

The appropriate efficiency assumptions for Network Rail

Assessing Network Rail's scope for efficiency gains

A report for Network Rail

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Section 1

Executive summary

Introduction

- 1.1 Network Rail's ("NR") current regulatory settlement runs until March 2009. The Office of Rail Regulation ("ORR") has been, for some time, considering the evidence that may inform the next regulatory settlement, for the five-year control period 2009/10 – 2013/14. One component of that settlement concerns the rate at which, for price setting purposes, NR ought to be able to improve the efficiency of its operation, maintenance and renewal ("OM&R") activity.
- 1.2 In its Advice to Ministers of February 2007, the ORR suggested that its upper estimates of the achievable rate of efficiency improvement, for price setting purposes, were 9%, 9%, 8%, 7% and 6% in each of the five years covered by the next control period. This was apparently intended to be a profiled version of an aggregate figure of 8% - itself the upper boundary of the range suggested by consultants L.E.K consulting (International) Ltd ("LEK") and Oxera Consulting Ltd ("Oxera") in their report to the ORR of December 2005¹.
- 1.3 In February 2008, the ORR published an update on the framework for setting outputs and access charges.² This document indicates that ORR's current view is that during the next control period ("CP4"), NR could achieve "...*gross efficiency savings of between approximately 21% and 30% in OM&R*". The lower end of this range equates to 4.6% per annum and the upper end to 6.9% per annum. ORR states that the upper end of this range "...*is informed by, amongst others, the assessment of the [International Union of Railways ("UIC")] dataset and work being carried out by Oxera updating the 2005 LEK/Oxera study.*"³
- 1.4 The 2005 LEK/Oxera study was desktop exercise carried out "in a relatively short period of time" and without "any collaboration with Network Rail... nor any additional research within the industry". The results of the study suggest a "plausible range for Network Rail's unit cost efficiency gains [of] between 2% and 8%". The upper figure is high in comparison with the results of similar studies for other regulated industries, in which it is rare for identified potential efficiency targets to exceed 5% annually⁴.

¹ "Assessing NR's scope for efficiency gains over CP4 and beyond: a preliminary study", LEK/Oxera, December 2005 ("2005 LEK/Oxera study")

² "Update on the framework for setting outputs and access charges and strategic business plan assessment", ORR, February 2008

³ Ibid, para 8.38

⁴ Refer to Appendix 1. In addition, for example, LECG's report for Postcomm on "Future Efficient Costs of Royal Mail's Regulated Mail Activities", 2 August 2005, which reviews the available evidence in other regulated sectors, and concludes that a range of 3% to 4% can be taken from outturn regulated company savings.

- 1.5 LECG has been asked by NR to review the available analysis, including the 2005 LEK/Oxera study⁵, which might inform the level of appropriate efficiency targets for CP4. Specifically we were asked to consider:
- the pace at which other comparable regulated infrastructure/utility companies have achieved efficiency savings;
 - NR's likely rate of efficiency improvements relative to the comparator range, and the factors that would influence this; and
 - the way in which the results might properly be applied in determining appropriate efficiency targets for CP4.
- 1.6 In undertaking this work, in addition to the 2005 LEK/Oxera study for the ORR, we have considered, amongst other things, analogous top-down studies undertaken for other regulators based on similar datasets and the decisions reached by other regulators. Our analysis covers the methodologies applied, the datasets used and the conclusions reached. This report contains our conclusions. For convenience, it is framed around the logic apparently applied by LEK/Oxera in their 2005 report.
- 1.7 In summary, we believe that the plausible upper end of the range for efficiency gains achievable by NR over CP4 is lower than either the 8% per annum apparently adopted by the ORR in 2007 as the top end of its range, or the 6.9% per annum implied by its February 2008 document. In addition to that, we believe that there are good reasons to locate CP4 efficiency targets for NR within, rather than at the upper extreme of, the appropriate range.

The range of efficiency improvements identified in the 2005 LEK/Oxera study

- 1.8 As is normal within reports of this kind, the 2% to 8% p.a. range identified as plausible within the LEK/Oxera report is related only loosely to the specific results of the underlying analysis. We believe, however, that it would not be wrong to characterise the conclusions as resting on the premises set out below.
- 1.9 First, the low point in the range appears to be based on an analysis of trends in total factor productivity ("TFP"). Essentially, analysis of this kind posits that long run efficiency trends observable across the economy provide evidence of the efficiency trends that might be assumed to apply within the industry being examined. If there is a reason to believe that the industry being examined is less efficient than the economy as a whole, then the figure provided by this type of analysis will properly be regarded as a minimum, as appears to be the case here.
- 1.10 Second, there is an intermediate point in the range of some 5.4%. This figure has been derived on the hypothesis that the events of Hatfield "*effectively reset the industry to a level of inefficiency comparable with pre-privatisation*". The figure reflects the average gains achieved across a range of privatised industries in their second price control periods and/or

⁵ "Assessing Network Rail's scope for efficiency gains over CP4 and beyond: a preliminary study", LEK/Oxera, December 2005 ("2005 LEK/Oxera study")

in their second five-year period post-privatisation⁶ (which, according to the LEK/Oxera hypothesis, is equivalent to NR's CP4).

- 1.11 Third, the high point on the range is based on the hypothesis that there are additional gains specifically available to NR. This is necessarily *different* to the hypothesis set out in the paragraph above – although the difference is not explored within the LEK/Oxera report. The hypothesis rests on the observation that, although NR is likely to hit efficiency targets in CP3, that *may* still leave the company less efficient than it would have been if it had met the efficiency targets in CP2.
- 1.12 The calculations set out in the report produce an estimate of this gap as being some or all of a figure of £0.5 billion. This is equivalent on their calculations to between 2% and 5% (based on an extended range of £0.3 billion to £0.7 billion) in additional annual efficiency gains if the gap exists and can be closed by the end of CP4. On the assumption that gains of this magnitude would be incremental to the gains made by other industries post privatisation, the 8% at the top of the overall range appears to be derived from a pragmatic combination of the figure of 5.4% with something from the lower end of the 2% to 5% range.
- 1.13 Combining the results of the two analyses in this way relies – as the LEK/Oxera report notes – on “*certain hypotheses that remain to be tested*”. We do not know if those hypotheses have yet been tested, but we believe that if they were, they would fail. For reasons described in the sub-section immediately below, we believe that the combination involves double counting of “catch-up” gains, and is therefore invalid. On that basis alone, we would reduce the range described by Oxera from 2% to 8% down to 2% to 5.4%, below that currently adopted by the ORR.
- 1.14 Second, for reasons described further below, we believe that the comparator set of privatised industries used within the LEK/Oxera report, and apparently informing the figure of 5.4%, is flawed. Specifically, we believe that the set should exclude BT, which has many characteristics that would differentiate it from NR, and include BAA and Royal Mail, which we believe are more similar. Making these adjustments reduces the central range of gains achieved in the “second price controls” from 2% to 5.4% down to 2% to 4% per annum. Results at this level would not be unusual: we ourselves, following an exhaustive study commissioned by Postcomm, identified potential gains of only this magnitude, for the period covered by Royal Mail’s second price control.
- 1.15 Third, analysis of the results achieved by comparator companies, described further below, suggests that the highest efficiency gains are associated with static or declining measures of quality and service reliability; while the highest quality improvements tend to be associated with lower levels of efficiency gains. There are obvious reasons why this should be so, given a finite capacity on the part of any organisation to handle change. The scale of quality improvements sought by the ORR over CP4 suggests to us that efficiency targets closer to the middle of any comparator range would be more appropriate than targets set at its upper extreme.

⁶ The difference between the two is curious, given the general overlap between the second five year period post-privatisation and the second price control. We understand that NR have sought clarification of the underlying data.

The double counting of the scope for efficiency improvements

- 1.16 As noted briefly above, the two hypotheses incorporated within the LEK/Oxera report are logically inconsistent. In respect of the first, the report notes:

*"In investigating the top end of the range for Network Rail, these analyses have been based on the hypothesis that the sharp increase in costs that followed Hatfield and Railway Administration have effectively reset the industry to the very high level of inefficiency observed pre-privatisation"*⁷

- 1.17 The report then goes on to suggest that there may be additional catch-up gains, based on an apparent difference between the efficiency targets set in CP3 and those targeted in CP2. For these gains to be additional, though, they need to be incremental to those available from *the very high level of inefficiency observed pre-privatisation*. This would be counter to the hypothesis above – the industry either is, or is not, at pre-privatisation levels of inefficiency. The revised LEK/Oxera hypothesis, however, appears to be that the industry is at pre-privatisation levels of inefficiency *plus a bit more*.
- 1.18 This implication is important. The report asserts, but does not prove, that *"...to the extent that this gap does represent additional catch-up, it would be incremental to any view of ongoing efficiency improvements derived from analogy with efficiency trends in other regulated industries or other railways."*⁸ It is on the incremental nature of any catch-up gains that the 8% figure at the top end of the range suggested in the report rests.
- 1.19 We do not believe that there is any evidence to suggest that any such catch-up gains would be incremental. Given the way in which the analyses set out within the report have been combined, it is necessary to believe that the inefficiencies implicit in any gap are qualitatively different from the inefficiencies inherent in other regulated industries prior to privatisation. We believe that this is implausible. At the very least, we believe that the proposition has yet to be demonstrated.
- 1.20 If the gap is real, and if some portion of it represents available catch-up gains, then we believe that the more logical conclusion is that those gains are not qualitatively different from the gains available to other regulated industries post privatisation. Certainly the rates of improvement noted by LEK/Oxera for these other industries (up to 5.4%) far exceed the rate of frontier shift that they identify elsewhere within their report (of 1% to 2%), and must therefore include significant catch-up components.
- 1.21 Absent evidence to the contrary, we see no reason to believe that those catch-up components are qualitatively different from any gains available to NR post Hatfield. If that is right, then the supposedly *additional* post Hatfield gains must already have been picked up in the analysis carried out by LEK/Oxera on post-privatisation efficiency gains in other industries – commented on below. On that basis, they are double counted.
- 1.22 In summary, it appears that LEK/Oxera have then inappropriately combined these assumptions in some way in concluding that annual savings of up to eight per cent can be achieved in CP4. LECG considers that the potential rate of savings implied by the gap identified should be compared to the rates of savings achieved by other regulated companies rather than added to them.

⁷ 2005 LEK/Oxera study, page 45

⁸ 2005 LEK/Oxera study, page 42

The implied pace of change

- 1.23 We note also that LEK/Oxera conclude⁹ that the long term cumulative unit cost reductions actually achieved over a period of 8 to 11 years post privatisation were broadly in the range 20% to 50%.¹⁰ LEK/Oxera argue that if the gap they posit were real, then (hypothetically) closing it by 2008/09 would imply total savings since privatisation of only 32%. Their argument is, in effect, that others have achieved similar savings since privatisation, so there is no reason to believe that NR could not have.
- 1.24 That argument is specious: not only is this 32% in itself above the norm for the achievements that they identify; but also none of the comparator companies have achieved these efficiencies while simultaneously dealing with an event of the significance of Hatfield, or with the impact of being put into administration.
- 1.25 LEK/Oxera themselves have argued that the effects of Hatfield and Railway Administration have effectively reset the industry to pre-privatisation levels of inefficiency. On that basis, the achievements of other companies post privatisation need to be evaluated against the targets set for Network Rail *post Hatfield*. The upper end of the 2 to 8% range that they suggest would imply cumulative reductions - given those achieved in CP3 - of over 55%; to be achieved over the ten-year period covered by CP3 and CP4. On LEK/Oxera's own analysis, such an achievement would be unprecedented - none of the companies that they identify has achieved efficiency gains at the rate implied by their 8% target, or even the 6.9% rate implied by the ORR's February 2008 update.

Comparator analysis

- 1.26 The 2005 LEK/Oxera study considers the gains that have been made in other regulated industries as a proxy for the gains that NR might achieve during CP4. That section is largely drawn from earlier Oxera work.¹¹ The report suggests two criteria for inclusion in the comparator set: (i) the nature of their work should match that of NR; and (ii) the industry must be subject to economic regulation.¹²
- 1.27 The industries that make it through this filter are water and sewerage, electricity, and telecoms.¹³ It is unclear why BAA and Royal Mail do not, since they appear to share many of the same key characteristics (e.g. increasing returns to scale and density, long term effects of past investment) of NR. Indeed NR and Royal Mail share an important characteristic – in that neither is owned for profit by private investors – that may be particularly influential in determining the speed at which efficiency gains can be realised.
- 1.28 It is equally unclear why BT should make it through the filter, given the impact on BT of changes in the cost of technology. Driving efficiency improvements in organisations that rely more on manpower than they do on processing power is harder, and slower. In heavily

⁹ 2005 LEK/Oxera study, Figure 7.2 on page 40

¹⁰ Although the norms are in the range of 20% to 30%, with the upper level of 50% being achieved only by BT, and by NGC

¹¹ For example, "Operating cost reductions in regulated network industries", Oxera, June 2003

¹² 2005 LEK/Oxera study, page 19

¹³ 2005 LEK/Oxera study, page 19

unionised environments, such as those that apply at NR, and at Royal Mail, achieving efficiency gains is harder still.

- 1.29 As commented on within the body of this report, we have been unable to replicate LEK/Oxera's analysis of average efficiency gains in the second price control and/or years 6-10 post-privatisation.¹⁴ We have a number of questions relating to the figure of 5.4% that they derive, to which we have not, yet, been able to secure answers. We believe that excluding BT and including BAA and Royal Mail would bring the figures down. In our own study of post-privatisation efficiency gains in connection with the current price control for Royal Mail (which is cited but not commented on within the 2005 LEK/Oxera study), we concluded that:

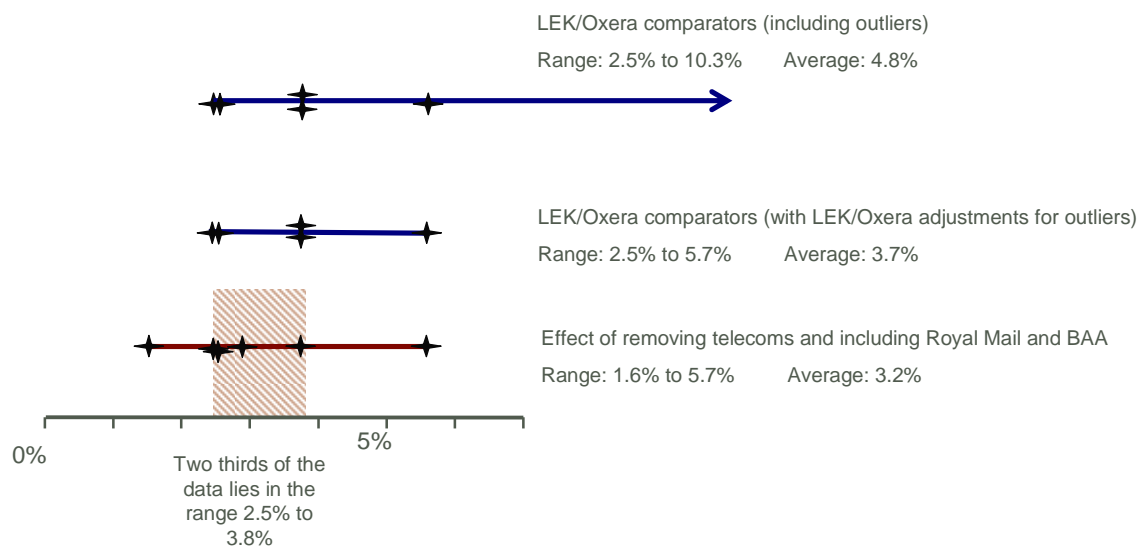
*"The results historically achieved in other regulated sectors, in conjunction with the more one-off gains generally achieved in the first 5 to 10 years of price controls, suggest that annual unit cost savings (in RUOE terms) of between 3% and 4% have typically been achievable in firms that are moving to an efficient frontier after an extended period of public ownership and absence of price pressure."*¹⁵

- 1.30 The 2005 LEK/Oxera study also summarises efficiency gains by sector over more extended periods. Although these do not appear to have featured as a component in their conclusions, it is instructive to look at the effect on the analysis of changing the comparator set as suggested above. The impact, as shown within the body of this report, is to reduce the range from between 2.5% and 10.3% to between 1.6% and 5.7% per annum.
- 1.31 Looked at graphically, the differences are more obviously visible. As the chart shows, the average actual results achieved are clustered in the range of 2.5% to around 4% - similar to the 3% to 4% range that we identified as part of the efficiency study carried out for Postcomm; and to conclusions reached recently by both the CAA and Ofwat.¹⁶ It is this narrower range that we believe should inform the ORR's decision on the level of efficiency improvements to be built into pricing decisions for CP4.

¹⁴ Summarised at figure 5.4 on page 24 of the 2005 LEK/Oxera study.

¹⁵ 2005 LEK/Oxera study, page 76 which quotes from LECG's report for Postcomm on "Future Efficient Costs of Royal Mail's Regulated Mail Activities", 2 August 2005.

¹⁶ "Royal Mail Price and Service Quality Review Final Proposals for Consultation", Postcomm, December 2005; "Future water and sewerage charges 2005-10 – Final determinations", Ofwat, December 2004; "Supporting Paper 4: Top-down efficiency analysis", CAA, November 2004

Figure 1: Impact of comparator selections

Sources: As per Table 3 below

- 1.32 Finally, it is not clear to us that achievements of comparator companies within their second price control periods are in fact properly comparable with the performance that might sensibly be expected from Network Rail in CP4. The improvements expected to be made by Network Rail in CP3 are well in excess of those achieved by comparator companies in the periods following privatisation. Given the scale of those improvements, it appears to us to be more natural to think of CP4 as being more closely analogous to the third quinquennium or third price control period of other comparator companies. On the figures presented in the 2005 LEK/Oxera study, with appropriate adjustments to the comparator set, the relevant figure could be something of the order of 3% per annum.

Impact of proposed service reliability improvements

- 1.33 The headline service reliability figure for NR is the Public Performance Measure (“PPM”). This is the percentage of franchised passenger trains arriving at their destination and within a specified lateness margin (typically five or ten minutes). This measure captures all delay causes including NR, train operators (“TOCs”) and others. Against this measure, NR’s punctuality has improved significantly from around 78.7% percent five years ago, to around 89% today, and is forecast to reach 90.2% at the start of CP4. NR has been set the target of improving this to 92.6% by the end of CP4, against a backdrop of increasing passenger numbers.
- 1.34 In publishing its “*Update on the framework for setting outputs and access charges and strategic plan assessment*” in February 2008, the ORR noted that:

“Our overarching objective for this work is to ensure an outcome that delivers a railway that is safer than ever before, is more reliable than ever

before, whilst carrying significantly more passengers and freight, at a cost that represents ever better value for money for users and taxpayers”¹⁷

- 1.35 It appears to be common ground within the industry that targets for increased safety and reliability are important, as indeed is increasing capacity. There is little evidence, however, that it is feasible to manage improvements on all of these fronts while simultaneously reducing costs at the rate that the ORR has suggested.
- 1.36 The ORR's cost reduction targets, as described above, appear to be based on the actual cost reduction achievements of the regulated industries. As shown in the table below, those achievements were generally made within a context of already very high performance on service availability. In the one industry requiring improvement on a similar scale to that of NR – Royal Mail, which started its second price control (2003 to 2006) with some 90.1%¹⁸ of first class mail delivered within the target deadlines – targets for efficiency savings were notably close to the low end of the range set out by the ORR.

¹⁷ “Update on the framework for setting outputs and access charges and strategic plan assessment”, ORR, February 2008, page 1

¹⁸ “National report to Postcomm and Postwatch, Quarter 4 cumulative report, April 2003 – March 2004”, Royal Mail, 2004

Table 1: Availability and quality parameters for selected comparators

Industry	Comparator time period	Service reliability	Other quality parameters	RUOE % p.a.
BAA	1987 – 2001	-	QSM (Quality Service Measure) declined	1.6
Sewerage Industry	1992/93 – 2003/04	Remained above 99.9%	Customer service and environmental compliance improved	(0.7) ¹⁹
Water Industry	1992/93 – 2003/04	99.5% increasing to 99.8%	Water quality and customer service quality improved	2.0 ²⁰
Royal Mail	2002/3-2005/6	91.8% increasing to 94.1%	Customer complaints constant	2.9
Electricity Distribution	1990/91 – 2000/01	Remained above 99.9%	Customer interruptions improved	3.8
Electricity Transmission	1990/91 – 2000/01	Decreased from 95.9% to 95.4%	Voltage and frequency excursions broadly constant	5.7
BT	1996/97-2003/04	Faults per line per year declines, but a smaller proportion of faults are being repaired within 24 hours ²¹	Residential customer satisfaction declined from 86% to 79% Business customer satisfaction declined from 88% to 83%	3.8 or 10.3

Source: LECG analysis

- 1.37 It is also notable that the water industry, whilst handling very substantial investment programs designed to improve quality, achieved volume adjusted Real Unit Operating Expenditure (“RUOE”) savings of only 2.0% (water) and (0.7)% (sewerage). We have argued above that BT does not properly belong within a comparator set for NR, but it is in any case striking that the 10.3% RUOE improvements achieved there – which form the upper limit within the analysis conducted by LEK/Oxera – were achieved alongside significant *reductions* in overall quality measures.
- 1.38 We believe that there are natural limits to any organisation’s capacity to handle change. The effect of those limits is exacerbated in the case of rail, where needed improvements in capacity, for example, have an impact for safety reasons on the scheduling of regular services. The inter-relationships between the targets for safety, quality and efficiency are perhaps paralleled in Royal Mail, but otherwise appear more complex than those facing other regulated industries. These argue for efficiency targets being more cautiously set.

¹⁹ While Figure 5.1 of the 2005 LEK/Oxera study quotes the figures excluding enhancement expenditure when considering quality enhancements it is more appropriate to consider the figures which include enhancement expenditure as stated in LEK/Oxera Figures C.1 and C.4.

²⁰ While Figure 5.1 of the 2005 LEK/Oxera study quotes the figures excluding enhancement expenditure when considering quality enhancements it is more appropriate to consider the figures which include enhancement expenditure as stated in LEK/Oxera Figures C.1 and C.4.

²¹ UK figures. The decline in faults per line per year may be reflective of technological change, whereas the reduction in the number may reflect cuts in manpower.

Top-down and bottom-up measures

- 1.39 It is normal in setting efficiency targets for price control purposes for measures derived on a top-down basis to be looked at against alternative measures derived on a bottom-up basis. The latter include specific plans produced by the regulated company or companies in relation to the efficiency improvements that they plan to make.
- 1.40 We understand that NR has undertaken a detailed bottom up analysis that suggested annual savings of 5%, 5%, 4%, 3% and 2% across the five years of the CP4 period. We understand that these figures incorporate a form of *stretch* target over and above the specific initiatives reflected in the bottom up analysis, reflecting the fact that the organisation is not in a position to know, ahead of the period, all of the initiatives that it might be able to make during the period.
- 1.41 These figures amount, in aggregate to an annual improvement in efficiency averaging some 4% per year. We note that an efficiency target at this level would be compatible with the range described on a top-down basis above, reflecting gains typically achieved in the periods immediately following privatisation.

Conclusions

- 1.42 We believe that the efficiency targets put forward by the ORR, apparently based on the results of a desktop study by LEK/Oxera reported on in December 2005, are not in fact supported by the evidence set out within that report. The upper end of the range set out in the report relies on the double counting of identified catch-up gains; uses an inappropriate set of comparator companies; and pays insufficient attention to the impact of required quality improvements. The report's conclusions are properly described as being "*preliminary*", and the upper end of the identified range as "*based on certain hypotheses that remain to be tested*".
- 1.43 We believe that a proper examination of the evidence available would support the imposition of top-down efficiency targets of no more than, and probably less than, 4% per year in volume-adjusted efficiency terms. We do not believe that targets set at this level would be incompatible with the results of NR's own bottom-up analysis, which incorporates a stretch target.

Section 2

Background to regulatory efficiency analyses

Introduction

- 2.1 Economic regulators such as the ORR and their advisors often undertake top-down efficiency studies using evidence of the efficiency achieved by comparator companies and evidence of TFP growth. Based on an established methodology, and consistent sets of historical data, other regulators have typically concluded that the scope for Real Unit Operating Expenditure (“RUOE”) gains lies in the range 3% to 4% per annum²², allowing for both a frontier shift and catch-up.
- 2.2 In February 2008, the ORR published an update on the framework for setting outputs and access charges.²³ This document indicates that ORR’s current view is that during the next control period (“CP4”), NR could achieve “...*gross efficiency savings of between approximately 21% and 30% in OM&R*”. The lower end of this range equates to 4.6% per annum and the upper end to 6.9% per annum. ORR states that the upper end of this range “...*is informed by, amongst others, the assessment of the [International Union of Railways (“UIC”)] dataset and work being carried out by Oxera updating the 2005 LEK/Oxera study.*”²⁴
- 2.3 We believe that the conclusions in the 2005 LEK/Oxera study that the top end of the range could be as large as 8% per annum and the conclusions by the ORR that the upper end of the range could be as large as 6.9% per annum, are high in comparison to the top down findings of other regulators.

LECG’s terms of reference

- 2.4 In assessing the potential efficiency savings in CP4, LECG has been asked to review the 2005 LEK/Oxera study, together with other available analysis. Specifically LECG were asked to consider:
- the pace at which other comparable regulated infrastructure/utility companies have achieved efficiency savings;

²² See, for example, LECG’s report for Postcomm on “Future Efficient Costs of Royal Mail’s Regulated Mail Activities”, 2 August 2005, which reviews the available evidence in other regulated sectors, and concludes that a range of 3% to 4% can be taken from outturn regulated company savings. A list of other regulators’ assumptions are set out in Appendix 1

²³ “Update on the framework for setting outputs and access charges and strategic business plan assessment”, ORR, February 2008

²⁴ Ibid, para 8.38

- the extent to which productivity improvements are catch-up or frontier shift;
 - NR's likely rate of efficiency improvements relative to the comparator range, and the factors that would influence this (including the extent to which comparator companies have improvements in outputs at the same time as delivering efficiency improvements, and the possibility that increases in input costs will exceed RPI); and
 - the way in which the results might properly be applied in determining appropriate efficiency targets for CP4.
- 2.5 LECG has not been asked to review the ORR's assessment of the UIC dataset. We understand that NR has engaged other consultants to perform this work. In addition, in the time available to perform our work, it has not been possible to consider the "*work being carried out by Oxera updating the 2005 LEK/Oxera study*".
- 2.6 Hence, in undertaking our work, we have considered, amongst other things, the 2005 LEK/Oxera study for the ORR²⁵, analogous top-down studies undertaken for other regulators based on similar datasets that have been used to inform regulators' efficiency assumptions, and the decisions reached by other regulators.

Report structure

- 2.7 In the remainder of this section, we summarise the conclusions of the 2005 LEK/Oxera study. We then provide some context to performing top-down reviews. We consider the methods and assumptions used by other regulators when undertaking similar top down benchmarking studies, and we comment on how regulators have typically interpreted the available data and their approach to selecting appropriate targets.
- 2.8 In Section 3, we review the comparator data used in the 2005 LEK/Oxera study. We present an alternative and more appropriate set of comparators and estimate the impact of making these changes.
- 2.9 Having established an appropriate comparator range, in Section 4 we consider the factors that would influence where NR might be expected to sit within the range. We consider the impact of the proposed service reliability and quality targets, the impact of historical cost increases (e.g. Hatfield etc) on the anticipated rate of efficiency gains in CP4 and the impact of input costs rising ahead of RPI during the next control period.
- 2.10 Further supporting material is included in our appendices and our findings and conclusions are set out in the Executive Summary.

2005 LEK/Oxera study conclusions

- 2.11 The 2% to 8% range identified as plausible within the 2005 LEK/Oxera study is related only loosely to the specific results of the underlying analysis. We believe, however, that it would not be wrong to characterise the conclusions as resting on the premises set out below.
- 2.12 First, the low point in the range (2% p.a.) appears to be based on an analysis of trends in total factor productivity ("TFP"). Essentially, analysis of this kind posits that long run

²⁵ "Assessing Network Rail's scope for efficiency gains over CP4 and beyond: a preliminary study", LEK/Oxera, December 2005 ("2005 LEK/Oxera study")

efficiency trends observable across the economy provide evidence of the efficiency trends that might be assumed to apply within the industry being examined. If there is a reason to believe that the industry being examined is less efficient than the economy as a whole, then the figure provided by this type of analysis will properly be regarded as a minimum, as appears to be the case here.

- 2.13 Second, there is an intermediate point in the range of some 5.4%. This figure has been derived on the hypothesis that the events of Hatfield “*effectively reset the industry to a level of inefficiency comparable with pre-privatisation*”. The figure reflects the average gains achieved across a range of privatised industries in their second price control periods and/or in their second five-year period post-privatisation (which, according to the LEK/Oxera hypothesis, is equivalent to NR’s CP4).
- 2.14 Third, the high point on the range is based on the hypothesis that there are additional gains specifically available to NR. This is necessarily *different* to the hypothesis set out in the paragraph above – although the difference is not explored within the 2005 LEK/Oxera study. The hypothesis rests on the observation that, although NR is likely to hit efficiency targets in CP3, that *may* still leave the company less efficient than it would have been if it had met the efficiency targets in CP2.
- 2.15 The calculations set out in the report produce an estimate of this gap as being some or all of a figure of £0.5 billion. This is equivalent, on their calculations to between 2% and 5% (based on an extended range of £0.3 billion to £0.7 billion) in additional annual efficiency gains if the gap exists and can be closed by the end of CP4. On the assumption that gains of this magnitude would be incremental to the gains made by other industries post privatisation, the 8% at the top of the overall range appears to be derived from a pragmatic combination of the figure of 5.4% with something from the lower end of the 2% to 5% range.
- 2.16 The level of caveating of these conclusions is notable. The report states that the LEK/Oxera assessment is “...based on certain hypotheses that remain to be tested...”²⁶ and that “...it is important to emphasise the preliminary nature of the estimated ranges of efficiency improvements” and that “...given the limitations of the scope of the study, the limited availability of information, and the inherent uncertainties at this stage of the process, there can be no guarantee that the final determination of achievable improvements will lie within the estimated range”.²⁷

Methods and assumptions used by other regulators when undertaking benchmarking studies

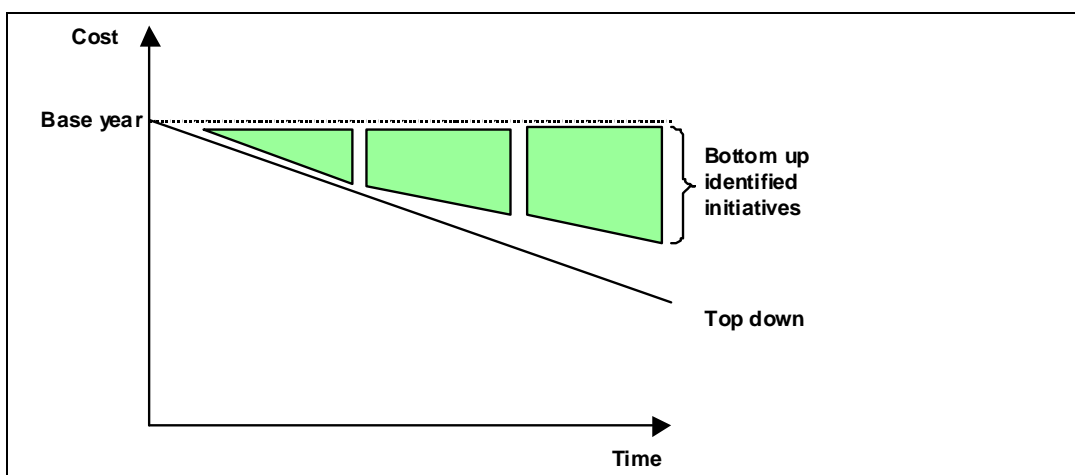
- 2.17 When assessing the appropriate assumptions to be made with respect to the efficiency improvements of a regulated company, it is common for regulators to employ a range of approaches. In general, these approaches can be categorised as “bottom-up” where individual cost components are analysed and benchmarked with a view to establishing an overall efficiency assumption, and “top-down” where the overall level of efficiency that might be expected is derived from overall efficiency assumptions made and efficiency improvements achieved elsewhere.

²⁶ 2005 LEK/Oxera study, pages 3 to 4

²⁷ 2005 LEK/Oxera study, pages 5 and 6

- 2.18 It is normal in setting efficiency targets for price control purposes for measures derived on a top-down basis to be looked at against alternative measures derived on a bottom-up basis. The latter include specific plans produced by the regulated company or companies in relation to the efficiency improvements that they plan to make.
- 2.19 In the regulatory context, top-down analysis typically takes the form of comparisons with the aggregate cost data of other companies, either nationally or internationally. Top-down analysis is necessary in cost efficiency studies because not all of the mechanisms available to the company for raising efficiency, or reducing costs over a forward period can normally be foreseen at the start of that period. Looking at the sum of initiatives that can be identified at the outset of the price control period (which is the nature of the bottom-up analysis that needs to be performed) may therefore understate the actual scope for forward efficiency gains.
- 2.20 In our experience, bottom-up estimates of the scope for efficiency gains are more likely to provide a lower limit to the actual scope. Looking at the problem on a top-down basis provides an alternative estimate of the scope for actual forward efficiency gains with which bottom-up estimates can be compared. In principle, neither of the two approaches has, or needs to have, primacy, although by its nature the bottom-up analysis is generally more comprehensive.
- 2.21 That is not to understate the importance of top-down analysis. Top-down analysis is a sensible component of the regulatory analyses and needs to be undertaken when regulators set price controls. It should not simply be dismissed by a regulator because it gives an inconsistent answer relative to other methodologies.
- 2.22 The relationship between the two forms of analysis is shown graphically below:

Figure 2: Graphical representation of top-down and bottom-up approach



Source: LECG analysis

- 2.23 Although the top-down approach is represented above as producing a single trend estimate, it is usual for a range of different approaches to be used, each of which may produce slightly different figures. We note that LEK/Oxera has used several top-down approaches in their report to reach their preliminary conclusions.

- 2.24 We would expect a regulator to use a wide range of techniques in setting an appropriate target (i.e. both bottom-up and top-down). These techniques would be expected to give alternative estimates on the total gains achievable. To the extent that there was a large gap between estimates, further analysis would be necessary to understand the nature of the gap. In our opinion it would be wrong to simply take the highest estimates produced.

Best practice requires a balanced approach

- 2.25 Best practice requires that any selected efficiency target should be clearly supported by the weight of underlying evidence. That is, we would expect the target to fall within the ranges derived from the different assessments. If a target was to be set based on the highest end of the range, then strong reasons for this would need to be provided.
- 2.26 We illustrate two examples of regulatory good practice in this respect: Postcomm's recent assessment of Royal Mail's efficiency over its current price control; and the CAA's assessment of NATS' efficiency.
- 2.27 In its assessment, Postcomm used a wide range of techniques to estimate Royal Mail's efficiency. The table below summarises the evidence it used to set Royal Mail's efficiency targets.

Table 2: Summary of findings relating to Royal Mail's future RUOE savings, assuming constant volume and mix

	Annual % decrease in RUOE
Top down assessment	3.0 % to 4.0%
Bottom up review of RML's Strategic Plan	1.4% to 2.6%
Internal benchmarking (assuming achieved over 4 years)	2.7% to 3.5%
Internal benchmarking (assuming achieved over 5 years)	2.2% to 2.8%
Conclusion	2.75% to 3.25%

Source: "Future Efficient Costs of Royal Mail's Regulated Mail Activities", LECG, 2 August 2005, Table 13

- 2.28 It should be noted that there was a high degree of consistency between the ranges derived from the different assessments. Based on this evidence, Postcomm selected a 3% target as being appropriate for Royal Mail (i.e. within, rather than at the limit of, the ranges identified).
- 2.29 The CAA's decision on NATS price control review for 2006-2010 was published in December 2005.²⁸ The CAA's efficiency assessment as part of this review was based on four related studies of the scope for future cost savings, which are summarised in the table below.

²⁸ http://www.caa.co.uk/docs/5/ergdocs/erg_ercp_natsdecision_dec05.pdf

Table 3: Summary of findings relating to NATS

	Results
Top down review of comparator companies	3% to 4% p.a. RUOE reductions (assuming constant volume)
International benchmarking	Gate to gate costs per unit output 17% higher than average
Corporate function benchmarking	Efficiency gaps of 17% to 28%
HR benchmarking	More expensive than average
Conclusion	2% to 3%

Sources: "Supporting Paper 4: Top-down efficiency analysis", CAA, November 2004, para 3.7; "Cost benchmarking NATS relative to selected ANSPs, Final Report on benchmarking with existing data", Steer Davis Gleave, May 2005, paragraph 2.106; "Benchmarking the corporate function costs of NATS", KPMG, October 2004, section 1.3.3; "HR Index Benchmark Report Executive Commentary", Saragota, 2003; "NATS Price Control Review 2006-2010 CAA's Firm Proposals", CAA, May 2005, paragraph 7.21.

2.30 It can be seen from the table that the CAA actually selected an efficiency range below the bottom of that suggested by the top down comparator analysis. The top-down analysis concluded that trends in productivity growth and opex reductions in other industries indicated potential for NATS to improve its own efficiency by up to 3% per annum (in real terms) in the period to 2010/11. This finding lay at the bottom of a range of 3% to 4% and reflected the relatively large impact that real wage growth is likely to have on NATS compared to other companies. The CAA noted that this conclusion was similar to the judgments that were emerging from the Ofwat and Ofgem reviews of the water and sewerage and electricity distribution businesses.

2.31 The CAA provided further commentary with respect to this choice, as follows:

"CAA therefore concludes that the top-down evidence continues to lend support to its conclusion that NATS should be able to reduce its opex by between 2% and 3% per annum. The CAA notes that this is a lower rate of improvement than NATS has achieved in CP1 and also lies below the achievements of other regulated companies in their second five-year period after privatisation. However, the CAA recognises that it is a target that would push NATS harder than its own March 2005 business plan projections and would therefore require significant effort on the part of NATS' management.

*The CAA also acknowledges that top-down comparisons of this type do not reflect the unique nature of NATS' business and need to be looked at alongside evidence on the scope for efficiency within the specific activities that NERL undertakes."*²⁹

2.32 The final point made by the CAA applies equally to the NR comparator analysis, namely that that top-down comparisons of this type do not reflect the unique nature of NR business. The analysis therefore needs to be looked at alongside evidence on the scope for efficiency

²⁹ "NATS Price Control Review 2006-2010 CAA's Firm Proposals", CAA, May 2005, paragraph 7.21

within the specific activities that NR undertakes. This would generally be informed by bottom-up benchmarking.

Bottom-up benchmarking and frontier shift

2.33 Bottom up benchmarking, by its very nature, identifies the actual initiatives that a company would deploy to improve its efficiency. A company at the efficiency frontier will identify initiatives that allow it to keep pace with frontier shift. It is, in fact, these very initiatives from frontier companies that cause frontier shift. A company progressing towards the frontier would identify initiatives that cover both frontier shift improvements and catch-up. There can be no meaningful distinction between catch-up and frontier shift at that level.

2.34 In its February 2008 update, ORR describes its thinking on the lower end of its efficiency range as follows:

“...the lower end our estimate is based on Network Rail’s 17.6% assumption, to which we have added our initial estimate of frontier-shift efficiency of approximately 5% over CP4...”³⁰

2.35 Methodologically, the addition of frontier shift efficiency to a bottom-up analysis is wrong and double-counts that component, since a bottom-up analysis will already identify initiatives to deliver frontier shift.

2.36 To the extent that there is a gap between the results of bottom-up and top-down benchmarking exercises, the regulator needs to consider the extent to which a stretch target should be applied to the bottom-up figures.

Consistent interpretation of the data

2.37 Comparisons with other regulated companies are commonly used to provide high-level indications of the scale of future efficiency savings. The 2005 LEK/Oxera study, for example, concludes that the range excluding outliers is 2.5% to 5.7%.

2.38 However, regulators typically accept that it is sensible to narrow this range. For example, Postcomm concluded recently that:

“After carefully considering Royal Mail’s arguments, Postcomm believes that LECG’s original judgements are broadly reasonable, while Royal Mail’s proposed judgements are generally selective and very conservative regarding possible future efficiency. LECG’s review of the top-down analysis sets out in some detail its comments on each of Royal Mail’s main points. LECG still believes that a RUOE trend of between 3% and 4% per year in constant volume terms can be justified by the “top-down” analysis.”³¹

³⁰ “Update on the framework for setting outputs and access charges and strategic business plan assessment”, ORR, February 2008, para 8.38

³¹ “Royal Mail Price and Service Quality Review Final Proposals for Consultation”, Postcomm, December 2005. Note that this conclusion refers to the top-down analysis. Postcomm did not conclude that top-down was better than bottom-up. It used both methods to conclude on an efficiency target of 3% p.a.

- 2.39 The result is consistent with a study conducted for Ofwat by Europe Economics³². They conclude that:

“the evidence from analysis of UK regulated firms suggest that savings of the order of 3 per cent to 5 per cent per annum in real operating expenditure have been achieved since privatisation”.

- 2.40 The CAA has reached similar conclusion, using Oxera analysis.³³ The CAA concluded:³⁴

“The figures show that other privatised companies have generally been able to reduce real unit opex by between 2.5% and 6% per annum (a range that is now often quoted in studies of the achievements of regulated monopolies since privatisation). Since comparisons based on real unit opex can be distorted by differences in volume growth across industries and differences in economies of scale, a more useful comparison in the context of the CAA’s review is one that strips out completely the effects of volume changes, as shown in the last column of table 5. These figures show that other privatised companies have been able to make savings that have enabled them to reduce by roughly 3% to 4% per annum the amount of opex that it takes to produce any given level of output.”

- 2.41 If a regulator were to depart from the 3% to 4% range, therefore, we believe that strong evidence for such a departure would be required.

Deriving an appropriate target within the range

- 2.42 Once an acceptable range has been determined, it is usually the case that regulators and their advisors consider where within the range the target should be set. This is normally done by reference to similarities and/or differences between the circumstances of the regulated company in its next price control and the circumstances of the comparator group historically. This requires the identification of significant factors that influence the rate at which the regulated company will be expected to improve its efficiency relative to these comparators.

- 2.43 For NR, there are at least three factors that need to be adequately considered. These are:

- the different nature of the quality and reliability improvements required of NR relative to those achieved by the comparators historically. All else being equal, this will tend to reduce the rate at which NR can reasonably be expected to improve efficiency;
- the scope for efficiency catch-up available to NR associated with the increase in costs that occurred following the Hatfield disaster and other rail safety incidents. All else being equal, this would have the countervailing effect of increasing the rate at which NR could be expected to improve its efficiency; and
- the extent to which input costs are expected to exceed RPI in CP4 to a greater extent than in the historical periods from which comparator data is drawn.

³² “Scope for Efficiency Improvement in the Water and Sewerage Industries, Final Report”, Europe Economics, March 2003

³³ “Report prepared for the Office of the Rail Regulator: Benchmarking of Operating Expenditure”, Oxera, 2003.

³⁴ UK Civil Aviation Authority Top down efficiency analysis, November 2004

- 2.44 There is much precedent showing one cannot blindly accept the top end of a range, and that the specific factors of a company need to be considered. For example, the CAA recently concluded:³⁵

“In arriving at an assumption for the purposes of these initial price control proposals, the CAA is, however, conscious of the need to pay particular regard to the actual circumstances faced by the management and staff of Heathrow and Gatwick airports, and the importance of service quality to passengers using these airports. In this context, the CAA notes that BAA’s operating cost base is significantly affected by labour costs and therefore that managing real wage growth will present BAA with a greater challenge than that presented to many other firms, including some operating in other regulated sectors...”

In light of these factors, the CAA considers that – rather than assume 1.5% annual operating cost efficiencies – it would be more appropriate to assume that operating cost efficiency should improve at a rate of 1% per annum in each year from 2005/06 until the end of Q5. The CAA has therefore incorporated this efficiency target in to its modelling of the price caps set out in this document.”

Efficiency incentives

- 2.45 Another reason for not selecting the top end of a range is to ensure that the price control properly incentivises out-performance.
- 2.46 LECG analysis suggests that efficiency targets set by regulators tend on average to be lower than the cost reductions actually realised. We estimate that, across industries and across regulatory reviews, the efficiency targets incorporated into price controls have averaged some 2.5% per year in real constant volume terms. We estimate that actual cost reductions achieved, however, across the same periods and industries, have averaged between around 4.0% and 4.8%, depending on precisely how they are measured.³⁶
- 2.47 This need not imply any weakness in the regulatory process – one of the original premises of RPI-X regulation is that it encourages companies to outperform against their efficiency targets.
- 2.48 The importance of incentives to out-perform is recognised, for example, by Ofwat, which describes the process it applies as follows:

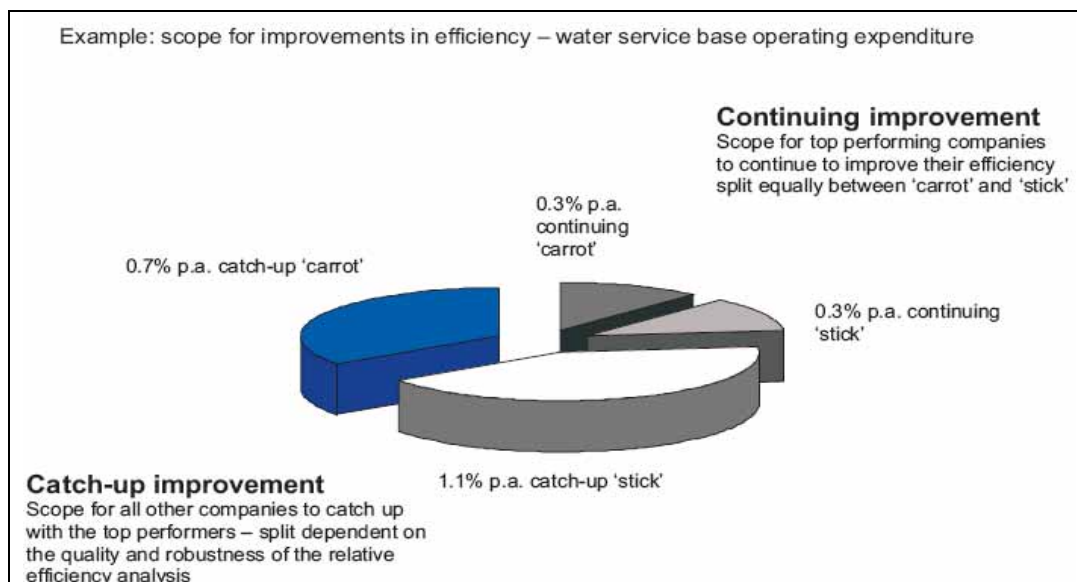
“[The figure below] shows how our assessment of efficiency improvements for base operating costs for the water service build to an assumption on the overall scope for operating efficiency improvements of around 2.4% each year, the overall size of the ‘pie’ in our example. This is split into 0.6% each year for continuing improvement and 1.8% for the catch-up. We have included only half of the scope for continuing efficiency in price limits 0.3%

³⁵ “Airports price control review - Initial proposals for Heathrow, Gatwick and Stansted”, CAA, December 2006.

³⁶ “Future Efficient Costs of Royal Mail’s Regulated Mail Activities”, LECG, 2 August 2005, page 386

and just over half of the scope for catch-up 1.1%. The balance represents the potential for outperformance for the companies.³⁷

Figure 3: Ofwat's illustration of how it selects appropriate efficiency targets



Source: "Future water and sewerage charges 2005-10 – Final determinations", Ofwat, December 2004

- 2.49 If a regulator were to set a target at the top end of the range, there would be little or no scope for out-performance. Indeed, even selecting the average of all comparators, perhaps 4% to 4.8%, still leaves little scope for out-performance - because a company cannot sensibly be expected, on average, to out-perform average performance.
- 2.50 We would expect, therefore, that efficiency targets for Network Rail would be scaled to reflect a realistic scope for out-performance. There is little incentive value in setting targets that are perceived by those at who they are aimed as being unrealistic, or unachievable.

Measurement Errors

- 2.51 There is one further reason for regulators to be prudent when selecting figures from top-down analysis, namely that of measurement bias. In its report to Ofwat in November 2003, Europe Economics provides a helpful theoretical analysis of some of the limitations that arise from using different methodologies to estimate the scope for future efficiency improvements. In particular, Europe Economics suggests that all top-down studies suffer from a number of measurement problems related to their use of national accounts data while studies based on direct TFP estimates suffer from the lack of reliable measures of outputs and capital input in infrastructure sectors. Moreover, Europe Economics suggest that all studies suffer from selective evidence bias, whose direction depends on the prejudices and interests of the person conducting the study.
- 2.52 Examples of factors that can introduce bias include the conversion of accounting costs to cash costs, adjustments for one off costs (e.g. such as business separation, restructuring

³⁷ "Future water and sewerage charges 2005-10 – Final determinations", Ofwat, December 2004

etc), cost allocation, and changes in cost allocation methodology over time. There are two precautions regulators take, therefore. First, regulators ensure that that they have a suitably sized sample of comparator companies and industries against which comparisons can be made, and, second, regulators select figures towards the middle of the ranges identified rather than at the limits of the ranges.

Section 3

The range of efficiency improvements achieved by comparator companies

Introduction

- 3.1 Comparisons with other regulated companies are commonly used to provide high-level indications of the scale of potential future efficiency savings. In this section, we summarise the efficiency savings that have been achieved in other UK regulated sectors. The 2005 LEK/Oxera study also considers this approach.
- 3.2 Section 5 of the 2005 LEK/Oxera study considers the gains that have been made in other regulated companies and industries as a proxy for the gains that might be made by NR during CP4. Much of the wording and data used in this section of the study appears to be drawn from earlier work by Oxera³⁸. LEK/Oxera undertake various pieces of comparator analysis including looking at the average long term annual efficiency gains of the comparators and the average gains for different price control periods and quinquennia.
- 3.3 We believe that a standard methodology has been established by regulators when conducting this type of top down analysis. We have considered, as part of our work whether LEK/Oxera's approach is consistent with this precedent and the conclusions that have typically been drawn from the data.
- 3.4 In summary, we find that LEK/Oxera's conclusions are not consistent with this precedent. We have identified a number of areas in which we either disagree with the approach adopted or believe the results to be internally inconsistent. These include:
- the selection of appropriate comparators – we believe that the analysis both includes comparators that are inappropriate and excludes other more appropriate comparators;
 - the treatment of the costs of quality enhancement – we believe that the analysis reported by LEK/Oxera is inconsistent in the way that adjustments for the costs of quality incurred by comparator companies are made;
 - differences between comparator cost reductions summarised on the one hand by control period and on the other by quinquennium – we believe that the results of the two analyses are, on their face, internally inconsistent; and
 - various other (but perhaps no less material) issues and inconsistencies.
- 3.5 We discuss each of these in more detail below, and identify the impact that adjustment for these factors would have on the findings of the report.

³⁸ For example, "Operating cost reductions in regulated network industries", Oxera, June 2003

Selection of appropriate comparators

- 3.6 The 2005 LEK/Oxera study states “*the main objective of this analysis is to estimate the cost trends in industries that are deemed to provide services comparable to those of the infrastructure services for the UK rail network, in order to use them as benchmarks for NR’s future productivity performance*”.³⁹ We concur that this is an appropriate objective for the analysis.
- 3.7 The report then describes the two criteria that have been applied to identify appropriate comparators, as follows:⁴⁰
- “*the nature of their work should match that of Network Rail – i.e. the provision of network infrastructure services. This criterion is significant because network industries share similar types of activities and certain characteristics, such as increasing returns to scale and density, and the long-term effects of past investment on current efficiency levels*”; and
 - “*the industry must be subject to incentive based economic regulation*”.
- 3.8 We agree that these are necessary criteria. However, they do not constitute an exhaustive list. Further criteria could include the extent of competition in the relevant market, ownership structures, the level of unionisation, and whether quality and system reliability/availability was expected to fall or rise.
- 3.9 Based on the criteria identified within the report, the following five comparators were selected:
- water companies;
 - sewerage companies;
 - electricity transmission (NGC plc);
 - electricity distribution; and
 - telecommunications (BT plc).
- 3.10 The 2005 LEK/Oxera study notes that the gas industry would have been a possible comparator, but that consistent historical data was not available. We have not checked the consistency of the historical data for the gas industry. However, we accept in principle that if consistent data is not available then the comparator cannot be used.
- 3.11 We believe that water, sewerage, electricity transmission and electricity distribution are reasonable comparators to include in the analysis. Including all of these would be consistent with established regulatory precedent in this area.
- 3.12 In our view, BT plc (“BT”) is not a suitable comparator for NR. There are significant differences between the operations of BT and NR as follows:
- for the period from which LEK/Oxera draws its efficiency data, BT’s “Quality of Service” reports⁴¹ show a material decline in the quality of service which BT offered its customers, whereas NR will be expected to improve its standards of service in CP4;

³⁹ 2005 LEK/Oxera study, page 19 and other Oxera report(s).

⁴⁰ 2005 LEK/Oxera study, page 19

- the rate of technological change in telecommunications far exceeds that in the rail industry; and
 - in telecommunications, network throughput and network capacity can be enhanced through (for example) data compression software, without any hardware change – a solution inapplicable to the movement of passengers or freight by rail.
- 3.13 BT fails, therefore, to meet the first of the criteria - that "*the nature of their work should match that of Network Rail*". We believe that technology-intensive industries, such as telecoms, may be expected to have faster technical progress than the other utility industries, and may be expected to be able to reduce their unit costs more quickly. For this reason, amongst others, we believe that BT should be excluded from the available range.
- 3.14 It is interesting that within the LEK/Oxera's analysis, some (but not all) of the BT efficiency metrics are excluded as outliers by LEK/Oxera⁴². BT is used, for example, to set the upper limit of the cumulative efficiency improvements achieved in regulated industries of 51.1% over 8 years.⁴³ This is a tougher target than the next highest of 50.1% over a (significantly longer) period of 11 years.
- 3.15 Our conclusion is that BT should not be included as a comparator for NR in this type of analysis.
- 3.16 We have not sought to identify every potential comparator. Two obvious comparators, however, are BAA and Royal Mail. These comparators operate significant UK based transport infrastructure networks and are subject to economic RPI-X type regulation. In addition, data is readily available for these companies. It is unclear why these were omitted from the LEK/Oxera analysis.
- 3.17 We believe that BAA is a suitable comparator because:
- it operates in the transport sector;
 - it interconnects directly with NR's infrastructure (in that many passengers travel to and from airports via train);
 - it has a substantial civil engineering investment programme;
 - it is (and, importantly, will continue to be) in competition with NR for civil engineering resources; and
 - it is subject to economic regulation.
- 3.18 Including BAA is again consistent with regulator precedent (i.e. it is normally considered by other regulators). However, we believe that it would be appropriate to remove known events such as 9/11 – which gave rise to increasing security costs.
- 3.19 We believe that Royal Mail is a very good comparator because:
- neither Royal Mail nor NR are owned by private investors;

⁴¹ BT's 'Quality of service' reports, October to March 2001 and October to March 2006, and BT's "Social and environmental report", Customers section, 2001 and 2006

⁴² See, for example, 2005 LEK/Oxera study footnote 6 on page 21.

⁴³ 2005 LEK/Oxera study, page 40, figure 7.2. This is a tougher target than the next highest comparator of 50.1% over a longer period of 11 years.

- both companies need to make substantial quality improvements whilst needing to reduce costs;
- both companies operate UK wide transport infrastructure;
- both companies have heavily unionised workforces;
- historically, Royal Mail has faced low levels of direct competition; and
- it is subject to economic regulation.

3.20 We believe that BAA and Royal Mail should have been included as comparators. The impact of including these comparators in the assessment of long-term efficiency gains actually achieved is as set out in the table below.

Table 4: Impact of making changes to comparator set

Industry	Period	Volume adjusted RUOE (average % p.a.)		
		LEK/Oxera comparator set	LEK/Oxera comparator set (excluding outliers)	Revised comparator set
Water Industry	1992/93-2003/04	2.5	2.5	2.5
Sewerage Industry	1992/93-2003/04	2.6	2.6	2.6
Electricity Distribution	1990/91-2000/01	3.8	3.8	3.8
NGC	1990/91-2001/02	5.7	5.7	5.7
BT - call volumes	1996/97-2003/04	10.3		
BT- exchange lines	1996/97-2003/04	3.8	3.8	
Royal Mail	2002/3 to 2005/6			2.9
BAA ⁴⁴	1987-1998			1.6
Range		2.5 to 10.3⁴⁵	2.5 to 5.7	1.6 to 5.7
Average		4.8	3.7	3.2

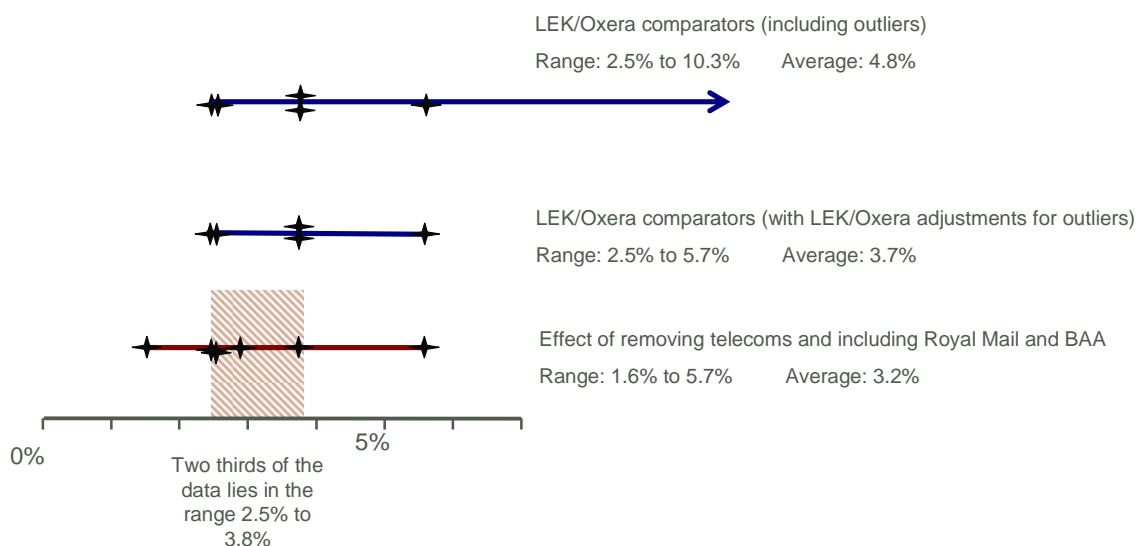
Sources: 2005 LEK/Oxera study; "Future efficient costs of Royal Mail's regulated Mail activities" LECG, 2 August 2005; and LECG analysis of "Transco Price Control Review for 2002-07, Report for Ofgem", Mazars Neville Russell, September 2001, Appendix D.

⁴⁴ This period has been selected to exclude the purchase of Duty Free International, which resulted in a significant increase in RUOE. For 1987 to 2000 the net efficiency gains were, therefore, negative. We understand that after 11 September 2001 BAA costs increased as a result of increase security arrangements. The figure has not been volume adjusted; again this is a prudent assumption. Assuming a return to scale of 0.9 this would imply an overall efficiency improvement of around 1% p.a. for BAA for this period.

⁴⁵ The results are sensitive to how volumes are excluded from the analysis. Whilst it appears that a standard assumption has been adopted, LEK/Oxera do not justify their assumptions. We suspect that if LEK/Oxera had adopted the average RUOE trend from the available data, then measurement issues around the volume adjustment might be less important. However, if specific results are selected to represent the range, then it is important that the right volume and elasticity assumptions be selected. This does not appear to have been done in the 2005 LEK/Oxera study.

- 3.21 The inclusion of these comparators therefore has the effect of reducing the range of efficiency gains achieved by comparable companies. By implication, the analysis suggests a lower range of gains than might reasonably be expected from NR in CP4.
- 3.22 Looked at graphically, the differences are more obviously visible. As the chart below shows, the average actual results achieved are clustered in the range of 2.5% to 3.8%.

Figure 4: Impact of comparator selections



Sources: As per table 3 above

- 3.23 Due to measurement issues and small sample biases, we do not believe selecting the upper end of the range of sensible comparators would be appropriate. It would also be inconsistent with the conclusions of other regulators – who appear to have narrowed the range and selected companies around the average or the median.
- 3.24 Our finding is consistent with the ranges selected by other regulators based on similar comparator data. For example, a study conducted for Ofwat by Europe Economics⁴⁶ concluded:

“the evidence from analysis of UK regulated firms suggest that savings of the order of 3 per cent to 5 per cent per annum in real operating expenditure have been achieved since privatisation

- 3.25 The CAA also reached similar conclusion, using Oxera analysis.⁴⁷ The CAA concluded:⁴⁸

These figures show that other privatised companies have been able to make savings that have enabled them to reduce by roughly 3% to 4% per annum the amount of opex that it takes to produce any given level of output.

⁴⁶ Scope for Efficiency Improvement in the Water and Sewerage Industries, Final Report, Europe Economics, March 2003

⁴⁷ “Report prepared for the Office of the Rail Regulator: Benchmarking of Operating Expenditure”, Oxera, 2003.

⁴⁸ UK Civil Aviation Authority Top down efficiency analysis, November 2004

- 3.26 It is this range that we believe should inform the ORR's decision on the level of efficiency improvements to be built into pricing decisions for CP4.

Treatment of the costs of quality enhancement

- 3.27 When undertaking top-down analysis, it is important that, wherever practicable, efficiency changes are compared on a like-for-like basis. Ensuring consistency is of critical importance, especially when the comparator sample sizes are small. The analysis set out in the 2005 LEK/Oxera study is, however, inconsistent in the way in which it controls for differences in the rate of change of quality.
- 3.28 In particular, the approach controls for *enhancement* expenditure (i.e. the incremental costs associated with improvements in quality and service availability are removed) for some comparators⁴⁹. However, there is no corresponding adjustment for *reductions* in quality or reliability when these coincide with efficiency savings made by other comparator companies. Methodologically, this is not correct, and it has biased the efficiency range of the comparator companies upwards.
- 3.29 Both of the water and sewerage industry comparators have been adjusted to control for their quality enhancement programmes⁵⁰. This increases the headline efficiency improvements as follows:

Table 5: Trends in actual real unit cost reductions of UK regulated companies used LEK/Oxera Controlling for quality enhancement programmes

	Period	Volume-adjusted RUOE (average % p.a.) excluding enhancement expenditure	Volume-adjusted RUOE (average % p.a.) including enhancement expenditure
Water industry controlling for quality enhancement	1992/93-2003/04	2.5	2.0
Sewerage industry controlling for quality enhancement	1992/93-2003/04	2.6	(0.7)

Source: 2005 LEK/Oxera study pages 20, 66 and 68

- 3.30 Conversely, the two comparators (BT and NGC) used to set the upper boundary on efficiency improvements both suffered declines in reported service availability/quality over the period in question⁵¹. For example, between 1995/6 and 2001/2 NGC's annual average system availability declined from 95.9% to 95.4%⁵². BT's quality also declined over this

⁴⁹ 2005 LEK/Oxera study, page 66

⁵⁰ 2005 LEK/Oxera study, figures C.2 and C.5

⁵¹ Further evidence on BT's and NGC's quality performance is set out in Section 4.

⁵² NGC's Report to the Authority for the Gas and Electricity Markets for 2004/05. System availability is defined as the sum for all circuits of hours available divided by the number of circuits multiplied by the number of hours in the relevant period. A circuit is defined as an overhead line, cable, supergrid transformer, or any combination of these plant items, controlled by one or more circuit breakers.

period, with overall business and residential customer satisfaction ratings falling between 1996/7 and 2003/4 as follows:

Table 6: BT quality measures in 1996/97 and 2003/04

Measure	1996/97 (%)	2003/04 (%)	Change (%)
% of overall satisfied residential customers	86.0	79.0	7.0
% of overall satisfied business customers	88.0	83.0	5.0

Source: BT Better World Social and Environmental report, 2001 and 2006

- 3.31 The LEK/Oxera analysis makes no adjustment in respect of declining quality for NGC or BT.
- 3.32 There are two internally consistent approaches available. The first would be to adjust all comparators to remove the effects of changing quality. If this approach were followed, it would then be necessary to make a specific allowance for quality improvements expected of NR in setting targets for CP4.
- 3.33 The second approach would be to ignore changes in quality across the comparators (the approach that most regulators appear to have adopted so far). This approach might be appropriate when data on the cost of quality is not available – which it will not be in all instances. In this case, NR should be compared to companies with similar quality targets.
- 3.34 If a consistent approach was adopted, we believe that a lower efficiency range would be appropriate (refer to Section 4 for further discussion on this).

Comparator cost reductions by control period and by quinquennium

- 3.35 In addition to looking at longer-term efficiency gains by company, the 2005 LEK/Oxera study also presents data on the real unit cost reductions (volume adjusted) of comparators by price control period and by quinquennium. The report states that this is based on the same comparator data that was used to set the 2.5% to 10.3% range above.⁵³ The reported results are as follows:

Table 7: Summary of actual real unit cost reductions (volume adjusted) of UK regulated companies by control period

	Range (% p.a.)	Average (% p.a.)
First Control Period	(3.8) – 5.2	1.9
Second Control Period	3.0 – 12.8	6.5
Third Control Period	(1.5) – 13.2	5.2

Source: 2005 LEK/Oxera study Figure 5.2

⁵³ 2005 LEK/Oxera study, page 22.

Table 8: Summary of actual real unit cost reductions (volume adjusted) of UK regulated companies by number of years since privatisation

Years since privatisation	Range (% pa)	Average (% pa)
1 to 5	1.5 – 6.7	3.9
6 to 10	3.7 – 4.5	4.3
11 to 15	(1.5) – 9.6	2.9

Source: 2005 LEK/Oxera study Figure 5.3

3.36 The 2005 LEK/Oxera study uses the average of the gains achieved in the second control period and the gains achieved in years 6 to 10 to estimate the rate of unit cost reduction that might be expected from NR in CP4 (5.4% per year), and the average of the third control period and years 11 to 15 as a benchmark for CP5 (4.1% per year). For the reasons described in the first part of this section, we believe that the comparator set used to generate these tables is inappropriate. Specifically, we believe that the set should exclude BT and include BAA and Royal Mail. Making these adjustments would reduce the benchmark rate of efficiency.

3.37 We showed in Table 3 above that adjusting the comparator set reduced long-term annual average efficiency savings from 4.8% to 3.2% (i.e. a reduction of 1.6%). Whilst this adjustment may not apply uniformly to all periods, it is likely that it will reduce the calculated efficiency gains for all periods and price controls. For the purposes of this report, we have assumed that it would apply uniformly⁵⁴. If this were the case, then the average of the efficiency gains for the second price control period and years 5 to 10 after privatisation would fall to under 4% per year. That was the conclusion of the study that we carried out for Postcomm, which Oxera quote, but do not comment on:

“...the results historically achieved in other regulated sectors, in conjunction with the more one-off gains generally achieved in the first 5 to 10 years of price controls suggest that annual unit cost savings (in RUOE terms) of between 3% and 4% have typically been achievable in firms that are moving to an efficient frontier after an extended period of public ownership and absence of price pressure.”⁵⁵

3.38 We note also that a reduction of 1.6% p.a. in the top end of the LEK/Oxera range (i.e. reducing the top end of the range from 8% to 6.4%) would bring it below that required to sustain the ORR’s current assumption that the range of gross efficiency savings could up to 30% during CP4.

The LEK/Oxera hypothesis

3.39 The LEK/Oxera analysis is premised on a hypothesis that “*the cost increase following Hatfield and Railway Administration effectively “reset” the industry to a level of inefficiency comparable with pre-privatisation*”. They then assert, “*the analogy would be with the second*

⁵⁴ NR has asked the ORR to provide LEK/Oxera’s dataset, in part so that certainty data anomalies can be checked. With this data we would be able to test the effect of changing the comparator dataset more accurately.

⁵⁵ LECG (2005) – see 2005 LEK/Oxera study, page 76

control period in other UK regulated industries, for which an appropriate average efficiency gain is 5.4% p.a.”⁵⁶ The figure of 5.4% is calculated as being the straight average of the 6.5% average gains in the second control period and the 4.3% average gains in years 6 to 10 following privatisation.

- 3.40 LEK/Oxera justify the adoption of the cost reductions in “control periods 2 to 3 and years 6 to 15 years post privatisation” as follows:⁵⁷

*“This analysis shows that in the first control period/ 5 years post privatisation the efficiency gains might be less than can be expected later on. This may be due to a lack of understanding of the cost structure of the industry and focussing on ensuring the serviceability of the asset base before significant cost reductions can be achieved. The period post Hatfield and during administration may have had a similar emphasis on network safety and serviceability and hence led to the large cost increases seen in this period (with less management focus on efficiency improvements). Therefore information regarding the cost reduction trends in control periods 2 to 3 and years 6 to 15 years post privatisation may provide a better indication of the potential for efficiency improvements in CP4 and CP5 for NR”.*⁵⁸

- 3.41 Whilst it is the case that some regulated industries do achieve greater efficiency improvements in the second price control period than in the first or third periods, there are a number of factors potentially responsible.⁵⁹ A key question that has not been addressed by LEK/Oxera is whether there is any evidence to suggest that these factors would apply to NR. The company is already familiar with incentive regulation, there has been no change in the nature of competition and it has already achieved significant efficiency savings during CP3.
- 3.42 This last point is relatively important. NR will achieve efficiency savings of around 32% during CP3. LEK/Oxera assumes, implicitly, that this is comparable to a first price control period. However, savings of this magnitude are more consistent with those achieved in the second control period and years 6 to 10, rather than in the first control period or years 1 to 5. This might imply for example either that LEK/Oxera’s hypothesis is flawed or that it implies that CP4 would be more analogous to the third control period or years 11 to 15.
- 3.43 In fact, the savings expected to be achieved by Network Rail in CP3 (a period of 5 years) are higher than cumulative savings in water over the first 11 years of regulation (24.8%), in sewerage over the first 11 years of regulation (25.8%) and in electricity distribution over the first 9 years of regulation (29.8%)⁶⁰. On that basis, it is incorrect to say that CP3 is equivalent to the first price control or first quinquennium and that CP4 will be equivalent to the second price control or the second quinquennium. On the evidence presented by LEK/Oxera, there is a better argument that CP4 is more analogous to the third control period or years 11 to 15,

⁵⁶ 2005 LEK/Oxera study, page 3

⁵⁷ 2005 LEK/Oxera study, page 23

⁵⁸ 2005 LEK/Oxera study, page 23

⁵⁹ For example, by its second control period, a company will have got used to incentive regulation and would be reaping the benefits of medium term efficiency initiatives started in CP1. Redundancy and severance costs incurred in the first control period may lead to lower salary costs in the second. There are also observable gains from separation and from the introduction of competition.

⁶⁰ 2005 LEK/Oxera study, Figure 7.2, page 40.

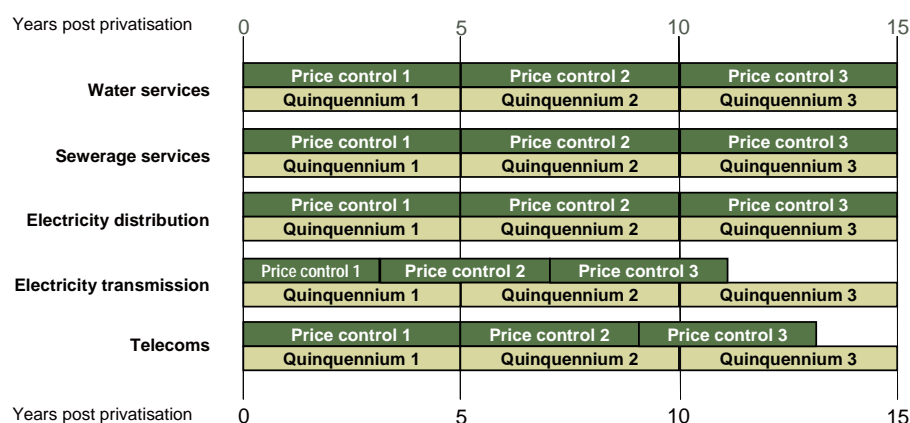
for which LEK/Oxera quote an average annual efficiency gain of 4.1%. As noted above, if the right comparator group were used, this could fall to something less than 3%.

- 3.44 We believe that LEK/Oxera's assumption that CP4 will be comparable to the second price control or the second quinquennium is too strong; and that it tends to increase the resulting range for potential efficiency gains. If we were to believe that CP4 for Network Rail has similarities with both the second and third price controls and with both of the periods covered by years 6 to 10 and years 11 to 15, it might equally be thought that the appropriate rate for CP4 would be the average of the second and third price control and years 6 to 15, equating to 4.7% p.a. based on the LEK/Oxera results. Again, as noted above, if the right comparator group were used, this could fall to around 3%.

Possible data errors

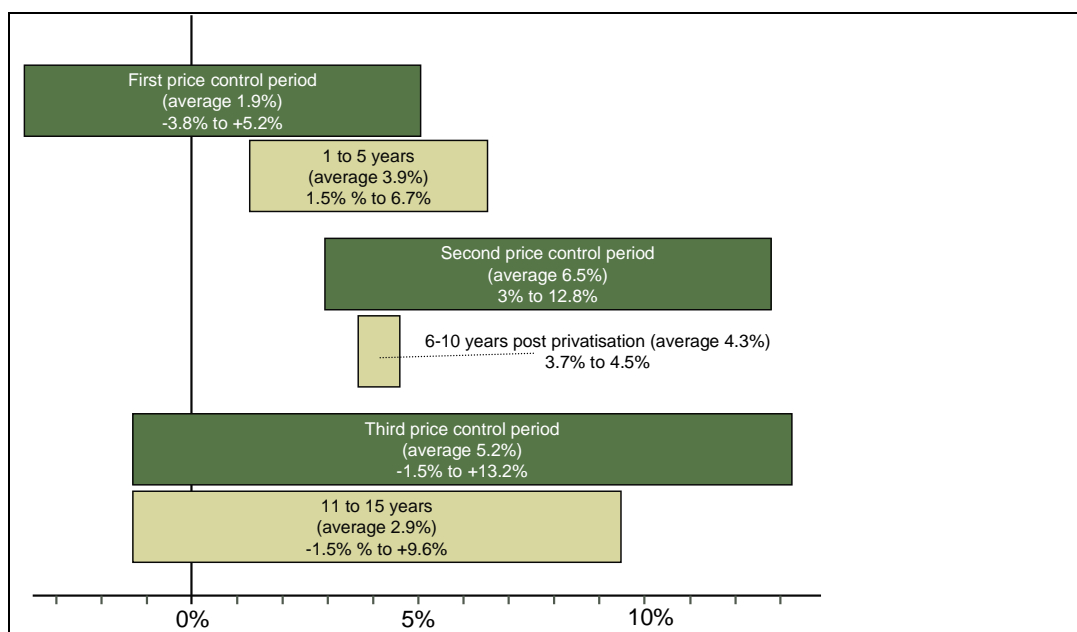
- 3.45 Notwithstanding the applicability or otherwise of the hypotheses above, there are a number of features of the analysis that appear odd. The alignment of price control periods and quinquennia is shown in the diagram below:

Figure 5: Similarity between control period and quinquennia



Sources: Transco Price Control Review for 2002-07 – Report for Ofgem, Mazars Neville Russell, September 2001, Appendix D, Table D.4, Ofwat, "Setting water and sewerage price limits: Is five years right?", January 2006, Incentive Regulation and Benchmarking of Electricity Distribution Networks: From Britain to Switzerland" (February 2007), by Michael Pollin (page 17), Section 2 of Oxera's "Structure of Royal Mail's control: lessons from BT's price controls", September 2005 and www.eia.doe.gov/emeu/pgem/electric/tableb3.html.

- 3.46 It can be seen from this that there is a close alignment of time periods, especially for the first control period and years 1 to 5. We would expect, therefore, very similar efficiency ranges and average efficiency improvements. This is not what is shown by the LEK/Oxera results. Displaying the data in Tables 6 and 7 above graphically illustrates the oddity of the results:

Figure 6: LEK/Oxera results

Source: 2005 LEK/Oxera study, Figures 5.2 and 5.3

3.47 It can be seen from the diagram, in conjunction with the tables from which it is drawn, that:

- the average efficiency gains quoted by LEK/Oxera for the quinquennium (3.9% p.a.) are more than 100% greater than the average quoted for the first price control period (1.9% p.a.). This is odd, given that price controls usually last for 5 years and that there is a particularly close match in this period, with 4 out of 5 comparators having price controls that match the 5 year period;
- the low end of the range of results for the first 5 years is 1.5% p.a, whereas the low end of the range for the first price control period is negative (-3.8% p.a.). Again, given the close match between price control and quinquennium this appears odd;
- the top of the range of efficiency gains for second price control period (12.8% p.a.) is nearly three times the top of the range of efficiency gains in the second quinquennium (4.5% p.a.); and
- the average efficiency gains for the second price control (6.5%) lies entirely outside the range of gains for the second quinquennium (3.7% to 4.5%).

3.48 The differences in these results are therefore difficult to explain, and we have been unable to replicate the underlying analysis. We understand that NR has requested the underlying data from the ORR so that the calculations can be reviewed. On the available evidence, we believe that the data contains errors.

3.49 Absent any errors, however, the implication is that the analysis is highly sensitive to the period chosen, since slight changes in the period have a large impact on estimated efficiency rates. This instability in the results could be a function of the use of small samples with significant outliers – which would make it difficult to place particular reliance on the resulting figures.

- 3.50 If NR were to accept these results, we believe that it would be appropriate for LEK/Oxera to show that there were statistical differences between periods. Presently, we are not convinced that there is necessarily a statistical difference between RUOE trends since privatisation/economic regulation and an average over second and third price control periods.
- 3.51 In addition, we believe that it would be sensible to show the trends between price control periods at a disaggregated level (i.e. industry level), to ensure the overall average results are not influenced by specific outliers.

Other issues

- 3.52 In performing our work, we found a number of additional issues with the 2005 LEK/Oxera study. We have not focused on these elements in detail, but they are potentially material. These issues relate to the source data, the selective use of figures and the frontier shift target derived from the TFP analysis.

Source data

- 3.53 The report notes that it was “*principally a desk exercise, drawing on... [pre-existing] publications... [and]...studies...*”⁶¹ It appears that the data in Appendix C, upon which much of the report is based, was taken from an earlier Oxera report⁶². This report concluded that on average and excluding some of the extreme observations, annual reductions in RUOE of 2.5% to 5.5% have been achieved since privatisation⁶³, a slightly different conclusion. We note that there are some unexplained differences in the data presented for historical periods between the two reports.
- 3.54 For example, Figure C.2 states that the 1994/95-1999/2000 weighted average RUOE reductions with enhancement expenditure excluded for water services was 4.6% p.a., whereas in the earlier Oxera report a figure of 3.6% p.a. was stated⁶⁴.
- 3.55 There are around a dozen or so such unexplained discrepancies between the two reports. We believe that these discrepancies should be investigated.

Selective use of figures

- 3.56 A substantial proportion of the data presented in Appendix C indicates that, in some circumstances, the comparator companies selected by LEK/Oxera had negative efficiency improvements (i.e. became less efficient). We note, for example, that Appendix C concludes that “*unit maintenance expenditure has increased since privatisation*” for both water companies and sewerage companies⁶⁵. It is not clear why this conclusion is not mentioned or apparently used in the main body of the 2005 LEK/Oxera study.
- 3.57 In our view, conclusions should make use of all available data.

⁶¹ 2005 LEK/Oxera study, page 3

⁶² “Operating Cost Reductions in Regulated Network Industries”, Oxera, June 2003

⁶³ “Operating Cost Reductions in Regulated Network Industries”, Oxera, June 2003, page iv.

⁶⁴ “Operating Cost Reductions in Regulated Network Industries”, Oxera, June 2003, table 3.7, page 23

⁶⁵ 2005 LEK/Oxera study, pages 67 and 69

TFP Evidence and frontier shift

- 3.58 In addition to considering the efficiency gains achieved by comparator companies, the 2005 LEK/Oxera study also describes a literature survey on TFP evidence. The report notes that:

*“TFP trends incorporate two effects ... Catch-up to best practice... and ...frontier shift or long term cost reductions...”*⁶⁶

- 3.59 The 2005 LEK/Oxera study takes TFP evidence from a number of earlier reports and uses it to derive a frontier shift component, by making an assumption as to the allocation of gains between frontier shift and catch-up components – “assumed to be 50/50 on the basis of a number of regulators’ assessments”⁶⁷. Using this approach, LEK/Oxera’s own mid-point estimate of frontier shift is 0.7% to 0.8% p.a.⁶⁸
- 3.60 The subsequent conclusion that “a rail specific benchmark might be 1% to 2% per annum...with an average frontier estimate of 1.5% p.a.” is out of step with this, and appears to be based on the following frontier shift targets adopted by other regulators:

Table 9: Frontier shift targets

	Frontier Shift Target
Ofwat (PR94) water and sewerage services	1.0
Ofwat (PR99) water and sewerage services	1.4
Ofwat (PR04) water services	0.3
Ofwat (PR04) sewerage services	0.5
Water Industry Commission for Scotland (2001)	0.9
Ofgem (DPCR3)	0.0
Ofgem (DPCR4)	1.5
Oftel (1997)	3.0
Oftel (2001)	2.8 ¹
Ofcom (2005)	1.5-3.0 ¹
Range	0.0-3.0
Average	1.4

Source: 2005 LEK/Oxera study Figure 5.9. LEK/Oxera note (1) Estimated

- 3.61 We note that the higher frontier shift values have been assumed by Oftel and Ofcom in the context of BT, which we argued above is not a suitable comparator for NR. With these higher figures eliminated, the average frontier shift adopted by other regulators is around 0.8% per annum – consistent with the 0.7% to 0.8% per annum mid-point range from LEK/Oxera’s own analysis.

⁶⁶ 2005 LEK/Oxera study, page 61

⁶⁷ 2005 LEK/Oxera study, page 28

⁶⁸ 2005 LEK/Oxera study, figure 5.11

3.62 A figure at this level would also be consistent with the CAA's most recent conclusions:

"In other regulatory reviews, regulators typically make an overall judgment about the scope for continuous improvements in efficiency (or 'frontier shift') in addition to the scope for savings as a result of addressing identified inefficiencies. In recent reviews, these additional efficiencies have typically been worth between 0.5% and 1.5% per annum in real terms.

*The CAA considers it might be reasonable to build a further 0.5% into the projected scope for annual efficiencies, over and above the 1% identified in light of the consultancy studies."*⁶⁹

3.63 Much of the TFP data used by LEK/Oxera comes from a 2002 paper⁷⁰, which, in turn, is based on the NIESEC02 TFP dataset. This dataset ends in 1999, and therefore contains no data for the 10 years prior to CP4. For the analysis to be more robust, LEK/Oxera should use the more recent EU KLEMS dataset. Analysis by Reckon⁷¹ suggests that recent TFP growth has been lower for both utilities and for transport, storage and communication.

Conclusions

3.64 The 2005 LEK/Oxera study considers the gains that have been made in other regulated industries as a proxy for the gains that might be expected to be made by NR during CP4. The section is largely drawn from earlier Oxera work⁷². The report suggests two criteria for inclusion in the comparator set: i) the nature of their work should match that of NR; and the industry must be subject to economic regulation.

3.65 The industries that make it through this filter are water and sewerage; electricity; and telecoms. It is unclear why BAA and Royal Mail do not, since they appear to share many of the same key characteristics (increasing returns to scale and density, long-term effects of past investment and strong trade unions) of NR. Indeed Royal Mail shares an important characteristic – public ownership – that may be particularly influential in determining the speed at which efficiency gains can be realised.

3.66 It is equally unclear why BT should make it through the filter, given the impact on BT of changes in the cost of technology. Driving efficiency improvements in organisations that rely more on manpower than they do on processing power is harder, and slower.

3.67 We agree, based on regulatory precedent that water, sewerage and electricity companies should be included in the analysis.

3.68 LEK/Oxera concludes that the real actual long term cost reductions for companies comparable to NR range from 2.5% to 10.3% per annum, or 2.5% to 5.7% per annum excluding outliers. Based on a more suitable set of comparators we believe that average actual results achieved are clustered in the range of 2.5% to 3.8%.

⁶⁹ "Airports price control review – Initial proposals for Heathrow, Gatwick and Stansted", CAA, December 2006, page 102.

⁷⁰ "Britain's Relative Productivity Performance: Updates to 1999 Final Report to DTI/Treasury/ONS", O'Mahony and de Boer, March 2002

⁷¹ "Gas Distribution price control review: Update of analysis of productivity improvement trends", Reckon LLP, 27 September 2007

⁷² For example, "Operating cost reductions in regulated network industries", Oxera, June 2003

- 3.69 LEK/Oxera use the average of control period 2 and years 6 to 10 to estimate the rate of unit cost reduction to be expected from NR in CP4 (5.4% per year). We have been unable to replicate LEK/Oxera's analysis of average efficiency gains in the second price control and/or years 6-10 post-privatisation⁷³. We have a number of questions relating to the accuracy of the 5.4% figure that they derive, to which we have not as yet been able to secure answers. We believe, though, that excluding BT and including BAA and Royal Mail would bring the figures down. Making these comparator adjustments could reduce the 5.4% average to below 4%.
- 3.70 We do not believe that it is at all clear that CP4 should be treated as being similar to a second price control or quinquennium. On the evidence presented in the 2005 LEK/Oxera study, we believe that there is a better argument that CP4 is more analogous to the third control period or years 11 to 15, for which LEK/Oxera quote an average annual efficiency gain of 4.1%. If the right comparator group were used, we believe that this would fall to something below 3%.
- 3.71 To the extent that it has similarities with both the second and third price controls and years 6 to 10 and 11 to 15, it might equally be thought that the appropriate rate for CP4 would be the average of the second and third price control and years 6 to 15, equating to 4.7% p.a. based on the LEK/Oxera results. If the right comparator group were used, we believe that this would fall to around 3%.
- 3.72 The table below summarises this range of analysis:

Table 10: Summary conclusions

	Real unit cost reductions (volume adjusted) (%pa)
Summary trend – all periods	2.5% to 3.8%
Average of third control period and third quinquennium (LEK/Oxera comparators)	4.1%
Average third control period and quinquennium (LECG comparators)	< 3.0%
Average of second and third control period and quinquennia (LEK/Oxera comparators)	4.7%
Average second and third control period and quinquennia (LECG comparators)	~3.0%
Second quinquennium (given NR is price controlled on a 5 year basis – second price control period less relevant) (LEK/Oxera comparators)	4.3%
Second quinquennium (LECG comparators)	<3.0%

Source: LECG analysis

- 3.73 Based on our analysis, we believe that the range of gains suggested by LEK/Oxera (i.e. 2% to 5.4%) ought properly to be reduced to between 2.5% and 4%. Results at this level would not be unusual: we ourselves, following an exhaustive study commissioned by Postcomm, identified potential gains of only this magnitude, for the period covered by Royal Mail's

⁷³ Summarised at figure 5.4 on page 24 of their report.

second price control. We have shown above that similar conclusions were also found by Ofwat and CAA.

Section 4

Network Rail's likely rate of efficiency improvement relative to the comparator range

Introduction

- 4.1 In the previous section, we concluded that the range of efficiency improvements achieved by relevant comparator companies for NR ought properly to be assessed as between 2.5% and 4%. In determining prospective efficiency targets for NR, it is important to consider factors that might influence where within this range an achievable target for NR might lie. These factors may influence the rate at which NR might be expected to improve its efficiency relative to these comparators.
- 4.2 We have identified three important factors. These are:
- the level and nature of the quality and availability/reliability improvements required of NR relative to those achieved by the comparators historically. The more NR is required to improve its service availability (and other quality parameters) relative to the comparator group the lower the rate at which NR can reasonably be expected to improve efficiency;
 - the scope for efficiency catch-up available to NR associated with the increase in costs that occurred following the Hatfield disaster and other rail safety incidents. All else being equal, this might have the countervailing effect of increasing the rate at which NR would be expected to improve its efficiency; and
 - the extent to which the input price increases in CP4 outstrip RPI to a greater extent than they did historically during the periods from which comparator data is drawn.
- 4.3 We analyse the impact of these factors below.

The impact of quality changes

- 4.4 In publishing its *Update on the framework for setting access charges and strategic plan assessment* in February 2008, the ORR noted that:
- “The objectives of this review are for Network Rail, working with its industry partners, to deliver a railway that is safer and more reliable than ever, while carrying ever more passengers and freight at a cost that represents ever better value for money for rail users and tax payers”.*
- 4.5 It appears to be common ground within the industry that targets for increased safety and reliability are important, as indeed is increasing capacity. There is little evidence, however,

that it is feasible to manage improvements on all of these fronts while simultaneously reducing costs at the rate that the ORR has suggested.

- 4.6 There are two important dimensions to quality in the context of regulated industries. One dimension is system reliability (which is often measured as system availability). By system reliability we mean, for example, “does water come out of the tap when I turn it on” or “is there an available train service”? The second dimension is product or service quality. So for example, a general indicator of quality might be “does the water comply with Drinking Water Inspectorate standards when it comes out of the tap” or “is the train journey comfortable”?
- 4.7 This distinction between the dimensions is potentially important in the context of NR because NR will be expected to improve against both dimensions during CP4, whereas the quality improvements that were achieved by the comparator companies during the periods from which LEK/Oxera draw their data were primarily related to product quality.

NR performance

- 4.8 The headline reliability figure for NR is the Public Performance Measure (“PPM”). This is the percentage of franchised passenger trains arriving at their destination and within a specified lateness margin (typically five or ten minutes). This measure captures all delay causes including NR, train operating companies (“TOCs”) and others. Against this measure, NR’s punctuality has improved significantly “...from around 78.7 per cent five years ago to 88.7 per cent today⁷⁴ (a reduction of 47 percent in the proportion of trains which are late or cancelled despite running more trains)” and that it is now being asked to “...improve this to 92.6 per cent (a further reduction of 34 percent [in the proportion of trains which are late or cancelled]) by the end of CP4 while also reducing the number of trains which are severely delayed.”⁷⁵
- 4.9 There is a direct link between rail passenger numbers and train delays. As the number of passengers increases, so do “dwell times”⁷⁶ at stations. For any given timetable, increasing station dwell times will increase the risk of a train being delayed, and reduce the scope for services to catch-up if they get behind the timetable. Such delays have a greater than cumulative effect on network performance since one delayed train is likely to cause delays to others. Increasing passenger numbers, therefore, make the prescribed reliability improvements harder (and more expensive) to achieve.
- 4.10 There are expected to be significant increases in passenger numbers in all franchise areas during CP4, as indicated below:

⁷⁴ We take this to refer to October 2007

⁷⁵ NR Strategic Business Plan, October 2007, page 2

⁷⁶ The time at which a train remains at the platform of a station

Table 11: Predicted increases in passenger numbers over CP4

	Annual passenger km forecast in 2008/09 (millions)	Additional passenger km by 2013/14 (millions)	% increase
Kent	3,350	333	9.9%
Brighton Main Line and Sussex	4,681	536	11.5%
South West Main Line	5,012	706	14.1%
Wessex Routes	431	58	13.5%
West Anglia	1,561	482	30.9%
North London Line and Thameside	1,047	118	11.3%
Great Eastern	2,775	319	11.5%
East Coast Main Line	6,375	975	15.3%
North East Routes	156	13	8.3%
North Trans-Pennine, North and West Yorkshire	1,189	189	15.9%
South Trans-Pennine, South Yorkshire and Lincolnshire	741	113	15.2%
Reading Penzance	1,178	158	13.4%
Great Western Main Line	4,327	637	14.7%
South and Central Wales and Borders	328	29	8.8%
South Wales Valleys	153	13	8.5%
Chilterns	661	98	14.8%
West Midlands	1,862	258	13.9%
West Coast Main Line	5,737	913	15.9%
Midland Main Line and East Midlands	2,655	498	18.8%
North West Urban	1,141	157	13.8%
Merseyrail	337	18	5.3%
North Wales and Borders	223	26	11.7%
North West Rural	153	12	7.8%
Total	46,073	6,659	14.5%

Source: LECG analysis of Network Rail, Strategic Business Plan, Figure 3.2

- 4.11 This is a similar increase to that sustained during CP3, and will, therefore, need to continue to be taken into account when considering an appropriate efficiency target for CP4.

The nature of reliability improvement in rail

- 4.12 We believe that in other utility networks, in particular in those where the system availability/network reliability is high and relatively stable, improving the availability/reliability of the network involves specific pieces of enhancement type capital investment at specific locations (for example, installing a storm overflow). Whilst this may result in the total cost of improving reliability being significant, it has proportionately little impact on the operating and maintenance costs.⁷⁷
- 4.13 In contrast, in rail the main driver in improving PPM scores is increasing maintenance and renewals activity (rather than enhancement expenditure). A review of the specific projects included in NR's bottom-up plans for CP4 shows, for example, specific initiatives focused on allowing NR to detect and repair or replace a higher proportion of defective components before they impact on service reliability. We would expect, therefore, that the requirement to improve PPM scores would tend to increase OM&R expenditure, thereby reducing the rate at which NR could be expected to improve its efficiency in terms of a reduction in costs (as opposed to increases in productivity) relative to the average of the comparator group.
- 4.14 We believe in any case that there are natural limits to any organisation's capacity to handle change. The effect of those limits is exacerbated in the case of rail for a number of reasons. First, NR is expected to increase its overall capacity to deal with increasing passenger numbers, and second, for example, these improvements in capacity, for safety reasons, have an impact on the scheduling of regular services. The inter-relationships between the targets for safety, quality and efficiency are perhaps paralleled in Royal Mail, but otherwise appear more complex than those facing other regulated industries. These points argue for efficiency targets being set more cautiously.
- 4.15 We set out below the changes in service availability/reliability observed for the comparator companies over the periods for which efficiency data was used by LEK/Oxera. We have selected what we believe to be the most appropriate measure in each case.

⁷⁷ We note for example that the £2 bn 2005-10 water quality programme results in only £29.1m p.a. additional operating expenditure by 2009/10, and that the water industry's 2005/10 environmental quality programme covered a total of over 3,000 sites, cost £3.45 bn yet resulted in only £100m additional operating expenditure by 2009/10 ("Future water and sewerage charges 2005-10 Final determinations Periodic review 2004", Ofwat, –Tables 34 and 38

Table 12: Service reliability over time for comparator companies

Companies	Comparator time period	Reliability metric	Service reliability over relevant period	Efficiency gain (% p.a.)
Network Rail	2009/10 – 20013/14	PPM scores	90.2% to 92.6	To be determined
Sewerage Industry	1992/93 – 2003/04	Proportion of properties not subject to sewer flooding incidents from overloaded sewers (or other causes).	Remained above 99.9%	-0.7
Water Industry	1992/93 – 2003/04	Proportion of properties not subject to unplanned supply interruptions of 12 hours or more.	99.6% increasing to 99.8%	2.0
Royal Mail	2002/3-2005/6	1 st class stamped mail delivered to scheduled standards	91.8% increasing to 94.1%	2.9
Electricity Distribution	1990/91 – 2000/01	Based on number of customer minutes lost due to interruptions	Remained above 99.9%	3.8
Electricity Transmission	1990/91 – 2000/01	% average annual system availability ⁷⁸	Decreased from 95.9% to 95.4%	5.7
BT	1996/97-2003/04	Faults per line per year and proportion of faults being repaired within 24 hours	Faults per line per year declines, but a smaller proportion of faults are being repaired within 24 hours ⁷⁹	3.8 or 10.3

Sources: LECG analysis of Network Rail SBP, OFFER report on Distribution and Transmission system performance 1997/98, Report to the Authority for the Gas and Electricity Markets 2004/05, Frontier Economics (2002), Impact of liberalisation in the postal sector, page 18, Security of supply, leakage and the efficient use of water, 2003-04, 1999-00 and 1997-98, Network Rail SBP, October 2007, Appendix 14

- 4.16 The general trend is that companies whose service reliability increased improved their efficiency more slowly than those whose service reliability remained almost constant or declined. It is notable that, since privatisation, the water industry has handled very substantial investment programs designed to improve water quality, security of supply and environmental compliance. The industry has achieved volume adjusted RUOE savings (before adjusting for quality as LEK/Oxera does) of only 2.0% (water) and -0.7% (sewerage).
- 4.17 NR intends to improve its PPM system reliability score further during CP4, from 90.2% to 92.6%, an increase of 2.4%. This is similar to the improvement in service reliability planned for Royal Mail, and in contrast to the declines in quality observed for NGC and BT during the periods for which efficiency data has been taken.

⁷⁸ System availability is defined by the formula: The sum for all circuits of hours available / (No. of circuits)*(No. of hours in period). A circuit is defined as an overhead line, cable, supergrid transformer, or any combination of these plant items controlled by one or more circuit breakers.

⁷⁹ UK figures. The decline in faults per line per year may be reflective of technological change, whereas the reduction in the number may reflect cuts in manpower.

- 4.18 The requirement on NR to improve its service reliability significantly over the CP4 period is only consistent, therefore, with efficiency targets set towards the middle to lower half of the comparator range.

The link between rates of quality improvement and rates of efficiency improvement

- 4.19 In addition to the link between the observed rates of improvement in system reliability and the observed rates of efficiency improvement, we have identified that there is also a similar correlation between changes in broader service quality measures for the comparator companies for the time periods from which LEK/Oxera drew their data. We summarise this in the table below.

Table 13: Summary of reliability, quality and efficiency improvements for comparator companies

Comparator	Service quality parameters	Trend	Efficiency gain (% p.a.)
Sewerage industry	<ul style="list-style-type: none"> • Properties subject to sewer flooding incidents • Billing contact response times • Written complaints handling • Bills not based on meter readings • Telephone call answering 	All improving	-0.7
Water Industry	<ul style="list-style-type: none"> • Water quality • Risk of low pressure • Unplanned supply interruptions • Hosepipe bans • Billing contact response times • Written complaints handling • Telephone call answering 	All improving	2.0
BAA	<ul style="list-style-type: none"> • QSM Quality Service Measure 	Declining between 1992 and 2001 ⁸⁰	1.6
Royal Mail	<ul style="list-style-type: none"> • Complaints made 	Constant	2.9
Electricity Distribution	<ul style="list-style-type: none"> • Customer interruptions (number and impact) 	Improved	3.8
Electricity Transmission	<ul style="list-style-type: none"> • Voltage excursions • Frequency excursions 	Constant	5.7
BT	<ul style="list-style-type: none"> • Residential customer satisfaction • Business customers satisfaction 	Declining	10.3 – call volumes 3.8 – exchange lines

Sources: As stated in Appendix 2, and 2005 LEK/Oxera study

- 4.20 It is evident from the table that BT, the company that achieved the most rapid improvements in efficiency, suffered declines in service quality over the relevant period. We have argued above that BT does not properly belong within a comparator set for NR, but it is in any case striking that the 10.3% RUOE improvements achieved there – which form the upper limit within the analysis conducted by LEK/Oxera – were achieved against a background of significant reductions in customer satisfaction.

⁸⁰ Data prior to 1992 was not readily available.

- 4.21 The table shows that companies where both service reliability and other quality parameters improved over the relevant period were in the bottom half of the efficiency improvement range. It might be reasonable to conclude, therefore, that the requirements on NR to improve its service availability and other quality parameters indicate that it should be set targets towards the lower end of the comparator range.

The impact of historical costs increases (Hatfield etc) on the anticipated rate of efficiency gains in CP4

- 4.22 Taken in isolation, the improvements in system reliability and quality required by NR would be expected to reduce the rate at which NR could improve its efficiency in CP4 relative to the average comparator. This by itself suggests that it would be appropriate to select a target towards the lower half of the comparator range.
- 4.23 There is, however, a countervailing consideration, which is the possibility of additional efficiency savings in eliminating some or all of the effects of the cost increases that occurred following the Hatfield disaster and the subsequent placing of Railtrack into administration. This is the possibility raised within the 2005 LEK/Oxera study.
- 4.24 We agree that considering the relative efficiency of NR post Hatfield is relevant to the analysis that LEK/Oxera were undertaking – but primarily because it might help to corroborate other top down analysis. We also believe if a gap were proved to exist, it might be wrong to assume that all of the gap could be closed during CP4. We comment further below.

The LEK/Oxera assessment

- 4.25 The LEK/Oxera study includes an assessment of the scope for additional catch-up that may exist as a result of the cost increases following the Hatfield disaster, Railway Administration and other rail safety incidents. The LEK/Oxera analysis is based on comparing two alternative projections for the level of efficiency that might be expected of NR in 2008/9, which they refer to as “*Method 1*” and “*Method 2*”. Details of these methods are outlined below.
- 4.26 Method 1 is a projection of the pre-Hatfield OM&R cost base to 2008/9. To do this, LEK/Oxera take the 1996/7 OM&R expenditure (in 2003/4 money), and make some allowance for additional renewal costs as a result of Hatfield, but make “...no adjustment for increases in volumes of maintenance activity that would be justifiable in the long run”⁸¹ and no allowance for additional operating expenditure.⁸² We comment on this further below.
- 4.27 LEK/Oxera then applies the CP1 and CP2 efficiency targets and a 4.1% efficiency target for CP3 to derive a notional 2008/9 expenditure of £2.4 billion. The 2005 LEK/Oxera study sets out the calculation as follows:

⁸¹ 2005 LEK/Oxera study, page 39

⁸² 2005 LEK/Oxera study, page 39

Table 14: LEK/Oxera method 1

	£ billion
Actual Controllable OMR expenditure in 1996/97	2.2
Inflation to 2003/04	0.3
Adjusted to approximate 2003/04 renewals activity levels, assuming constant efficiency	0.9
Efficiency gains to 2003/04 at CP1/2 targets	(0.5)
Expenditure in 2003/04 at CP1/2 target efficiency	2.9
Efficiency gains to 2005/06 at CP2	(0.2)
Efficiency gains to 2008/09 at average rate from other relevant industries of approximately 4% pa.	(0.3)
Notional Expenditure in 2008/09 (at approximate 2003/04 renewals activity levels and CP1/2 targets with continued efficiency gains to 2008/09)	2.4

Source: Figure 7.3, 2005 LEK/Oxera study

- 4.28 With their second method, LEK/Oxera takes the peak OM&R expenditure, which occurred in 2003/4 (£4.2 billion), and applies the CP3 efficiency targets to it to derive an alternative notional 2008/9 expenditure of £2.9 billion. LEK/Oxera set out the calculations as follows:

Table 15: LEK/Oxera “Method 2”

	£bn
Actual Controllable OMR expenditure in 2003/04	4.2
Renewals efficiency gains at CP3 targets	(0.6)
Maintenance efficiency gains at CP3 targets	(0.4)
Opex efficiency gains at CP3 targets	(0.3)
Notional Expenditure in 2008/09 (at approximate 2003/04 renewals activity levels and CP3 target efficiency)	2.9

Source: Figure 7.3, 2005 LEK/Oxera study

- 4.29 Within the 2005 LEK/Oxera study, the difference between the two projections is put forward as “*potential for additional catch-up after CP3*”⁸³. In effect, the argument is that, notwithstanding the achievement of efficiency targets contained within CP3, there are residual inefficiencies that can be understood in terms of a failure to achieve the (adjusted) targets contained within CP1 and CP2. The implication is that it was the targets within CP1 and CP2 which better captured the potential for longer term efficiency gains within the industry.

⁸³ 2005 LEK/Oxera study, page 38

- 4.30 The 2005 LEK/Oxera study does not identify whether some, all or none of the identified gap is properly attributable to residual inefficiency; and their conclusion that there may be an element of additional catch-up efficiency gains available is unexplained – “*based on the data available and in the context of this preliminary study, it is plausible that...*”. Alternative explanations, such as structural changes in the efficiency of the industry and/or inaccuracies in volume recording are noted but not explored.

Double counting

- 4.31 Even if it were the case, however, that the analysis described above was sufficient to identify the potential existence of catch-up efficiency gains, that would not in itself be enough to support their treatment within the conclusions to the 2005 LEK/Oxera study. In particular, these potential gains are treated as *incremental* to those arising from the study of comparator companies commented on in Section 3 above:

“To the extent that this gap does represent additional catch up, it would be incremental to any view of on-going efficiency improvements derived from analogy with efficiency trends in other regulated industries...”⁸⁴

- 4.32 That conclusion is not explained; and absent explanation it is logically incompatible with the hypothesis underlying the analysis of comparator companies, that:

“In investigating the top end of the range for Network Rail, these analyses have been based on the hypothesis that the sharp increase in costs that followed Hatfield and Railway Administration have effectively reset the industry to the relatively high level of inefficiency observed pre-privatisation”⁸⁵

- 4.33 There is a hypothesis available which would allow a combination of the results of the two analyses, but it is a tortuous one: *that the increase in costs following Hatfield has effectively reset the industry to the very high level of inefficiency observed pre-privatisation, **plus an increment which is reflected in the differential between the efficiency targets set in CP2 and CP3.*** The necessary implications of this hypothesis are:

- that the analysis carried out in respect of CP2, after adjustment, is in some way superior to that carried out in respect of CP3; and
- that the factors of which the increment is composed are in some way different from the factors which applied in other industries post privatisation.

- 4.34 Neither of these implications is attractive. The original efficiency targets within CP2 reflected a pre-Hatfield world, in which levels of maintenance and replacement were subsequently found to be inadequate. Although the 2005 LEK/Oxera study attempts an adjustment to reflect the increased levels of replacement activity in 2003/4, they also acknowledge that “*...relevant activity volumes were not reported by Railtrack/Network Rail through this period.*”⁸⁶ They also make no equivalent adjustment for opex and maintenance costs.

⁸⁴ 2005 LEK/Oxera study, page 42

⁸⁵ 2005 LEK/Oxera study, page 45

⁸⁶ 2005 LEK/Oxera study, page 38

- 4.35 The assumption in the 2005 LEK/Oxera study is rather that “...all real terms increases in opex represent inefficiency...”⁸⁷ We do not believe that this is feasible - that the additional safety and other requirements that have arisen as a result of the Hatfield disaster and other incidents did not require any increase in controllable opex or maintenance costs. We understand that NR’s own analysis indicates that 55% of the real controllable opex expenditure was required to cover items such as:
- NR taking over the industry planning function when the Strategic Rail Authority (“SRA”) was abolished;
 - new requirements for industry performance reporting and analysis following the DfT Future of Rail paper; and
 - the Government requirement for more devolved local decision making and greater disaggregation.
- 4.36 The LEK/Oxera assumption that “all real terms increases in opex represent inefficiency” is not, therefore, supported. To the extent that these real terms cost increases in controllable operating costs were efficient this would reduce the perceived efficiency gap.
- 4.37 The 2005 LEK/Oxera study states that they “...have made no adjustment for increases in volumes of maintenance activity that would be justifiable in the long run”⁸⁸. This omission is premised on the basis that “Network Rail’s 2005 business plan forecasts maintenance expenditure to reduce ... in real terms ... similar to the low point in 1999/00, [and therefore] it is plausible that activity volumes will also have returned broadly to 1999/00 levels”. We believe that this is unlikely. In particular:
- NR states that 37% of the real maintenance expenditure increase was justified.⁸⁹ To the extent that the historical maintenance levels were insufficient and had caused a growing backlog, it seems unlikely that maintenance activity volumes will fall back to the 1999/00 levels, even if maintenance costs do; and
 - the justification for the assumption proposed by LEK/Oxera is not consistent with the other assumptions in the calculation. LEK/Oxera argue that because the maintenance costs are forecast to return, in real terms “...broadly to the low point in 1999/00” that activity volumes would also fall back to those levels. Similar real term costs would only indicate similar activity volumes if there had been no efficiency improvements – yet, LEK/Oxera applies the CP1 and CP2 efficiency targets to the maintenance costs over this period in its calculation.
- 4.38 If adjustments were made for the legitimate and efficient increases in operating expenditure, and legitimate and efficient increases in maintenance expenditure, this would have the effect of reducing the perceived efficiency gap calculated by LEK/Oxera
- 4.39 The second of the implications noted above is, however, more important. The report asserts, but does not prove, that “to the extent that this gap does represent additional catch-up, it would be incremental to any view of ongoing efficiency improvements derived from analogy with efficiency trends in other regulated industries or other railways.”⁹⁰ It is on the

⁸⁷ 2005 LEK/Oxera study, page 39

⁸⁸ 2005 LEK/Oxera study, page 39

⁸⁹ “NR SBP Supporting Document – Response to LEK/Oxera study”, NR, page 13

⁹⁰ 2005 LEK/Oxera study, page 42

incremental nature of any catch-up gains that the 8% figure at the top end of the range suggested in the report appears to rest.

- 4.40 We do not believe that there is any evidence to suggest that any such catch-up gains would be incremental. Given the way in which the analyses set out within the report have been combined, it is necessary to believe that the inefficiencies implicit in any gap are qualitatively different from the inefficiencies inherent in other regulated industries prior to privatisation. We believe that this is implausible. At the very least, we believe that the proposition has yet to be demonstrated.
- 4.41 If the gap is real, and if some portion of it represents available catch-up gains, then we believe that the more logical conclusion is that those gains are not qualitatively different from the gains available to other regulated industries post privatisation. Certainly the rates of improvement noted by LEK/Oxera for these other industries (up to 5.4%) far exceed the rate of frontier shift that they identify elsewhere within their report (of 1% to 2%), and must therefore include significant catch-up components.
- 4.42 Absent evidence to the contrary, we see no reason to believe that those catch-up components are qualitatively different from any gains available to NR post Hatfield. If that is right, then the supposedly *additional* post Hatfield gains must already have been picked up in the analysis carried out by LEK/Oxera on post-privatisation efficiency gains in other industries – commented on below. On that basis, they are double counted.

The speed with which any gap could be closed

- 4.43 To the extent that the gap derived in the analysis referred to above represents additional catch-up gains available, it would be normal to assume that the gap would be closed over time. Within the 2005 LEK/Oxera study, however, “*after CP3*” is treated as meaning “*by the end of CP4*”. There is no evidence presented to support the assumption that 100% of any perceived efficiency gap would be closed by the end of CP4.
- 4.44 Indeed, as we set out below, regulators typically assume that only a proportion of the gap can be closed in the next price control period, and LEK/Oxera’s own conclusions on the efficiency rates for CP5 assume that NR will still not be at the efficiency frontier at that stage, implying that it would not be able to catch-up all these efficiency gains by then.
- 4.45 The assumption within the 2005 LEK/Oxera study - that all of the perceived efficiency gap can be caught up over CP3 - is an unusual assumption to make, and is not consistent with normal regulatory practice, as explained below. Typically, regulators assume that only a proportion of any efficiency gap can be caught up during the next price control period, as shown in the table below.

Table 16: Regulators assumptions on the proportion of the assessed efficiency gap for operating expenditure that can be caught up by the end of the price control

Industry	Regulator	Proportion
Sewerage	Owat	60%
Water	Owat	60%
Electricity distribution	Ofgem	75%

Sources: "Future water and sewerage charges 2005-10 – Final Determinations", Ofwat, December 2004. "Report on Benchmarking for DCPR4" (for Ofgem), CEPA, 30 September 2003

- 4.46 Even if there were an identifiable gap to be closed, and even if that gap were incremental to the results of other analysis, therefore, we do not believe that the relevant amounts could be assumed to be capable of being addressed in full within CP4.

Input costs

- 4.47 In its Advice to Ministers,⁹¹ ORR states that the range of assumptions that it is considering "...excludes any explicit consideration of the impact of input price inflation", that "Network Rail has argued that [ORR] should make an ex ante adjustment to [the] efficiency assumptions to reflect forecast divergences in its input prices from RPI...", but that at that time ORR was "...not minded to make such an adjustment". More recently, in its February 2008 update,⁹² when deriving the upper end of its efficiency range the ORR still makes "...no reduction for possible input price inflation in the efficiency estimate." In contrast, at the lower end, the ORR has "...reduced [its] gross efficiency estimate of 21% by approximately 5%" to allow for possible input price inflation. We note that the ORR states that it has not yet concluded on the treatment of input costs for CP4.
- 4.48 To the extent that input costs increases are expected to rise above RPI for the regulated company to a greater extent than any such differential experienced by the comparators in the past, it would be appropriate to make an allowance for this when setting an efficiency target. A detailed assessment would need to be undertaken to establish whether this will be the case for NR in CP4. We note, however, that there is significant evidence that input costs will rise faster than RPI. There are three sources for such evidence:
- detailed analysis of input price trends undertaken on behalf of NR by LEK in 2007;⁹³
 - third party forecasts of tender prices; and
 - the competing transport and other infrastructure projects that are planned to occur during CP4.
- 4.49 In the subsections below, we summarise this evidence. However, it is perhaps interesting to note that the importance of a careful consideration of input costs when setting RPI-X type

⁹¹ Advice to Ministers and framework for setting access charges, ORR, February 2007, paragraphs 3.29 and 5.27

⁹² "Update on the framework for setting outputs and access charges and strategic business plan assessment", ORR, February 2008, para 8.38

⁹³ "Input price trends Summary Report", LEK Consulting, 3 August 2007

price controls is stressed by recent work by Oxera into the interaction between input prices and RPI-X type regulation.⁹⁴ This work stresses, for example that:

“A contentious issue in utility regulation is the treatment of input price inflation in price control reviews. Input prices have risen and become more volatile for some sectors in recent years, and regulators have employed various assumptions and methods in estimating their effects”

“...regulators and companies should work towards deriving a robust estimate of input price inflation”.

- 4.50 The implications of Oxera’s work are that input price inflation needs to be considered. If input price inflation is known to differ from RPI then it is appropriate to allow for this increase. The effects can be significant. Oxera in their paper points out the cost of input inflation being above RPI over the next price control for gas distribution networks *“would have an impact of over £200m per annum of the firms’ costs”*. Our view is that if an explicit allowance were not given for increasing input prices above RPI, an alternative approach would be for it to be factored into a net efficiency assumption.

The LEK Input Price Trends Summary Report

- 4.51 NR engaged LEK to refresh a 2006 study into the future trends in input prices. LEK produced its report, entitled “Input Price Trends Summary Report” in August 2007. The main objectives of the study were:

- identifying the main labour, plant & materials inputs of NR and the key cost drivers in each supply market, explaining variations compared with historical trends, and identifying the impacts of supply constraints, and changes in constraints, within each supply market;
- developing forecasts of input price trends for NR’s supply markets, forecast to 2013/14 both by category of purchase and in aggregate (i.e., weighted by the mix of NR’s planned expenditure); and
- developing a view of regional variations in these input price trends across Great Britain.

- 4.52 We do not intend to replicate the LEK evidence here. In summary, the LEK median forecast was for a 1.0% input price premium to RPI over CP4.⁹⁵

Third party forecasts

- 4.53 We have considered a similar issue on behalf of an economic regulator of another industry.⁹⁶ Our analysis showed that third parties are forecasting that tender prices, as measured by the Tender Price Index (“TPI”) would rise ahead of RPI for the foreseeable future. To the extent that NR subcontracts renewals work, or is in competition with subcontractors for skilled

⁹⁴ “Regulatory foresight: input prices and the RPI-X approach”, Oxera, March 2008

⁹⁵ Input price trends Summary Report, LEK Consulting, 3 August 2007, page 9

⁹⁶ Factors to be considered when determining the appropriate size of the next capital programme for Scottish Water, LECG, 3 December 2007

labour and other materials, the high TPI⁹⁷ forecasts indicate that NR's input costs are likely to rise ahead of the RPI.

- 4.54 A number of organisations publish forecasts of construction output and tender price inflation. These include the Royal Institution of Chartered Surveyors' Building Cost Information Service ("BCIS"), EC Harris, Gardiner & Theobald Construction and Property Consultancy ("G&T") and Sense Ltd ("Sense"). These published forecasts are set out below.
- 4.55 The BCIS, has predicted that TPI will outstrip RPI for some time, stating that "*Tender prices are expected to rise by more than two-and-a-half times the rate of inflation over the next five years, rising by 33% against a background of 12% general inflation*".⁹⁸ More recently in January 2008, BICS stated that:

*"...trend increases in new work output over the forecast period, and upward pressure from input cost rises are expected to lead to tender price rises outstripping general inflation over each year of the forecast period"*⁹⁹

- 4.56 Increases in TPI relative to RPI are also predicted by other sources. These include the Sense Tender Price Survey Supply Chain survey from Autumn 2006, and data published by Gardiner and Theobald ("G&T") in February 2008.

Table 17: Forecast of Tender Price inflation from other sources

Year	Forecast RPI	Forecast TPI (G&T)	Forecast TPI (Sense)
2008	3.0%	5%	4.75%
2009	2.6%	5%	5.5%
2010	2.6%	5%	5.75%

Sources: G&T Tender Price Indicator Q4 2007 (released February 2008), Sense Tender Price Survey Supply Chain Autumn 2006, Forecasts for the UK economy (February 2008), A comparison of independent forecasts, HM Treasury, Table M3

- 4.57 Although these forecasts do not cover the whole of CP4, they do indicate consistently that input costs are likely to exceed RPI by a significant margin. NR's input costs in CP4 are, therefore, likely to rise ahead of RPI.

Utility infrastructure and civil engineering projects

- 4.58 There are a significant number of transport sector infrastructure projects planned for the CP4 period, which are likely to compete for the skills, manpower and other resources that NR will require for its operation, maintenance and renewal activities. These include:

⁹⁷ The tender price index reflects the tender price movements of specific sub-sectors of the construction industry. The index is obtained from tender prices which represent the cost a client must pay to construct a new building.

⁹⁸ BCIS press release: 24 August 2006 BCIS five year forecast of tender prices to 1st quarter 2011

⁹⁹ BCIS (Building Cost Information service) Tender Price Index Survey press release January 2008

- Heathrow East (T1/T2);
- the Argent Kings Cross Development;
- Crossrail;
- Rail links to Glasgow airport;
- light transit route to Edinburgh airport;
- a new rail link from Edinburgh to the Borders reusing an existing track bed route;
- a potential third crossing over the Firth of Forth;
- improvements to the A9 Perth to Inverness, the major road heading North;
- rebuilding in Yorkshire, Gloucestershire and other recently flooded areas;
- the 2012 Olympics;
- the 2014 Commonwealth Games;
- nuclear and renewable electricity generation plant and associated facilities;
- the Stratford City development; and
- a range of military infrastructure projects including major projects to rebuild and refurbish the garrisons in Aldershot (Project Connaught) and across Salisbury Plain (Project Allenby).

4.59 The existence of these projects reaffirms the analysis above that NR's input costs for CP4 are likely to rise ahead of RPI, but presents an additional issue related to the rate at which efficiency improvements can be delivered. Specifically, to the extent that the particular skills required to implement rail efficiency initiatives are in short supply (due to competition for these resources from other infrastructure projects), this would delay the rate at which such initiatives can be implemented, irrespective of any impact on the efficient level of costs.

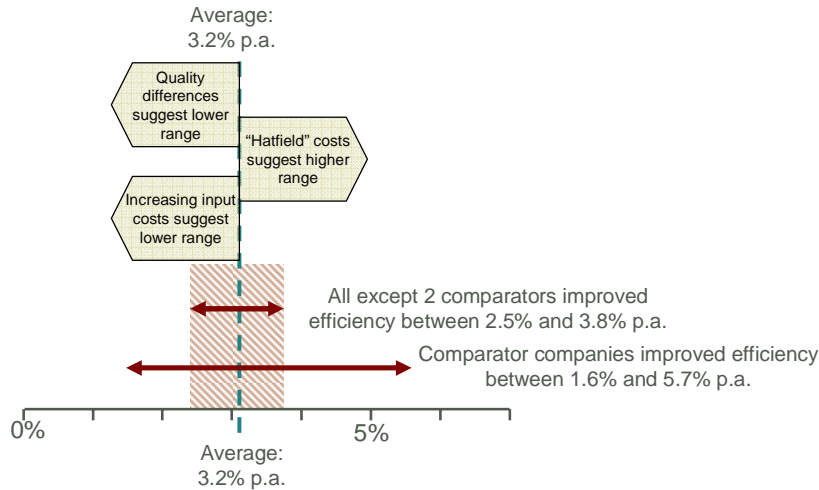
Conclusions

4.60 There are three main factors that would influence the rate at which NR would be expected to improve its efficiency relate to the rates of efficiency improvements observed in the comparator group. These are:

- the different nature of the quality improvements required of NR relative to those achieved by the comparators historically. Taking this into account will reduce the rate at which NR can reasonably be expected to improve efficiency relative to the average of the comparators;
- the scope for efficiency catch-up available to NR associated with the increase in costs that occurred following the implementation of new methods and standards of working after the Hatfield disaster and other rail safety incidents would have the countervailing effect of increasing the rate at which NR could be expected to improve its efficiency; and,
- the likelihood that input cost increases would outstrip RPI during CP4 to a greater extent than in the comparator data. This would tend to reduce the rate at which NR can reasonably be expected to improve efficiency relative to the average of the comparators.

4.61 The countervailing nature of all of the above factors can be illustrated as follows:

Figure 7: Balance of influences on the scope for efficiency catch-up



Source: LECG analysis

- 4.62 As can be seen from the diagram, adjustments to allow for the quality requirements and for the cost increases resulting from Hatfield and any impact input prices exceeding RPI to a greater degree than is represented in the comparator data have a somewhat countervailing effect. This suggests to us that assumptions around the average of the range are likely to be most appropriate.
- 4.63 Uncertainty as to the magnitude of these impacts would lead us to conclude that it would be appropriate to be prudent rather than aggressive, again supporting an assumption towards the middle of the range.

Appendix 1: Efficiency assumptions made by other UK regulators

We provide below a summary of the efficiency conclusions made by a selection of different regulators whilst setting price controls in the UK. For sectors containing more than one regulated company an average target has been provided. It is rare for regulators based on the data below to set targets above 5% per annum.

Table 18: Efficiency Assumptions made by other UK regulators (not volume adjusted)

Company	Duration	Real reduction per annum	Cost Category
BAA	1992-1997	3.3%	Employees/passengers - average
BAA	1997-2002	4.0%	Employees/passengers - average
BAA	2003-2008	1.7%	Average operating costs/passenger
British Gas	1992-1997	2.5%	Total non-gas costs
BG Transco	1997-2002	3.1%	Operating expenditure
BG Transco	2002-2007	2.5%	Real operating expenditure
BGT	1997-2000	4.0%	Unit supply costs
BT	1993-1997	3.0%	Unit costs
BT	1997-2001	3.5%	Unit operating costs – average
Manchester Airport	1998-2003	4.6%	Staff cost/passenger
Manchester Airport	2003-2008	3.75%	Staff cost/passenger
NATS	2001-2005	2% - 5%	Operating expenditure
NATS	2006-2010	2% - 3%	Operating expenditure
NIE distribution	1997-2002	3.0%	Operating costs (MMC)
NIE distribution	2002-2007	3.0%	Operating costs (Ofreg)
NIE supply	1997-2001	1.5%	Operating costs (MMC)
NGC	1993-1997	5.0%	Operating costs
NGC	1997-2001	2.5%	Operating expenditure
NGC asset owner	2001-2006	3.5%	Controllable operating costs
Royal Mail	2002-2006	5.4%	Operating expenditure
REC distribution	1995–2000	2.0%	Unit operating costs
REC distribution	2000-2005	2.3%	Operating costs
REC distribution	2005-2010	1.5%	Operating expenditure
REC supply	1994-1998	2.0%	Unit operating costs
REC supply	1998-2000	2.0%	Operating costs
Railtrack	2001-2006	3.1%	Total 'steady-state' spend
Scottish Hydro	1995-2000	2.0%	Operating costs (MMC)
Scottish Transmission	1994-2000	2.0%	Controllable operating costs
Scottish Transmission	2000-2005	1.0% - 2.0%	Total operating costs
Ofwat WaSCs	1995-2000	2.0%	Operating expenditure
Ofwat WoCs	2005-2010	1.4%	Operating expenditure

Source: "Future Efficient Costs of Royal Mail's Regulated Activities", LECG, August 2005, LECG Table 251.

Appendix 2: Quality Indicators

Water and sewerage

The table below presents data on the performance of Water and Sewerage services over time. The selected quality and availability indicators provided are:

- Properties at risk of low pressure;
- Properties subject to unplanned supply interruptions of 12 hours or more;
- Population subject to hosepipe bans;
- Billing contacts not responded to (within five working days);
- Written complaints not responded to (within ten working days);
- Bills not based on meter readings;
- Received telephone calls not answered within 30 seconds;
- Percentage of tests passing water standards;
- Number of breaches of water standards.
- Properties subject to sewer flooding incidents (overloaded sewers and other causes);
- Properties at risk of sewer flooding incidents (once in ten years); and
- Properties at risk of sewer flooding incidents (twice in ten years).

The information provided below is sourced from the DWI 'How good is our drinking Water', 2003 report and Ofwat, Levels of service for the Water industry in England and Wales, 2003-2004.

Table 19: Indicators of water service quality

	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
Properties at risk of low pressure (%)	0.78	0.43	0.25	0.16	0.13	0.11	0.10	0.06	0.04
Properties subject to unplanned supply interruptions of 12 hours or more (%)	0.58	0.21	0.15	0.05	0.06	0.11	0.12	0.05	0.14
Population subject to hosepipe bans (%)	39	30	3	3	0	0	0	0	0
Percentage of tests passing water standards (%)	99.45	99.70	99.75	99.78	99.82	99.83	99.86	99.87	99.88
Number of breaches of water standards	17,341	9,107	7,434	6,245	5,148	4,475	4,054	3,741	3,418

Sources: "How good is our drinking water?", DWI 2003 report summary available at <http://www.dwi.gov.uk/pubs/annrep03/Howgood2003/howgood2003.htm> and "Levels of service for the Water industry in England and Wales", Ofwat 2003-2004

Table 20: Indicators of sewerage service quality

	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
Properties subject to sewer flooding incidents (overloaded sewers and other causes) (%)	0.02	0.02	0.03	0.02	0.03	0.03	0.02	0.02	0.01
Properties at risk of sewer flooding incidents (once in ten years) (%)	0.07	0.07	0.07	0.07	0.08	0.08	0.05	0.04	0.03
Properties at risk of sewer flooding incidents (twice in ten years) (%)	0.07	0.06	0.05	0.05	0.04	0.04	0.02	0.01	0.01

Sources: "Levels of service for the Water industry in England and Wales", Ofwat 2003-2004

Table 21: Indicators of water and sewerage service quality

	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
Billing contacts not responded to (within five working days) (%)	10.00	8.16	4.74	2.53	1.52	0.86	1.23	0.53	0.47
Written complaints not responded to (within ten working days) (%)	5.79	5.07	1.99	1.28	0.64	0.44	0.66	0.15	0.14
Bills not based on meter readings (%)	3.67	2.32	0.87	0.34	0.33	0.70	0.45	0.16	0.15
Received telephone calls not answered within 30 seconds (%)		26.97	18.76	9.70	9.21	7.64	6.37	5.89	5.85

Sources: "Levels of service for the Water industry in England and Wales", Ofwat 2003-2004

BT

The table below presents data on the performance of BT services over time. The indicators provided are:

- Overall satisfied residential customers;¹⁰⁰
- Overall satisfied business customers;¹⁰⁰
- Number of faults per 100 lines per year – UK average; and
- % of faults repaired within 24 hours – UK average.

Table 22: Indicators of BT quality

	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04
% of overall satisfied residential customers	86.0	85.0	89.0	86.0	80.0	77.0	76.0	79.0
% of overall satisfied business customers	88.0	88.0	86.0	82.0	79.0	64.0	80.0	83.0

Source: BT Better World Social and Environmental Report 1996/97 – 2003/04

Table 23: Indicators of BT reliability

	1996	1997	1998	1999	2000	2001	2002	2003
Number of faults per 100 lines per year – UK average	14.25	13.83	14.50	15.00	14.17	13.25	11.79	10.59
% of faults repaired within 24 hours – UK average	82.54	82.12	80.74	78.95	70.53	72.03	74.78	73.01

Source: OECD Telecommunications Database 2005

¹⁰⁰ Satisfied customer figures are produced using both internal and independent surveys (the composition of the surveys varies year on year). Customer satisfaction measures those customers who comment that they are fairly, very or extremely dissatisfied with the service provided by BT.

Electricity Distribution

The table below presents data on the performance of Electricity Distribution services over time. The various indicators provided are:

- Electricity customer interruptions per 100 customers; and
- Electricity customer minutes lost per customer.

The data is sourced from the *2006-07 Electricity Distribution Quality of Service Report Data tables* and the OFFER report on *'Distribution and Transmission system performance 1997/98.'*

Table 24: Indicators of Electricity distribution quality

	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98	2001/02
Electricity customer interruptions per 100 customers	112.0	88.0	95.0	85.0	88.0	91.0	89.0	88.0	87.4
Electricity customer minutes lost per customer	227.0	103.0	106.0	96.0	97.0	97.0	87.0	88.0	83.7

Source: OFFER report on Distribution and Transmission system performance 1997/98 and 2006-07 Electricity Distribution Quality of Service Report Data tables, Table A 2.1, Reported & Revised 2006/07 Customer Interruptions and Customer Minutes Lost

Royal Mail

The table below presents data on the performance of Royal Mail services over time.

Table 25: Indicators of Royal Mail quality

	2002/03	2003/04	2004/05	2005/06	2006/07
1st class stamped and metered all - Scheduled Standards	91.8	90.1	91.4	94.1	94.0
2nd class stamped and metered all - Scheduled Standards	98.6	97.8	98.5	98.8	98.9
Royal Mail complaints received in period	1,647,720	1,738,191	1,936,315	1,648,902	1,220,830

Source: Various Royal Mail quality of service reports at:
<http://www.royalmailgroup.com/portal/rmg/content1;jsessionid=B5SJBWLEMGPYAFB2IGVUUBQUHRA0UQ2K?catId=23300505&mediaId=23700533>

BAA

We have been able to locate numerical information relating to a quality of service measure termed 'Quality Service Measure' ("QSM") for Heathrow, Gatwick and Stansted. This is a measure based on a survey of airport users in which they rank the quality of the airport from 1 to 5 where 1 is equivalent to extremely poor and 5 is equivalent to excellent.

Table 26: Indicators of BAA quality

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Quality of Service Measure: Heathrow	4.0	4.0	4.0	4.0	4.0	3.9	3.9	3.9	3.9	3.9
Quality of Service Measure: Gatwick	4.2	4.2	4.1	4.1	4.2	4.1	4.1	4.1	4.0	4.0
Quality of Service Measure: Stansted	4.5	4.5	4.4	4.4	4.3	4.3	4.2	4.1	4.1	4.1

Source: BAA plc: a report on the economic regulation of the London airports companies (Heathrow Airport Ltd, Gatwick Airport Ltd and Stansted Airport Ltd), Competition Authority, 2002, <http://www.caa.co.uk/default.aspx?catid=5&pagetype=90&pageid=1322> and BAA Customer Service Trend Report, January to March 2007

Notes: The Quality Service Measure is based on a survey of airport users in which they rank the quality of the airport. A ranking of 1 is equivalent to extremely poor and 5 is equivalent to excellent.

Electricity Transmission

The table below presents data on the performance of Electricity Transmission services over time. There are three categories of quality measure included, these are:

- % average annual system availability;¹⁰¹
- Voltage excursions; and
- Frequency Excursions.

The data is sourced from the 'Report to the Authority for the Gas and Electricity Markets 2004/05.'

Table 27: Indicators of Electricity transmission quality

	1995/96	1996/97	1997/98	1998/99	1999/00	2000/01	2001/02
Voltage Excursions			2			1	1
Frequency Excursions	2						
% Average Annual System Availability	95.9	95.8	96.3	96.3	96.0	95.8	95.4

Source: Report to the Authority for the Gas and Electricity Markets 2004/05

¹⁰¹ System availability is defined by the formula: The sum for all circuits of hours available / (No. of circuits)*(No. of hours in period). A circuit is defined as an overhead line, cable, supergrid transformer, or any combination of these plant items controlled by one or more circuit breakers.