open access operators	▪ Open access operators do not pay fixed charges – how would a LRIC charge be integrated then? Significant impact if open access operators are required to pay LRIC as well as SRIC. ▪ A combination of SRIC and LRIC may be necessary so that the variable usage charge (either in its current or amended form) continued to provide signals for efficient use of the existing network, as well as long term future costs and demand for network capacity. ▪ Explicit investment signals of future enhancements may trigger entry or exit from the rail network - allocatively efficient assuming LRIC is estimated correctly
Freight operators	▪ Freight operators do not pay fixed charges – how would a LRIC charge be integrated then? Significant impact if freight operators are required to pay LRIC as well as SRIC. ▪ As with open access operators, a combination of SRIC and LRIC may be necessary in order that the variable usage charge (either in its current or amended form) continued to provide signals for efficient use of the existing network, as well as long term future costs and demand for network capacity. ▪ Explicit investment signals of future enhancements may trigger entry or exit from the rail network - allocatively efficient assuming LRIC is estimated correctly.
Time and resources required for implementation	
Since the existing structure of track access charges was established, more information has become available to facilitate longer term investment planning and enhancements. Network Rail has developed the ICM to support route, vehicle and area based costing, although this model is more focused on renewals than capacity expansion. The ICM, we understand, also contains the functionality to estimate the infrastructure costs associated with incremental and decremental changes in network capacity. The information used to develop the HLOS and for the RUS process will also provide useful information.	
Time	5-years implementation as a LRIC based charging regime will require new industry processes to be put in place. An evaluation of the robustness of the LRIC analysis would also be required

	and processes put in place to tie Network Rail's charging frameworks to the price control via business planning. Could potentially be implemented as part of a more comprehensive track access charging package in CP5.
Resources	▪ Resource heavy option. ▪ Extensive industry consultation. ▪ Development of network charging model. ▪ Link with CP5 consultation period. ▪ Link between access policy, funding/investment policy framework and the structure of charges.

Evaluation

- Broadly speaking, LRIC is most appropriate in circumstances when demand is expected to exceed capacity in the foreseeable future and investment signals upon which decisions such as where to invest and how much are the primary aim. A move to a more LRIC based charging structure would reflect a perceived need to provide incentives for the optimal long term use and development of the rail network.
- The perceived advantages of LRIC include:
  - it is a valid measure of the long-run impact on Network Rail of increasing demand; and
  - as with the current regime capacity is priced cheaply when there is an excess of supply thus discouraging the construction of further capacity.
- The current regulatory framework does not explicitly encourage Network Rail to consider transparently the interactions between charging, cost drivers and their business plans at price reviews. LRIC charging would complement planning processes and the investment framework in the existing price control.
- Lumpy investment characteristic of rail could result in volatile LRIC measures and there are practical issues associated with specifying enhancements and allocating to different users of network. However, these issues can be addressed by smoothing charges over the useful life of enhancements and through a degree of trial and error to identify the most appropriate level at which to estimate LRIC. Could potentially recover costs of enhancements (LRAIC) in separate charge to operators who caused the enhancement (reallocation of fixed costs).
- Other problems (LRIC may lead to sub-optimal allocation of existing capacity; time, location, scale and cost of enhancements difficult to predict; enhancements are currently mainly funded by third parties; dealing with multiple users/ outputs).
- In general, this is a difficult option to implement (as the case studies in other regulated sectors illustrate) and so the objective of promoting efficient development of the network would need to be the priority to outweigh LRIC's limitations.

Assessment of charging option against industry legal and regulatory constraints

Promote ORR duties under section 4 of Railways Act	LRIC based charges likely to promote ORR duties (promote improvements in railway service performance; development of railway network to the greatest extent economically practicable).	✓
Not discriminate between users of the network	Not discriminatory provided LRIC charges applied to all users of the network.	✓
Be consistent with EU	LRIC based charges are permitted under the directive	✓

directive 2001/14/EC	if they take account of willingness to pay.	
Ensure charges enable NR to recover allowed revenue	Provided the network grant and the fixed charge remain in place, the two-part tariff will continue to ensure Network Rail recovers its required revenue. However, were the fixed charge amended, volatility of LRIC estimates may require an additional revenue recovery mark up to complement the network grant (as currently achieved by the two-part tariff).	✓

Does charging option better meet the ORR's charging objectives?

- Conclusion is that LRIC based pricing is likely to be overly complex in a GB rail context, particularly given existing industry constraints - planning processes; access rights policy; role of third-parties in funding enhancements and required services.
- May be practically implemented if a simplified approach for the recovery of specified investments and enhancements were adopted almost separate to the existing structure of charges. This shares more characteristics with customer contributions in the GB energy sector and would result in a reallocation of the fixed component of the two-part tariff.

Sources

CEPA, '*The Role of Incentives in the GB Rail Industry*', July 2006

ORR, '*Periodic Review 2008 – Structure of track access and station long term charges*', June 2006

ORR, '*Periodic Review 2008 – Determination of Network Rail's outputs and funding for 2009-14*', Oct 2008

Turvey, R., '*What are Marginal Costs and How to Estimate Them?*', Technical Paper 13, 2000

Vass, P., '*Access Pricing: The Economic and Financial Interface*' CRI Regulatory Review, 2001

Box 6.2: Average costs

<table>
<tr><th colspan="2">Rail industry issues</th></tr>
<tr><td colspan="2">Network Rail's existing structure of track access charges is based on a two-part tariff (fixed: variable) which seeks to recover capital and operating costs. Both components of the two-part tariff are based on principles of averaging costs across different customer groups and cost drivers, with the principles of cost allocation relatively complex. An extension of an average cost approach could help to facilitate a simpler access charging structure with lower administrative burdens imposed on rail network users and operators.</td></tr>
<tr><th colspan="2">Description of rail access charge</th></tr>
<tr><td colspan="2">This option would involve the determination of track access charges based on the allocation of Network Rail's present accounting costs, averaged across users and cost drivers of the GB rail network. There are various cost allocation rules which could be adopted depending on the policy objective (perceived fairness) of allocating present and past rail network accounting costs according to different demand characteristics or cost drivers (cost of supply).</td></tr>
<tr><th colspan="2">Counterfactual</th></tr>
<tr><td colspan="2">Track access charges are to a certain degree already based on a hybrid of Short Run Incremental Cost (SRIC) and Average Cost. For example, forward looking variable cost is allocated to each vehicle type based on the vehicle's share of total 'equivalent' gross tonne miles (EGTM). The fixed charge, to recover network fixed and common costs, is currently allocated to individual franchised passenger operators through a model that broadly allocates the charge on the basis of vehicle miles operated by each operator. This option would involve the extension of these principles potentially to simplify the existing charging structure. The complexity in the current structure is particularly related to different charges for different types of rolling stock.</td></tr>
<tr><th>Information requirements</th><th>Cost drivers</th></tr>
<tr><td>The information requirements for an average cost track access charging methodology are relatively simple compared to the other short-listed options. Network Rail collects and provides present and past network accounting costs as part of its business planning and price control. A set of allocation principles/ rules would need to allocate these accounting costs to different cost drivers and the extent of the use of the network by network users.</td><td>An average cost pricing rules allocates Network Rail's accounting costs allowed under its periodic price control:
▪ Operational expenditure; and
▪ Capital expenditure.
Both network operational costs and network develop/ enhancement costs are likely to vary by patterns of network use and location on the network.</td></tr>
<tr><th>Calculation principles</th><th>Practical issues / considerations</th></tr>
<tr><td>Accounting costs can be averaged across customers and cost drivers. This can be achieved by developing a set of cost allocation principles and a model that reconciles individual customer charges to allowed revenue under the price control. The rules/principles for cost allocation can be relatively complex (for example the approach currently used to set Network Rail's variable charge) or relatively simple (for example where different user types are more aggregative or a simpler set of cost</td><td>The existing variable components of Network Rail's track access charges are relatively complex. For example, EGTM is a function of four cost drivers, including: gross tonne miles, axle weight, unsprung mass and vehicle speed. Freight vehicles have an additional cost driver based on the suspension type of the vehicle (separated into seven bands). An average cost approach could be used to simplify the existing structure of track access charges by for example introducing relatively simpler cost allocation</td></tr>
</table>

drivers are used to determine the variable charge).	principles and cost drivers.

Ex-ante behavioural incentives

Although charges based on average costs have some virtue in fairness, because they share existing costs among customers in proportion to their contribution to present costs, charges based on average cost principles have poor efficiency properties. In principle, Network Rail's structure of charges should give appropriate incentives to train operators to make best use of existing rail capacity and the long term development and pattern of use of the rail network. Average cost charges cannot give adequate incentives for either objective as they reflect past or present accounting costs and can therefore not influence future behaviour in an economic and efficient manner. Averaging across different cost drivers and network users with different demand characteristics could also create 'deadweight losses' – i.e. some customers will pay less than the value they attach to rail network access and will gain as a result of averaging while others will face a price greater than their willingness to pay and will therefore consume less.

Complementarity with existing structure of charges

An average cost approach would be an extension of the hybrid SRIC/ Average Cost basis of the current variable and fixed two-part tariff. The two-part tariff structure would remain in place but the principles of averaging and the allocation of present and past accounting costs would be significantly extended to simplify the existing charging structure.

Cost drivers for which there already exists a degree of averaging in the structure of track access charges include:

- Location: where on the network a train operator requires track access;
- Volume: the volume of network access provided; and
- Time of use: both time of day and time of year.

As well as averaging according to the costs of supplying the rail network, charges can also be averaged according to customers demand characteristics. As with cost drivers, there already exists a degree of averaging in the existing structure of track access charges, including: i) averaging across rail user type; and ii) averaging across rail use.

Complementarity with other charging options

The other charging options considered in this report all intend to provide more explicit price signals to network users with respect to the costs the users impose on network operation and/or development. An average cost approach – although relatively practical – is unlikely to complement other options which seek to increase the cost reflectivity and incentives on Network Rail, train operators, train manufacturers and industry funders.

Practical experience / international case-studies

The most common structure for track access charges in European countries is a simple charge per train kilometre, which may then be differentiated by type of traction, weight, speed and axleload of the train. Some countries (such as Finland) only charge per gross tonne kilometre, whilst others (such as Austria) combine gross tonne kilometre charges for wear and tear with charges per train kilometre for other cost elements. Charges can and have then been differentiated by location, type of traction and time of day, as well as reflecting congestion and external costs. To what extent such complexities are worthwhile in terms of the impact of the incentives they produce is an empirical question (Nash 2005).

Infrabel (Belgium rail infrastructure manager) has developed an Activity-Based-Cost Model (similar to Network Rail's Infrastructure Cost Model) and Enterprise Resource Planning System which seeks to chart all exploitation costs made by Infrabel for all the products and services

offered and provide more detailed information about cost allocations to these products and services. Hungarian State Railway's (MAV Co.) current access charges are provided according to a full cost allocation method, where all cost components are coupled to services and "flow" into the prices of these. The current cost accounting system is not adjusted to serve the needs of marginal cost calculations while the price system uses about 5-8 variables that are available independently from each other to allocate costs to passenger and freight operators. In Latvia, the basic approach taken to charging is full cost recovery. In general, international experience illustrates that countries have either adopted marginal cost access charging principles (with mark-ups) or full cost recovery (after subsidies are accounted for).

Impact on stakeholders

Franchised operators Open access operators Freight operators	▪ The impact on all train operators will depend on the principles and cost drivers adopted for allocating Network Rail's accounting costs. For example, variable charges are currently differentiated by vehicle type and user. A change in these principles will necessarily require changes in the level of track access charges for different types of rail network user. ▪ A change from the existing SRIC basis of the variable charge to a more aggregative historical cost basis would have substantial implications for users' incentives, as well as train manufacturers and industry funders. An average cost approach is likely to worsen incentives acting between Network Rail and network users.

Time and resources required for implementation

This option will require relatively little time and resources to implement by the rail industry as most of the principles already exist. As with most of the short-listed options, an industry consultation is likely to be necessary to understand the impacts on different train operators, to agree the specific details of the regime and evaluation of the costs and benefits relative to the current structure of track access charges.

Time	1 – 3 years implementation.
Resourcing	Relatively simple to introduce and is also likely to reduce administrative burden of track charges provided the basis of averaging and cost allocation is simplified.

Evaluation

- Setting charges equal to average cost facilitates recovery of Network Rail's costs of operating and developing the rail network. However, Network Rail offers a range of products and services to rail users (loosely defined as access to the rail network) which require that some form of cost allocation principles are required to allocate components of cost to different cost drivers and network users. Cost allocation principles create complexity for the rail network charging structure.
- Although charges based on average cost have some virtue in fairness, because they share existing costs among customers in proportion to their contribution to present costs, charges based on average cost principles have poor efficiency properties. Average cost charges cannot give adequate incentives for train operators to either make best use of existing rail capacity and/or the long term development and pattern of use of the rail network as they reflect past or present accounting costs and can therefore not influence future behaviour in an economic and efficient manner.

- The network subsidy is likely to reduce the attraction of an average cost approach as the core regulatory objective is not primarily to ensure that Network Rail breaks-even purely from recovery of access charges. The structure of track access charges – while required to meet revenue requirements – provides an opportunity to provide incentives to network users to economise on network use both with respect to the existing network and in theory the long term development of the network.
- The key attraction of an average cost approach is the simplicity of its implementation and low administrative burden it imposes on network users. However, given the existing structure of charges is based on SRMC principles, introducing an average cost approach will require some implementation resources and would have substantial implications for users' incentives, as well as train manufacturers and industry funders.

Assessment of charging option against industry legal and regulatory constraints

Promote ORR duties under section 4 of Railways Act	Promotes a number of ORR duties under the Railways Act.	✓
Not discriminate between users of the network	Not discriminatory provided AC charges applied to all users of the network.	✓
Be consistent with EU directive 2001/14/EC	To avoid undesirable disproportionate fluctuations, Directive 2001/14/EC allows charges to be averaged.	✓
Ensure charges enable NR to recover allowed revenue	Key principle of average cost based charging is full cost recovery.	✓

Does charging option better meet the ORR's charging objectives?

Average Cost is a relatively simple cost model to implement but fails to provide strong incentives to optimise network use or the efficient development of the network. Given the existing structure of track access charges are based on SRMC, this approach would be quite a significant change. Given stated objectives to improve the cost reflectivity of Network Rail's track access charges and the alignment of incentives between the network owner and network users, an average cost option is unlikely to lead to improvements over the current position.

Sources

Nash, C., '*Rail Infrastructure Charges in Europe*', Journal of Transport Economics and Policy, Volume 29 Part 2, September 2005, pp. 259 – 278

CER., '*Rail Charging and Accounting Schemes in Europe – case studies from 6 European countries*', May 2008

Box 6.3: Regional Short Run Incremental Cost

Rail industry issues	
Usage costs vary significantly both by train and track type. The current variable usage charge is set based on national average usage costs. In order for the variable usage charge to properly reflect the wear and tear caused by different vehicle types on different parts of the network, it would be necessary to introduce geographical disaggregation of variable usage costs. Usage costs could be de-averaged on a zonal, route or line basis depending on cost variability across different geographical areas of the rail network.	
Description of rail access charge	
The current structure of track access charges includes a variable track usage charge, traction electricity charge and electrification asset usage charge. The variable track usage charge broadly reflects the short run incremental costs (SRIC) of rail network use – i.e. the costs of additional (or avoided) operating, maintenance and renewals expenditure. The objective of the charging regime is to ensure that Network Rail's costs are allocated to the train operators who cause those costs to be incurred. The existing assessment of SRIC is at a national average level. A regional SRIC basis for setting access charges would involve more granular (route or area) based costing with an allocation / distribution of costs between vehicles operating on that route/geographic area in proportion to their use and their vehicle characteristics.	
Counterfactual	
The current variable track usage charge is based on national average usage costs, and leads to the charge for a certain class of vehicle being the same regardless of whether, for example, it runs on a major main line, a branch line in Scotland or a freight only line. Current SRIC estimation comprises a hybrid 'top-down' and 'bottom-up' approach: ▪ Forward looking operating, maintenance and renewal costs, by individual asset category, that are deemed to be variable with use are determined. ▪ The aggregated variable cost is then allocated to each vehicle type based on the vehicle's share of total 'equivalent' gross tonne miles (EGTMs). ▪ The EGTM is a function of different cost drivers including: gross tonne miles, axle weight, mass and vehicle speed.	
Information requirements	**Cost drivers**
SRICs are specific to a given baseline of traffic and infrastructure capacity and capability. The SRIC component of track access charges is at present estimated using a combination of engineering approaches: ▪ Top-down analysis involves cost allocation methods which allocate constituent parts of total cost to common cost drivers. ▪ Bottom-up engineering methods are used to determine the variability of different cost categories with the cost driver and to allocate costs to different types of vehicle. These variable elements of cost are identified at the national average traffic density. A localised assessment of SRIC will require detailed	Track infrastructure costs depend on a wide range of factors, including: ▪ Type of track structure; ▪ Track condition; ▪ Elapsed time; ▪ Curvature; ▪ Usage; and ▪ Topography. General maintenance costs and operating costs by route or geographic area are the basic costs that would be included in a localised SRIC charge. Heavy maintenance, renewal, external (social and environmental), disruption (congestion) and opportunity costs of use of rail

information on the distribution of costs and expenditure by route or geographic area of the rail network.	capacity should all – arguably - be included if track access charges are to fully reflect social marginal cost.
Calculation principles	**Practical issues / considerations**
Similar principles to the current estimation of network variable costs but with more granular based costing. This could involve: ▪ Assessing incremental costs 'top-down' by route or area and distributing them between vehicles and operators using that route/area; and ▪ Bottom-up assessment of costs using engineering analysis of variable costs by vehicle at different locations of the existing rail network. See Booz Allen Hamilton / TTCI (2005) for further details on either approach.	Localised (route/geographic area) cost data needs to be sufficiently well developed and reliable to support a more granular assessment of variable cost. The nature of rail infrastructure costs also means that SRIC-based charges will be very low relative to the average total cost of the infrastructure. Some form of adjustment must therefore be applied (for example, as currently in the rail sector, through the two-part tariff) to reconcile localised SRIC track access charges with NR's allowed revenue. In certain locations, however, and at certain times of the day, SRIC may also be much higher, because of disruption and opportunity costs. This creates other practical issues of reconciling cost recovery targets with SRIC pricing. We understand that Network Rail has undertaken some work using its ICM to consider parameters for SRIC type charges on a locational basis for PR08.
Ex-ante behavioural incentives	
Usage costs vary significantly both by train and track type. In a fragmented industry structure, broad access rights without appropriate track use charges can lead to very inefficient track use. Economic theory tells us that setting charges equal to short run marginal/incremental cost should promote efficient use of the rail network. Infrastructure charges which cover SRIC should help to ensure an appropriate level of infrastructure use, and also that scarce capacity is allocated efficiently between competing train operators. If the price is above SRIC, some train operators may be priced off the network even though the value to society of the train path is greater than the cost of making that train path available. Conversely, if the price is below SRIC, some train services may be allowed onto the network even though the benefits generated by those services are less than the cost of providing them. A more localised and granular assessment of SRIC costs should – in theory – help to facilitate a more allocatively efficient utilisation of the rail network relative to a geographically aggregated average charging structure. From the work carried out by Network Rail for PR08 we understand that SRIC costs may be very low on heavily used main line routes such as the West and East Coast lines, but much higher on relatively lightly used rural routes. This is because increased use of busy mainlines has very little impact on maintenance and renewal requirements, whereas increased use of rural lines has a greater impact on such costs. Whilst aware that updated cost information is now available, if these initial observations were confirmed, it is possible that the introduction of SRIC charges could have significant impacts in the longer term on incentives to use different parts of the network. This impact could be partly mitigated by the introduction of a scarcity charge that reflected the opportunity costs of using congested parts of the network.	
Complementarity with the existing structure of charges	
A regional or route based SRIC charge would be an extension of the current variable usage charge,	

based on a geographical disaggregation of variable usage costs. 'Geographically de-averaged tariff' is a broad term than can be used to cover the spectrum of tariffs that range from completely cost reflective bespoke prices for each customer through to tariffs that apply for particular routes and regions of the rail network (for example, England and Wales and Scotland) but are not customized for particular customers. The more incremental geographical de-averaging that occurs (i.e., the more tariffs that are developed for each route or region of the network) the closer the approach becomes to a bespoke tariff, which raises the question of how much incremental de-averaging to engage in. Greater geographical disaggregation in the calculation of variable usage charges would be an extension of an existing approach well understood by industry stakeholders and users of the GB rail network. The fixed component of a two-part tariff (and the network grant) provides the practical means to reconcile the extension of SRMC pricing with Network Rail's required revenue targets. As detailed below, the key issue and practical constraint associated with a localised SRIC option is the accuracy of information about local infrastructure-related costs and the impact of changes in the provision of train services at a local level on those costs. Interestingly, the price of electricity for the traction electricity charge is already split into regions and time-bands and modelled consumption rates are also disaggregated by route as well as vehicle. This illustrates that geographically disaggregated SRIC tariff structures can be implemented for the rail network provided there is suitably accurate information on cost drivers by route and region of the network.

However, it is important to note that overlaying the existing relatively complex track access charges with additional complexity on a regional basis, could lead to a very complex overall structure. This suggests that if SRIC charges were introduced it would be necessary to consider whether some simplification of the existing structure of charges could be implemented.

Complementarity with other charging options

A more localised (granular) variable charge would complement other shortlisted options such as an environmental charge or a slot/route reservation charge that seek to price environmental and opportunity cost elements of social marginal cost. There are similar practical issues with their implementation – such as how to define routes (or geographies) on which more localised and granular assessments of SRIC would be based. As a package, greater geographically based SRIC charging would challenge train operators and their funders financially to better understand the wear and tear and wider social costs they cause by making particular timetabling and train running decisions. However, greater geographical disaggregation with the implementation of other options (such as a reservation charge) would significantly increase the complexity of the track access regime relative to the current structure of access charges.

Practical experience / international case-studies

There are examples of train path per km variable charges having been implemented in France, Italy and Eastern Europe. The network operators in GB gas and electricity provide examples of more geographically based charges using cost data from either within a distribution area or on a network wide basis. National or local system operators are then concerned with ensuring access rights and the allocation of those costs to different types of user of the local network.

Impact on stakeholders

Franchised operators	Franchise agreements protect franchisees from short term changes. Although in the longer term localised SRIC charges would more transparently signal to franchisees and their funders the explicit costs of timetabling and track access right decisions, it will only significantly impact on franchise train operators behaviour if Schedule 18.1 clauses are removed from the franchising framework. Greater geographical assessment of SRIC may in the longer term provide signals to franchise operators and their funders of the costs of running particular services

	in different locations of the GB rail network and as a consequence may impact on the long-term subsidy requirements of different franchise services and routes. The impact on franchised operators (and other train operators) of introducing localised SRIC charges assumes that the mix of the fixed and variable components of the two-part tariff would remain the same.
Open access operators	Although geographically disaggregated variable charges are an option for promoting better allocative efficiency in network use, there will by definition be implications for the economics of existing services and route planning for train operators who are not protected by franchising clauses. Open access operators will be affected by pricing signals and incentives previously not in place for their industry. As discussed above, somewhat counter-intuitively, routes that are lightly used may see charges increase, other routes and areas of the rail network may see charges fall. Regional SRIC pricing may as result either promote or restrict open access competition.
Freight operators	The impact on freight operators is likely to be similar to open access operators. Freight will be affected by pricing signals and incentives previously not in place for their industry and there may as a result be implications for the economic viability of existing services and route planning. Geographically disaggregated tariffs will help to identify the variable costs of different categories of freight only lines (those that link with the main network and facilities and those that are in practice only used by freight, such as freight passing loops).
Time and resources required for implementation	
Since the existing structure of track access charges was established, more information has become available on traffic levels and total expenditure by route. Network Rail has developed the ICM to support route, vehicle and area based costing. ORR and other stakeholders in the GB rail industry will need to ensure there is sufficient confidence in the accuracy of this cost information to support a more granular assessment of SRIC based on particular routes and geographic areas.	
Time	1 – 3 years implementation as a more regional charging regime will require new industry processes to be put in place and to evaluate the robustness of the analysis of geographically disaggregated SRIC, building on initial work from Network Rail. Could potentially be implemented as part of a more comprehensive charging package in CP5.
Resourcing	We expect an industry consultation will be required to understand the impacts on different train operators, to agree the specific details of a regional SRIC regime and evaluation of the costs and benefits relative to the current national average based charges. This will require resourcing input from ORR, Network Rail, train operators and rail industry funders to evaluate the different options and their costs and benefits.
Evaluation	
ORR considered geographically based charges as part of previous reviews of track access charges. At PR08, ORR noted that where geographic cost differences were material, incorrect price signals would be provided to train operators and funders in making decisions on operating train services if nationally averaged variable usage charges were retained. There were two broad components of	

geographical disaggregation of SRIC which were considered: routes related to different customers and routes of different capacity and capability. The more incremental geographical de-averaging that occurs according to these principles (i.e., the more tariffs that are developed for each route or different category of customer) the closer the approach becomes to a bespoke tariff, which raises the question of how much incremental de-averaging to engage in. The primary purpose of a geographically de-averaged variable (SRIC) access charge would be to ensure network users face charges that sufficiently reflect the costs they impose on Network Rail. At a minimum, this would ensure that users of the network and funders of rail services (either at a national or regional level) have confidence that the variable usage charges they are supporting are related to the costs in the areas in which they are operating. There are also the theoretical allocative benefits of variable access charges being set as close as possible equal to a geographically determined SRIC (see discussion on ex-ante behavioural incentives above). However, the benefits of a locally disaggregated SRIC charge principally relate to the consequences of 'price signals' provided by such a charge. By 'price signal' we mean the information that is contained within, and communicated to network users and funders, through prices. The role of price signals (and the ability of rail network users to respond to them) is therefore central to the evaluation and options for de-averaging SRICs. The stronger the price signal, ceteris paribus, the more likely it is that cost reflective differential tariffs will influence rail network decisions and lead to more efficient consumption and investment decisions. However, the differentiation of SRIC charges by route capability and characteristics are only likely to be appropriate where there are material differences in the costs involved. There is also a balance to strike between improving the accuracy of the price signals set by the variable SRIC component of the existing two-part tariff, with the additional complexity that geographically differentiated charges would imply. The more price sensitive particular rail users are, the more likely they are to respond to changes to prices and price differentials on a geographical basis and so produce benefits in terms of network utilisation.		
Assessment of charging option against industry legal and regulatory constraints		
Promote ORR duties under section 4 of Railways Act	Help promote competition in the provision of railway services; regard to the interests, in securing value for money, of the users or potential users of railway services.	✓
Not discriminate between users of the network	Not discriminatory provided regional SRIC charges are applied to all users of the network.	✓
Be consistent with EU directive 2001/14/EC	To avoid undesirable disproportionate fluctuations, Directive 2001/14/EC allows charges to be averaged. However, "the relative magnitudes of the infrastructure charges shall be related to the costs attributable to the services."	✓
Ensure charges enable NR to recover allowed revenue	Would only partially recover Network Rail's allowed revenues – price mark-ups or a two-part tariff also required to ensure cost recovery.	✓
Does charging option better meet the ORR's charging objectives?		
Understanding geographic cost variation is critical to considering the case for regional route based SRIC charges. Interestingly, the traction electricity charge is split by region and time-band and modelled consumption rates are also disaggregated by routes as well as vehicle. Thus there is		

precedent of geographical disaggregation in the existing structure of track access charges provided there is suitable confidence in the variation of SRICs by route or area and the accuracy of cost drivers. Fundamentally, there is a proportionality issue as to whether a significant increase in complexity will also produce sizable benefits from better aligned incentives and more cost reflective price incentives for different customers and routes/areas of the GB rail network. While regional SRIC based charges will increase cost reflectivity - and thus should in theory facilitate better fulfilment of the rail industry's charging objectives - the role of price signals (and the ability of rail network users to respond to them) is central to the long term benefits that a geographically de-averaged SRIC variable track usage charge can promote.
Sources
CEPA, '*The Role of Incentives in the GB Rail Industry*', July 2006 Booz Allen Hamilton / TTCI, '*Review of Variable Usage and Electrification Asset Usage Charges – Final Report Prepared for the ORR*' June 2005 ORR, '*Periodic Review 2008 – Structure of track access and station long term charges*', June 2006 ORR, '*Periodic Review 2008 – Determination of Network Rail's outputs and funding for 2009-14*', Oct 2008

Box 6.4: Scarcity charges

Rail industry issues	
Scarcity costs arise where the presence of a train prevents another train from operating or requires it to take an inferior path. Although industry planning processes exist to guide the pattern of traffic on the rail network, in cases where capacity is scarce, and there are demands on the system which cannot be met, the opportunity costs of preventing a train from operating or forcing a train to take an alternative route are not reflected in the access charging structure.	
Description of rail access charge	
Scarcity charges are levied when a train path is reserved and reflect the opportunity costs of alternative uses of that path. The term path can be replaced by slot or access rights in the description of the scarcity charge (as is used to set airport runway slot charges). The objectives of introducing a scarcity charge would be to facilitate a more efficient allocation of capacity on the rail network and to incentivise efficient holding of paths/access rights compared to paths/access rights used. A scarcity charge could range from a simple flat rate reservation charge (paid when a path is reserved) through to a fully-fledged scarcity charge (where train operators would be charged the full economic value of reserving a path). In this box we focus on the second option of a scarcity charge based on the opportunity cost and which would be paid irrespective of whether the path is used.	
Counterfactual	
Planning processes in the rail industry such as ORR's Track Access Policy, Route Utilisation Strategies (RUSs) and the Network Code currently guide industry decision making regarding the level, type and pattern of traffic on the GB rail network. They are used as the principal mechanisms for incorporating capacity utilisation and path reservation/ holding into industry decision making: ▪ The objective of each RUS is to set out the effective and economically efficient use of capacity on any particular route. RUSs are also an input into the calculation of Network Rail's Schedule 8 access contracts recovered through the capacity charge. ▪ The Network Code relates to track charges through conditions Part G: Network Change and Part J: Changes to access rights. Part J includes a number processes designed to ensure the release of unused or underused capacity to encourage efficient holding of paths and routes. These processes include specific arrangements for access right review meetings and "use it or lose it" provisions where operators are judged to have failed to use a train slot if they have made not made a train movement in a period of 90 days. ▪ Where capacity choices exist, ORR also applies procedures to ensure the fair and efficient allocation of network capacity through the Track Access Policy. This can involve cost-benefit analyses of the alternative uses of capacity and the approval of track access rights. Introduction of a scarcity or reservation charge would involve adopting a more explicit price incentive approach to capacity utilisation and route allocation compared to the planning approaches currently adopted in the GB rail industry.	
Information requirements	**Cost drivers**
Benefits from scarcity charges are most likely to result if levied for sections of track where demand exceeds capacity and there are constraints on running additional trains on routes. This requires a measure of where rail network capacity is constrained. ORR has previously proposed that capacity could be defined as constrained where the Capacity Utilisation Index exceeds a certain	Opportunity cost of alternative use of network capacity slots. The charge could be levied by: ▪ reservation (per train path basis); ▪ path cancellation (per train path basis); ▪ bottleneck (per train/ km/ network node); or ▪ train line. The scarcity charge should be levied by the type

level. Route Utilisation Strategies also provide useful information of trade-offs between different uses of paths.	of constraint (cost driver) preventing the running of additional trains on the GB rail network. We focus in this box on a charge for the right to use a particular part of the network, based on the opportunity cost.
Calculation principles	**Practical issues / considerations**
A number of alternative approaches have been proposed to calculate the value of train path/ slots, including: ▪ Auctioning; ▪ Use of models (to estimate the net social benefit of alternative use of slots); and ▪ Charging customers the LRIC of expanding the capacity of the network Use of models requires extensive demand and cost data from freight, passenger operators and the infrastructure manager. For examples of application in GB rail see Johnson and Nash (2005) – a case study of Britain's East Coast Main Line. Calculating a reservation charge is likely to be significantly simpler compared to a fully-fledged scarcity charge – although there is still an issue of establishing the value of a given train path and whether the charge should be rebatable if the right/path is used.	Key practical issues include: ▪ Defining when capacity is constrained. ▪ Defining a "path". ▪ Allocating slots on an efficient basis. ▪ How much to charge for capacity. Bottlenecks are likely to interact to constrain operators on certain routes – creating complexity. Physical characteristics of the rail network and commercial requirements of franchise operators will also impose constraints on the 'efficient' use and allocation of capacity on the rail network. Estimating the *social opportunity cost* of use of network capacity.
Ex-ante behavioural incentives	
We would expect a scarcity or reservation charge to help incentivise train operators to make more efficient use of existing network capacity. This may help lower whole infrastructure renewal and development costs. Although a pricing system does not currently determine the use of capacity - which is allocated according to franchise agreements and industry planning processes – a scarcity charge would provide explicit price/ financial incentives to train operators to economise on their use of network capacity. However, there will also be practical issues and considerations (see above) that are likely to result in constraints on the behavioural and efficiency properties of a scarcity/reservation charge. The impact of a financial incentive on rail network users' actual behaviour will also depend on the interaction of the scarcity charge with existing planning processes for capacity utilisation.	
Complementarity with the existing structure of charges	
A reservation or scarcity charge could be implemented through the existing fixed element of franchised train operator track access charges. A study for ORR by the Leeds Institute for Transport Studies proposed the option of amending the existing fixed element of the two-part tariff so that it is effectively regarded as a prime user reservation charge which entitles the franchisee to the level of access rights specified in their track access agreement. An explicit scarcity charge could then be levied on freight and open access operators (and franchise operators for additional train path/routes sought so as to avoid discrimination between operators) to determine the allocation of remaining marginal slots on particular rail network routes. This would provide all train operating companies and their funders with price incentives regarding the use of capacity outside the fixed franchise service	

agreements. Alternatively, a scarcity or reservation charge could be netted off Network Rail's other variable charges or additional to the existing charges (for example a mark-up applied to the variable usage charge for congested areas). ORR has previously proposed the option of additional revenue raised by Network Rail in a scarcity charge being ring fenced to pay for enhancement schemes to relieve network capacity constraints. Although a scarcity charge shares common features with the existing capacity charge, both are sufficiently different in their objectives that one might expect both to remain in place. How the current capacity charge and a scarcity charge might interact would, however, require careful consideration before a scarcity charge was implemented. As with all the options being evaluated, we are generally assuming that Network Rail would not be able to keep any additional revenue raised, but that instead it would be netted off the existing charges to meet the revenue requirement. However, this does not preclude providing Network Rail with an incentive to share some of the additional revenue raised where they have an ability to influence the more efficient use or development of the network.	
Complementarity with other charging options	
A scarcity charge would complement a tariff structure that also charges train operating companies the wear and tear they cause (SRMC), environmental costs and – potentially – long run marginal costs of rail network use. Explicit route/ path reservation charges could be introduced as a more "granular" package of track access charges which include route or area based SRIC costing for general maintenance and operating costs recovered through the variable component of the two-part tariff. Train operators would then be presented with locational price incentives for capacity and general wear and tear costs. However, a move to route/ area based charging on a capacity and variable cost basis will inevitably increase the complexity of track access charges relative to existing structures and cost estimation.	
Practical experience / international case-studies	
Switzerland has path cancellation fees (per train path); France has a train path reservation fee (per path kilometre reserved) – applied differently to both passenger and freight trains and accounting for approximately 55% of charging revenue.	
Impact on stakeholders	
Franchised operators	Franchise agreements protect franchisees from short term changes in track access charges. Although in the longer term, a scarcity charge would more transparently signal to franchisees and their funders the explicit costs of timetabling and track access right decisions, a scarcity charge will only significantly impact on franchise operator behaviour if Clause 18.1 is removed from the franchising framework. If performance regimes and the outputs of franchise operator agreements were also made more flexible, then the introduction of a scarcity charge could potentially facilitate more of a "market" for marginal slots outside the core franchising system.
Open access operators	The introduction of a form of scarcity charge will affect open access operators' access to marginal network slots. However, as with freight and franchised passenger operators, the ability to respond to scarcity price incentives will depend on the particular interactions with network planning processes and constraints imposed through the RUSs and Network Code access policy conditions. Provided industry planning processes are aligned with a scarcity charging structure, we might expect the introduction of a scarcity charge to help facilitate open access

	competition on particular routes and areas of the network depending on franchise operator obligations. The actual impact on the overall level of track access charges will depend on the utilisation of specific paths or routes sought by existing or future open access entrants.
Freight operators	Many of the issues would be similar to those for open access operators, although the freight only lines may not be particularly affected by the introduction of a scarcity charge.
Time and resources required for implementation	
A reservation charge was consulted on as part of PR08. The complexities and constraints on its implementation are therefore well understood by the GB rail industry. Implementation of a scarcity/ reservation charge would require an annual assessment of capacity constrained slots/routes and consultation on how the value of slots/routes might be established. There exists significant research by both academic and regulatory commentators on how a reservation charge could be practically implemented in GB using existing industry processes and governance (for example, Capacity Utilisation Index and Route Utilisation Strategies) however from a process perspective ORR will also need to demonstrate that the introduction of a scarcity charge better meets its charging objectives relative to the current regime.	
Time	1 – 3 years implementation as a scarcity charging regime will need to be aligned with a review of access policy and rights, and the role of network planning processes in capacity allocation.
Resourcing	We expect an industry consultation will be required to understand more fully the impacts on different train operators, to agree the specific details of a scarcity/ reservation charging regime and how (or whether) planning processes will need to develop to align with an access charging structure that prices scarce capacity. This will require resourcing input from ORR, Network Rail, train operators and rail industry funders. Operation of a scarcity charging regime (for example through bidding) could also increase transaction costs in the rail industry and will require Network Rail to manage the process.
Evaluation	
ORR considered the option of introducing a reservation charge as part of PR08. ORR concluded that given the complexity of defining when capacity was constrained and existing industry planning processes related to congested infrastructure it was more attracted to a reservation charge than a fully-fledged scarcity charge. However, following further work and consultation with the rail industry, ORR concluded in its final determination for CP4 that there was insufficient evidence that a reservation charge would produce net benefits for the industry. A simple reservation charge continues to have the most practical appeal for the industry and could be levied on access rights which are fully documented and stable. However, there remain other implementation issues such as should the charge be rebateable if the right/ path is used and should the charge apply only where capacity is constrained? Given franchise agreements and other long term access agreements mean the allocation of paths and slots are often fixed for a number of years and industry planning processes (Route Utilisation Strategies; Network Code; Track Access Policy)) guide the long term allocation of capacity, scarcity charges are only likely to have the greatest benefit (and be most practically implemented) in guiding the allocation of marginal slots outside the primary access allocation process. The key issue is whether there is a stated objective to create more of a "market" for capacity and access rights (price mechanism approach) or whether the existing industry processes are considered sufficient to achieve an effective and economically efficient use of capacity	

on particular routes and train paths (planning mechanism approach). Given the protections in place for franchised operators, it is also important to be conscious that the introduction of a scarcity/reservation charge is likely to have the most significant impact on the freight and open access passenger operators. While the introduction of a scarcity charge may increase the overall cost to freight and open-access operators of track access, provided the charge is set at relatively low level, the incentive properties may still be maintained without significantly increasing the financial costs of track access. The financial effect of introducing a scarcity charge could also be mitigated by a more general rebalancing of the level and allocation of costs in Network Rail's overall track access charging structure.		
Assessment of charging option against industry legal and regulatory constraints		
Promote ORR duties under section 4 of Railways Act	Promote competition in the provision of railway services for the benefit of users of railway services; development and use of railway network to the greatest extent economically practicable.	✓
Not discriminate between users of the network	Not discriminatory provided all operators pay a charge for additional train path/routes sought.	✓
Be consistent with EU directive 2001/14/EC	Permitted under European Directive 2001/14 (Article 12) - "Infrastructure managers may levy an appropriate charge for capacity that is requested but not used. The charge shall provide incentives for efficient use of capacity."	✓
Ensure charges enable NR to recover allowed revenue	Would recover a small proportion of Network Rail's allowed revenues as part of two-part tariff structure.	✓
Does charging option better meet the ORR's charging objectives?		
A simple flat rate reservation charge would reflect the opportunity cost of a path, and increase the cost reflectivity of track access charges while also being practical in implementation. Even if only implemented for marginal routes/slots (with marginal financial incentives) there may be longer term benefits for whole industry costs and shorter term benefits from more efficient utilisation of capacity constrained network bottlenecks. The key issue is whether use of a price mechanism approach would result in a far more efficient and effective allocation of capacity compared to the existing network planning processes.		
Sources		
ECMT, '*Charges for the Use of Infrastructure in ECMT Railways*', 2005 Institute for Transport Studies, '*Scoping study for scarcity charges – final report for the Office of Rail Regulation*', March 2006 Johnson, D and Nash, C, '*Charging for Scarce Capacity: A case study of Britain's East Coast Main Line', Third Rail Conference on Railroad Industry Structure, Competition and Investment*, 2005 ORR, '*Periodic Review 2008 – Structure of track access and station long term charges*', June 2006 ORR, '*Periodic Review 2008 – Determination of Network Rail's outputs and funding for 2009-14*', Oct 2008 ORR, '*Review of Access Policy*', January 2010		

Box 6.5: Cost-benefit sharing and customer outputs

Rail industry issues	
Using the structure of track access charges to make Network Rail more responsive to the needs of train operators and incentivised to develop the network while driving down whole industry costs. Reviewing the existing structure for track access charges with a view to improving incentives along the value-chain of the rail industry.	
Description of rail access charge	
Track user incentive mechanisms could be structured to directly expose Network Rail to movements in operator revenues. Current charges indirectly reflect revenues collected through a levy on vehicle miles although Network Rail does not gain any more overall revenue. Introducing some form of revenue sharing may have the potential to improve risk allocation and incentives within the system as a whole. Previous investigation of cost-benefit sharing has identified that the benefits of this approach could be enhanced through the introduction of complementary customer-led output-based charges. Cost-benefit sharing would be a step in a new direction for UK rail regulation, introducing the notion that Network Rail should take a stake in the benefits delivered to ultimate customers, rather than just serving to recover the operational costs they incur. As a result, these proposals might be seen as a change in the price control framework, rather than an amendment to the structure of track access charges.	
Counterfactual	
TOCs currently receive significant revenue sharing support from the DfT. Thin margins, relatively unchanging costs and volatile revenues make companies susceptible to failure when demand is low. In order to reduce this risk, DfT "share" and "support" deviations from companies' franchise bidlines. DfT share half of TOC revenues above their target revenue for each year up to a company-specific threshold beyond which it takes 80 percent of incremental revenue raised. In any year when revenue collected falls short of target revenue, DfT top up a portion of this difference. Between 98 and 100 percent of target revenue DfT top up half of the difference, and below this level TOCs receive 80 percent of the deviation. Companies must provide performance bonds and maintain cash liquidity to give DfT confidence that they will fulfil their obligations. These arrangements mean that TOC revenues are already relatively protected from volume risk. The resulting regulatory framework for franchisees acts as a hybrid revenue and price cap. These arrangements are not in place for all rail users.	
Information requirements	**Cost drivers**
Simple forms of cost-benefit sharing only require forecast and actual revenues. This could be applied alongside existing revenue sharing arrangements with the DfT.	n/a
Calculation principles	**Practical issues / considerations**
Cost-benefit sharing could be introduced in a number of different forms. However, one concrete proposal has been suggested by ATOC. They proposed that Network Rail could share "around" 20 percent of the difference between forecast and actual passenger revenues in any year. Network Rail's exposure could be capped and sharing tapered on either side of the forecast	This may require some negotiation regarding the current revenue share/support structure with the DfT. Additional revenue sharing would have to avoid creating tipping points or dampening customer service incentives. There could also be consideration of whether it could displace some of DfT's exposure, which might be the DfT's desired outcome from the approach. ATOC suggest that if a revenue share/support

level. However these parameters would be important in determining how effective cost-benefit sharing could be, and may be incompatible with existing arrangements.	mechanism were introduced, that Clause 18.1 / Schedule 9 would be waived in new rail franchises let under their proposals. This may mean that even if not desirable on its own merits, it may be instrumental for introducing more valuable reforms. Revenue sharing may interact with Network Rail's variable charges, resulting in a form of pseudo-profit sharing that has knock on effects for other incentives or mechanisms.

Ex-ante behavioural incentives

In isolation of any conflicting impacts from other charges, cost-benefit sharing would, all things being equal, have two intended behavioural effects:

- **Incentivising valuable investments** – there are a number of "modest" investments that Network Rail could make that would benefit the rail system as a whole, but which it is not currently incentivised to complete as it is insensitive to the value of the passenger flow. Network Rail is not incentivised to target investment towards projects that would result in higher revenue per km and therefore releasing the greatest value to the system as a whole. If Network Rail was exposed to some of this upside through revenue sharing and/or additional output incentives it might become more pro-active in targeting these investments. This effect would be contingent on significant cultural change on behalf of Network Rail and require more guaranteed upside on investments to work.
- **Incentivising Network Rail to find operating cost solutions** – to the extent that they were available, Network Rail would benefit from looking for solutions to provide more innovative timetabling options, and other approaches to improve revenue that did not involve capital investment to expand capacity.
- **Reducing rail operator risk premia** – while rail operator access costs are based on traffic metrics, their revenues are based on the value of passengers/goods transported. While the number of trains operated and operator revenues are correlated (it would be interesting to test this assertion), there is a mismatch between the relatively fixed access costs per train and the variable revenues they raise. The uncertainty this creates for profit margins theoretically results in operators charging an implicit risk premium in their prices. If operators could better align their marginal revenues and costs, this premium should fall. Revenue sharing would bring revenues closer into line with costs (i.e. revenues become less variable. These factors would make operator margins less variable enabling companies to reduce the implicit risk premium built into their prices to the benefit of customers. However, this may not materialise until franchise re-tendering.

Known side effects of this approach include:

- **Increased revenue requirement** – The transfer of volume risk to Network Rail may result in a higher allowed cost of capital (than otherwise) to compensate for its exposure. The magnitude of this increase would depend on both Network Rail's financial position and forthcoming investment requirements. This would translate into higher costs to be recovered from rail operators. Therefore, risk transfer is paid for by rail users, unlike under revenue sharing with the DfT, where the incremental risk is immaterial and costs are spread across the entire tax base. This would at least partially offset any reduction in operators' risk premia.

Complementarity with existing structure of charges

As cost benefit sharing is a new approach, driven by downstream revenues rather than costs, and risk transfer from companies to Network Rail, it may not be simply to bolt it on to the existing structure of charges before addressing a number of questions, the answers to which may be different

depending on whether there are output-based charges:

- What is the interaction between incentives based on number of trains and the number of passengers?
- Would it displace or supplement existing sharing mechanisms?
- Could Network Rail feasibly be exposed to unlimited risk and what would the incentive effects be of capping it?
- How would it affect franchise bidding?

Complementarity with other charging options

While a number of the considerations for revenue sharing remain the same irrespective of other charging options, certain charges may be more compatible than others. In particular, LRIC-based charging may complement revenue sharing well. This would link investment cost and longer-term horizons with charges paid.

Practical experience / international case-studies

The UK National Air Traffic Services price review has a 50 percent revenue driver built into the determination. Volume risk sharing was introduced in 2003, following financing problems in the aftermath of 9/11. A mechanism was introduced such that volume risk is shared equally between NATs (En Route) plc (NERL) and its users, when volumes are greater than 80 percent of those forecasted. Below this level, they are shared, but NERL are only exposed to 20 percent, reflecting their fixed costs. This has the twin effect of shielding users from price volatility and encouraging NERL to become more adaptable to volumes, especially when they are low.

Impact on stakeholders

Franchised operators	TOC profit margins would stabilise, reducing the overall risk to franchisees. Revenues should be boosted by investment being targeted at improvements that would generate the greatest increase in revenue.
Open access operators	If open access operators had revenue sharing, they may be more incentivised to enter into routes with more volatile or uncertain revenues. Provided a revenue sharing mechanism were symmetric, it would provide a hedge against lower than expected revenues following market entry relative to the increase in track access charges from running additional/new services. Compared to the existing charging structure, a revenue sharing mechanism may, ceteris paribus, therefore reduce overall risk to open access operators and increase (on a case by case basis depending on the sharing mechanism) the incentive to run additional services on new routes and lines where previously revenues were considered too volatile or uncertain to warrant entry.
Freight operators	Freight operators would have to have different output measures constructed. They would be able to free ride on any incremental benefits of upgrades, but the value to them may be lower than passenger trains due to the lower time importance of their cargo. Separate examination of cargo revenues would be required. However it would be beneficial for Network Rail to make investments that would be important for freight too. Therefore, at least some form of output measure may be justifiable.

Time and resources required for implementation		
Implementation of this approach on its own would not require significant additional time or resources. However, introduction of complementary output measures alongside it might introduce new information requirements.		
Time	1 – 3 years implementation as CBS and CLO approaches will need significant consultation and investigation into appropriate incentive parameters. Implementation may need to be delayed to allow parallel introduction of mechanisms across companies and sectors.	
Resourcing	We expect an industry consultation will be required to understand more fully the impacts on different train operators, the impact on Network Rail and its cost of capital, and how it would interact with cost-based access charges. This will require resourcing input from ORR, Network Rail, train operators and rail industry funders. Operation of CBS and CLO could be operated at low cost but may require further costly reviews.	
Evaluation		
• Risk premium maybe offset by increase in cost of capital for Network Rail. • This may mean that companies not sharing revenue with Network Rail may be subsidising those who do. • Could you achieve the same effect by getting DfT to share more risk instead, and then using more targeted output measures? May output-based measures alone be sufficient? • To what extent could Network Rail share revenue with companies instead of DfT? • Would Network Rail like some up-side? • ORR would have to work closely with DfT to fit this into franchise agreements.		
Assessment of charging option against industry legal and regulatory constraints		
Promote ORR duties under section 4 of Railways Act	Promote efficiency and economy on the part of persons providing railway services; promote use of the rail network and development of the rail network to the greatest extent economically practicable.	✓
Not discriminate between users of the network	Not discriminatory provided all operators are subject to the charging regime.	✓
Be consistent with EU directive 2001/14/EC	In principle there is no reason why a cost-benefit charging structure would be inconsistent with the EC Directive.	✓
Ensure charges enable NR to recover allowed revenue	NR may be required to top up rail user revenues. This option as its key principle provides an interaction between NR's required revenue and track charging structures.	✓
Does charging option better meet the ORR's charging objectives?		
We cannot fully answer this question until we have a more full understanding of its implications and interaction with other charges now or in the future. Adopting this approach would mark a		

fundamental change in the regulation of rail operators and Network Rail, and therefore its consequences should be considered closely. While the incentive effects of sharing may be weak, it may be useful as a bargaining tool for facilitating new charging structures. Sharing can help protect company margins and reduce their vulnerability to shocks, but does not necessarily have harmful effects. Companies may be willing to remove Clause 18.1 from their licences going forward to allow its introduction, and in doing so, the greatest value of this approach may be to open up the possibility of more efficient regulation.
Sources
http://www.caa.co.uk/docs/5/ergdocs/20100209NATSPriceControl.pdf http://www.atoc.org/clientfiles/File/publicationsdocuments/FutureFranchisesReport_AW.PDF

Box 6.6: Track occupancy charges for train paths and routes

Rail industry issues

Network Rail's existing structure of track access charges is based on a two-part tariff (fixed: variable) which seeks to recover capital and operating costs. Although this charging framework is relatively simple in principle, its application is relatively complex as a result of the range of tariffs offered to different types of user of the rail network and the role of engineering principles and different classes of rolling stock in setting the variable component of the two-part tariff. Charges are also set on an average network wide basis and are not geared towards maximising the efficient use of individual train "paths" and routes across Network Rail's rail network.

Description of rail access charge

This option considers a track occupancy charging framework, whereby charges could be levied on per minute per train service or per train km basis for the use of different paths and routes on the rail network. We focus on how the principles of a track occupancy charging framework could be used to help simplify Network Rail's current structure of track access charges and facilitate better use of scarce capacity on individual paths and routes of the rail network.

A track occupancy charging framework could focus on a number of metrics as the basis for charges levied by train path or route, including:

- maximum charge per train km per train path;
- maximum charge per minute per train service per train path; and
- maximum charge per gross tonnes train kms or gross tonnes minutes per train path.

A track occupancy framework which accounts for weight ("gross tonnes miles" or "gross tonnes minutes") would be more complex (although closer to the existing regime) compared to a simple charge per train km/per minute per train path. If train weight was considered a necessary variable in the structure of track access charges (as it is currently) a series of "weight bands" could also in principle be adopted as a more simplified approach.

A maximum charge per minute per train service would be similar to the track access charging framework in place High Speed 1 (HS1) (the high speed railway between St Pancras in London and the Channel Tunnel which connects with the international high speed routes between London and Paris, and London and Brussels). The HS1 charging framework provides that track access charges may include:

- an investment recovery charge (to recover the costs relating to the construction of HS1 and, potentially, any further investments in relation to HS1); and
- a charge to recover operating and maintenance costs and lifecycle repayment (renewal) costs (ORMC).

The principles of the investment recovery charge are to reflect the usage of HS1 by train operators and to recover a significant part of the long term capital costs of the HS1 project over the life of its concession. The charge is set in terms of track occupancy (i.e. time spent on the HS1 through line) by way of a maximum charge per minute per train service per timetabled paths (not actual paths used). The apportionment of costs for the OMRC charge is also set on basis of minutes used of the HS1 through line.

Counterfactual

Network Rail's structure of track access charges is based on a two-part tariff. Cost apportionment for the variable element of Network Rail's forward looking efficient costs is calculated based on vehicle type share of total 'equivalent' gross tonne miles. Cost apportionment for the fixed charge is based on similar principles, whereby the fixed charge is allocated between train operating

<table>
<tr><td colspan="2">companies based on relative vehicle miles by each operator. There are over 500 passenger track usage charges and over 3000 freight track usage charges based on different vehicle classes. A track occupancy charging structure could facilitate a simpler access charging regime as train operator usage-based charges would be based on train km or time spent on a train path or route.</td></tr>
<tr><th>Information requirements</th><th>Cost drivers</th></tr>
<tr><td>A measurement of time and quantity of use on a train path/route would be required to implement this option. Provided the track occupancy charging framework is based on timetabled paths (not actual paths used) and scheduled journey times of services (as is the case for HS1) this is likely to be relatively easy to administer as timetabling decisions and planning frameworks are already in place for Network Rail and train operating companies.</td><td>▪ Journey lengths.
▪ Stopping patterns.
▪ Speeds.
▪ Journey time.
▪ Weight (if included as part of the track occupancy framework).</td></tr>
<tr><th>Calculation principles</th><th>Practical issues / considerations</th></tr>
<tr><td>The calculation principles will depend on the capital and operational costs that are intended to be recovered by Network Rail's track access charges. For example, similar principles of track occupancy could be used for apportionment of both fixed and variable costs assuming the network grant remained fixed and the apportionment of revenue recovered through fixed and variable usage charges also remained constant. Alternatively, a separate investment recovery charge (as for HS1) could be adopted solely for recovering a particular enhancement or investment between different types of rail user. The calculation principles thus depend on the objectives of introducing a track occupancy charging regime.

Including weight as an additional variable in the charge will add complexity, although different bands of weight ("low", "medium" and "heavy") could be adopted in order to simply the influence of different vehicle types and weights compared to the existing structure of access charges.</td><td>The most important practical consideration is how to balance the objective of a simplified track occupancy charging framework with the objective of charges levied on a train path basis, while also potentially including train weight considerations.

With respect to a maximum charge per minute per train service per train path, although the principles of regulation and charging may be similar, the business model for Network Rail is very different from that of HS1:
▪ The revenues recovered by the HS1 charging framework are based on the concession to design, build, finance and operate the Channel Tunnel Rail Link Project.
▪ The charging framework for HS1 only applies to single route, although connected to parts of the freight and passenger service rail network. In contrast, the revenues recovered by Network Rail contribute to the operation, maintenance, enhancement and renewal of a much larger and complex rail network with multiple routes and service models.

The complicated ways slots and routes are put together to produce a variety of types of services, and the fact that the value of a particular slot for a particular use depends on how other slots are being used, could also create complexity (as for a more explicit scarcity charge on a train path or route basis).</td></tr>
</table>

Ex-ante behavioural incentives
A track occupancy charging regime would reflect time or km usage of Network Rail infrastructure by train operators and so provides an incentive for use of the railway infrastructure. If Network Rail track access charges were applied purely on the basis of minutes used, there would be an obvious incentive to reduce journey times and increase train speeds. If stopping at stations was also included in time spent on Network Rail infrastructure, then clearly charges for stopping train services would be greater than for non-stopping services (HS1 excludes the incremental time it takes for a train to stop at a station in order to remove this disincentive). Depending on the volume risk borne by Network Rail, a track occupancy framework could also create an incentive on Network Rail to maximise scheduled journey times (HS1 Ltd bears volume risk and therefore can introduce strategies to manage that risk by introducing discounts to encourage development of new rail services). A track occupancy charging framework, based on either a train km or minutes used basis, would approximate a form of "capacity" charge, although because charges are based on capacity used (and not the opportunity cost of scarce capacity) this would simply allocate cost according to a measure of capacity, and would not provide incentives to operators to economise on their use of scarce network capacity. Incentives for more efficient use of scarce capacity would be achieved through an explicit scarcity charge as discussed elsewhere in the report.
Complementarity with existing structure of charges
A track occupancy framework will require significant change to cost apportionment calculations although the overall structure of the charge (two-part tariff) could largely remain in place. In practice, a charge per minute or train km per train path will need to be calculated on the basis of timetabled paths and scheduled services which will fundamentally change the number and format of the track access charging product. Depending on the degree of granularity sought, a track occupancy framework is also likely to simplify Network Rail's structure of charges. However, the most fundamental change will be a charge levied on a train path basis.
Complementarity with other charging options
Route/path based charges are also considered under the regional SRIC and scarcity charging option. A track occupancy framework is similar in terms of implementation (path/route based charges) although the principles for cost apportionment are very different under the different approaches. The investment recovery element of the HS1 track occupancy tariff provides a useful case study of how a LRIC type enhancement or investment based charge could be recovered from different train operators on a "per minute per train service" basis. Depending on how volume risk is integrated into the regulatory regime, a track occupancy framework also shares features and properties with the cost-benefit sharing and customer outputs option. A track occupancy charging framework in particular shares properties with a scarcity charging framework – both are geared towards charging for use of train paths / capacity. However, as noted above, a scarcity charge is levied on the basis of a right to use a particular part of the network, based on the opportunity cost of scarce network capacity.
Practical experience / international case-studies
HS1 provides the direct example of how a track occupancy charging framework can be implemented, although it is important to note that this applies to single high-speed rail route while Network Rail's network consists of many different types of route (main-line, urban, rural etc.) Belgium has a combination of train-path line and installation charges for access and use of its rail network (one of the parameters in the formula of the train path-line charge is the total mass of the train). France also has train path-line charges; although these form a reservation charge to incentivise operators to use the network in an optimal way. Germany also has a form of train-path

pricing system.	
Impact on stakeholders	
Franchised operators	As with the other options, franchise agreements protect franchisees from short term changes for core services. However, a track occupancy charging framework would have strong incentives for the types of additional services run by franchised operators. Depending on how track occupation is measured there will also be long-term signals to funders and franchise operators of the costs of different timetabling decisions.
Open access operators	Similar to additional franchise operator services, charging on the basis of time of occupation of the network would create an incentive to reduce journey times and increase train speeds. Thus, the types of services offered by open access operators may be fundamentally affected by a track occupancy charging structure.
Freight operators	Freight will be affected by pricing signals and incentives previously not in place for their industry and there may as a result be implications for the economic viability of existing services and route planning. Interestingly, the charging framework for HS1 is structured so as to recover only the marginal costs to HS1 Ltd of providing for freight services. A similar "ring-fencing" of freight could be adopted if track occupancy were implemented for Network Rail.
Time and resources required for implementation	
Charging on the basis of track occupancy would be a fundamental change for the industry. However, provided charges were calculated on the basis of timetabled route and scheduled journey times/km then the industry processes are already in place for its implementation.	
Time	1-3 years implementation depending on the form of the track occupancy charging framework adopted by the industry.
Resourcing	▪ Extensive industry consultation would be required as cost apportionment would change significantly from the current approach to the variable and fixed charge. ▪ Likely to be relatively simple to administer given charges will be more closely aligned with the timetabling schedule for all types of train operator services.
Evaluation	
Track occupancy charging has significant merit in terms of facilitating a simpler charging framework for different types of train operator. However, Network Rail's network is significantly more complicated than the single HS1 rail route with a much greater variety of train services offered on different routes and lines. For example, a number of routes are timetabled for stopping services, which under a pure track occupancy framework would incur significantly higher charges than non-stopping services. If (as for HS1) charges for stopping services were reduced by the incremental time it takes for a time to stop at a station then this may significantly increase the complexity and the administration of the charging regime when the primary objective in the first place is to simplify charges relative to the existing approach. As with the regional LRIC/SRIC options, a track occupancy charge levied on train path or regional basis will have fundamental implications for the pricing signals and incentives for the industry as currently there are no pricing signals by route or geography. The complicated ways in which slots and routes are put together to	

produce a variety of types of services could also create complexity.

Most fundamentally, a track occupancy charging framework is unlikely to reflect the costs which different users impose on Network Rail and other operators as a result of network use. Although occupation of the network provides an approach for apportioning costs incurred by Network Rail (as it does for investment recovery for HS1) minutes or km per train service is unlikely to be the primary driver of forward looking efficient costs either on a short run or long run basis. Short run costs relate more to the type of vehicle using the network (as in the current variable track usage charge) and long run costs relate to usage relative to capacity of a route or line. Although a track occupancy charge (minutes used or km) approximates a capacity charge, such a charging framework does not account for opportunity costs of scarce rail network capacity and therefore would not necessarily incentivise operators to use the network in an optimal way. As is illustrated by the potential disincentive for offering stopping train services, a track occupancy framework also has the potential for perverse incentives and unintended consequences unless the regime is carefully designed to reflect the types of train operators and services expected to use parts of Network Rail's infrastructure.

Assessment of charging option against industry legal and regulatory constraints

Promote ORR duties under section 4 of Railways Act	Promotes a number of ORR duties under the Railways Act.	✓
Not discriminate between users of the network	Not discriminatory provided charges are applied to all users of the network.	✓
Be consistent with EU directive 2001/14/EC	A track occupancy framework would be consistent with the EU directive.	✓
Ensure charges enables NR to recover allowed revenue	No change to the two-part tariff structure would be required to implement track occupancy.	✓

Does charging option better meet the ORR's charging objectives?

The primary benefits of a track occupancy approach are its apparent simplicity and focus on charging for capacity (e.g. through a per minute charge) rather than simple wear and tear. However, the analysis suggests that applied to Network Rail's network such a regime may not be as simple as its development and application for HS1. More fundamentally, a track occupancy charging framework is unlikely to reflect the costs which different users impose on Network Rail as a result of network use and therefore while having administrative merits is unlikely to better meet ORR's charging objectives relative to the existing regime.

Sources

CER, '*Rail charging and accounting systems in Europe – Case studies from six countries*', May 2008

High Speed 1, '*Network Statement*', August 2009

High Speed 1, '*Second Consultation on Prospective Levels and Principles of Track Access Charging for the High Speed 1 Railway*,

ORR, '*Regulation of High Speed 1: Statement by the ORR*', October 2009

6.4. The impact on rail users

One of the most important, but also one of the hardest aspects of the qualitative evaluation, is to consider the potential impact of the options set out above on rail users. Part of the difficulty is that without a more detailed specification of each option it is difficult to provide anything other than a high level indication of the likely impact on rail users. In particular, there are a variety of ways in which particularly the fundamental change options could be implemented, that would potentially have significantly different impacts for different groups of rail users. As noted above the regional LRIC and average cost options could both be implemented with relatively more or less complexity that could have significant impacts on the incentives created by the options. It is also difficult to identify the impact on rail users because it will depend on whether the Clause 18.1 provisions remain in place unchanged, in which case most options for change would have no appreciable impact on TOCs during their current franchises (with the impact limited to additional services or changes to core services), or if some changes to this clause were made, in which case, depending on the nature of the changes, there would be an impact on TOCs within their current franchise period. Table 6.2 summarises the potential direction and magnitude of the impact of the different options on three groups of rail users – franchised TOCs, open access passenger operators and freight users.

Table 6.2: A summary of the potential impact of the different options on rail users

Option	Franchised TOCs	Open access operators	Freight operators
Regional LRIC	No material impact while Clause 18.1 remains in place, but likely to send much stronger signals to funders and TOCs under new franchises about efficient development of the network.	Substantial increase in costs if required to pay LRIC in addition to current variable charges, but could promote more efficient decisions.	As for open access operators.
Average cost	It depends on whether there are changes to the Clause 18.1 provisions.	Depends on how the proposals are introduced, but compared to only paying variable charges it could significantly increase the costs, without improving efficiency incentives.	As for open access operators.
Regional SRMC	Will change costs by geography, but only if there is a change in	Could affect current operating decisions with changes to the attraction of different	As for open access operators.

	Clause 18.1.	routes leading to more efficient decisions.	
Scarcity charge	Could send better signals in the longer term about the best locations for investment. Impact at least partly depends on how any change would interact with the current administered approaches to allocating capacity.	Could reduce the incentives to run some routes. Same issue as for franchised TOCs regarding the current administered processes.	As for open access operators. Same issue as for franchised TOCs regarding the current administered processes.
Cost benefit sharing	Some revenue stabilisation and improvements should be better targeted.	Would depend on nature of sharing, but could in principle increase entry on more risky routes from a financial perspective. A symmetric revenue sharing mechanism, would act as a hedge against lower than expected revenues following market entry to a train route.	Very much depends on the approach to implementation.
Track occupancy charge	No material impact unless there were changes to Clause 18.1 of the franchise agreements. Could then lead to substantial impacts regarding incentives to run trains, including stopping services.	Depending on the level of the charge it could materially change the most cost effective routes.	Similar issues to those for open access operators.

This table illustrates the importance of whether there are changes to Clause 18.1 in determining the potential impact of the options to change track access charges. Many of the options have the potential to significantly increase the charges paid by open access and freight operators who currently only pay variable charges. Any incremental charges faced by these operators have the potential to substantially affect the economics of these operators. Assuming that changes were introduced without increasing Network Rail's revenue allowance then this increase in charges for open access and freight operators would over time lead to lower charges for franchised TOCs. The options would generally only have a direct effect on franchised TOCs within their current franchise period if there were changes

to Clause 18.1. Options could be introduced on a phased basis so that changes came into effect in each franchise area at the point of franchise renewal.

6.5. An overall package of reforms

6.5.1. Incremental changes

As noted earlier in this section, the third, fourth, and fifth options that we have set out – regional SRIC, a scarcity charge and cost benefit sharing - could each in theory be implemented in isolation as an addition or change to the current track access charges, without substantially affecting the existing charges. For a scarcity charge some adjustments to the fixed charges would be required, assuming that it was intended that Network Rail's overall revenue allowance did not increase. The cost benefit sharing approach is explicitly premised on the basis that Network Rail would have the scope to earn additional revenue or lose some revenue. Depending on the structure of the regional SRIC this could result in a material change to the fixed charge to ensure revenue recovery.

As the evaluations above indicate there are potential advantages and disadvantages for all of these options, and substantial further work would be required to implement the options. In terms of a way forward, we would propose the following:

- The regional SRIC option would only relate to a relatively small proportion of network costs, and would not impact the FTACs. In principle greater geographic cost reflectivity through the regional SRIC approach would send better signals about wear and tear costs. Given Network Rail has already done some work on these issues it appears to be an area where further research could usefully be undertaken with a view to seeing whether a more cost reflective approach could be developed without substantially increasing the complexity of the charging structure. This option should be pursued irrespective of whether other options are pursued.
- The scarcity charge option has the greatest potential to have an impact if it also affects franchised TOCs. If they are not included it is likely to have only a marginal effect on open access and freight operators. Although we have not done sufficient analysis to reach a definitive conclusion, we expect this means that a scarcity charge only effectively covering open access and freight operators may not lead to benefits that outweigh costs, but ORR could consider this in more detail. If the Government is prepared to consider some amendments to Clause 18.1 of the franchise agreements then this might be a good time to consider a wider application of scarcity charges.
- The cost benefit sharing option would be best pursued through co-operation with the DfT as and when new franchises are tendered. This option has the potential to lead to improvements in the incentives for Network Rail to promote better use of the network and more co-operation with train operators, and we would recommend

that it is pursued further. If ORR wishes to pursue this option it would be helpful to first discuss the issues with the DfT to understand its enthusiasm for aligning this approach with the provisions of new franchises, although it could also be introduced for open access and freight operators without close working with the DfT.

While a scarcity charge could be implemented as an incremental change to the existing structure of charges, it could also provide signals and be related to the introduction of LRIC based charges, which we discuss further below.

6.5.2. More fundamental changes

Considering the three options that involve more fundamental changes to the existing structure of track access charges, namely LRIC and average cost charging, and the track occupancy charge, we consider further below how they might be implemented in practice. Of the three options we consider that LRIC has the greatest potential to lead to longer term benefits through more efficient allocation of network capacity, and in particular, the development of future network capacity.

However, LRIC is also potentially the most complex and hardest of the options to implement in practice. For example, how would LRIC based pricing complement and interact with industry planning processes, track access rights policy and the role of third-parties in funding enhancements? There are also practical issues associated with specifying enhancements and allocating costs to existing and future users of the network. Given its inherent complexity, a LRIC approach is only likely to be most appropriate in circumstances when demand is expected to exceed capacity in the foreseeable future, and therefore investment signals upon which decisions such as where to invest and how much are the primary objective. We discuss further below some of the particular issues with implementing LRIC, and some simpler variants on a full LRIC approach that might nevertheless lead to many of benefits being realised.

Before this discussion we consider further the average cost and track occupancy charge options. The average cost option is relatively simple to implement compared to the other fundamental change options, but its incentive properties, particularly for the longer term development of the network are likely to be poor. We would not recommend ORR pursue this option, and priority should be given to trying to make the LRIC approach work effectively.

The track occupancy charge option would have more significant implementation issues given the degree of change compared to the current structure, and furthermore, it would not provide strong signals for the efficient development of the network. However, it may provide stronger signals for the efficient use of the existing network. We are sceptical about the benefits of this approach, but recognise that only with substantial further work could a more definitive evaluation of this option be made in the context of trying to implement it across a whole network.

6.5.3. Options to implement LRIC

As discussed earlier in the report, the introduction of a full LRIC approach is potentially very complex and would require a large amount of work on the part of Network Rail, ORR, project sponsors and other stakeholders. However, it has the potential through the information it transmits about the costs of expanding network capacity to send very valuable signals to network users and funders about the costs of network expansion, which could better inform expansion decisions. The complexity of LRIC is probably the key reason why it has not been implemented more widely in the regulated sectors, although the energy sector has made extensive use of LRIC, and often at a highly disaggregated level, which does at least show that it can in theory be implemented at a highly granular level.

There are a number of important issues that have to be considered when deciding whether and how to implement LRIC:

- What charges do the users pay, and in particular, do they pay the prevailing LRIC, which will be high before expansion and low after expansion, or do they pay the costs of expansion over the useful life of the assets after they have been built?
- How do the LRIC signals feed through into Network Rail's decisions about which investments to make and when?
- Given the Government's role in developing the HLOS, what role would LRIC play alongside the HLOS?

If rail users pay the prevailing LRIC there is a risk that charges are very volatile. In particular, just prior to a capacity expansion being undertaken the LRIC may be very high, and users willingness to pay would be a strong signal that the investment should be undertaken. However, once the investment has been undertaken the LRIC could be quite low for a period unless the users paid the prevailing costs of the expansion for the useful life of the assets. We generally consider that where an investment is triggered by a willingness to pay on the part of a TOC or freight operator then they should pay the additional costs for the useful life of the asset as they are deriving the benefits. It is more difficult where the decision to invest is made by requirements specified by a funder, although in practice where this funder is tendering for a significant proportion of the services then any concern falls away.

There is likely to be a process of trial and error to determine in what way and at what level of disaggregation to specify the increments to capacity for the estimates of LRIC. The potential volatility of LRIC can be mitigated in two main ways that mean the approach can better be described as LRAIC. First, LRIC estimates can be calculated over relatively large regional areas and the costs recovered in a similar way. Second, the costs can be recovered over the useful economic life of the assets, which will help address potential volatility. It would also be appropriate for users in the future to contribute to the costs of the capacity

enhancement where they derive benefits from using the assets that have been funded by other users (as under the existing rebate mechanism for investors in large-scale enhancements). This will be a more important issue the greater the level of granularity at which LRIC is estimated, and therefore the more specific users pay for particular enhancements.

It is beyond the scope of this review to consider precisely how Network Rail's price control would be adapted to complement the LRIC approach. However, in broad terms it would seem appropriate that the investments undertaken by Network Rail should follow from the signals provided by LRIC, where the TOCs, freight operators or funders signal a willingness to pay. This is effectively the approach in the gas transmission sector where user willingness to pay is a basis for National Grid's investment decisions and returns under the price control.

It is possible that the LRIC approach could be implemented as an additional approach to the HLOS requirements. For example, TOCs and freight operators could choose to pay the charges implied by LRIC on an incremental basis for specific assets they require over and above the developments included in the HLOS. This would be similar to the current approach being used for a development in the Chiltern Railways area, but the use of LRIC would provide signals over time to train operators and freight users for capacity expansion.

Way forward

To introduce any of these more fundamental changes would require substantial further work by ORR and other stakeholders including Network Rail. We would recommend that ORR pursue the LRIC option through further work. We recommend that ORR does not pursue the average cost approach, and while we are sceptical about the benefits of a track occupancy charge we recognise that much further work would be required before a full evaluation of this option could be made.

6.6. The implications of the institutional context of the rail sector

All of the options discussed above require some co-operation or change of approach by other stakeholders in the rail sector for a change in track access charges to have a substantial effect. In particular, most of the options would have a substantially greater effect if there were changes to Clause 18.1 of the franchise agreements so that TOCs were exposed to the impact of changes in charging structures (other than just for additional services and changes to core services), even if their overall financial position was largely unchanged. A more detailed analysis of any of the options discussed above would need to consider whether the likely benefits of change compared to the status quo was likely to be positive with and without changes to Clause 18.1.

Although a lack of change in the institutional context may significantly reduce the potential benefits from introducing many of the options discussed above, it does not entirely eliminate

the possibility that some options could be worthwhile, particularly as any changes would feed into franchises as they were re-let. The scarcity charge and cost benefit sharing options may fall into this category.

6.7. Summary

In this section we have evaluated a long list of potential options to change the charging structure in the rail sector against a set of criteria that are substantially similar to ORR's charging objectives. We have evaluated in further detail six of the initial long list of options. We identified three potential incremental changes that could be made to the charging structure, which are a regional SRIC approach, a scarcity charge and a cost benefit sharing approach. All of these options could be implemented with minimal changes to the existing charging structure. We also identified three more radical options to change the charging structure – an average cost approach, a regional LRIC approach and a track occupancy charge. These options would require additional work and analysis before they could be introduced, but some of these options, and particularly the LRIC option, have the potential to substantially improve the incentives for efficient network use and development within the rail sector.

As discussed above, all of the options to varying degrees, would have a bigger impact compared to the status quo if other changes to the institutional structure of the rail sector were made at the same time as these changes.

Of the six options identified as requiring further consideration we believe there are four which may offer improvements for the sector if applied to some, or all, of the customer groups using the rail network. Three of the options are incremental changes and one involves a fundamental change. They are:

- a regional SRIC which could allow a simplification of the current charging structure;
- a scarcity charge based on the opportunity cost for paths or routes at times of congestion;
- cost benefit sharing between train operators and Network Rail; and
- a LRIC based approach.

At this stage we do not recommend that ORR further pursues the average cost option.

Although we have some reservations about the track occupancy charge, until substantially more work is undertaken to consider how it would work across the whole network it is difficult to fully evaluate the potential of this option. ORR could consider further work to allow a more robust evaluation of this option.

To establish whether some or all of the changes should be employed requires further analysis. This should involve the detailed definition of a specific application of the approach and then an assessment of the advantages and disadvantages of that specific approach. This

should allow the establishment of whether all customer groups or just specific targeted groups should be subject to a revised track access regime. Further detailed modelling of the approach and a determination of the implementation issues also need to be undertaken before any change can be considered.

Many of the options that we have recommended for further consideration place greater emphasis on the value rather than the accounting costs of services using the rail network. Although the precise impact of this will depend on how the options were implemented in detail, it is likely that over time they would encourage the development of services that have higher value in terms of the revenue that can be raised from running the services, which could displace some lower value services.

It is likely to be important to think about how best to combine the different options, and in particular, it will be important to ensure that the incentives across different types of lines and routes are appropriate. For example, combining regional SRIC and LRIC could help ensure that appropriate signals are in place for congested and uncongested routes. SRIC for heavily used congested routes may be low (as illustrated by cost analysis carried out by Network Rail for PR08) but LRIC high, and conversely for uncongested relatively lightly used rural routes and train lines.

7. CONCLUSIONS

Our report is primarily intended to begin a debate about whether and how the track access charges should be changed in time for the next control period. Therefore, rather than reaching definitive conclusions on whether and how track access charges should change, we have focused on identifying the most promising options for ORR to consider in more detail in the future. For any of the options we have identified ORR and other stakeholders, including Network Rail, would need to undertake substantial further work before a change in charges could be implemented.

We have considered incremental and more fundamental options for changes to the charging structure.

7.1. Incremental changes

We set out three options – a regional SRIC (variable) charge, a scarcity charge and cost benefit sharing – which could each in theory be implemented in isolation as an addition or change to the current track access charges, without substantially affecting the existing charges. For a scarcity charge, some adjustments to the fixed charges would be required, assuming that it was intended that Network Rail's overall revenue allowance did not increase. The cost benefit sharing approach is explicitly premised on the basis that Network Rail would have the scope to earn additional revenue or lose some revenue. Depending on the structure of the regional SRIC this could result in a material change to the fixed charge to ensure revenue recovery.

In terms of a way forward:

- The regional SRIC option would only relate to a relatively small proportion of network costs, and would not impact the FTACs. In principle greater geographic cost reflectivity through the regional SRIC approach would send better signals about the use of current capacity. Given Network Rail has already done some work on these issues it appears to be an area where further research could usefully be undertaken with a view to seeing whether a more cost reflective approach could be developed without substantially increasing the complexity of the charging structure. This option should be pursued irrespective of whether other options are pursued.
- The scarcity charge option has the greatest potential to have an impact if it also affects franchised TOCs. If they are not included, it is likely to have only a marginal effect on open access and freight operators. Although we have not done sufficient analysis to reach a definitive conclusion, we expect this means that a scarcity charge only effectively covering open access and freight operators may not lead to benefits that outweigh costs, but ORR could consider this in more detail. If the Government is prepared to consider some amendments to Clause 18.1 of the franchise

agreements then this might be a good time to consider a wider application of scarcity charges.

- The cost benefit sharing option would be best pursued through co-operation with the DfT as and when new franchises are tendered. This option has the potential to lead to improvements in the incentives for Network Rail to promote better use of the network and more co-operation with train operators, and we would recommend that it is pursued further. If ORR wishes to pursue this option it would be helpful to first discuss the issues with the DfT to understand its enthusiasm for aligning this approach with the provisions of new franchises, although it could also be introduced for open access and freight operators without close working with the DfT.

While a scarcity charge could be implemented as an incremental change to the existing structure of charges, it could also provide signals and be related to the introduction of LRIC based charges.

7.2. More fundamental changes

To introduce any of the more fundamental changes – regional LRIC, average cost approach or a track occupancy charge - would require substantial further work by ORR and other stakeholders including Network Rail. We would recommend that ORR pursue the LRIC option through further work. We recommend that ORR does not pursue the average cost approach, and while we are sceptical about the benefits of a track occupancy charge, we recognise that much further work would be required before a full evaluation of this option could be made.

7.3. Institutional constraints

All of the options discussed above require some co-operation or change of approach by other stakeholders in the rail sector for a change in track access charges to have a substantial effect. In particular, most of the options would have a substantially greater effect if there were changes to Clause 18.1 of the franchise agreements so that TOCs were exposed to the impact of changes in charging structures (beyond additional services and changes to core services), even if their overall financial position was largely unchanged. A more detailed analysis of any of the options discussed above would need to consider whether the likely benefits of change compared to the status quo was likely to be positive with and without changes to Clause 18.1.

Table 7.1 below presents a summary assessment of each of the shortlisted options against the evaluation criteria developed for this report. We then summarise our overall conclusions.

Table 7.1: Summary assessment of short-listed options against evaluation criteria

Evaluation Criteria	Regional LRIC	Average Cost	Regional SRMC	Scarcity Charge	Cost-benefit sharing	Track occupancy charge
Cost reflectivity	Valid measure of the long run impact on Network Rail of increasing demand and provides signals to operators regarding costs of alleviating scarce capacity.	Determination of track access charges based on allocation of Network Rail's accounting costs. Costs can be averaged across customers and cost drivers.	Similar principles to the current estimation of variable costs but with more granular based costing.	Reflect the opportunity costs of alternative uses of train paths or routes.	Track user incentive mechanisms structured to directly expose Network Rail to movements in user revenues.	Track occupancy charging framework unlikely to reflect the costs which different users impose on Network Rail and other operators from network use.
	✓✓✓	✓	✓✓	✓✓	✓✓	✓
Revenue recovery	Could potentially recover costs of network enhancements. Volatility of LRIC estimates may require additional revenue recovery mark-up to complement the two-part tariff.	Setting charges equal to average cost facilitates recovery of Network Rail's costs of operating and developing the rail network. Key principle of average cost based charging is full cost recovery.	Would only partially recover Network Rail's allowed revenues, but the two-part tariff ensures full cost recovery.	Would recover a small proportion of Network Rail's allowed revenues, but the two-part tariff ensures full cost recovery.	Network Rail may be required to top up rail user revenues. This option as its key principle provides an interaction between Network Rail's required revenue and track charging structures.	No change to the two-part tariff structure would be required to implement track occupancy charges.
	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓	✓✓✓
No undue discrimination	Given strong cost reflectivity there is limited concerns about undue discrimination.	Not directly discriminatory, but can argue that poor cost reflectivity means some users would pay	Not discriminatory provided SRIC charges applied to all users of the network.	Not discriminatory provided all operators pay a charge for additional path/routes sought.	Not discriminatory provided all operators are subject to the charging regime.	Not directly discriminatory, but can argue that poor cost reflectivity means some users would pay

Evaluation Criteria	Regional LRIC	Average Cost	Regional SRMC	Scarcity Charge	Cost-benefit sharing	Track occupancy charge
		unreasonably large charges.				unreasonably large charges.
	✓✓✓	✓	✓✓✓	✓✓✓	✓✓✓	✓
Promote competition	Explicit investment signals of future enhancements may trigger entry or exit from the rail network.	Compared to only paying variable charges could increase costs, without improving efficiency incentives.	Could affect current operating decisions with changes to the attraction of different routes.	May help facilitate open access competition on particular routes and areas of the network.	Would depend on nature of sharing, but could in principle increase entry on more risky routes.	Could lead to substantial impacts regarding incentives to run trains, including stopping services.
	✓✓	✓✓	✓✓	✓✓	✓✓	✓
Effect on customers	LRIC provides price signal incentives to users of their long-run impact on Network Rail's costs of increasing demand.	Substantial impact on user incentives, as well as train manufacturers and industry funders.	More price sensitive rail users are, the more likely they are to respond to price differentials on geographic basis.	Impact depends on how any change would interact with current administered approaches to allocating capacity.	Revenue sharing would bring operators' costs closer in line with their revenues.	Potential for perverse incentives and unintended consequences unless regime is carefully designed.
	?	✓	?	✓✓✓	✓✓✓	?
Simplicity	Complex in a GB rail context, particularly given industry constraints.	Key attraction of an AC approach is its simplicity of implementation and low administrative burden.	Could lead to very complex overall structure if overlaid on existing track access charging structure.	A reservation charge would be relatively simple to implement and was consulted on as part of PR08. A full scarcity charge may be more complex.	Cost-benefit sharing could be introduced in a number of different forms with different levels of complexity.	Track occupancy facilitates a simpler charging framework for different types of train operator.
	✓	✓✓✓	✓	✓✓	✓✓	✓✓✓

Evaluation Criteria	Regional LRIC	Average Cost	Regional SRMC	Scarcity Charge	Cost-benefit sharing	Track occupancy charge
Optimise network	LRIC based charging structure would provide incentives for optimal long term use and development.	AC fails to provide strong incentives to optimise network use or the efficient development of the network.	In theory should help to ensure an appropriate level of infrastructure use.	Help incentivise train operators to make more efficient use of existing network capacity.	Could incentivise Network Rail to target investment towards projects that would result in higher revenue per km.	Track occupancy unlikely to be driver of forward looking efficient costs on a short or long run basis.
	✓✓✓	✓	✓✓✓	✓✓✓	✓✓	✓
Promotion of growth	Capacity is priced cheaply when there is an excess of supply, thus discouraging construction of further capacity.	Fails to provide optimal incentives for the efficient development of network.	Provides incentives for the optimal use of the existing network.	Could send better signals in the longer term about the best locations for investment.	Regional LRIC based charging may complement cost and benefit sharing well. This would link investment cost and longer-term horizons with charges paid.	Although a track occupancy charge approximates a capacity charge, such a charging framework does not account for opportunity costs of scarce network capacity.
	✓✓✓	✓	✓✓	✓✓	✓✓	✓
Practicality	Complex, although may be practically implemented if a simplified approach for the recovery of specified investments and enhancements were adopted.	Will require relatively little time and resources to implement by the rail industry as most of the principles already exist.	Proportionality issue as to whether a significant increase in complexity and granularity of costs will produce sizable benefits from better aligned incentives and more cost reflective price	Implementation of a scarcity charge would require an annual assessment of capacity constrained slots/routes and mechanism for value of slots/routes	Adopting this approach would mark a fundamental change in the regulation of rail operators and Network Rail. Its consequences should be considered closely.	Charging on the basis of track occupancy would be a fundamental change for the industry. However, provided charges were calculated on the basis of timetabled route

Evaluation Criteria	Regional LRIC	Average Cost	Regional SRMC	Scarcity Charge	Cost-benefit sharing	Track occupancy charge
			incentives.	established.	Introduction of output measures alongside cost benefit sharing might introduce new information requirements.	and scheduled journey times/km then the industry processes are already in place for its implementation.
	✓	✓✓	✓	✓✓	✓✓	✓✓✓

7.4. Overall conclusions

Of the six options identified as requiring further consideration we believe there are four which may offer improvements for the sector if applied to some, or all, of the customer groups using the rail network. Three of the options are incremental changes and one involves a fundamental change. They are:

- a regional SRIC which could allow a simplification of the current charging structure;
- a scarcity charge based on the opportunity cost for paths or routes at times of congestion;
- cost benefit sharing between train operators and Network Rail; and
- a LRIC based approach.

At this stage we do not recommend that ORR further pursues the average cost option.

Although we have some reservations about the track occupancy charge, until substantially more work is undertaken to consider how it would work across the whole network it is difficult to fully evaluate the potential of this option. ORR could consider further work to allow a more robust evaluation of this option.

To establish whether some or all the changes should be employed requires further analysis. This should involve the detailed definition of a specific application of the approach and then an assessment of the advantages and disadvantages of that specific approach. This should allow the establishment of whether all customer groups or just specific targeted groups should be subject to a revised track access regime. Further detailed modelling of the approach and a determination of the implementation issues also need to be undertaken before any change can be considered.

ANNEX 1: CURRENT TRACK ACCESS CHARGES

Introduction

This Annex provides background and further detail about Network Rail's current structure of track access charges. As well as more general background to access charges, we discuss the objective/ intention of each component of the charging regime, including the key issues and complexities associated with each charge.

Background to access charges

Charges for access to the railway infrastructure have been in place since privatisation. Access charges were first included in the track access contracts between train operators and Railtrack as the first franchises were let or when the first freight track access contracts were approved. The current structure of access charges was largely determined at the periodic review 2000 (PR2000) for passenger train operators and the review of freight charging policy 2001 for freight train operators.[27]

In 2006 ORR gave Network Rail greater responsibility for leading the work to develop proposals for the majority of access charges for CP4. The intention was to encourage Network Rail to have a greater degree of ownership of access charges and build on its improving cost knowledge following its work to develop its infrastructure cost model (ICM). Network Rail's proposals for access charges were then subject to the review of ORR and its approval at PR08. The broad division of responsibilities between Network Rail and ORR for producing track access charges is illustrated in Figure A1 below.

The global objective for the access charging regime is to just recover Network Rail's efficient total costs. However, given the nature of the rail network cost base and the need to provide appropriate incentives, the existing charging regime is more complex than an overall 'average charge'. Instead, a number of individual charges are levied with specific purposes in mind. As far as possible these charges are levied on those parties using the rail network that 'cause' the costs to be incurred.[28]

The existing charging regime has two main elements:

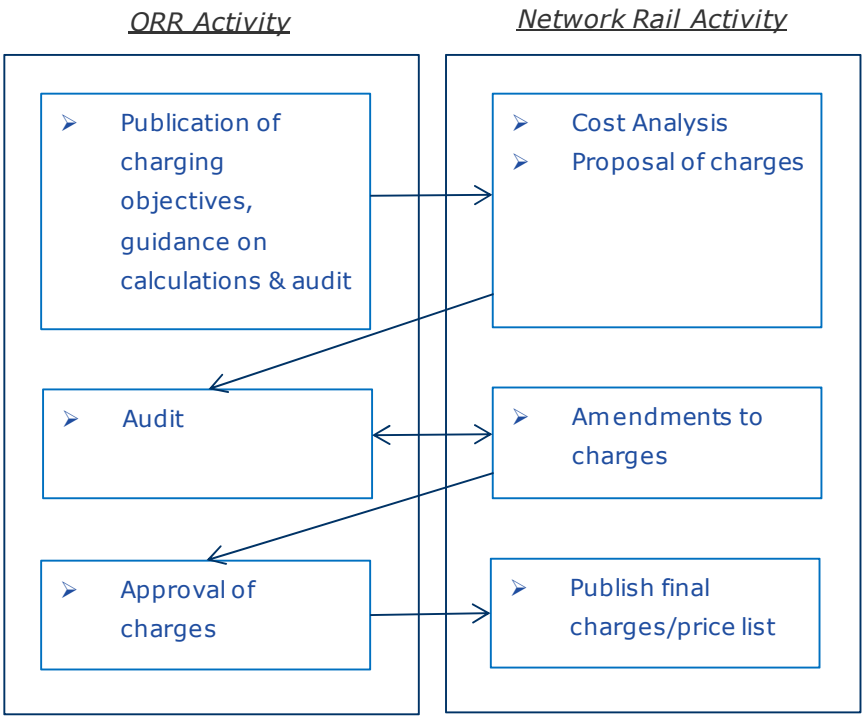
- *Variable charges* - to provide signals to provide signals for optimal rolling stock development and network usage in the short-term, paid by all train operators across the network. These charges include: variable track usage charges; capacity charges; and electricity traction charges.[29]

[27] http://www.rail-reg.gov.uk/upload/pdf/383.pdf
[28] Network Rail, Strategic Business Plan – Supporting Document Structure of Charges, October 2007
[29] CER, 'Rail Charging and Accounting Systems – Case Studies from six countries', May 2008

- *Fixed charges* – which recover Network Rail's residual revenue requirement after estimating the income from all the variable track access charges, the station long term charge, network grants and other price control income. The fixed charge is only paid by franchised train operators.

The establishment of the existing charging structures for track use is based on a large body of industry research of railway infrastructure costs and their variability. It focuses on recovering the efficient costs caused by use of the existing infrastructure by way of a two-part tariff structure. In the sections which follow we describe the objective and issues associated with each of the components of the two-part tariff.

Figure A1: Responsibilities for calculating and determining access charges



Source: ORR

Variable usage charge

The variable usage charge is designed to recover Network Rail's operating, maintenance and renewals costs that vary with traffic; in economic terms this reflects the short run incremental cost. The variable usage charge provides incentives on operators in relation to services and rolling stock deployment across the network. The current variable usage charges are based on a network-wide average rate for each vehicle type. Network Rail's approach for calculating the variable charge in CP4 is based on a range of relationships in the ICM about the causation of maintenance and renewals costs on the network due to traffic.

Variable electricity traction charge

The traction electricity charge enables Network Rail to recover the costs incurred in procuring electricity for train operators for traction purposes. The traction electricity charge level for a specific service is dependent on the:

- price of electricity;
- rate at which electricity is consumed; and
- the electrified vehicle miles operated.

The price of electricity is split into 22 regions and timebands and consumption rates are disaggregated by routes as well as vehicle.

Electricity asset usage charge

The electricity asset usage charge recovers Network Rail's variable maintenance and renewals costs of electrification assets, e.g. overhead lines. The charge is based on estimating the likely element of electrification costs that vary with small changes to the number of rail services operating on the network, based on use of the ICM and expert judgement. The electricity asset usage charge is part of the calculation of individual vehicle usage charges.

Capacity charge

The capacity charge was introduced as part of PR2000. The charge recovers additional schedule 8 (performance regime) costs of additional traffic on the network. These costs arise because as the network becomes more crowded it becomes more difficult for Network Rail to recover from incidents of lateness and achieve its schedule 8 performance regime benchmarks. The capacity charge was initially intended to provide incentives to train operators to take account of the higher whole industry costs associated with operating at busy times and on congested parts of the network. The current form of the capacity charge is a simplified version of a charge per route section and time-band that was originally envisaged.

Coal spillage charge

The coal spillage charge recovers the cost impact of spilt coal on Network Rail's additional maintenance and renewals costs. The costs of coal spillage depend in large part on the volume of coal transported. The charge is levied as a 'per gross tonne mile' mark-up on the variable usage charge.

Freight-only line charge

Freight operators pay a range of variable charges but until PR08 did not contribute to Network Rail's fixed costs or common costs The freight-only line charge recovers the fixed

costs of freight only lines. The full costs of freight only lines can only be charged where the freight market can bear this cost.

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Freight operators pay a range of variable charges but until PR08 did not contribute to Network Rail's fixed costs or common costs The freight-only line charge recovers the fixed costs of freight only lines. The full costs of freight only lines can only be charged where the freight market can bear this cost.

Fixed track access charge

The fixed track access charge recovers Network Rail's residual revenue requirement after estimating the income from all the variable track access charges, the station long term charge, network grants and other price control income. Fixed costs are allocated to individual TOCs using a range of traffic metrics at a number of different levels of geographical disaggregation. At a very high level this can be summarised as being based on the percentage of timetabled train miles that a TOC represents as a proportion of total timetabled train miles within a particular geographic area.

At PR08, Network Rail introduced a number of changes to the way the charge is allocated between TOCs by increasing the disaggregation of the fixed maintenance and renewals costs. Fixed renewals and maintenance costs are now allocated to 307 strategic route sections and on the basis of timetabled vehicle miles. Broadly this is equivalent to charging average cost for train miles in each of the 307 strategic route areas.

Summary

The global objective for the track access charging regime is to just recover Network Rail's efficient total costs. However, given the nature of the rail network cost base and the need to provide appropriate incentives, the existing charging regime is more complex than an overall 'average charge'. Instead, a number of individual charges are levied with specific purposes in mind. The existing charging regime has two main elements focused on recovering the efficient costs caused by use of the existing infrastructure by way of a two-part tariff structure.

Franchised passenger operators pay a fixed track access charge as well as variable track access charges. Freight and open access operators pay variable track access charges and, where applicable, the freight-only line charge and coal spillage charges.

ANNEX 2: ECONOMIC PRINCIPLES AND CONCEPTS

Introduction

The theoretical and practical issues of access pricing and marginal cost estimation in both competitive and regulated markets is a widely debated subject.[30] The technical nature of the analysis and the economic characteristics of capital intensive infrastructure services (such as railway networks) creates complexity for cost estimation and the principles of cost apportionment to different users of the infrastructure service.

Estimation of costs focuses on the economic and financial interface which underpins the practical application of economic principles to access pricing.[31] There are several definitions of cost which can be used for setting access charges, giving very different options for how charges could be set.

The principle definitions of cost include:

- average cost;
- incremental cost; and
- marginal cost.

We briefly discuss each of these definitions in the subsections below. Following these short descriptions, we discuss the definitions of long run unit costs (including long run average cost, long run incremental cost and long run marginal cost) and their application to railway track infrastructure charges. Finally we provide a brief discussion of "opportunity cost" and its relevance to rail network access pricing.

Average Costs

Average costs are total present costs of providing a product or service averaged across customers. Typically they are expressed as Average Cost per unit given output x. In a rail industry context, Average Cost would reflect the average cost of operating and maintaining the existing rail network per unit of demand (demand could be defined as number of train services run, total miles of journey or minutes used of the rail network).

Algebraically, Average Costs are expressed as:

$$\text{Average cost} = \text{Total Cost (TC)} / \text{Output (Q)}$$

Average Cost principles have poor efficiency properties because although they share costs among users in proportion to their contribution to cost of a fixed output, they do not

[30] See Turvey. R., 'What are marginal costs and how to estimate them?', CRI Technical Paper 13, 2000 & 'Access Pricing, Investment and Efficient Use of Capacity in Network Industries', CRI Proceedings 32 2004

[31] 'Access pricing: the economic and financial interface', Peter Vass, CRI 2001

provide incentives or price signals to customers or users with respect to how costs vary with output.

Marginal costs

Marginal cost is an estimate of how cost would change if output changed.

Short run marginal cost (SRMC) measures the cost of increasing output when some production inputs are fixed. Applied to rail infrastructure, the SRMC measures the cost of accommodating an additional train on the existing rail network. Strictly, this includes not only direct costs (in particular, wear and tear of the track) but also congestion costs (for which the capacity charge is a proxy) and / or the opportunity costs to other operators of using scarce capacity (represented by a scarcity charge).

The long run marginal cost (LRMC) measures the cost of increasing output when all inputs can be varied. Applied to rail infrastructure, it measures the cost of accommodating an additional train service over a time period when the capacity of the network can be increased.[32]

Algebraically, marginal costs are expressed as follows:

$$\text{Marginal Cost} = \Delta TC / \Delta Q \text{ (where } \Delta Q = 1 \text{)}$$

$$\text{Consequently: Marginal Cost} = \Delta TC$$

Marginal cost therefore means a first derivative, that is the slope of the total cost curve at each level of output.

As is illustrated by the distinction between SRMC and LRMC an assessment of marginal cost includes a time dimension as the analysis needs to consider the period of time over which costs vary.

Incremental costs

Marginal cost can be difficult to measure in practice because it is not always possible to measure the change in cost caused by a one unit change in output, even if costs are ultimately recovered over the useful life of an enhancement. Incremental costs are an alternative approach to marginal costs and are based on a substantial (i.e. non-marginal) change in a future output. As for marginal costs, incremental costs can be analysed in short-run and long-run terms.

Algebraically, incremental costs are expressed as follows:

$$\text{Incremental Cost} = \Delta TC / \Delta Q \text{ (where } \Delta Q \text{ is a non-marginal change in Q)}$$

[32] NERA, 'An examination of rail infrastructure charges – Final Report prepared for the EC', 1998

As is illustrated by the formulae above, although marginal and incremental costs are similar in principle, their estimation and therefore properties as the basis for setting access prices are not the same.

Long run costs

An analysis of long run costs needs to consider demand and costs over a planning period for a service or asset.

In the context of infrastructure systems, an important part of the analysis is whether long run costs relate to an existing system, and whether costs for expanding or replacing that system relate to forecast growth in demand (based on an industry planning scenario) or the cost of expanding the system to meet incremental demand *over and above* the industry base planning / investment horizon.

The table below summarises the key definitions of long run unit costs.

Table A.1: Definitions of long run unit costs

Long run unit cost	**Definition**	**Cost recovery**
Long run average cost (LRAC)	The constant annuitized cost per unit of capacity over the planning period.	Average long run cost of maintaining current level of capacity.
Long run average incremental cost (LRAIC)	The constant annuitized cost of an investment scenario per unit of additional capacity over the planning period.	Average cost of recovering a base investment scenario for the planning period.
Long run incremental cost (LRIC)	The constant annuitized cost per-unit for a non-marginal incremental amount of capacity over the planning period.	The incremental cost above a base investment scenario for the planning period caused by a non-marginal increment of demand.
Long run marginal cost (LRMC)	The constant annuitized marginal cost per unit for a permanent marginal increase in capacity for each year over the base investment scenario.	The incremental cost above a base investment scenario for the planning period caused by a marginal increment of demand.

Source: Vass (2001)

Each definition of long run unit cost recovers a present value revenue series that equals the present value of costs (either total, incremental or marginal) over the investment planning period. This is achieved by an annuity method, which recovers long run cost across demand

and time in the investment planning period, an example for which is provided in the text box below. The key point illustrated in the text box is that as well as long run costs being expressed in present value terms, outputs and demand are also time-weighted because of the annuity method.

Text Box 1: Annuity methods

Annuity methods take in to account the time dimension of long run costs over a planning period. As well as discounting costs so they are expressed in present value terms, annuity methods also weight outputs and demand by discount factors. The objective is to derive a single unit cost that recovers the present value of costs over the planning period, given forecast demands and the discount factors (df) reflecting the cost of capital.

This is expressed algebraically below for the example of LRAC over a three year planning horizon of forecast demand (Q):

$$LRAC = (C_1*df_1) +(C_2*df_2) + (C_3*df_3) / (Q_1*df_1) +(Q_2*df_2) + (Q_3*df_3)$$

Annuity methods allow long run costs to be expressed in a typical cost versus output relationship by "compressing" the time dimension of investment and long run costs.

Source: CEPA / Vass (2001)

Qualitative example of LRIC in railway infrastructure services

All infrastructure services have their own distinctive characteristics and attributes which influence the long run unit cost of supply. In the text box below, we provide a qualitative example of how the principles of LRIC could apply to access prices for railway infrastructure services.

Text Box 2: Urban line upgrade

Background

A basic passenger train service over an urban train route is two trains per hour (tph). Due to the nature of the trains and services currently run on the route, it is unlikely that the current route infrastructure can also accommodate a passenger service of 3 tph throughout the working day.

An existing train operator on the urban route states their intention to increase passenger services to four trains per hour (4tph). This requires a network enhancement (for example, resignalling) which once completed will prevent the railway infrastructure becoming congested and able to run the enhanced 4tph passenger service.

Long run incremental cost

Under a LRIC charging framework train operators on the urban route could be required to pay the charges implied by LRIC of upgrading the urban line on an incremental basis for the specific assets they require over existing capacity and investment plans for the route (as opposed to the costs of the upgrade being recovered across all network users by the enhancement/investment's capitalisation in Network Rail's Regulatory Asset Base).

Thus, there would be a more explicit allocation of the capital costs of expansion to the network users who caused the enhancement to take place.

The recovery of the present value costs of the enhancement could be recovered either before the enhancement takes place (the incremental cost is recovered across time-weighted demand) or once

the enhancement takes place (similar to a connection charge in energy network industries).

Key issues

The example illustrates two key decisions concerning the investment in the urban route enhancement and correspondingly two key components of implementing a LRIC charging structure in a rail industry context:

- Whether the enhancement should take place? and
- Who (and when) should pay for the enhancement to take place?

The network enhancement in this example was deemed to be necessary once the passenger service operator stated their intention to increase passenger services to four tph.

Under a LRIC charging structure this statement of intent to increase network use could be directly linked to the track access charges applying to that route / line of the network. How this cost is shared amongst existing users of the urban route line would need to be addressed under the LRIC charging structure and would ultimately determine the financial impact on existing and future users of the network.

The framework under which users would signal their willingness to cover total costs would determine the financial and regulatory impact on Network Rail of introducing LRIC based charging.

Source: CEPA

ANNEX 3: APPROACHES IN OTHER SECTORS

Introduction

We have reviewed and summarised the approaches to access charges in three other regulated sectors in Great Britain, which are:

- Energy.
- Telecoms.
- Water.

Energy

Boxes A2.1 to A2.4 below discuss in turn the approaches to access charging for electricity distribution, electricity transmission, gas distribution and gas transmission.

Box A2.1: Electricity distribution charges

Electricity Distribution Charges

The "structure of electricity distribution charges" is the way in which connection and use of system charges are set and applied to users of distribution networks. As with gas distribution, charges are derived in relation to a price control formula set by Ofgem for the transportation of electricity.

Structure of charges

There are 14 bespoke distribution charging methodologies in the UK although the network operators are currently implementing common arrangements for access pricing. As a result, tariff structures and the approach to cost allocation currently varies between distribution service areas. In general, the structure of a customer's electricity distribution charge is dependent upon their voltage level of connection:

- Charges for the extra high voltage level are designed to send economic signals about the use of existing capacity and future demand for existing capacity. Costs are recovered on a fixed and capacity basis.
- Charges for the lower voltage level networks are set with regards to an aggregated estimate of long run marginal cost (the Distribution Reinforcement Model). Depending upon customer group characteristics, costs are recovered by a unit (volume), entitlement and fixed charge.

Since 2005, electricity distribution has moved towards a relatively shallow connection boundary in line with electricity transmission. New network connectees pay a connection charge which recovers the cost of sole use assets.

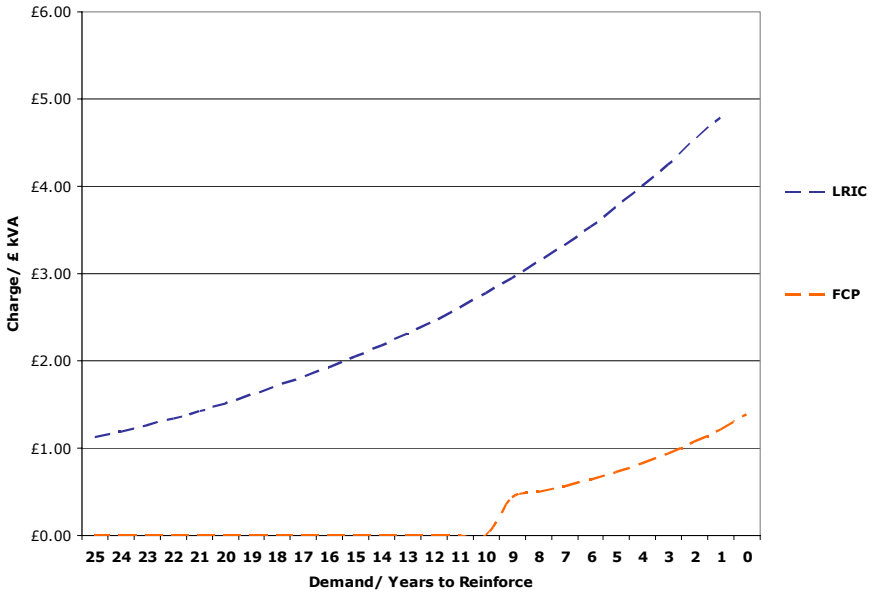
Cost estimation and allocation

Ofgem and the Distribution Network Operators (DNOs) have an ongoing structure of charges project which is seeking to implement access charges based on an estimate of long run incremental cost. The DNO's have developed two charging models for estimating LRIC and for allocating this cost to customer charges.

The *LRIC electricity distribution model* is currently used by one network operator for calculating high-voltage level charges. The model calculates nodal (locational) incremental costs which represent the brought forward (or deferred) reinforcement costs (change in net present value costs) caused by the addition of an increment of demand or generation at each network node. The model takes account of the effect a change in user behaviour has on network power flows given an assumed growth rate for demand over the investment planning period. The model seeks to provide appropriate incentives to customers and encourage efficient use and long term development of the distribution network by providing price signals which reflect the level of capacity relative to demand in the local area of the network.

The *Forward Cost Pricing (FCP) model* calculates annual charges that recover the expected costs of reinforcing parts of a DNO's high-voltage network before the reinforcement is necessary. Charges calculated by the FCP model each year provide cost signals that are relative to available capacity in a particular location of the network. However, rather than reflecting long run incremental cost at the margin (from a small increment of demand or generation) network charges based on the FCP model

The diagram below provides an illustration of the cost signals provided by the LRIC distribution and FCP model. As demand approaches capacity and the local network requires an enhancement or upgrade both FCP and LRIC provide a cost signal to network users of the approaching need for reinforcement.



DNO costs that are not recovered through use of system charges are recovered through a connection charge. Connection charges are determined on a defined set of cost apportionment/allocation rules which are detailed within a DNO's connection charging methodology statement and describe how much of any reinforcement costs should be born /shared by a connectee.

Incentives

DNO operators allowed revenue is fixed under the price control so the methodologies in place for use of system charges and connection charges are structured to provide price signals and incentives to network users for the efficient and economic use and development of the distribution network. Depending on the methodology used to determine LRIC, the use of system charging methodologies signal the long run incremental costs of average network or at the margin at particular locations on the network.

Key points

Ofgem has been trying to promote reform in distribution charging arrangements for some time. In 2005 a move away from 'deep' connection charges (i.e. a connecting generator pays for all the costs of assets to connect them upfront) was approved and a structure of charges project has been seeking to further develop pro-competitive cost reflective charging methodologies for implementation by 2010.

The move towards more cost reflective and LRIC based use of system charging structures has been driven by a number of policy objectives and industry developments in distribution networks, including:

- the emergence of capacity constrained locations on distribution networks and "hotspots" of required capex enhancement and upgrade expenditure;
- expected growth of small-scale distributed generation connecting to distribution networks and the need for network charges to reflect the costs and benefits that DG at lower voltages may provide for the network;
- the long term objective for network charges to facilitate and encourage demand side management; and
- to facilitate competition where independent network operators (IDNOs) are able to provide cheaper or faster connections than the incumbent DNO.

Box A2.2: Electricity transmission charges

Electricity Transmission Charging

Background

The high voltage electricity transmission networks in Great Britain are owned by three companies (National Grid Electricity Transmission, Scottish Power Transmission and Scottish Hydro Electric Transmission). Ofgem, the regulator, determines the amount of revenue each company may recover through charges at periodic price control reviews. As well as owning assets, NGET plays the role of System Operator. This involves operating the transmission network, including ensuring that supply and demand balance in real time and determining and levying network charges.

Structure of charges

Three sets of charges are levied for connection to/use of the GB transmission network:

- Transmission Network Use of System (TNUoS) charges are designed to send efficient signals about the use of existing capacity and future demand for existing capacity. TNUoS is a **zonal** (i.e. averaged for demand and generation customers within specific areas) entry exit tariff based on the demand placed on the system by a user during system peak; the key driver of network investment. TNUoS charges recover the costs of all "potentially sharable" assets. NGET uses a load flow model to determine the LRMC of connecting at each point on the network (which recovers circa 20% of allowed revenue) and applies a uniform uplift to ensure that revenue is recovered in total and in the correct proportions from entry and exit. TNUoS is thus an entry/exit capacity charge determined ex-ante but subject to change on an annual basis.

- Balancing Services Use of System (BSUoS) charges recover the costs incurred by National Grid in operating the system. This includes contracting for reserve and operating the network in real time through accepting bids and offers in the balancing mechanism (an auction in which parties demonstrate their willingness to vary output). BSUoS charges are calculated every half-hour and recovered in proportion to the amount of energy a party flows during that period. They are thus a £/MWh commodity charge determined ex-post.
- The connection boundary in the electricity transmission sector is very shallow (i.e. the vast majority of costs are recovered via TNUoS charges). Connection Charges only recover the costs of those assets which could not, either now or in future, be used by more than one user. Connection charges are paid at the point a user connects.

A common methodology is applied across the country (despite the fact there are three companies owning assets).

Cost estimation and allocation

The direct current load flow (DCLF) investment cost related pricing (ICRP) transport model calculates the marginal costs of investment in the transmission system that would be required as a consequence of an increase in demand or generation at each connection point or node on the transmission system. This is based on a study of peak conditions on the transmission system. The increment is measured as a variation in demand of 1 MW.

Incentives

As specified in National Grid's transmission licence, the objectives of network charges are: to reflect the costs incurred in operating the transmission business; and to facilitate competition in generation and supply. This has been interpreted to mean sending long run signals to inform investment decisions about peak network capacity – via zonally varying cost-reflective charges - while ensuring recovery of allowed revenues.

Charges for the electricity network are therefore designed to reflect the impact of different customers on the need for network investment. Hence they are based on the impact a customer will have at peak. Charges are calculated in slightly different ways for different customer types:

- Charges are levied on the basis of the generator's maximum export capacity (which determines the capacity of the wires used to connect them) at any point during the year.
- Large demand customers also face zonally varying charges, calculated based on their consumption during the three highest periods of demand (the Triad). This is possible because of the presence of a half-hourly meter.
- Finally smaller customers, who do not have half hourly metering, face a zonally varying charge reflecting their aggregate consumption between 18:00 and 21:00

over the winter.

Key points

The ICRP transport model has been in place in various forms since 1994 and developed as part of the introduction of the New Electricity Trading Arrangements (NETA) for England and Wales and the British Electricity Trading Arrangements (BETA) for the whole of Great Britain. A number of market participants have expressed a view that the LRIC based ICRP charging methodology can produce perverse incentives and locational price signals that fail to provide transparency and stability to network users in order to promote an environment which encourages investment and competition in electricity generation and transmission network use. There has also been significant consultation and disagreement amongst industry and regulatory commentators on the practical difficulties and principles that underlie long run cost estimation in National Grid's charging methodology.

Box A2.3: Gas distribution

Gas Distribution Charges

Background

There are eight gas distribution networks (GDNs), with a geographical region of Britain – their LDZ – where they are required by their licence to provide gas transportation services. In addition there are a number of other gas transportation licensees - Independent Gas Transporters (iGTs) - who are able to operate gas transportation networks but do not have a LDZ specified in their licence.

Distribution charges are derived in relation to a price control formula set by Ofgem for the transportation of gas. This formula dictates the maximum revenue that can be earned from the transportation of gas. Within the Network price control, revenue recovery is split between Local Distribution Zone (LDZ) system charges and LDZ customer charges. The relative level of these charges is based on the relative level of costs of these areas of activity.

Structure of charges

Gas transportation charges consist of two elements, "system" and "customer" charges. Broadly system charges relate to the costs associated with the main distribution system and the customer charges relate to the cost of service pipes and activities associated with customers. The proportion of charges recovered respectively from the LDZ system charges and customer charges is currently based on an allocation of all GDN costs between the upstream (system) and downstream (customer) network activities. This allocation results in a target percentage of cost to be recovered from system/customer

charges. The current allocation is based on average cost data for all 8 GDNs from 2003.

Capacity and commodity split

The process for setting Gas UoS charges involves identifying the costs associated with each pressure tier on a distribution network. Costs are allocated to capacity or commodity charges on the basis of the Capacity / Commodity split. The Capacity / Commodity split is currently 50:50.

The structure of gas distribution LDZ charges are as follows:

- *Capacity charges* – these charges account for 50 percent of the revenue recovered from LDZ UoS charges. Capacity charges are applied to the peak-day demand (in pence per peak day kWh per day).
- *Commodity charges* – these charges account for 50 percent of the revenue recovered from LDZ UoS charges. Commodity charges are applied to the annual demand (in pence per kWh).

There are separate charging functions for directly connected exit points from the distribution network, and for connected system exit points. This is to reflect the view that transportation to connected system exit points loads typically makes less use of the distribution system than do other similar sized loads.

Cost estimation and allocation

UoS charges are currently designed to reflect the costs associated with an average load for each specific end user category. Currently, distribution use of system charges do not depend on customer location within a GDN but on customer size, which acts as a proxy for the distribution assets a customer uses. In its 2005 review of the gas distribution structure of charges, Ofgem considered the introduction of locational charges, but decided that the advantages of moving away from a geographically averaged charging model were not sufficient to justify moving to distance / location related charges.

Incentives

As specified in the gas transporter licence, network charges are required to meet the following objectives:

- cost reflectivity;
- facilitate competition; and
- reflect developments in gas distribution.

Although distance/location related charges are not in place for GDN's charging methodologies, locational signals and incentives are provided by the separation of the gas distribution price control for each distribution service area. A capacity / commodity split provides an incentive for the efficient use of capacity – a key cost driver of gas

distribution network expenditure.

Key points

Ofgem concluded a review of the gas distribution structure of charges in 2006.[33] Two of the key issues it considered as part of this review were the introduction of distance/locational DUoS charges and the capacity/commodity split for LDZ charges. Ofgem concluded that the net benefits which could arise from moving away from the existing charging model to more cost-reflective locational charges was not sufficient to justify supporting a major reform of UoS charges. With regards the capacity/commodity split, Ofgem concluded that there was a strong case for increasing the proportion of capacity-related DUoS charges given the revenue drivers embedded in the GDN price control formula[34] and the stability benefits of increasing the capacity component of the LDZ charge. However, other industry processes (interruptions arrangements) were considered to prevent the effective application of increasing the capacity/commodity split and so the reform was put on hold until interruptions reforms were put in place by the gas distribution industry.

A2.4: Gas transmission

Background

National Grid (NG) is the owner and operator of the gas national transmission system (NTS) in Great Britain. The NTS is a network of pipelines which transports gas from coastal terminals and storage facilities to exist points from the system. Exit points are predominantly connections to distribution networks and large customers but also storage sites and direct connections to other systems (such as interconnectors to other countries).

The transportation price control treats the NTS Transportation Owner (TO) and the NTS System Operator (SO) separately. The separate price controls and incentives determined the maximum revenue that NG may derive from each in a formula year.

Structure of NTS transportation charges

A combination of an entry-exit, capacity-commodity and auction charging regime is in place for NTS transportation charges. Gas transmission charges are set separately for those activities related to TO and to the SO. The NTS TO allowed revenue is collected by entry and exit capacity charges, with a commodity charge levied on entry flows where entry auction revenue is forecast to be under-recovered. The NTS SO allowed revenue is collected largely by means of a commodity charge levied on entry and exit flows to the system.

[33] Ofgem, 'Conclusions on the review of the structure of gas distribution charges', February 2006

[34] The revenue driver establishes that 65 percent of allowed revenue within a formula year is fixed , while the remaining 35 percent varies with throughput.

Key points

Key features of the gas NTS structure of charges include:

- 50% of the NTS TO target revenue and under/over recovery of revenue from previous formula years is derived from obligated entry capacity sales determined through auctions subject to reserve prices. The other 50% of the TO target revenue is recovered by exit capacity charges applied on a peak day basis.
- Both auction reserve prices and exit charges reflect NG's long run marginal cost (LRMC) methodology. A TO Commodity charge may be levied on entry flows where entry capacity auction revenue is forecast to be below the entry target level.
- Commodity charges are payable on gas allocated. Capacity charges are payable when a right to flow gas is purchased, with payment due irrespective of whether or not the right is exercised (although all types of entry capacity can be traded on secondary markets by shippers).
- Capacity charges reflect the estimated LRMC of reinforcing the system to transport additional gas between entry and exit points. The NTS Transportation Model calculates the LRMC of transporting gas from each entry point to a "reference node" and from the "reference node" to each relevant offtake point.
- The NTS TO Commodity charge is a charge per unit of gas allocated to shippers at entry terminals. A rebate or credit mechanism exists to reduce any TO over or under recovery resulting from NTS entry capacity auctions. The NTS SO Commodity charge is a charge per unit of gas transported by the NTS and is applied uniformly on both entry and exit flows at all NTS system points.

Other charges

Other NTS transportation charges include:

- Other shipper charges – including charges for specific services at interconnectors, charges for administration processes and charges for the administration of allocation arrangements.
- DN pensions deficit charge – a specific annual cost allowance for part-funding of the deficit in the NGUK pension scheme. Target revenue for the pensions deficit charge is fixed for each of the formula years in the price control period.
- NTS entry capacity retention charge – NTS energy capacity substation is where NG moves unsold entry capacity from one entry point to meet the demand for entry capacity at a different site. Users are able to exclude capacity at entry points from being treated as substitutable capacity without having to buy and be allocated the capacity. To do this they are able to take out a retainer subject to a one-off charge.

Sources

National Grid – 'The statement of the Gas Transmission Transportation Charging

Methodology – Effective from 1 April 2010' -

Telecoms

Box 2.5 summarises the current approach to access charging in the telecoms sector. While we have sought to capture the main points regarding access charging in telecoms, it is important to note that there has been extensive work by Oftel and Ofcom, and extensive debate, about the approaches to access charging in telecoms.

BT's network charge controls

British Telecommunications plc (BT) has been subject to multiple layers of regulation since privatisation in 1984. Most of its current regulatory arrangements are administrated under the Communications Act 2003 and a set of "voluntary undertakings" accepted by Ofcom under the Enterprise Act 2002.[35] One element of Ofcom's oversight of BT is the imposition of network charge controls (NCCs) in markets where they have been found to have "significant market power."

Structure of charges

BT are subject to NCCs for certain charges paid by other "Communications Providers" across four service "baskets:"

- wholesale call origination;
- wholesale and call termination;
- interconnection circuits; and
- project management, policy and planning.

These charges effectively cap the cost for competitors of accessing BT's fixed line network to deliver or convey calls.

Prior to 1997 NCCs were set annually based on an incurred historic cost accounting basis. However since 1997, they have been determined on a more efficient forward-looking basis. The starting values for NCCs have been set every four years based on a "technology neutral," "hypothetical ongoing network cost model" adjusted yearly on an RPI-X basis. In 1997 and 2001 the starting charges were set as a long-run incremental cost plus an equal proportionate mark-up (LRIC+EPMU). In 2005 and 2009, they switched their approach to a similar current cost accounting (CCA) fully allocated cost (FAC) basis.[36]

The introduction of an LRIC approach in 1997 was in line with contemporary European

[35] BT. (2010, February 9). *Regulation in the UK.* Retrieved February 9, 2010, from The BT Web Site: http://www.btplc.com/Thegroup/RegulatoryandPublicaffairs/RegulationsintheUK/index.htm

[36] Ofcom. (2009, September 15). *Review of BT's Network Charge Controls - Explanatory Statement and Notification of decisions on charge controls in wholesale narrowband markets.* Retrieved January 10, 2010, from Ofcom Web Site: http://www.ofcom.org.uk/consult/condocs/review_bt_ncc/statement/nccstatement.pdf

Legislation that "charges for interconnection should be based on a price 'closely linked' to the long-run incremental cost"[37] and recommending "the use of long run average incremental costs for the assessment of cost orientated interconnection tariffs for terminating access."[38] This was in line with consensus that a LRIC would best approximate the price in a competitive market.

The purpose of Ofcom's post-1997 charging structure has been to set charges at their marginal cost, with a mark-up to cover a share of fixed and common costs. This should approximate efficient pricing subject to ensuring a minimum profit condition. While some form of Ramsey pricing would provide the first-best mark-up, LRIC+EPMU and CCA FAC are far more practicable.

Cost estimation and allocation

Ofcom define LRIC to include "all the long-run costs (both capital and operating costs) causally related to the supply of a defined increment: for example the total volume of a given service."[39] LRIC includes service-specific fixed costs that would not be accounted for in a short-run marginal cost. This should better reflect the "actual costs of supply." In order to satisfy cost recovery conditions, the LRIC must be supplemented by the EPMU. This is effectively a crude approximation of what would occur under efficient Ramsey pricing. The inputs for this approach were derived from BT's unaudited top-down data, constructed by subtracting costs unrelated to a particular activity from management accounts.[40]

Ofcom shifted to the CCA FAC approach in 2005 largely on the grounds of improved transparency, consistency and the availability of auditable data. This change is not a large shift in philosophy as CCA FAC is a fairly robust proxy for LRIC+EPMU. CCA FAC determinations are based on a bottom-up calculation of costs, indentifying both the current price of and quantity of inputs required.

Despite the new approach, BT have retained their LRIC systems "to aid potential future regulatory and legal tests that require LRIC information."[41] This is particularly important in BT's case as LRIC information can provide a useful tool to indentify anticompetitive pricing practices such as "margin-squeeze."

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[37] Commission of the European Communities. (1997, June 30). *Directive 97/33/EC of the European Parliament and of the Council of 30 June 1997 on interconnection in Telecommunications with regard to ensuring universal service and interoperability through application of the principles of Open Network Provision (ONP).* Retrieved January 10, 2010, from Europa Web Site: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31997L0033:EN:HTML

[38] Commission of the European Communities. (1998, January 8). *Commission Recommendation of 8 January 1998 on interconnection in a liberalised telecommunications market (Part 1 - Interconnection pricing) (98/195/EC).* Retrieved January 10, 2010, from Europa Web Site: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1998:073:0042:0050:EN:PDF

[39] Ofcom. (2009, March 19). *Review of BT network charge controls Consultation on proposed charge controls in wholesale narrowband markets.,* pp28. Retrieved January 10, 2010, from Ofcom Web Site: http://www.ofcom.org.uk/consult/condocs/review_bt_ncc/reviewbtncc.pdf

[40] For full details of the initial LRIC methodology see Oftel. (1996). *Pricing of Telecommunications Services From 1997 - Annex D: Long Run Incremental Costs.* Retrieved January 10, 2010, from Ofcom Web Site: http://www.ofcom.org.uk/static/archive/oftel/publications/1995_98/pricing/pri1997/annexd.htm

[41] Ofcom. (2009, March 19). *Review of BT network charge controls Consultation on proposed charge controls in wholesale narrowband markets.* Retrieved January 10, 2010, from Ofcom Web Site: http://www.ofcom.org.uk/consult/condocs/review_bt_ncc/reviewbtncc.pdf

Incentives

NCC's role is largely to counter the significant market power that BT hold in certain markets. However their design provides the following two beneficial incentives:

- "build-or-buy" signals – pricing at replacement cost provides signals to competitors to buy incumbent services or to build new infrastructure if they are more efficient and could do so at lower cost; and
- efficiency incentives – annual RPI-X adjustments encourage efficiency improvements over time.

Key points

While the nature of natural monopoly in the telecommunications industry is different to rail, BT's NCC experience highlights lessons that would be relevant if LRIC was reintroduced for rail access charges:

- incremental charging methodologies should be based on robust, auditable evidence;
- incentives for entry to bypass a critical facility are particularly important in a context of technological change; and
- it is possible to implement a charging structure that approximates efficient prices more simply than first best pricing would require.

Water

Box 2.6 summarises the approach to access pricing in the water sector in England and Wales.

England Wales Bulk Water and Access Pricing

Background

The 1989 Water Act created the Director General of Water Services and his office, Ofwat. Subsequently the Water Industry Act (WIA) 1991, as amended by the Water Act 2003 (WA03), outlined the detailed approach to the regulation of the water and sewerage industry. As well as being required to comply with the requirements of the Act, water undertakers must also comply with the requirements of the Competition Act 1998 (CA98). Typically, each water undertaker or water and sewerage undertaker is vertically integrated. They provide a series of interrelated but distinct functions at each stage of the value chain. These stages are:

- *Water resources* – the extraction/abstraction of raw water.
- *Treatment* – treating abstracted water such that it can be supplied to either

industrial premises or treating in accordance with environmental guidance to supply it to domestic and some non-domestic customers (potable water).

- *Distribution* – the transportation of water through networks (comprising different sized pipelines) to the end users of that water.
- *Supply/Retail* – the processes involved in selling water to end customers, including billing and, where appropriate, water efficiency services.

Following privatisation in 1989, the previously publicly owned water supply system operated by public water authorities was divided between a number of distinct companies, each of which was responsible for providing water and sewerage services in a defined area of England and Wales. There are now currently twenty-one incumbent water companies in England and Wales.

Water supply licensing

The WA03 introduced a framework for competition in the provision of water services known as the Water Supply Licensing (WSL) regime. WSL allows customers who consume more than 50 megalitres per annum (eligible customers) to switch to a licensed water supplier and allows a WSL licensee to have access to a water undertaker's supply system to enable the licensee to supply water to eligible premises. Prospective licensees have to obtain a WSL before they can supply water through a water undertaker's supply system in competition with the water undertaker.

Prospective WSL suppliers can apply either for a:

- *Retail licence* – which permits the supplier to purchase a wholesale supply of water from a water undertaker and to retail it to customers at eligible premises; or
- *Combined licence* - that gives the holder the 'supplementary authorisation' in addition to the retail licence to introduce water into a water undertaker's supply system.

The various reviews of the water sector and the desire to introduce greater competition, means that there is a credible prospect of the current industry structure changing. Bulk and access prices are expected to have an important role in promoting or facilitating competition in the water and sewage industry.

Structure of charges

Water companies currently sell water in bulk to end-consumers and to other water companies (both existing incumbents and new appointees). Currently there is no single approach to setting tariffs for these types of bulk transfers, although water companies generally offer a large user tariff to bigger business customers. The WSL regime requires a different method for pricing by water companies to water supply licensees, and bulk transfers between existing undertakers can also be priced differently again.

The table overleaf summarises the current approaches including: the role of Ofwat in the price setting process; the basis on which the prices are set; and the cost reflectivity of bulk supply tariffs:

- Bulk supply agreements tend to have been established in response to historical developments in the water sector and, as such, tend to be unique, bespoke agreements, in some cases enshrined in law. Ofwat has a role in determinations on these tariffs in the event of a dispute.
- Large users are currently defined as customers that are, or are likely to be, supplied with not less than 50Ml/year for companies in England and 250Ml/year in Wales. Various undertakers have chosen to structure their large user tariffs for water services in different ways. Some common features include:
    - Seasonal Tariffs – comprises different volumetric rates that are higher in summer than winter months.
    - Subscribed Demand Tariffs – which are designed to incentivise companies to manage daily demand.
    - Interruptible Tariffs – which offer lower tariffs for customers that are willing to accept an interruption in supply on a short (circa 4 hours) or medium-term (24 hours) basis.
    - Reservation charges for stand-by supplies – which charges customers who have their own source of water but require access to reserve supplies.

The section which follows considers the Costs Principle governing the structure and cost reflectivity of access pricing for WLS licensees.

Type of supply	Ofwat's role	Approach to charge setting	Cost reflectivity
Bulk supplies between water undertakers for onward general distribution into supply	Oversight, publication on register. Determination in the event of dispute.	Based on sections 40&40A WIA91	Price agreed by negotiation, or determined by Ofwat on a case specific basis.
Bulk supplies from existing incumbent to new appointee for specific supply to large customer or new development	Determination in the event of dispute. Publication on register.	Based on sections 40&40A WIA91.	Price agreed by negotiation, or determined by Ofwat. Negotiations or determination can refer to the incumbent's equivalent tariff and be adjusted for costs avoided or incurred.
Standard supplies to business customers	Setting price limits, approval of company charges.	Large User Tariffs based on discount to end-user tariffs for non-use of local network, AC based.	Reflects differential cost of supplying large customers within a licensed area but not necessarily reflective of the circumstances for any given customer.
Special Agreements / non-standard supplies to business customers	Oversight, approval if post privatisation	Use Large User Tariff minus customer-specific discount. , AC based.	Entered into where there is a factor / cost driver which means the customer is sufficiently different from the average customer in the class to warrant a non-standard tariff.
Retail or combined supply by existing incumbent to licensee under Water Supply Licensing	Determination in the event of dispute.	The Costs Principle	Incumbent's retail price minus customer-specific ARROW costs plus additional costs.

Source: CEPA / Ofwat

Cost estimation and allocation in WSL access pricing regime

The WIA sets out the Costs Principles in accordance with which water undertakers must set their access prices for WSL licensees. The aim of the Costs Principle is to produce prices that fully compensate each water undertaker for the net costs (or expenses) that it unavoidably incurs when providing a combined or wholesale supply as compared with its continuing to supply the final customer.

The Costs Principle makes an adjustment in the amount that the water undertaker can recover from a WSL licensee by taking account of costs that the water undertaker will no longer face because the WSL licensee supplies water to the customer. These costs are expenses that can be avoided or reduced; or any amount that is recoverable in some other way – commonly referred to as ARROW costs – and leads to a 'retail-minus' rule for setting access prices, also known as the efficient component pricing rule.

Retail-minus pricing setting rule

Access price = any expenses reasonably incurred + retail charge – ARROW costs

The retail charge should be calculated as the annual income that the water undertaker expects to recover under the customer's existing tariff or contract for volume of water that the customer requires.

Water undertakers are required to calculate annual ARROW costs by comparing the forecast expenditure arising from a water resource management plan when the licensee does not have access.

Because potential entrants need access price information to identify opportunities for wholesale or combined access, water undertakers are required to calculate detailed case-specific prices for purely indicative purposes, including:

- for each water resource zone;
- based on two standard volumes of water;
- for both wholesale and combined access;
- for each of the next five years;
- with access starting in each of the next five years (for combined supply);
- with updates on an annual basis; and
- for potable water.

The Competition Appeals Tribunal (CAT) has recently considered the current access regime charging arrangements for WSL in relation to the Albion Water case. The CAT concluded that the Costs Principle (originally used by Dŵr Cymru to determine its access price) precluded competition and was open to serious question:

"In our view ECPR is not a safe methodology to use in this case for the purpose of determining the reasonableness of the First Access Price because: (i) the 'retail' price used in the calculation is not shown to be cost-related as regards the distribution element; (ii) the evidence strongly

suggests that that price is itself excessive; (iii) the particular method of ECPR used in this case would eliminate the existing competition and in effect, preclude virtually any competitive entry, because the resultant margins are insufficient; and (iv) the approach of the Authority to avoidable costs in its evidence and submissions was not the same as that in the Decision."

Key points

Albion Water case highlights that you need to give regard to Competition Law (as well as any other legal requirements on the principles and arrangements for charging for network access) as part of an access charging regime.

Bulk water charges are still determined by negotiation and special agreement – where the GB rail sector was during the early years of privatization of Railtrack. Ofwat has only recently started to consider the complications of standard de-averaged tariffs for the large bulk users of the network and the trade-offs this creates with other objectives for access pricing (including transparency, stability and predictability).

ANNEX 4: LITERATURE REVIEW

This annex summarises and provides links to a small number of rail access charging publications relevant for this review.

Cherry, M. (2001, January) "The new incentive framework for rail access" http://www.bath.ac.uk/cri/pubpdf/Conference_seminar/26_Access_Pricing.pdf

Railtrack's first post-privatisation track access review concluded in 2000. This paper, written shortly after this event, examines its impact on the franchised passenger track access regime. Cherry examines the structure of charges created under this review, focussing separately on fixed charges, and variable usage, congestion and electricity purchase charges. He usefully describes the rationale behind the introduction and reform of this structure, and how incentives became a major theme of the review.

European Conference of Ministers of Transport (ECMT). (2005, October) "Railway Reform & Charges for the Use of Infrastructure" http://internationaltransportforum.org/europe/ecmt/pubpdf/05RailReformE.pdf

While European Ministers of Transport agreed to promote "seamless rail services across Europe" and "competition in rail freight markets," this review found that existing charging regimes were not consistent with objectives to promote financial stability, deliver price signals to users promote competition where it might be sustainable. They draw evidence from across borders to identify countries where charges fall below the marginal cost of traffic, freight cross-subsidises passenger services, and differences in charging regimes impede international services. They conclude that these problems are due to the early stage of this "major transition" but also poor application of theory using flawed data. They provide a plan of action for Ministers to better achieve their goals.

Nash, C. & Johnson, D. (2005, December) "Scoping study for scarcity charges Appendix 2: Issues in defining and measuring railway capacity" http://www.rail-reg.gov.uk/upload/pdf/its_uleeds_app2.pdf

Using the East Coast Main Line as an example, this report explains some of the major issues for defining and measuring railway capacity. Nash and Johnson examine the physical chacteristics that create bottlenecks and how they interact with the need to develop commercial timetables, and share capacity with freight and suburban services. They found that physical impediments cannot easily be overcome without creating new constraints, commercial requirements mean that capacity utilisation indices overstate the number of trains that could run in practice, and that there can be paradoxical interactions between different users, such that increasing the frequency of one service may allow higher frequency on others.

Nash, C., & Matthews, B. (2002, May) "Implementing rail infrastructure charging reform – barriers and possible means of overcoming them" http://www.imprint-eu.org/public/Papers/imprint_nash_matthews.pdf

This paper examines European Commission rail infrastructure policy particularly with regard to the practicalities of implementing a charging structure based on marginal social cost. Nash and Matthews draw evidence from three countries with different track access regimes: Britain (fixed

and variable marginal social cost based charges), Sweden (marginal social cost pricing) and Germany (average cost pricing). They then identify and propose means of overcoming a set of nine barriers to introducing an effective marginal social pricing regime.

Nash, C., & Matthews, B. (2003, October) "Rail Infrastructure Charges - The Issue of Scarcity"
http://transportation.northwestern.edu/docs/0000/nash.pdf

This paper examines European rail infrastructure capacity scarcity policy and the "planned" approach in Britain under the Strategic Rail Authority's Capacity Utilisation Policy. Nash and Matthew examines the practicality and desirability of competing approaches for measuring the opportunity cost of scarce capacity. While they see the merits of a market-led capacity bidding approach, on balance they find that short-term allocation decisions may be more effective under a planned approach based on social cost-benefit analysis.

The Community of European Railway and Infrastructure Companies (CER). (2008, May) "Rail Charging and Accounting Schemes in Europe: Case studies from six countries" http://www.eimrail.org/documents/29.05.2008_Chargingbooklet_with_covers_000.pdf

While European harmonisation policies have existed for some time, this report highlights the variety of rail access charging approaches still in place in a series of case studies. CER provide snapshots of six rail charging frameworks in Europe, focussing on their charging principles and operating context: Belgium (Infrabel), France (Réseau Ferré de France), Germany (DB Netz), Great Britain (Network Rail), Hungary (MAV Co) and Latvia (LDZ). These examples show how structures have evolved to match country-specific policy objectives and political contexts, leading to the conclusion that harmonisation is a difficult policy to achieve.

Thompson, L. S. (2008, December) "Railway Access Charges in the EU: Current Status and Developements Since 2004"
http://www.internationaltransportforum.org/Pub/pdf/08RailCharges.pdf

European rail charge harmonisation has been difficult to achieve due to the operational and economic complexity of rail. This paper examines different access charging models in the EU and their developments between 2004 and 2008. Thompson concludes that going forward, all freight operators should have a simple access charging regime, major parts of the EU rail freight network should have closely harmonised access charges, and that all countries should consider two-part regimes for suburban passenger services.

Turvey, R. (2001, January) "Economic principles of access pricing" http://www.bath.ac.uk/cri/pubpdf/Conference_seminar/26_Access_Pricing.pdf

This article visits the principles of access pricing for all infrastructure services, including rail. These are viewed with the objective of achieving economic efficiency in the context of simple constraints and problems with economic marginal cost pricing. Turvey visits basic principles of access charging before adding layers of complexity through indivisible investments, multiple users, and new users. He uses this approach to highlight the difficulties these imperfections create for managing congestion and covering investment costs.

ANNEX 5: ENVIRONMENTAL CHARGE OPTION

The box below is a detailed evaluation of the environmental charge option.

<table>
<tr><th colspan="2">Description of rail access charge</th></tr>
<tr><td colspan="2">There are a number of material environmental impacts associated with operating rail services. These environmental impacts impose a social cost that could in theory be reflected in track access charges. The use of access charges to recover costs to society from rail network use would mark a significant move away from the existing commercial (i.e. private cost) approach to the determination of rail network track access charges.
As we discuss further below, if there is a concern that imposing an environmental charge on rail users could distort outcomes compared to other modes of transport, and the Government is not prepared to introduce an economy wide environmental measure, such as a carbon tax, then an alternative approach could be a charge or incentive to reduce in absolute terms environmental harm from railway activity, but without increasing the overall costs of rail travel.</td></tr>
<tr><th colspan="2">Counterfactual</th></tr>
<tr><td colspan="2">The rail industry currently adopts a planning/ administrative approach to dealing with environmental impacts. For example, the environmental standards applied through Part E of the Network Code and Key Performance Indicators for sustainable development in Network Rail's price control framework. ORR also required Network Rail to enable provision for TOCs to move to on train metering of electricity from April 2010, which will incentivise more environmentally friendly driving through lower electricity bills.</td></tr>
<tr><th>Information requirements</th><th>Cost drivers</th></tr>
<tr><td>Quantification of environmental impacts in monetary or cost terms. Major studies that have provided data on environmental costs of rail transport are as follows:
▪ Surface Transport Costs and Charges 1998 (ITS Leeds 2001);
▪ External Costs of Transport (INFRAS 2000 / 2004);
▪ Internalising the Social Costs of Transport (OECD 1994).
Estimates of monetised environmental impacts are also provided in more recent Department of Transport led research.</td><td>As part of the SRA's Environmental Agenda (2001) a comprehensive list of all environmental impacts associated with UK rail operations was developed. These included:
▪ Greenhouse gas emissions;
▪ Air pollutant emissions;
▪ Noise and vibration;
▪ Water and land pollution and contamination;
▪ Land-take; and
▪ Visual Intrusion.
The most significant of the environmental impacts are greenhouse gas emissions, air pollutant emissions and noise.</td></tr>
<tr><th>Calculation principles</th><th>Practical issues / considerations</th></tr>
<tr><td>Environmental impact methodology:
▪ Quantify environmental cost driver;
▪ Quantify environmental impacts; and
▪ Value environmental impacts in monetary terms.
The approach to valuing the environmental impact differs by cost driver. For example, noise valuation has in the past been achieved through 'hedonic pricing' – differences in noise levels are reflected in the market value of a</td><td>The ability to levy environmental charges is included in the Directive 2001/14/EC:
▪ "The infrastructure charge may be modified to take account of the cost of the environmental effects caused by the operation of the train."
The Directive also states that:
▪ "Charging of environmental costs which results in an increase in the overall revenue accruing to the infrastructure manager shall however be allowed only if such charging is</td></tr>
</table>

given property. CO2 emissions have in the past been valued using damage costs estimates for climate change (for examples see Defra guidelines). A similar calculation principle could attempt to integrate a carbon price from the European Union Emission Trading Scheme (ETS) or the Government's social cost of carbon. Given the rail sector's use of electricity (which includes the cost of carbon in its wholesale price) a mechanism would need to be developed to ensure that carbon costs were not double counted in an environmental charge for the rail industry.	applied at a comparable level to competing modes of transport." The Directive thus places the consideration of environmental charges in the wider context of pricing and competition between different modes of transport and their relative costs to the European community. This creates a practical constraint on ORR as it does not have control over charging for environmental costs in other transport modes.
Ex-ante behavioural incentives	
The objective of an environmental charge would be to signal environmental (external) costs of rail network use to train operators. An environmental charge would "internalise" these external costs and so reflect societal marginal costs as opposed to only private marginal costs of network use.	
Complementarity with the existing structure of charges	
The implication of this (given explicit environmental charges also do not currently apply to other modes of transport in the UK) is that the introduction of an environmental charge for GB rail must satisfy revenue neutrality. ORR would be required to adjust train operators' fixed charges or other variable components of the total access charge so that Network Rail's total income remains unchanged. As noted by First Economics in a discussion paper on environmental charges – "leaving aside the additional risk that Network Rail bears in both scenarios, the distortions that changes to existing charges may cause may have detrimental consequences for overall efficiency. This is especially the case for the second [adjusting variable usage charges] of the two options." Given constraints of revenue neutrality there are risks that the introduction of an environmental charge could distort economic price signals provided through the existing structure of track access charges. If an environmental charge were included as part of the resetting of Network Rail allowed revenues this issue would however fall away.	
Complementarity with other charging options	
Environmental (external) costs are part of rail infrastructure short run incremental costs (SRIC). An environmental charge could practically be implemented as part of a wider restructuring of access charges which seek to recover more granular localised short-run marginal costs. The constraint of revenue neutrality raises similar issues as in relation to the existing structure of track access charges. While a lot of environmental may be considered short term in nature, it is also important to consider environmental impacts on a longer term, whole life basis, as once an investment has been made that causes some form of environmental harm, it is difficult to undo that harm cost effectively. The current structure of track access charges does not seek to reflect longer term factors such as these.	
Practical experience / international case-studies	
There are three EU examples where rail's external costs have been at least partially internalised through the use of taxes/charges. These are track access charges in Sweden and Finland that are differentiated according to marginal environmental (air pollution and CO_2 emissions) and accident costs, and additional track access charges in Germany to take into account energy use. Switzerland has also used access charges to incentivise railway noise reduction (AEA Technology 2005).	
Impact on stakeholders	
Franchised operators	Franchise agreements protect franchisees from short term

	changes. A localised assessment of environmental costs may in the longer term provide signals (or at minimum greater transparency) to franchise operators and their funders of the environmental costs of running particular services in different locations of the GB rail network.	
Open access operators and Freight operators	The effect of an environmental charge will be felt more by freight and open access operators who are not protected by franchise agreements. There is significant potential for perverse incentives if these transport modes are imposed with environmental charges but other competitive modes (such as road haulage) are not required to pay the wider social costs resulting from their operation.	
Time and resources required for implementation		
There exists significant industry and academic research examining the environmental impacts of rail operations. ORR commissioned AEA Technology as part of the 2005 Structure of Charges Review to consider the environmental costs of rail transport in a GB rail industry context. If rail access charges were to include an environmental charge, further research would need to be undertaken and the figures for environmental costs of rail transport produced by AEA updated.		
Time	1 – 3 years implementation as the impact of any environmental charge would need to be considered alongside the existing structure of charges, including whether the revenue raised was additional or netted off against existing charges.	
Resourcing	We expect an industry consultation will be required to understand more fully the impacts on different train operators and to agree the specific details of an environmental charge. This will require resourcing input from ORR, Network Rail, train operators and rail industry funders.	
Evaluation		
Introducing environmental costs into track access charges would be complex. To fully reflect the costs, charges would need to vary by type of operator and area of incidence. There are also serious implications with respect to the effect on rail's competitive position as a mode of transport as the majority of road transport does not pay marginal social costs – including its environmental impacts.[42] Introducing charges on the rail industry alone could lead to perverse incentives (given that in general rail transport is found to be more environmentally friendly than road transport) unless there are also moves to internalise environmental costs in other transport modes in Great Britain. Given the risks of distortions compared other modes of transport, it may be appropriate to explore charges that provide incentives to reduce the absolute amount of rail industry environmental impacts rather than pricing in the full social costs of environmental impacts. This approach could also be combined with an approach based on keeping overall revenue raised neutral.		
Assessment of charging option against industry legal and regulatory constraints		
Promote ORR duties under section 4 of Railways Act	Contribute to the achievement of sustainable development; regard to the effect on the environment of activities connected with the provision of railway services.	✓

[42] While Vehicle Excise Duty (VED) for passenger vehicles takes into account CO_2 impacts, and there are reductions in VED for vehicles that meet more stringent air pollutant emissions criteria, the environmental externalities of road transport are by no means currently fully accounted for in taxes or charges.

Not discriminate between users of the network	Not discriminatory provided environmental charges are applied to all users of the network.	✓
Be consistent with EU directive 2001/14/EC	Permitted under European Directive 2001/14 (Article 12) - "Infrastructure managers may levy an appropriate charge for capacity that is requested but not used. The charge shall provide incentives for efficient use of capacity."	✓
Ensure charges enable NR to recover allowed revenue	Would recover a small proportion of Network Rail's allowed revenues as part of two-part tariff structure.	✓

Does charging option better meet the ORR's charging objectives?

ORR rejected the concept of an environmental charge in CP4. In its 'Advice to Ministers and framework for setting access charges' (ORR 2007) it stated that:

- "Based on the fact that equivalent charges do not currently exist for other transport modes, and given that rail is relatively environmentally friendly, we would not wish to encourage demand to shift to less environmentally friendly modes of transport.
- Even if environmental charges were neutral for the industry as a whole, the impact on particular operators could still risk a shift to less environmentally friendly modes. If environmental charges are introduced for other transport modes we will re-examine the case for an equivalent charge for rail."

Although in theory there may be significant benefits of internalising the environmental costs of rail transport, without the introduction of similar charges for other transport modes it is unlikely that an environmental charge can be practically implemented in the GB rail industry at present.

Sources

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