Annex 6
Real Price Effects & Frontier Shift
GD17

Draft Determination

15 March 2016

About the Utility Regulator

The Utility Regulator is the independent non-ministerial government department responsible for regulating Northern Ireland's electricity, gas, water and sewerage industries, to promote the short and long-term interests of consumers.

We are not a policy-making department of government, but we make sure that the energy and water utility industries in Northern Ireland are regulated and developed within ministerial policy as set out in our statutory duties.

We are governed by a Board of Directors and are accountable to the Northern Ireland Assembly through financial and annual reporting obligations.

We are based at Queens House in the centre of Belfast. The Chief Executive leads a management team of directors representing each of the key functional areas in the organisation: Corporate Affairs; Electricity; Gas; Retail and Social; and Water. The staff team includes economists, engineers, accountants, utility specialists, legal advisors and administration professionals.

Our Mission	Value and sustainability in energy and water.
Our Vision	We will make a difference for consumers by listening, innovating and leading.

Our Values

Be a best practice regulator: transparent, consistent, proportional, accountable, and targeted.

Be a united team.

Be collaborative and co-operative.

Be professional.

Listen and explain.

Make a difference.

Act with integrity.

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1 Introduction

1.1　In this Annex we give further detail of our analysis and considerations under the areas of real price effects and frontier shift.

1.2　The concept of frontier shift is wider than simple productivity assumptions. Within this report, we have adopted the methodology we first introduced at PC13 for NI Water[1], which aligns closely with the Competition Commission (CC) determination for Northern Ireland Electricity at RP5 and more recent Competition and Markets Authority (CMA) decisions.

1.3　This process combines nominal input price forecasts with productivity expectations and RPI inflation. The frontier shift in real terms can be represented in a simple way as follows:

Frontier shift in real terms　=　input price increase　　　　　　　minus

forecast RPI (measured inflation)　minus

productivity increase

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[1] http://www.uregni.gov.uk/uploads/publications/ANNEX_D_-_Rate_of_Frontier_Shift_-_PC13_FD.pdf

2 Real Price Effects

2.1   The price of a company's various inputs may differ over time. Price controls have normally been indexed by the Retail Price Index (RPI) to account for broad changes in prices. However, being a measure of general inflation, not all types of cost changes will be reflected in the range of prices used to calculate the RPI. To account for this it is common practice to calculate and make adjustments for the difference, either positive or negative, between particular input price changes for a company or industry and the RPI measure of inflation. This is described as *real price effects* (RPEs).

2.2   In the detailed business plan submissions FE provided forecast nominal RPEs for specific input cost categories over the GD17 period.   These forecasts were accompanied by an explanatory commentary and analysis.

2.3   Part of FE's submission was a report on benchmarking and efficiency assessment by their advisors, Oxera.   The report gave an overview of possible approaches to benchmarking FE. It also noted the range of RPEs applied to gas and electricity transmission and distribution companies in recent regulatory decisions.   However caution was advised as NI GDNs may differ from their GB counterparts.

2.4   PNGL provided nominal forecast RPEs as part of their submission. This was in turn accompanied by a paper setting out statistical analysis undertaken by their advisors, NERA. In summary this analysis used two distinct methods: long term trend growth and 'ARIMA'[2] time series modelling. The different methodologies gave a range of results for predicted RPEs across the GD17 period. A simple average of forecasts using models from a (p,1,q) and (p,0,q) time series process was adopted using the Bayesian Information Criterion within the sample to identify the preferred ARIMA specifications. No *ex post* forecasting accuracy test was employed by NERA. The outcome provided results for both preferred ARIMA specifications and compared these to the forecast of RPEs across GD17 using a simple OLS time series approach.

2.5   The NERA work forecasts that input costs for PNGL's opex were expected to increase above RPI by between 5.6% or 7% in total by 2020, dependant on the calculation method chosen. For capex the predictions were between 7.1 % or 8.3% by 2020.

2.6   SGN were successful in a 2014 competitive application process for the award of a new low pressure gas conveyance (distribution) licence to take gas to the west (GttW) of Northern Ireland. Construction of the SGN network is expected to begin in 2017.

2.7   In their business plan submission for GD17, SGN provided high level forecast yearly RPEs of 1.4% for opex (contract labour) and 2.75% for capex. The forecast RPEs for capex consisted of 1.4% for contract labour and 1.35% for materials. Being SGN's first price control, we have decided to not apply RPEs for the opex cost element of the GD17 price control. We do however propose to apply RPE's to SGN's capex

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[2] 'ARIMA' or autoregressive (AR) of order *p* plus data made stationary via integration or differencing plus a moving average (MA) term or order *q* is the name used for a particular type of time series model used to predict or forecast future values. Such models are often described as <u>mean reverting</u> as by lengthening the forecast horizon they will tend to bring forecasts into line with the long term mean or average growth rate of the variable under examination, whilst cycles are maintained via inclusion of an AR process.

costs during GD17. We therefore do not address RPEs for SGN opex costs in detail within the individual cost category sections that follow.

2.8   We proposed certain input cost categories in our overall approach for the GD17 price control. As noted at that time, they would form the categories for GD17 as a minimum. We carry these categories forward for use in GD17, maintaining continuity with GD14 cost categories for efficiency benchmarking, and our detailed reasoning follows below. The category weights are listed below this section in Table 1.

Weights

2.9   To estimate RPEs we first separate a company's costs into various categories of opex and capex. This is a necessary step as input prices in different cost categories may vary for each component of opex and capex.

2.10   Nominal price inflation for each category of cost is then calculated. Finally, accounting for RPI and applying weights to each cost category we calculate an overall value, or weighted average, of RPEs in each year of the price control.

2.11   As part of their business plan submissions, the three GDNs were asked to submit what they thought were the appropriate cost category weights for both opex and capex.

2.12   FE had relatively similar proportions to those adopted at GD14 for opex, although labour was separated into manpower and contracted elements. FE did not have a separate capex category for materials, but had a significant weighting for contractor costs instead, which would have materials costs included.

2.13   PNGL's submission used the same weights as was adopted by the UR in GD14 and proposed in our overall approach for GD17. SGN's proposed weights were quite markedly different to the other GDNs.

2.14   For GD17, we considered the adoption of weights specific to each company. However, having given this due consideration, we have decided not to adopt this approach. We are concerned that if we were to do so, we may be inconsistent with the principal objective of RPEs – estimating the likely shift in the industry *frontier.* Our approach thereby avoids any risk that our frontier shift approach essentially passes through company costs via a RPEs assessment which mirrors a company's actual costs proportions rather than the cost weights applying to an *efficient company at the frontier*.

2.15   It is also important to note that company weights may change over time more readily than the broader approach of using notional weights. In addition, by adopting such an approach it would be necessary to determine each company's specific price inputs. This would not be practical or beneficial for the 'notional company' approach adopted.

2.16   Therefore for the GD17 Draft Determination we have decided to adopt the same weights as used in GD14. These are based on the notional structure weights of the different cost categories of a GDN as determined by Ofgem.

2.17   These weights as adopted do not differentiate between direct and contract labour. We carry this approach forward to avoid any unintentional influence on GDN decisions on labour supply when choosing between direct and/or contracted labour.

**Table 1 - Cost Categories and Weightings for Efficiency**

Cost category	Opex	Capex
Labour (direct and contract)	52%	56%
Materials	6%	19%
Equipment/plant	1%	4%
Other	41%	21%

Source: UR

Input prices – Labour

2.18 As the cost category of labour makes up over half of the opex and capex, it is important that the figures used for these input prices are both fair and robust.

2.19 The three GDNs were asked to provide their estimates of labour costs for the GD17 period.

2.20 FE forecast slightly more moderate increases in labour costs, with a somewhat flatter profile than PNGL. The Oxera benchmarking paper usefully provided an overview of recent potentially relevant regulatory decisions on labour RPEs.

2.21 PNGL adopted forecasts from NERA which estimated a relatively sharp increase in the cost of labour in the short-term, with the increases slowing towards trend rate after 2019. NERA adopted ARIMA modelling analysis which incorporates significant mean reverting behaviour within the modelled time series, resulting in their forecast being materially above that predicted under a simple OLS time series approach.

2.22 SGN provided forecasts for direct and contract labour separately. The forecasts were of more moderate increases, peaking in 2018 for both descriptions of labour and remaining flat thereafter to the end of GD17.

2.23 In GD14, for our analysis we used average earnings figures (calculated by wages and salaries divided by employees). Forecasts for this data series are provided by the Office of Budget Responsibility (OBR), a body which is independent of government that provides authoritative analysis on a range of economic issues. For GD17 we consider continuity of this approach beneficial, and given the data source, reliable and consistent with our other data series.

2.24 Although PNGL and NERA's ARIMA modelling has its advantages, it is also important to note that OBR's analysis will also be empirically based and also takes into account the continued prospect of recovery, the extent and timing thereof for the UK economy, as part of a world view.

Figure 1: Average Earnings Growth (%) - OBR
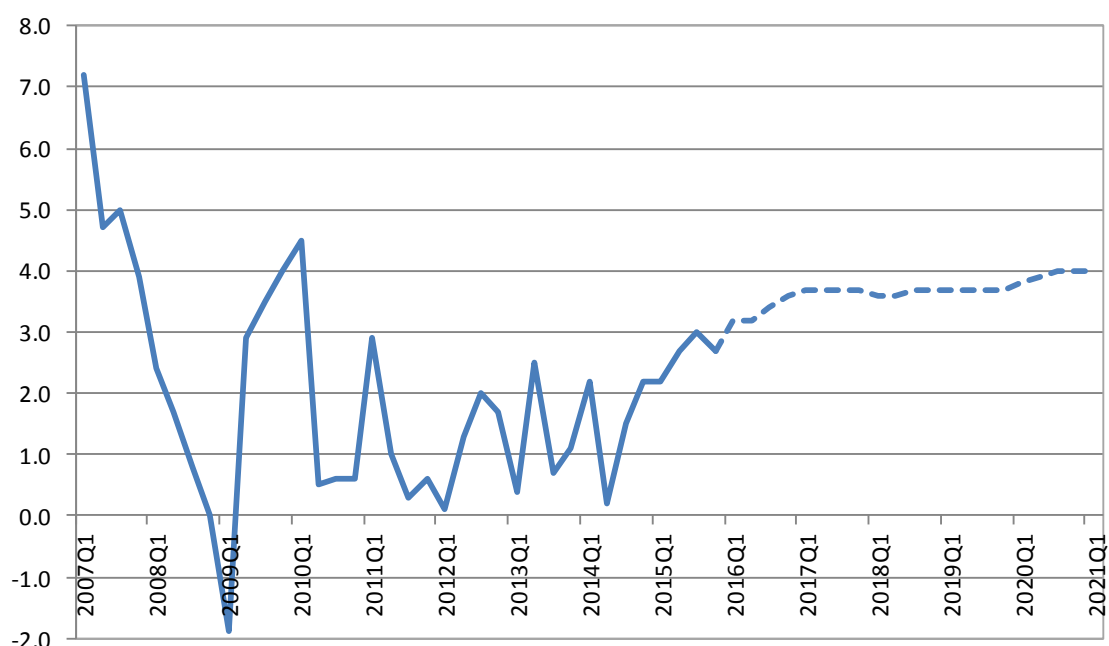
Source: OBR Economic and Fiscal Outlook: Economy supplementary table 1.6, November 2015

Table 2: Economic and Fiscal Outlook – Labour Market

Labour market	Percentage change on a year earlier, unless otherwise stated					
	Out turn	Forecast				
	2015	2016	2017	2018	2019	2020
Employment (millions)	31.1	31.5	31.7	31.9	32.0	32.2
Productivity per hour	1.1	1.5	1.9	2.2	2.2	2.2
Wages and salaries	4.4	4.5	4.5	4.2	4.1	4.3
Average earnings	2.6	3.4	3.7	3.6	3.7	3.9
LFS unemployment (% rate)	5.5	5.2	5.2	5.3	5.4	5.4
Claimant count (millions)	0.80	0.77	0.82	0.86	0.87	0.88

Source: OBR Economic and Fiscal Outlook, table 3.6, November 2015

2.25 Since the economy entered recession around 2009, earnings growth has remained quite low. However, as the economy has made some improvement and the unemployment rate has fallen, the OBR are predicting a return to nominal earnings growth of between 3 and 4 per cent over the next 5 years or so. As RPI inflation is low, this translates into a forecast of a real terms increase in labour costs during the period of GD17.

2.26 We adopt the OBR figures from their forecast in November 2015 and are minded to update for any more recent forecast available by the time of our final determination.
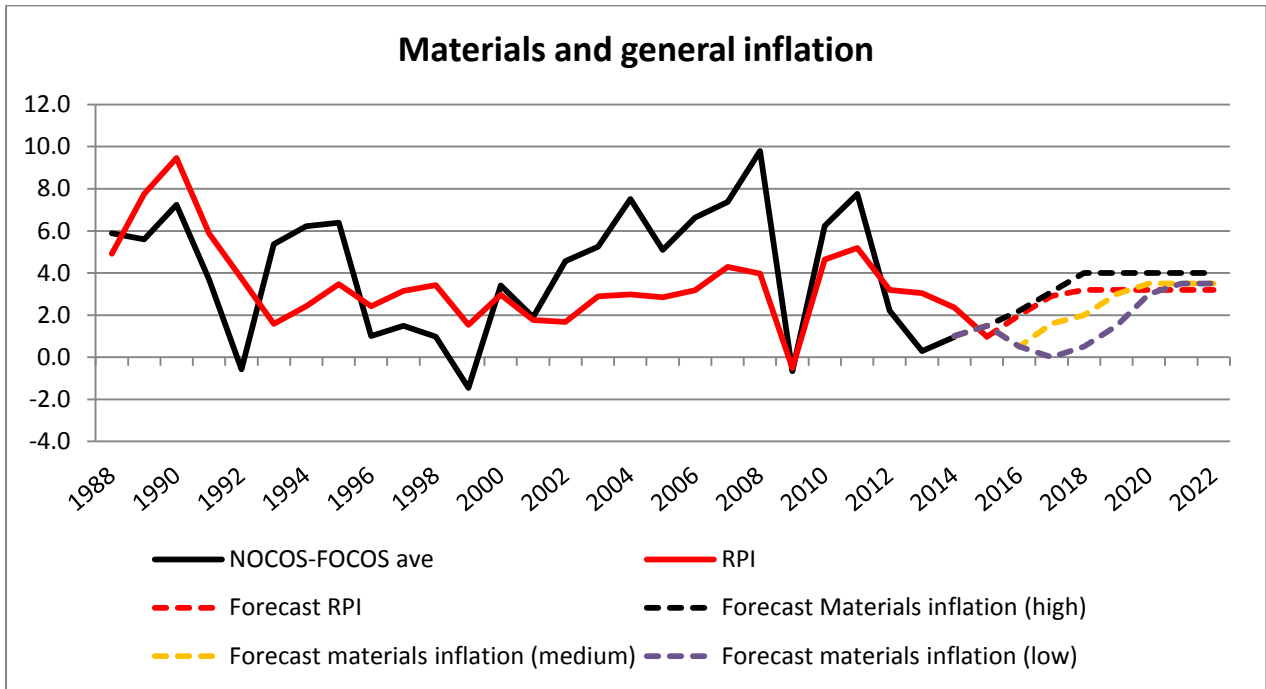
Input Prices – Materials

2.27   The next category we assess is materials, which make up almost a fifth of capex costs. Materials costs carry less weight for opex, but are still an important consideration of RPEs.

2.28   SGN signalled in their submission that materials price inflation was not relevant to their opex, but rather to their capex costs. We note this point and considered it against our proposal to seek to apply a 'notional efficient company' approach to RPEs, including weights for all the GDNs.

2.29   We noted FE's cost category proposed in the 'Weights' section above. The outturn of their proposal was that no separate materials category was included.

2.30   PNGL provided forecasts for material prices that show an increase throughout the GD17 period.

2.31   Our analysis for this area in GD14 drew on price indices published by the Department for Business Innovation & Skills (BIS)[3]. This analysis resulted in applying the long term average of the NOCOS and FOCOS indices over the GD14 period as the materials price input inflation assumption.

2.32   We considered indices available to estimate the price changes for materials during GD17. The Office of National Statistics (ONS) assessment of the indices used in GD14 was that they provided an important tool to multiple users and were a needed resource. However the methodology for calculating the indices was deemed in need of updating. The indices used for GD14 were subsequently discontinued[4]. However given the usefulness of the discontinued indices, the ONS have produced a short-term replacement solution known as the interim construction Output Price Indices (I-OPIs).

2.33   The continuity provided by the introduction of the I-OPIs is welcome. However they offer a time series of only 2 years data and we did not consider drawing conclusions from the I-OPIs alone as appropriate. The NOCOS and FOCOS indices by contrast offer a time series of data of over 25 years.

2.34   Subsequently we estimated the level of material price inflation for the GD17 period using the data indices above. To do this we first took the current 'snapshot' of inflationary indications provided by the I-OPI. We then forecast possible 'high' 'medium' and 'low' growth trends that all increase toward the long term average of the NOCOS and FOCOS indices. This is illustrated in Figure 2 and Figure 3 below.

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[3] i.e. 'NOCOS' - Resource Cost Index of Building Non-Housing, Material and 'FOCOS' Resource Cost Index for Infrastructure, Materials. See §14.21 http://www.uregni.gov.uk/uploads/publications/2013-12-20_GD14_Price_Control_for_NI_GDNs_2014-2016_Final_Determination.pdf#page=166&zoom=90,69,770
[4] https://www.gov.uk/government/collections/price-and-cost-indices#history

Figure 2: BIS Construction Resource Indices

Materials and general inflation

Source: BIS Construction Resource Indices: NOCOS' - Resource Cost Index of Building Non-Housing, Material and 'FOCOS' Resource Cost Index for Infrastructure, Materials, OBR Economic and Fiscal Outlook, November 2015, ONS and UR analysis.

Figure 3: ONS Interim Construction Output Price Indices

I-OPI % change over 12 months
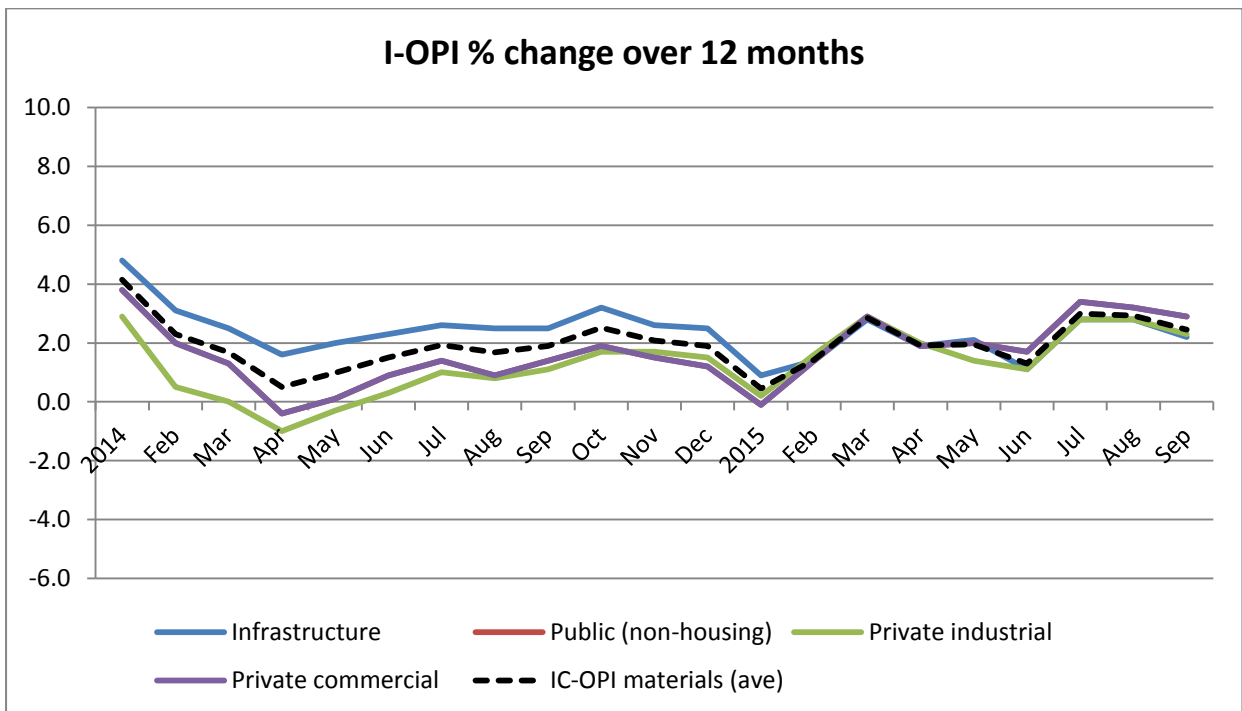
Source: ONS Interim Construction Output Price Indices (OPIs), Quarter 3 2015, Table 2 and UR analysis

2.35   Price levels in materials can be quite volatile, but have not seen sustained increases in recent years. Rather, evidence points to a weakened demand in global markets of late.

The Bank of England's February 2016 Inflation Report notes "muted growth in world prices"[5] as a contributory factor to lower than expected general UK inflation. This combined with reportedly high commodity inventories[6] suggests continued downward pressure on cost inputs may be expected. On consideration, we suggest the most likely scenario is that any price growth will be low in the short-to-medium term, and subject to economic conditions, there is the potential for perhaps negative growth.

2.36   Reflecting on the above we have chosen the medium growth scenario from our forecasts of materials price inflation. Our medium growth scenario is positive, draws on recently regulatory practice and increases towards the long term average whilst expecting in the near term a more modest growth rate in light of current market conditions. This choice allows for the scenario we describe in the previous paragraph while still permitting some additional flexibility in material price movements.
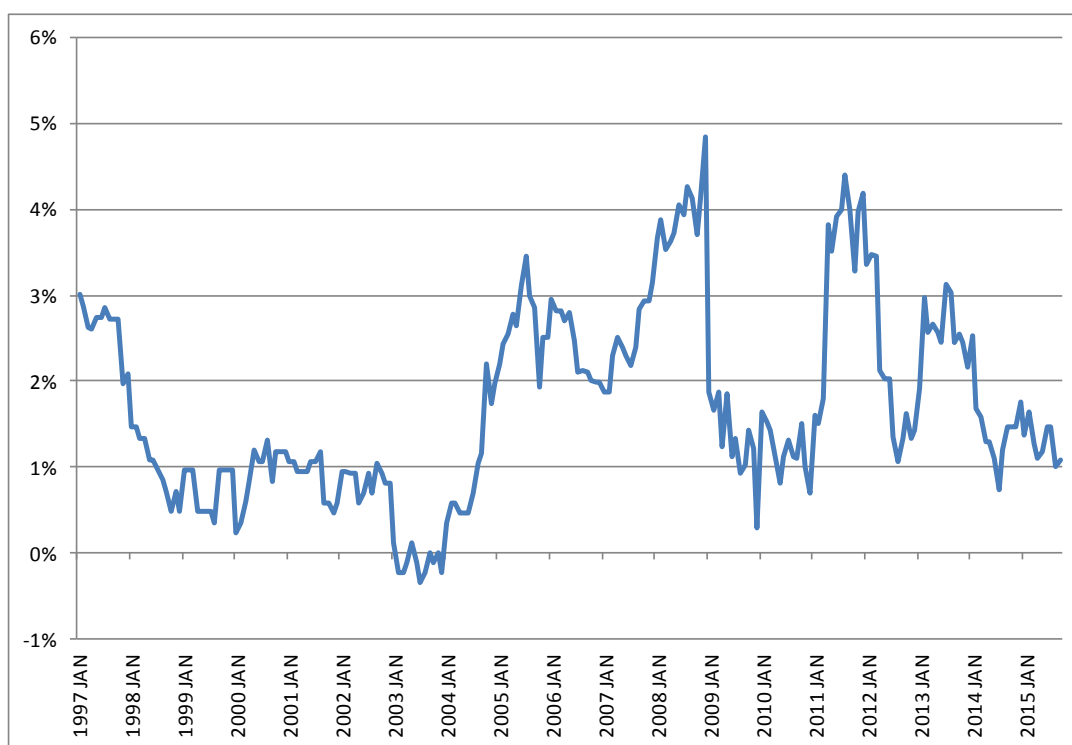
Input Prices – Equipment & Plant

2.37   PNGL provided forecasts for equipment and plant prices that show an increase to a peak in 2019, followed by a turn towards a slight downward trajectory until the end of GD17.

2.38   Both FE and SGN proposed no specific figures for this area of costs, due to their respective preferred cost categories within their business plans.

2.39   To establish how equipment and plant costs are expected to change over the next few years we examined data from ONS – namely the Machinery & Equipment component (K389) of the Producer Prices Index (PPI).

2.40   The figure below illustrates how machinery and equipment is quite a volatile index, which in recent years has ranged between around 0% and 5% annual growth. In our forecast for the GD17 period we have used the long-term average of 2.4% to populate the input price calculations. This is due to our expectation that the current trend towards the long term average growth rate shall continue throughout the GD17 period.

2.41   In terms of relative importance it is important to note that the plant and equipment category has a relatively small weighting for both opex and capex (1% and 4% respectively).

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[5] Monetary Policy Summary section - http://www.bankofengland.co.uk/publications/Documents/inflationreport/2016/feb.pdf
[6] For example: Platts (London) report http://www.platts.com/latest-news/metals/london/investec-cuts-base-metals-forecasts-sees-disincentive-26343325

Figure 4: ONS PPI – Machinery and Equipment (K389)

*Source*: ONS Producer Price Indices, Machinery and Equipment

Input Prices - other

2.42   As was the case in our last GDN price control (GD14), for the "other" category, in the absence of a suitable index for this cost item we assume that prices increase at the same nominal rate as the Retail Prices Index (RPI). This in effect leads to a nil RPE applying to other costs.

2.43   More detail of the assumed RPI values is provided below.

Retail Price Index Projections

2.44   As the input prices above are in nominal terms, it is necessary to apply an RPI discount in order to transform the calculated price effects into real terms.

2.45   In line with a number of recent price controls we have based our RPI values on forecasts made by the OBR. The latest OBR forecasts were published in November 2015 and show a moderate increase in RPI until around late 2017, before it levels off somewhat, to slightly above 3%.

Figure 5: RPI since 1997
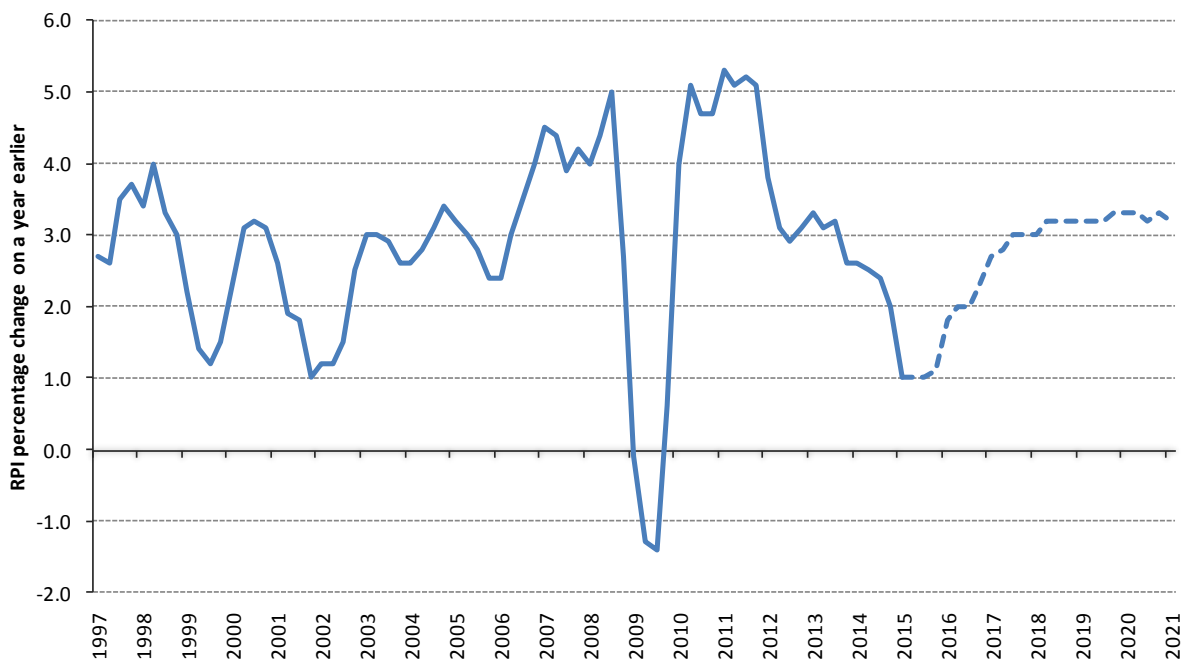
Source: [1] Solid line denotes actual data from ONS, dashed line of figures from OBR forecasts.

2.46   As a sense-check we have compared OBR estimates with latest HM Treasury forecasts. However, although slightly more recent, the HM Treasury estimates are in line with what was forecast by the OBR in November 2015.

2.47   We are therefore content to use the OBR RPI forecasts in our calculation of real price effects.   We are also minded to consider updating for any more recent forecast available by the time of our final determination.

2.48   The detailed annual figures for all input price categories are set out in Table 5: Opex Frontier Shift and Table 6: Capex Frontier Shift.

3 Productivity

3.1   A company can become more efficient over time and so close the gap between its efficiency level and that of the economic frontier. Equally, the industry's overall efficiency or frontier can change over time. It is possible the most efficient company in an industry can find new or improved ways of using less input volumes to maintain current output levels.

Productivity Growth

3.2   In addition to real price effects, it is necessary to apply a productivity assumption to both opex and capex so as to take account of continuing efficiencies which the industry can achieve over the price control period. This is a base level of efficiency which even frontier companies would be expected to achieve as they continually improve their business over time (with new technologies and working practices for example).

3.3   FE stated they had built productivity growth into their business plan submission. Hence the company did not propose a distinct level of productivity improvement within the GD17 business plan templates.

3.4   PNGL proposed an annual increase in productivity of 0.8% for opex and 0.6% for capex. These figures were the midpoint of NERA analysis results that drew from the EU KLEMS productivity data.

3.5   EU KLEMS offers both gross output (GO) and value added (VA) measures of total factor productivity. NERA in their analysis for PNGL opted for the GO measure solely, as they did not consider VA relevant to PNGL. In addition NERA said Ofgem and the CMA have both commented on the suitability of the VA measure.

3.6   We considered NERA's position on use of GO and/or VA measures. During our considerations we noted that a significant body of work has already been carried out on EU KLEMS data. Specifically with regards the issue of whether to use VA or GO we consider relevant the Competition Commission's (CC) recent deliberations and conclusions on the matter in their recent NIE RP5 determination.

3.7   The CC took a balanced view of both productivity measures. They noted that neither measure perfectly captures the productivity changes that could be expected in a company's cost base. In addition the CC noted changes in GO have been systematically smaller than changes in VA. However they subsequently concluded while there were some disadvantages, that it was their view that both GO and VA measures are useful[7].

3.8   On that basis they produced a range of possible productivity improvement. Table 3 shows the CC's figures for aggregate average annual productivity growth rates (ie for the UK economy as a whole) based on the different measures of productivity.

3.9   In their final determination of NIE Networks, the CC considered that the aggregate EU KLEMS data could support a range of estimates of productivity of between 0.5 and 1.5 per cent. It is worth noting that Ofgem RIIO-GD1 and T1 analysis underpinned the CC's range produced for the table below.

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[7] See appendix 11.1 of the CC's NIE RP5 final determination, §§ 3 - 10 https://assets.digital.cabinet-office.gov.uk/media/534cd4b4ed915d630e000041/appendices-glossary.pdf

Table 3: Average annual TFP growth rates for different sectors using EU KLEMS, 1970 to 2007

per cent

Sector/group	TFP (VA)	Labour & intermediate input productivity (VA) at constant capital	TFP (GO)	Labour & intermediate input productivity (GO) at constant capital	Labour & intermediate input productivity (GO)
Unweighted average all industries	1.3	1.5	0.5	0.5	0.8

Source: EU KLEMS/Ofgem RIIO—T1/GD1: Real Price Effects and ongoing efficiency appendix, p15, 17 December 2012.

Notes:
1. The averages used by Ofgem exclude the following industries: real estate, public administration, education, health and social services.
2. VA = value added measure.
3. GO = gross output measure.

Source: Competition Commission final determination of the NIE RP5 price control, Table 11.2

3.10 As part of the price control process, it is necessary to ascertain the level of productivity improvement likely to be achievable by the GDNs. To do this we consider ways that we may establish an improvement amount applicable.

3.11 A reasonable barometer of potential productivity improvement is that which has been observed in industries similar to the GDNs and/or has been applied to other GDNs.

3.12 In terms of available observation data we agree with the CC/CMA and consider the EU KLEMS data provides a useful data source over a reasonably long time series. From the material set out above, and the range summarised in Table 3 we consider it reasonable to conclude that continuing productivity is relatively small. That is, the above estimated range provides a suitable choice for productivity improvement.

3.13 However while relatively small, over time this is material enough to indicate continued efficiencies in working practices since their cumulative effect amounts to our anticipation that companies shall deliver further efficiencies into the long term, even if residing at the frontier for the industry.

3.14 Table 4 below has been taken from the CC's determination and updated for more recent price control decisions. It shows a summary of the various regulatory assumptions that have been made regarding productivity per annum. In GD14, we applied a 1.0% productivity assumption for both opex and capex.

Table 4: Recent regulatory assumptions on productivity

Opex productivity

UR—Water and sewerage	0.9
PPP Arbiter—underground infracos, central costs	0.7
PPP Arbiter—underground infracos, opex	0.9
Ofgem—GB DNOs	1.0
Ofgem—Transmission & Gas Distribution	1.0
ORR—Network Rail, opex	0.2
ORR—Network Rail, maint	0.7
CC – NIE RP5 opex	1.0
CMA – Bristol Water PR14[8]	1.0
UR – GD14 opex	1.0

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[8] Applied to totex

Capex productivity	
PPP Arbiter—underground infracos	1.2
Ofgem—GB DNOs	1.0
Ofgem—Transmission & Gas Distribution	0.7
ORR—Network Rail	0.7
CC - NIE RP5 capex	1.0
CMA – Bristol Water PR14[9]	1.0
UR – GD14 capex	1.0

Source: UR, CC analysis.

3.15　In their final determination of RP5 for NIE, the Competition Commission, in assessing all the available evidence, considered a productivity assumption of 1% as reasonable in their case:

> *"To reach our decision on productivity, we considered the evidence provided by other regulatory decisions, the EU KLEMS data and the recent business plans of the GB DNOs. We considered that the recent business plans of the GB DNOs and Ofgem's recent decisions in respect of the GB DNOs and Transmission & Gas Distribution were particularly relevant. This was because these businesses overlapped significantly with NIE's business activities.*

> *Based on this evidence, we considered that we should expect NIE to make an incremental efficiency improvement of 1 per cent a year for each of opex and capex.*

> *We therefore determined that we should apply a productivity assumption of 1 per cent a year to NIE's costs (ie to each of opex and capex)."*

3.16　Further evidence from recent regulatory analysis and determinations are available in relation to Bristol Water. The CMA in their Bristol Water final determination applied a cost trend adjustment for RPI–1% (efficiency and input price inflation).

3.17　We considered the evidence presented by other regulatory decisions on productivity improvement. The CC/CMA range of 0.5% - 1.5% appears reasonable in the broad circumstances of a regulated monopoly network company. Subsequently we also consider a midpoint productivity assumption of 1.0% per annum to be a reasonable assumption for the GDNs. Therefore we shall adopt a 1.0% per annum productivity assumption for the GD17 price control period.

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[9] Applied to totex

4 Frontier Shift Conclusions

4.1 The frontier shift in real terms is calculated by applying the average annual productivity figure (1.0%) to the real price effects result. The real price effect figure is computed from discounting RPI from the weighted impact of nominal input prices.[10]

4.2 In a simplified calculation however, frontier shift can be determined as follows:

Frontier shift in real terms   =   input price increase   minus
forecast RPI (measured inflation)   minus
productivity increase

4.3 The respective net impact of frontier shift for both opex and capex is shown in the tables 5 and 6 below. Please note numbers may not sum due to rounding.

Table 5: Opex Frontier Shift

Opex	Weight	2015	2016	2017	2018	2019	2020	2021	2022
Labour (direct and contracted)	52%	2.6	3.4	3.7	3.6	3.7	3.9	3.9	3.9
Materials	6%	1.5	0.5	1.6	2.0	3.0	3.5	3.5	3.5
Equipment/Plant	1%	1.1	1.7	2.3	2.3	2.3	2.3	2.3	2.3
Other	41%	1.0	2.0	2.9	3.2	3.2	3.2	3.2	3.2
Total nominal input price inflation		1.9	2.6	3.2	3.3	3.4	3.6	3.6	3.6
RPI		1.0	2.0	2.9	3.2	3.2	3.2	3.2	3.2
Productivity growth		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Frontier shift		**-0.2**	**-0.4**	**-0.7**	**-0.9**	**-0.8**	**-0.6**	**-0.6**	**-0.6**
Frontier Shift (%)		0.2%	0.4%	0.7%	0.9%	0.8%	0.6%	0.6%	0.6%
Frontier Shift (Cumulative %)		0.2%	0.5%	1.2%	2.1%	2.8%	3.5%	4.1%	4.7%

Table 6: Capex Frontier Shift

Capex	Weight	2015	2016	2017	2018	2019	2020	2021	2022
Labour (direct and contracted)	56%	2.6	3.4	3.7	3.6	3.7	3.9	3.9	3.9
Materials	19%	1.5	0.5	1.6	2.0	3.0	3.5	3.5	3.5
Equipment/Plant	4%	1.1	1.7	2.3	2.3	2.3	2.3	2.3	2.3
Other	21%	1.0	2.0	2.9	3.2	3.2	3.2	3.2	3.2
Total nominal input price inflation		2.0	2.5	3.1	3.2	3.4	3.6	3.6	3.6
RPI		1.0	2.0	2.9	3.2	3.2	3.2	3.2	3.2
Productivity growth		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Frontier shift		**0.0**	**-0.5**	**-0.8**	**-1.0**	**-0.8**	**-0.6**	**-0.6**	**-0.6**
Frontier Shift (%)		0.0%	0.5%	0.8%	1.0%	0.8%	0.6%	0.6%	0.6%
Frontier Shift (Cumulative %)		0.0%	0.6%	1.4%	2.4%	3.2%	3.8%	4.3%	4.9%

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[10] For example for 2016, the opex frontier shift is calculated as follows: (1.026/1.02)*(1-0.01)-1=-0.4