



## **RIIO T1 Business Plan**

### **Section 9 Financial Strategy**

### **Appendix 3 First Economics Real Price Effects**

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**Real Price Effects****Prepared for the GB Transmission Network Owners****30 June 2011****1. Introduction**

This paper contains First Economics' estimates of the real price effects (RPEs) that are likely to confront the GB electricity and gas transmission networks over the period 2011 to 2021. It is intended to be a contribution to the business plans that the networks' owners are preparing as part of Ofgem's RIIO-T1 review.

The paper is structured into five main parts:

- section 2 outlines our methodology;
- section 3 explains the assumptions we are making about GDP growth and the ongoing recovery from the 2008-09 recession;
- section 4 provides forecasts of future labour and materials price increases;
- section 5 contains estimates of future RPI-measured inflation; and
- section 6 concludes.

**2. Methodology**

Our approach to forecasting input price inflation was set out in some detail in papers that we prepared for the electricity DNOs in DPCR5. There are three key parts to the analysis.

*Input price inflation forecasts are to be anchored against the most likely path for GDP growth*

The rate at which prices for labour and materials change over time is inextricably linked to the demand for those inputs: all other things being equal, the less that buyers want of a good or service the more difficult it is for the supplier to pass on price increases (and vice versa). The starting point in our work must therefore be a projection of the rate at which demand and output are likely to increase in the economy as a whole, which we can then interpret for each of the individual categories of input that we are having to consider in our analysis.

At the time of writing, the UK is still very obviously recovering from the effects of recession. By contrast, the global economy, powered by demand from outside of the US and the EU, is expanding rapidly. This means that we need to analyse both the national and global outlook and consider carefully which provides the most relevant anchor for our analysis of the price increases affecting each individual category of input.

*Input price forecasts should be prepared on a nominal basis alongside a separate forecast of RPI-measured inflation*

Arguably the key methodological issue that emerged during DPCR5 concerned the link between labour and materials cost increases and RPI-measured inflation. In all of our previous reports we made forecasts of nominal input price inflation and used a separate forecast of RPI in order to calculate the corresponding real price effects. Others have tended to forecast real terms cost increases more directly, often on the basis of the historical correlations between nominal input price inflation and RPI-measured inflation.

Our approach is considered and deliberate. As an overarching point of principle we do not believe that measures of real wage inflation or real terms material cost increases are sufficiently well-behaved to permit a researcher to estimate input price inflation less the increase in the value of the RPI index in one step. This is for two reasons:

- first, RPI is just one measure of inflation and one that happens to be heavily influenced by housing costs. This is an especially important consideration at the current time given that a return to 'normal' mortgage interest rates are going to push RPI up in the next 3-4 years without having any impact on CPI or the Bank of England's ability to meet its 2% inflation target (see section 5 for more on this). To imagine that real price effects tend to a constant when measured relative to an oscillating RPI benchmark is not credible at present; and
- second, in an era of inflation targeting it cannot be that increases (or reductions) in RPI feed directly into increases (or reductions) in nominal rates of input price inflation. If they did, the economy would be prone to price spirals in which a shock that temporarily pushed inflation up would generate a second round of price increases as workers and suppliers sought to preserve their real income growth, in turn pushing up RPI still further and generating a vicious circle of ever-increasing input prices and inflation – a phenomenon that would be causing considerable problems at the current time given the elevated level of inflation in the economy. We believe instead that it is medium-term inflation expectations that influence workers' wage demands, whilst we see materials costs very much as a driver of RPI-measured inflation rather than the other way around. We discuss this further in appendix 1.

This is not to say that nominal input price inflation and RPI are completely independent. Since RPI measures the rate at which prices in the economy are changing, and since prices over time move in line with costs, it must be that the rates of nominal input price increases and RPI-measured inflation are related. We think, however, that this link is best recognised by giving an overall sense-check to the results of the nominal input price inflation less RPI calculations rather than constraining the estimates of real price effects from the outset.

*After a period of more than 1-2 years the experiences of the recent past provide the best guide to price increases in the future*

No forecaster can ever claim that their predictions are 100% accurate and it is entirely natural for companies in June 2011 to be unclear as to what the 2013-21 period has in store for them, especially when the UK and the global economy is experiencing a sudden and unexpected period of restructuring.

We would, however, caution against being too believing of stories which maintain that the drivers of inflation from now on will be fundamentally different from the factors that influenced inflation in the years prior to recession. While some change is inevitable, it is impossible to say with any certainty what price pressures will be different and what impacts there will be on the inflation rates that we are analysing in this report. Rather than convince ourselves prematurely that there is to be a structural break from the past, we believe instead that observed pre-recession, pre-2008 data constitute a central or best available estimate of the price increases that one can expect to impact on the transmission networks once the recovery from recession is over and the UK economy goes back to growing at a 'normal' rate.

In practical terms this means that most of our forecasts are built up in to two stages:

- we look first of all at the path of prices in the short-term when price increases will be heavily influenced by short-term expectations of economic growth; and
- we then turn to recent empirical data and try to identify an underlying trend in the rate of growth in wages and materials prices during recent years that exhibited normal economic conditions. We then extrapolate from this historical trend to produce medium- to long-term forecasts of (nominal) input price inflation.

We acknowledge that this methodology is not foolproof. However, we believe that the likely error in our forecasts is symmetrically distributed insofar as nobody at this moment in time can claim with any real credibility why it must be that price increases will settle onto higher or lower trends than those that could be observed prior to the onset of recession.

### 3. GDP Growth

#### 3.1 Latest evidence

Our 2011-21 forecasting work begins with a brief summary of the economic outlook.

In our previous reports we have relied on HM Treasury and Bank of England projections of GDP growth. The HM Treasury's forecasts are now produced by the independent Office of Budgetary Responsibility (OBR), which in our view strengthens the case for using public-sector numbers rather than a more partial private-sector forecast as the anchor for RPE calculations. Accordingly, we present only the forecasts made by these organisations in the analysis that follows (while acknowledging that there is a reasonable range of views among other experts around these central estimates).

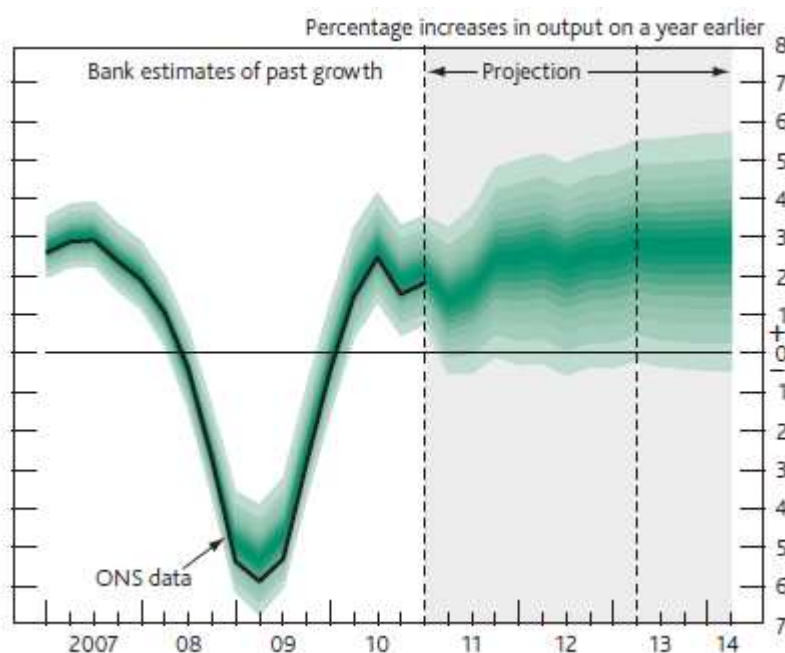
Table 3.1 and figure 3.2 reproduce figures that may be found in HM Treasury's April 2011 Budget and the Bank of England's May 2011 Inflation Report.

**Table 3.1: HM Treasury's April 2011 forecasts of GDP growth**

	Percentage change on a year earlier, unless otherwise stated						
	Outturn	Forecast <sup>1</sup>					
	2009	2010	2011	2012	2013	2014	2015
<b>World economy</b>							
World GDP at purchasing power parity	-0.7	5.0	4.2	4.3	4.3	4.4	4.4
Euro Area GDP	-4.0	1.7	1.4	1.8	1.8	1.9	1.9
World trade in goods and services	-11.1	12.7	6.9	6.8	6.9	7.0	7.0
UK export markets <sup>1</sup>	-11.4	10.7	5.8	5.8	5.8	6.1	6.0
<b>UK economy</b>							
Gross domestic product (GDP)	- 4.9	1.3	1.7	2.5	2.9	2.9	2.8

Source: HM Treasury.

**Figure 3.2: The Bank of England's May 2011 forecasts of GDP growth**



Source: Bank of England.

The two sets of numbers tell a fairly consistent story about the path which the UK economy is set to follow. In both cases, there is a year of transition in 2011 during which the rebalancing of the UK economy away from growth driven by household consumption and public-sector expansion and towards business investment and export growth depresses overall growth in output. Thereafter the UK economy is seen growing at close to 3% per annum – i.e. just above trend – from 2012 through to 2014 or 2015.

The Bank of England also helpfully identifies the key uncertainties around the central case. The main downside risk is around household expenditure and fears that reductions in real disposable incomes may cause some households to cut back sharply on their expenditure. Balanced against this on the upside, the Bank notes that companies are making historically large profits at present and could boost GDP growth if some of their surpluses were to be spent on new capital investments or transferred to workers in the form of higher wages. Figure 3.2 shows a balanced set of risks around the central case, with the downside probabilities no greater than the upside probabilities in the Bank's estimation.

As far as the global economy is concerned, the figures in table 3.1 show a fairly strong profile of GDP growth, due in large part to the very rapid recovery from the recession of 2008-09 outside of the US and Europe. Although there are risks to global growth, most notably from a slump back into recession in the US and/or the bursting of various bubbles that appear to have built up in China, the central case is one in which growth continues at a healthy and consistent rate from 2011 onwards.

Looked at side-by-side, the clear implication is that the demand for products that are bought and sold mainly in separate national markets will for a period of time look quite different from the demand for goods and services that are traded globally. For the purposes of our analysis, this might be expected to mean that there are greater pressures on materials prices than on UK

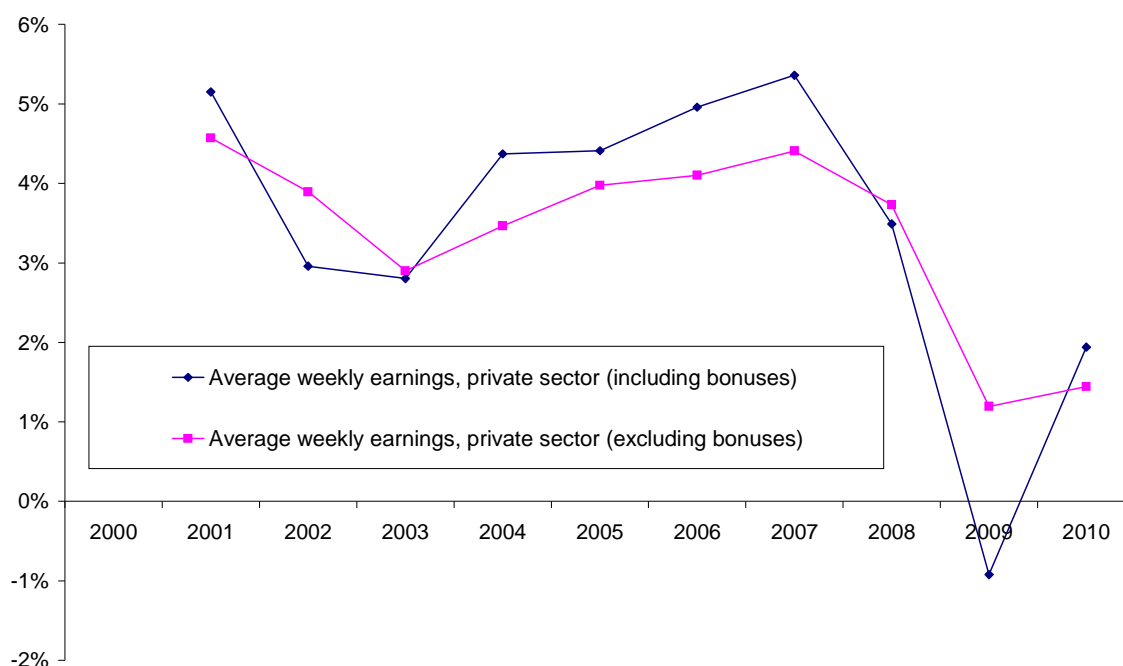
labour costs in the near term. We now consider to what extent this is apparent in recent data and what the prognosis is for the 2011 to 2021 period.

#### 4. Input price inflation

##### 4.1 Wages – general

Our analysis of wage increases for the majority of people that regulated networks employ has previously been focused around the ONS's average earnings index. This index was discontinued by the ONS in 2010 and observers have been directed instead to the newer average weekly earnings index for information on wage increases across the UK economy. Figure 4.1 plots the series for private sector wages including and excluding bonuses.

**Figure 4.1: Private sector wage inflation**



Source: ONS.

The chart shows a marked shift in wage pressures due to recession. After growing at an average annual rate of around 4% on both measures between 2000 and 2008, wages declined in absolute terms in 2009, after accounting for the effects of withdrawn bonuses, and then grew by less than 2% in 2010. The latest monthly data from April 2011 puts annual private-sector wage growth at 1.6% including bonuses and 1.8% excluding bonuses.

Going forward the expectation is one of subdued wage growth stretching over a period of up to 3 years. This is based to a large extent on historical experience which shows that pay increases typically lag behind the growth in GDP by several quarters, mainly because recession creates a pool of unemployed workers who compete vigorously for jobs once economic activity picks up and firms resume hiring. Although this recession resulted in fewer redundancies than previous recessions, there are still around 1m more individuals than normal in unemployment and many more who have been forced onto part-time hours or into jobs that they might not otherwise have taken. This should mean that employers, including the transmission networks when they are

looking to fill roles that do not have sector-specific features, will for a period find that they do not need to offer significant pay increases in order to attract and retain good staff.

HM Treasury's April 2011 Budget report gives a sense of what sort of increases firms should expect to have to pay during the next five years.

**Table 4.2: Labour market forecasts**

	Percentage change on a year earlier, unless otherwise stated						
	Outturn			Forecast <sup>1</sup>			
	2009	2010	2011	2012	2013	2014	2015
<b>Labour market</b>							
Employment (millions)	29.0	29.0	29.0	29.2	29.5	29.7	30.0
Wages and salaries	- 0.1	1.5	1.8	2.8	4.8	5.3	5.4
Average earnings <sup>6</sup>	1.8	1.7	2.0	2.2	3.8	4.3	4.5
ILO unemployment (% rate)	7.6	7.9	8.2	8.1	7.6	7.0	6.4
Claimant count (millions)	1.53	1.50	1.54	1.53	1.43	1.31	1.18

Source: ONS.

The projections have average earnings growth sticking stubbornly at around 2% during 2011 and 2012 before moving back towards normal levels in 2013. We use the financial year equivalents as the best available estimates of the wage inflation for general workers employed by the transmission networks in the period to 2015/16, as set out in table 4.3 below. From 2016/17 onwards we think it is prudent for the transmission companies to allow for pay increases in line with the pre-recession growth of average weekly earnings including bonuses of 4.25% per annum.

**Table 4.3: General wage inflation**

	Average earnings growth
2011/12	2.0%
2012/13	2.5%
2013/14	4.1%
2014/15	4.4%
2015/16	4.5%
2016/17 and thereafter	4.25%

## 4.2 Wages – specialist

During DPCR5 we argued that certain types of worker – most notably electrical engineers and labour with specialist infrastructure skills like civil engineers, project managers and surveyors – will be able to extract above-average wage increases. Our contention was that the coincidence of the ramp up in expenditure and investment that is occurring simultaneously in the different infrastructure industries, the exacerbatory impact of major projects like the Crossrail, and the continued existence of skills shortage in a number of the skilled professions, create a mismatch in supply and demand that gives significant bargaining power to the specialist labour that the transmission networks require. We assumed in the forecasts that we produced that this bargaining power would translate in to a premium of up to 1.5% per annum.

Data published during the last 2-3 years confirms the story that we told. Table 4.4 compares increases in indices tracking skilled infrastructure workers' wage increases with average earnings

growth between 2007 and 2010. It shows that clearly that specialist wages have grown much more than average during and after the recession.

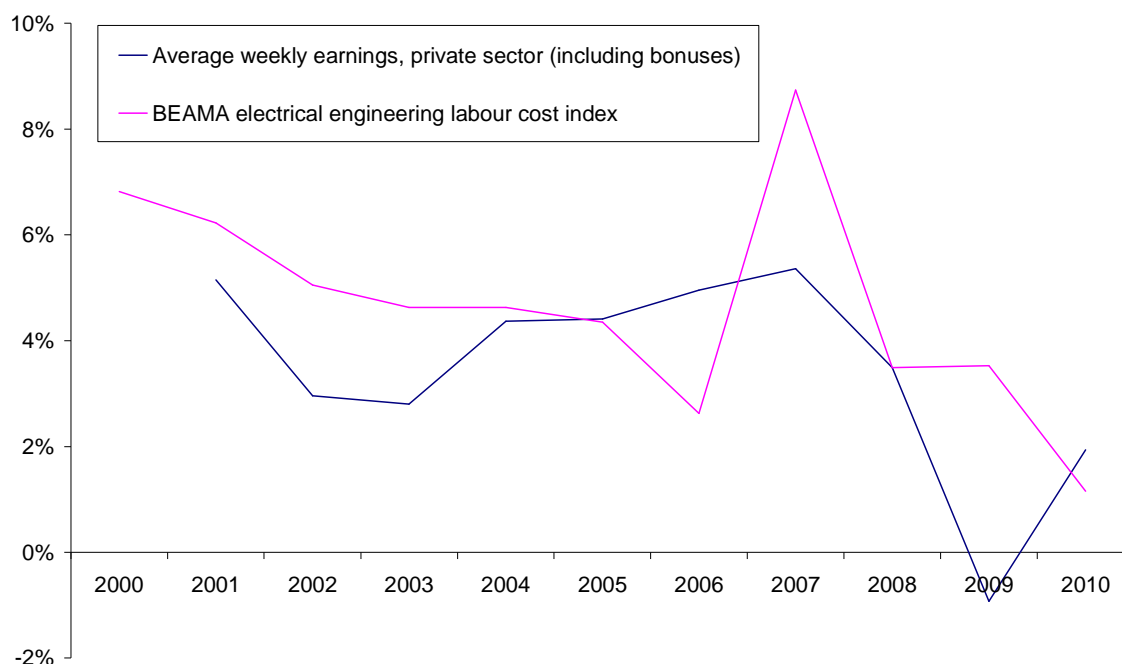
**Table 4.4: Wage increases, 2010 vs 2007**

Index	Growth
ONS: electricity, gas and water sector, incl. bonuses	9.5%
BEAMA: electrical engineering	8.4%
BEAMA: mechanical engineering	13.4%
BIS: electrical labour	14.2%
ONS: private-sector average earnings growth, incl. bonus	4.5%
ONS: private-sector average earnings growth, excl. bonus	6.5%

Source: ONS, BEAMA, BIS.

These latest three years of data add to the period over which specialist wage inflation has outstripped average earnings growth, as seen in the figure 4.5 comparison of the BEAMA electrical engineering series and average weekly earnings.

**Figure 4.5: Wage inflation among electrical engineers**



Source: ONS, BEAMA.

Going forward, demand for specialist skills is certain to remain high. The transmission networks have told us that they will be proposing a two- to five-fold increase in capital investment in the next regulatory period. In addition, increased DNO capex, continued high levels of investment in the water sector, a ramp up in Network Rail's expenditure, and a steady stream of other infrastructure projects will create considerable competition for the specialist skills that the transmission networks need. As a consequence, wage inflation for specialist labour is almost certain to go on outstripping average earnings growth.



Our reading of table 4.4 and figure 4.5 is that it is prudent to add 1.25% to the base trend in average earnings for the specialist workers in the transmission networks' input mix. This gives inflation expectations for this type of labour set out in the table below.

**Table 4.6: Wage inflation for workers with specialist skills**

	Specialist wage growth
2011/12	3.25%
2012/13	3.75%
2013/14	5.35%
2014/15	5.65%
2015/16	5.75%
2016/17 and thereafter	5.5%

### 4.3 Materials

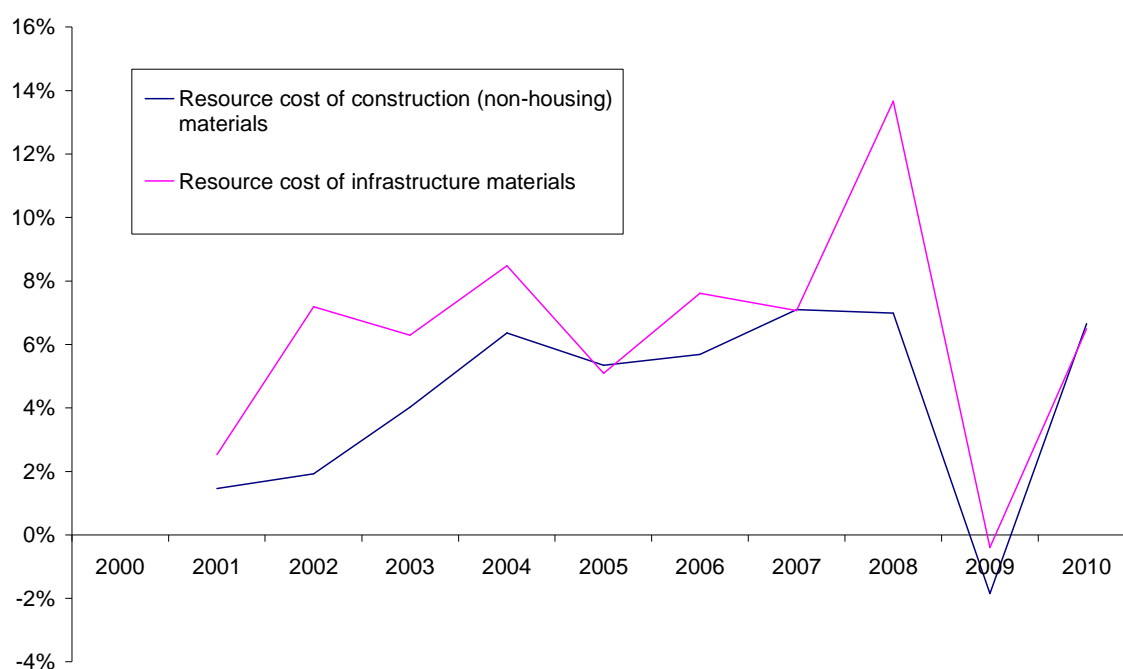
Materials have tended to be the hardest of all the items in the transmission input mix to forecast. Up until around ten years ago materials costs were typically flat or falling over time, just like the prices of most other physical goods. This picture then changed with the emergence of China and other developing economies as major consumers of raw commodities. Recession temporarily reined back most prices, but in the last 18 months companies have once again had to deal with significant price increases.

We consider the situation currently confronting the transmission networks by looking at different material types in turn.

#### *Materials – general/civils*

Figure 4.7 plots the BIS cost of infrastructure materials and cost of construction (non-housing) materials series over the period 2000 to 2010.

**Table 4.7: Materials costs**



Source: BCIS.

The chart shows that 2009 was the only year since 2002 in which the two indices did not register inflation of more than 4%. Price increases in 2010 then exceeded 6%.

We recognise that there is a legitimate view that the price increases that companies have faced since 2005 cannot carry on forever. But at the same time, we do not think it is tenable to argue, as some parties did in DPCR5, that inflation will decelerate rapidly. Ofgem in its GDPCR calculations and First Economics in our DPCR5 work both previously assumed that the rate of increase of general materials costs in steady state is 4.5% and we continue to take the view that this is a reasonable benchmark to factor into forward-looking RPE calculations.

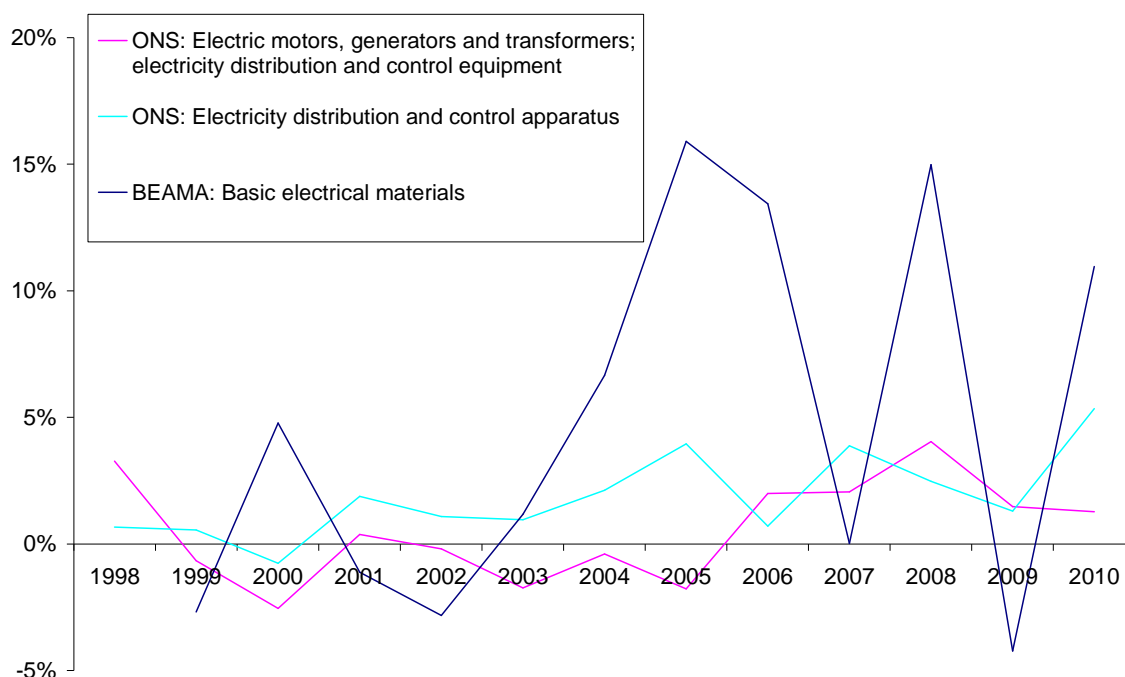
**Table 4.8: Forecasts of general materials inflation**

	Materials cost increases
2011/12 and thereafter	4.5%

*Materials – electrical*

The BEAMA electrical materials index gives a more precise reading of the inflation affecting the specialist electrical equipment than the electricity transmission networks are installing on their networks. Figure 4.9 plots the change in the value of the index over the last ten years alongside movements in two series from the ONS’s producer price indices.

**Figure 4.9: Electrical material cost increases**



Sources: BEAMA; ONS.

The chart shows that the BEAMA index has fluctuated considerably over time, often showing double-digit growth in one year followed by flat prices the year after. The ONS indices have been less variable and since 2006 have shown inflation of between 1% and 5% per annum.

In forecasting what will happen to these indices in the coming months and years, one has to take account first and foremost of likely commodity price movements. Here the story for the foreseeable future remains one of growing demand from China and other developing countries

putting pressure on the supply of metals and driving prices up. Insofar as the outlook for global economic growth is one of strong and stable expansion (as shown in the OBR forecasts in table 3.1 above), the likeliest or central scenario has to be one in which the average annual increase in the BEAMA index will approach the compound 8% inflation rate seen between 2003 and 2010. Recognising that the ONS indices show a lower rate of price increases, we consider it is prudent for the transmission networks to factor in price increases of 5% per annum over the 2011 to 2021 forecast period.

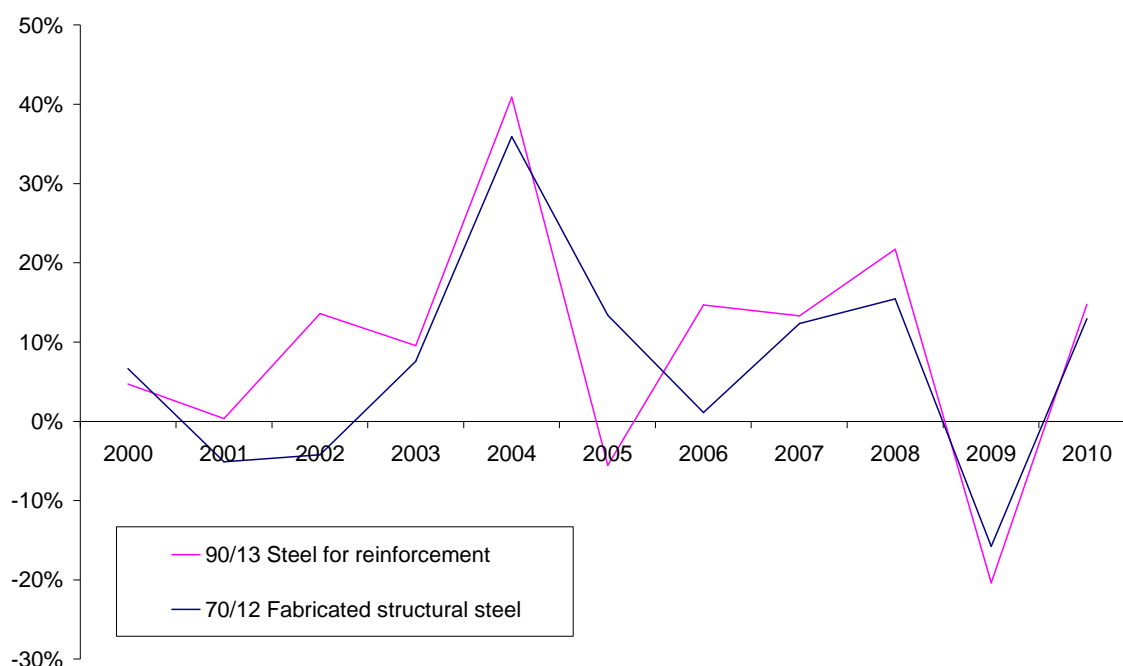
**Table 4.10: Specialist electrical materials cost inflation**

	Specialist electrical materials cost increases
2011/12 and thereafter	5%

*Materials – gas pipeline*

The specialist materials that are relevant to the gas transmission network comprise mainly reinforced steel for new pipes. The two BIS indices which track the prices of specialised steel are shown in figure 4.11.

**Figure 4.11: Reinforced/structural steel prices**



Source: BCIS.

The vertical axis in this graph has a different scale to any of the previous charts. This reflects the fact that the steel which gas networks use has characteristics which make it close to a ‘pure’ commodity (whereas general materials and electrical materials have characteristics of manufactured goods, with a higher labour content to dilute the swings in global commodity prices). Smoothing out the bumps over time, the two series both exhibit price increases of close to 100% over the period 2003 to 2010.

Forecasting steel prices requires a huge amount of guesswork; as an illustration of this, when the FT conducted a survey of steel price forecasts for 2011 in January this year, estimates of year-

on-year price increase ranged from 13% to 66%. The latest BEAMA data nevertheless show that prices in May 2011 sit 12-14% above the 2010/11 average and we therefore think it is prudent for NGG to factor a 20% increase in prices into the first year of its business plan forecasts. Thereafter we would advise allowing for a 5% increase in prices per annum to reflect continuing growth in global demand, albeit accepting that there is a very large confidence interval around this estimate and recognising that NGG and Ofgem may wish to seek the advice of someone with more sector-specific expertise than ourselves.

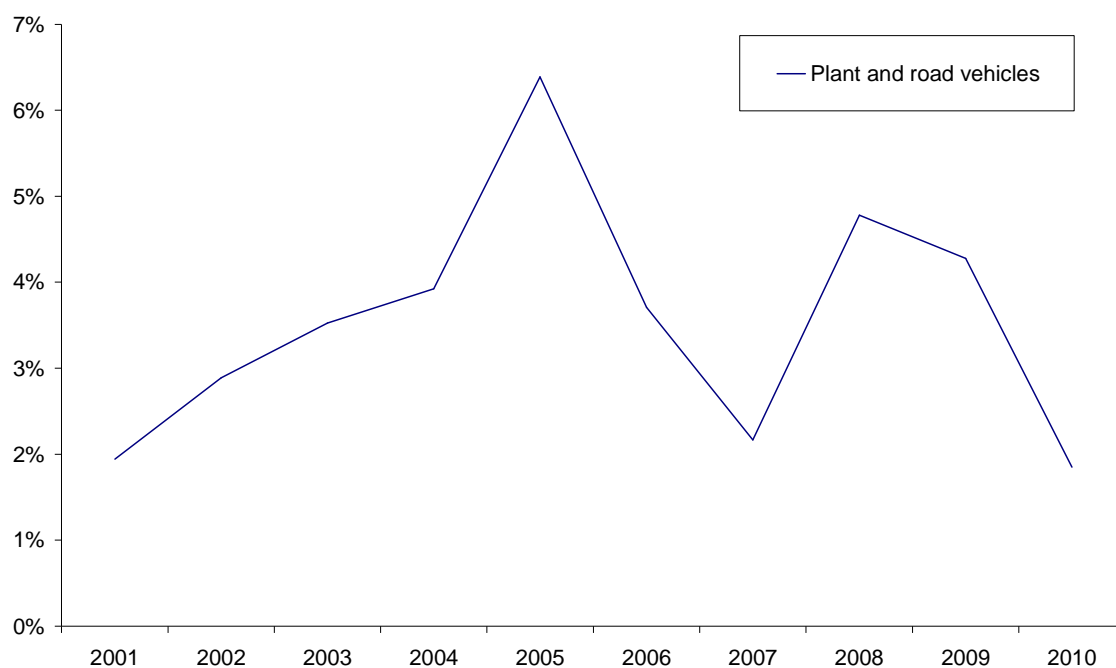
**Table 4.12: Steel for gas pipelines cost inflation**

	Specialist steel cost increases
2011/12	20%
2012/13 and thereafter	5%

#### 4.4 Plant and equipment

The best indicator of the cost pressures impacting on the plant and equipment that transmission networks to repair and extend their networks is the BIS plant and road vehicles index. Figure 4.13 plots the annual change in this index over the period 2000 to 2010.

**Figure 4.13: Plant and equipment cost increases**



Source: BCIS.

Despite the significant reduction in demand brought about by the recession in the construction sector, the BIS index still exhibited inflation of 4.3% and 1.8% in 2009 and 2010 respectively. The average annual price increase pre-recession between 2003 and 2008 was just over 4%.

On the basis of this recent experience, we have suggested in previous reports that it is prudent to allow for comparable price increases of 4% per annum going forward. The most recent evidence does nothing to alter our views on this matter.

**Table 4.14: Plant and equipment cost inflation**

	Plant and equipment cost increases
2011/12 and thereafter	4%

## 4.5 Summary

Table 4.15 contains an overall summary of the estimates emerging from the above analysis.

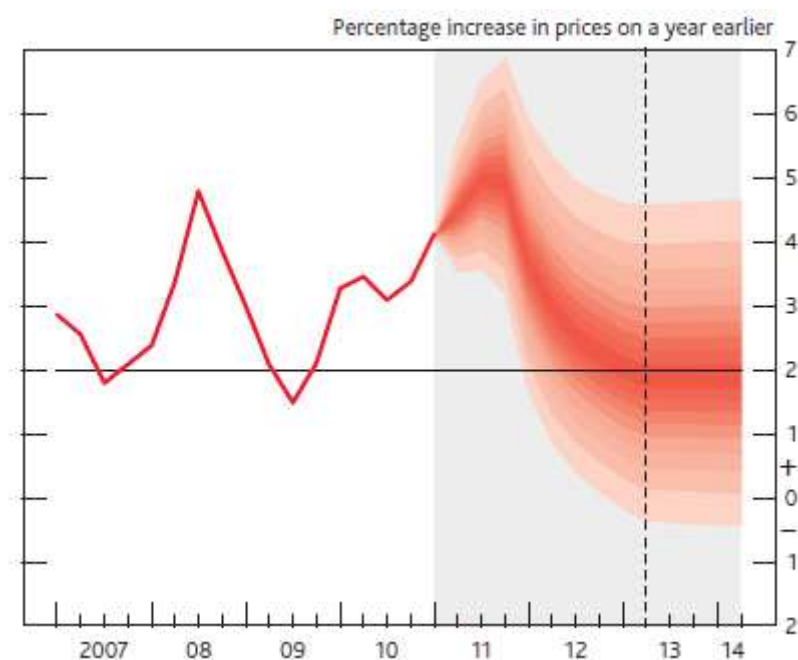
**Table 4.11: Input price inflation forecasts (%)**

	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17 to 2020/21
Labour – general	2	2.5	4.1	4.4	4.5	4.25
Labour – specialist	3.25	3.75	5.35	5.65	5.75	5.5
Materials – general/civils	4.5	4.5	4.5	4.5	4.5	4.5
Materials – electrical	5.0	5.0	5.0	5.0	5.0	5.0
Materials – steel for pipelines	20.0	5.0	5.0	5.0	5.0	5.0
Plant and equipment	4.0	4.0	4.0	4.0	4.0	4.0

## 5.1 RPI

Having opted to anchor our analysis to the GDP forecasts prepared by the Bank of England and HM Treasury, it is only logical that our forecasts of RPI-measured inflation are derived from the same sources. Figure 5.1 and table 5.2 reproduce the projections found in the Bank's May 2011 Inflation Report and HM Treasury's April 2011 Budget report.

**Figure 5.1: The Bank of England's May 2011 CPI Forecasts**



Source: Bank of England.

**Table 5.2: HM Treasury's April 2011 inflation forecasts**

	Percentage change on a year earlier, unless otherwise stated						
	Outturn			Forecast <sup>1</sup>			
	2009	2010	2011	2012	2013	2014	2015
<b>Inflation</b>							
CPI	2.2	3.3	4.2	2.5	2.0	2.0	2.0
RPI	-0.5	4.6	5.1	3.6	3.5	3.6	3.8
Terms of trade <sup>5</sup>	-0.9	-0.3	-2.6	-1.0	-0.2	-0.1	0.0
GDP deflator at market prices	1.5	3.0	3.0	2.4	2.7	2.7	2.7

Source: HM Treasury.

As always with these forecasts, CPI-measured inflation is assumed to come into line with the government's 2% target two years from now and stay at 2% thereafter. In the intervening 24 months, the forecast has CPI-measured inflation noticeably above target due mainly to upward pressure that has been placed on prices in shops by the January 2011 increase in VAT and the depreciation of sterling over the past 2-3 years.

The most interesting part of the numbers is the forecast of RPI-measured inflation that sits alongside the CPI numbers. In 2011 and 2012 RPI moves higher due to the same factors that are lifting CPI-measured inflation. Thereafter, a wedge of between 1.5 and 2 percentage points opens up between the RPI and CPI inflation rates. This surprisingly large gap is explained by the OBR to be a function of two main factors:

- a temporary divergence between the two measures of inflation caused by the upward movement in mortgage interest rates (which are included in the RPI basket but not the CPI basket) back to 'normal' levels; and

- a more permanent widening of the gap that naturally exists between CPI- and RPI-measured inflation from around 0.5 to 0.8 percentage points historically to around 1.2 percentage points going forward.

The OBR explains in its April 2011 that the latter of these two effects is partly a statistical phenomenon caused by the different CPI and RPI methods for aggregating prices into an index and partly by expectations that house prices (which are picked up by RPI but not CPI) will track average earnings growth in future. Taken together the two things mean that a 2% CPI inflation target is now best thought of as converting to a 3.2% RPI-measured inflation rate. This is a higher run rate than we have included in our previous forecasts and means that any given nominal rate of input inflation will now convert to a lower rate of real input price inflation relative to RPI (but not, for the avoidance of doubt, to a higher rate of real input price inflation relative to CPI).

**Table 5.3: RPI forecasts**

	RPI-measured inflation
2011/12	5.2%
2012/13	3.4%
2013/14	3.5%
2014/15	3.6%
2015/16	3.8%
2016/17 and thereafter	3.2%

## 5. Conclusions and Interpretation

Table 5.1 combines the numbers in sections 3 and 4 into overall calculations of RPEs.

**Table 5.1: First Economics' RPE estimates**

	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17 to 2020/21
Labour – general	(3.2)	(0.9)	0.6	0.8	0.7	1.05
Labour – specialist	(1.95)	0.35	1.85	2.05	1.95	2.3
Materials – general/civils	(0.7)	1.1	1.0	0.9	0.7	1.3
Materials – electrical	(0.2)	1.6	1.5	1.4	1.2	1.8
Materials – steel for pipelines	14.8	1.6	1.5	1.4	1.2	1.8
Plant and equipment	(1.2)	0.6	0.5	0.4	0.2	0.8

The story that this table tells is slightly different from the one that we put forward in our DPCR5 reports. This is for two main reasons:

- first, we have reflected the UK's relatively slow recovery from recession in our estimates of wage inflation. The expectation for the UK economy as a whole is that workers will suffer reductions in real incomes for another two years and we need to recognise that the transmission networks will be among the firms that benefit from lower cost pressures as a result of this; and
- second, our calculations of real price effects are against a noticeably higher RPI-measured inflation rate. This is best thought of as a presentational quirk in that the nominal figures in

the latter half of the ten-year forecast period are broadly the same as the ones that we gave to the electricity DNOs, hence our view of the real-life cost pressures that the transmission networks will face over the medium to long term has not changed. What is different is our estimate of the amount of cost increase that companies and Ofgem need to capture in RPEs and the amount of cost increase that the networks will be compensated for naturally via the indexation of price controls in line with RPI.

The second of these points highlights something that First Economics has written about in numerous papers over the last six years – i.e. when measuring real input price inflation, one has to pay as much attention to the benchmark against which real is being measured as to the actual price increases that firms are facing.



## Annex 1: Forecasting in nominal terms versus forecasting in real terms

In section 2 we explained that forecasts of real input price inflation are best obtained from separate estimates of nominal input price inflation and RPI-measured inflation rather than more direct, one-step estimates of real price increases.

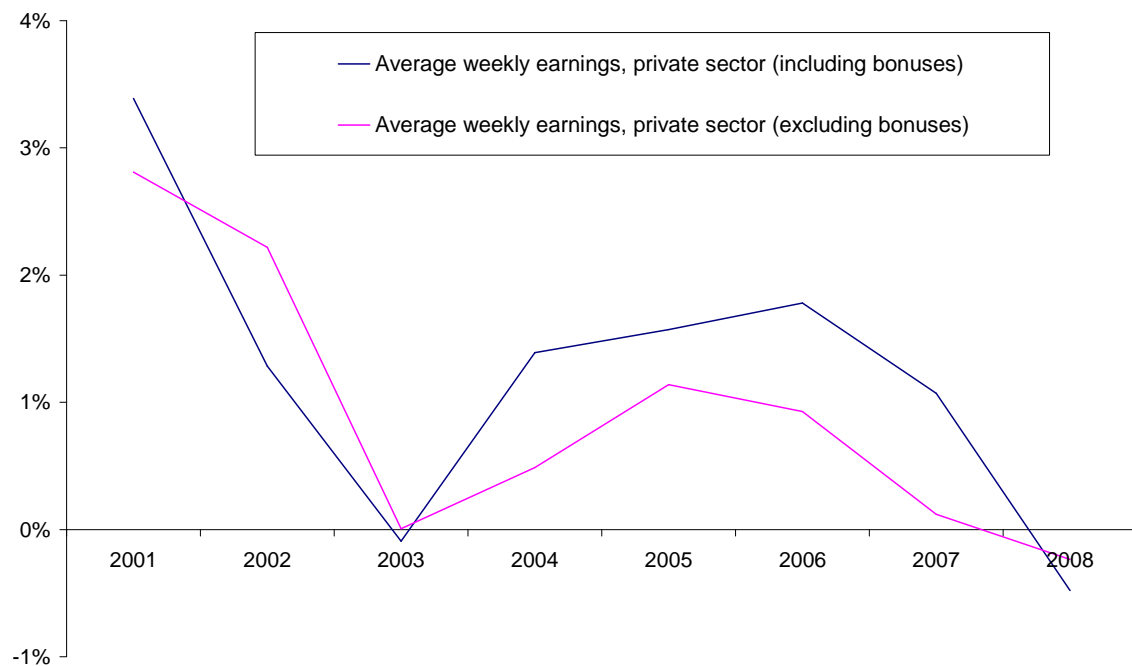
Figures A1 and A2 help to illustrate the point we were making.

**Figure A1: Nominal wage inflation**



Source: ONS.

**Figure A2: Real wage inflation**



Source: ONS.

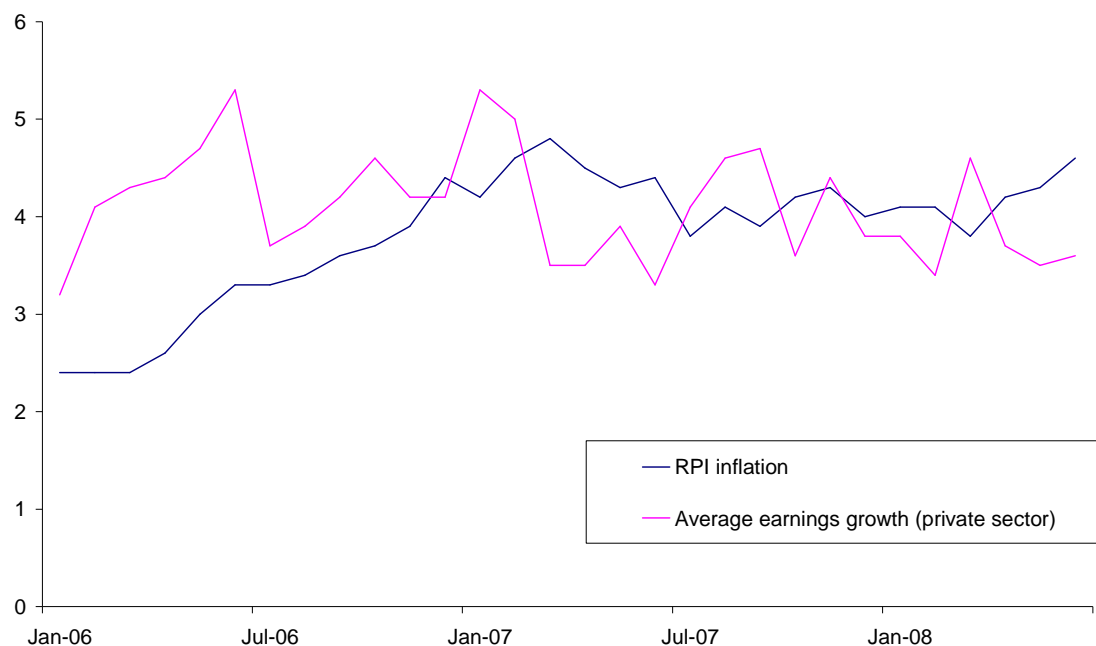
The charts depict the same wage increases, but with figure A1 presented in nominal terms and figure A2 presented in real terms. It can be seen straight away that the data in figure A1 is far more stable than the data in figure A2.

As we explained in section 4, the conclusion that we think should be drawn from the charts is that UK wage inflation is approximately 4.25% per annum in normal economic conditions. This is not just the average rate of nominal wage inflation over the period considered; it is also an accurate proxy – to within 1.5 percentage point – of nominal wage inflation in every year covered by the chart (a period deliberately chosen to exclude the abnormal economic conditions of 2009 and 2010).

This is not a mere quirk or coincidence. In an era of inflation targeting the demands that workers make of their employer tend not to be unduly influenced by the prevailing rate of inflation. Wage increases are anchored instead to forward-looking inflation expectations. In practical terms, this means that workers will be happy with a 4.25% pay increase even as inflation creeps up to, say, 5% provided that they believe the Bank of England is capable of meeting its inflation target over the long term. In such a situation, it is only if the emergence of 5% inflation translates into permanently higher inflation expectations on the part of workers that pay demands will creep up beyond the normal 4.25%.

Figure A3 illustrates this point with a real-life example. The chart shows a gradual increase in inflation during 2006 and 2007 to a peak of 4.5% in April 2007 and readings of 4% or thereabouts in the subsequent 12-month period. Throughout this time it can be seen that wage inflation was restrained, with workers at some points accepting an erosion in pay in real terms. (NB: this was a period of strong economic growth and historically low unemployment; this was not a time when the threat of recession was in the minds of most individuals.)

**Figure A3: Average earnings growth and inflation, 2006 to 2008**



Source: ONS.

Bank of England Inflation Reports from this period repeatedly emphasised the importance of containing inflation expectations. Had wages responded to abnormally high RPI-measured

inflation, the UK economy would have suffered a 1970s style wage-price spiral. However, because the Bank was successful in keeping inflation expectations in check, the feared wage pressures never materialised and the Bank was able to step back from the corrective action it would otherwise have had to take.

It follows from this analysis that the correct way to forecast future real wage inflation is to deduct forecast RPIX-measured inflation from an estimate of nominal wage growth. If, therefore, one considers it likely that wage inflation in the medium- to long-term will match pre-recession wage increases, one needs to allow for nominal wage inflation of 4.25% per annum and not any particular level of real wage inflation of 1.25% per annum.

Among other things, this means that an increase in RPI-measured inflation due to the factors listed in section 5 of the main paper should lead to a lower rate of real wage inflation in steady state.