

Victorian Gas Distribution Business Opex Rate of Change

Prepared for
Envestra, Multinet and SP AusNet

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AUSTRALIAN CAPITAL TERRITORY NEW SOUTH WALES VICTORIA

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EXECUTIVE SUMMARY

The three Victorian gas distribution businesses (GDBs) – Envestra, Multinet and SP AusNet – have commissioned Meyrick and Associates to advise on the appropriate operations and maintenance expenditure (opex) ‘rate of change’ formula and parameters to apply in the Gas Access Arrangement Review (GAAR) for 2008 to 2012.

The ‘rate of change’ aims to index real opex for the starting year of the regulatory period forward through the remainder of the regulatory period taking account of changes in the three key opex drivers: input prices; ongoing productivity gains; and, output growth.

Two ways of calculating the opex rate of change were presented during the Essential Services Commission’s (ESC) recent electricity distribution price review. Pacific Economics Group (PEG 2004, 2005) presented the traditional opex indexing formula in work on behalf of SPI while the ESC (2005b) used a different formula in its final decision.

PEG (2004) showed that the appropriate formula for rolling forward starting year real opex is given by:

$$(1) \quad \Delta \text{Real Opex} = \Delta \text{Opex Price} - \Delta \text{Opex Partial Productivity} + \Delta \text{Output Quantity} - \Delta \text{CPI}$$

where the ‘ Δ ’ symbol stands for ‘the proportional change in’. This approach is conceptually correct and is consistent with practice in several North American jurisdictions.

The ESC (2005b) formula is:

$$(2) \quad \Delta \text{Real Opex} = \Delta \text{Inverse Opex Partial Productivity} - \Delta \text{Incremental Opex Price}$$

The ESC then adds on the $\Delta \text{Output Quantity}$ term separately. The rationale behind (2) is not well explained in ESC (2005b) and, unlike the PEG (2004) approach, appears to be lacking in rigorous justification.

Turning to the principal opex drivers, Meyrick and Associates (2007) has reviewed available price indexes that best reflect GDB opex prices. PEG (2006a) developed a detailed opex price deflator for electricity DBs which is made up of a 62 per cent weighting on the Electricity, gas and water sector Labour cost index with the balance of the weight being spread across five Producer price indexes. Since the functions of electricity and gas distribution are broadly analogous, the PEG (2006a) deflator is considered the best currently available for GDB opex as well.

The measure of labour prices we use is Average weekly ordinary time earnings (AWOTE) which best reflects labour price pressures in a tight labour market as it picks up the effect of

employers prematurely promoting individuals they want to retain and ‘reclassifying’ jobs as a means of paying staff more to prevent them from being poached by other organisations.

BIS Shrapnel (2007) forecast that wages growth in the EGW sector will continue to outpace national wages growth over the next 6 years with the EGW AWOTE increasing by 5.7 per cent per annum. Key factors driving up EGW sector wages are the increase in infrastructure maintenance programs and ongoing industry restructuring. Combined with the entry of new players, particularly in the energy retail sector, and increased competition through product differentiation, the demand for both technical and customer service staff has increased significantly and is expected to remain high.

Over the period 2000 to 2005 the producer price indexes in the PEG (2006a) opex price increased at a weighted average rate of 2.6 per cent per annum, around the same rate as the CPI. We assume that this growth rate will continue over the period of the next GAA. Combining our forecasts for EGW sector labour and non-labour opex costs, the overall GDB opex price is expected to increase by 4.52 per cent per annum over the next GAA period.

On the basis of the available evidence, we conclude that the high rates of opex partial productivity growth observed in the Victorian gas distribution industry in the period since privatisation are unlikely to be sustainable going forward, just as they have not been sustainable for a long period in the Victorian electricity distribution industry. A number of independent exercises have forecast a marked slow down in future gas distribution opex partial productivity growth rates to rates close to those observed in the mature North American industry.

On the basis of the evidence reviewed in section 4, we recommend that the rate of change formula use an annual opex partial productivity growth rate of 0.8 per cent. This rate is consistent with other available information on forecast productivity growth rates for the Victorian industry and those achieved in the mature North American industry. It is also similar in magnitude to those used by other Australian regulators for energy distribution industries far less advanced in reform than Victoria and is similar to that used by the ESC (2005b) in the EDPR. It should be noted that it is somewhat higher than the future opex partial productivity growth rate calculated from Meyrick and Associates (2007) of 0.4 per cent for the period 2008 to 2012 based on current forecasts of GDB input and output levels and, thus, is likely to contain a ‘stretch’ element.

For output growth we use the gas distribution total output index presented in Meyrick and Associates (2007) using the GDBs’ current forecasts for the period 2008 to 2012. The forecast average annual total output change for the Victorian distribution industry as a whole is 1.77 per cent. Of the individual GDBs, Multinet has the lowest forecast average annual

output growth at 0.83 per cent while Envestra and SP AusNet are both considerably higher at 2.44 per cent and 2.12 per cent, respectively.

Using these estimates of the three primary parameters that feed into the full rate of change formula and BIS Shrapnel's estimate of 2.83 per cent for change in the CPI for 2008–12, the change in real opex can be calculated as follows using the PEG (2004) formula:

$$\begin{aligned}\Delta\text{Real Opex} &= \Delta\text{Price Opex} - \Delta\text{Opex Partial Productivity} + \Delta\text{Output Quantity} - \Delta\text{CPI} \\ &= 4.52\% - 0.80\% + 1.77\% - 2.83\% \\ &= 2.66\%\end{aligned}$$

That is, taking account of forecast changes in opex real prices, forecast improvements in opex partial productivity after allowing for the impact of the convergence effect and increased compliance and safety requirements facing the GDBs, and forecast increases in output quantities, opex in constant prices should increase by 2.66 per cent per annum for the Victorian gas distribution industry as a whole. Given the different output growth rates expected for the three GDBs, the changes in real opex are 3.33 per cent, 1.72 per cent and 3.01 per cent for Envestra, Multinet and SP AusNet, respectively.

Using the same underlying data, the ESC (2005b) approach is found to significantly understate real opex requirements going forward compared to the PEG (2004) approach. Given the sound theoretical underpinnings of the PEG (2004) approach we recommend that the GAAR opex roll forward be calculated using this formula.

1 INTRODUCTION

The three Victorian gas distribution businesses (GDBs) – Envestra, Multinet and SP AusNet – have commissioned Meyrick and Associates (‘Meyrick’) to advise on the appropriate operations and maintenance expenditure (opex) ‘rate of change’ formula and parameters to apply in the Gas Access Arrangement Review (GAAR) for 2008 to 2012.

Effectively, the ‘rate of change’ aims to index either the nominal or real opex for the starting year of the regulatory period forward through the remainder of the regulatory period taking account of changes in the three key opex drivers: input prices; ongoing productivity gains; and, output growth. Conceptually, if all else remains unchanged, an increase in (nominal/real) opex input prices will lead to an increase in (nominal/real) opex requirements. Similarly, ongoing improvements in the partial productivity of opex will reduce opex requirements going forward, all else unchanged, while output growth will lead to an increase in opex requirements, all else unchanged.

In the following section of the report we review alternative formulae that have been used to calculate the opex rate of change before examining appropriate parameters for the three key components of opex prices, opex partial productivity and output growth in sections 3 to 5. We report the consumer price index forecast used in section 6 before drawing conclusions and making our recommendation for the appropriate rates of change to apply in section 7.

2 RATE OF CHANGE FORMULAE

Two ways of calculating the opex rate of change were presented during the Essential Services Commission’s (ESC) recent electricity distribution price review (EDPR). Pacific Economics Group (PEG 2004, 2005) presented the traditional opex indexing formula in work on behalf of SPI (subsequently SP AusNet) while the ESC (2005b) used a different formula in its final decision.

2.1 The Pacific Economics Group (2004) approach

PEG (2004) showed that the appropriate formula for rolling forward starting year real opex is given by:

$$(1) \Delta \text{Real Opex} = \Delta \text{Opex Price} - \Delta \text{Opex Partial Productivity} + \Delta \text{Output Quantity} - \Delta \text{CPI}$$

where the ‘ Δ ’ symbol stands for ‘the proportional change in’. This formula was argued to be the correct one to use in a CPI-X based regime. This approach is conceptually correct and is consistent with practice in several North American jurisdictions listed in PEG (2004).

PEG (2004) gives a lengthy theoretical justification for the formula (1) which we repeat below. The starting point is the following relationship between the GDB's actual opex cost, C_{OM} , and its efficient opex cost C_{OM}^* :

$$(2) \quad C_{OM} = C_{OM}^* \cdot \eta$$

where η is an inefficiency factor. Using standard microeconomic theory, the GDB's efficient opex cost can be shown to be a function of vectors of opex prices (W), output quantities (Y), capital quantities (X_k), operating environment variables (Z) and time (T) as follows:

$$(3) \quad C_{OM}^* = g(W, Y, X_k, Z, T).$$

Totally differentiating equation (3) with respect to time produces the following:

$$(4) \quad \dot{C}_{OM}^* = \left(\sum_i \varepsilon_{Y_i} \cdot \dot{Y}_i + \sum_j \varepsilon_{W_j} \cdot \dot{W}_j + \sum_m \varepsilon_{X_{K,m}} \cdot \dot{X}_{K,m} + \sum_n \varepsilon_{Z_n} \cdot \dot{Z}_n \right) + \dot{g}.$$

The ε coefficients are elasticities with respect to opex cost and the dot over a variable represents the variable's growth rate. Combining equations (2) and (4) we get:

$$(5) \quad \dot{C}_{OM} = \left(\sum_i \varepsilon_{Y_i} \cdot \dot{Y}_i + \sum_j \varepsilon_{W_j} \cdot \dot{W}_j + \sum_m \varepsilon_{X_{K,m}} \cdot \dot{X}_{K,m} + \sum_n \varepsilon_{Z_n} \cdot \dot{Z}_n \right) + \dot{g} + \dot{\eta}.$$

That is, the growth rate in actual opex cost is the sum of three terms: the sum of the products of outputs, opex prices, capital quantities and operating environment variables by their respective opex elasticities; the shift in the cost function over time; and, the growth rate in the inefficiency factor.

Applying Shephard's Lemma (which states that the derivative of efficient cost with respect to price is equal to the efficient quantity), the elasticity of efficient cost with respect to the price of each input j can then be shown to equal the optimal share of that input in minimum cost (SC_j^*). Equation (5) can be rewritten as:

$$(6) \quad \begin{aligned} \dot{C}_{OM} &= \sum_i \varepsilon_{Y_i} \cdot \dot{Y}_i + \sum_j SC_j^* \cdot \dot{W}_j + \sum_m \varepsilon_{X_{K,m}} \cdot \dot{X}_{K,m} + \sum_n \varepsilon_{Z_n} \cdot \dot{Z}_n + \dot{g} + \dot{\eta}. \\ &= \sum_i \varepsilon_{Y_i} \cdot \dot{Y}_i + \dot{W}_{OM}^* + \sum_m \varepsilon_{X_{K,m}} \cdot \dot{X}_{K,m} + \sum_n \varepsilon_{Z_n} \cdot \dot{Z}_n + \dot{g} + \dot{\eta}. \end{aligned}$$

The second term on the right hand side of (6) is the growth rate of the opex price index, denoted here by \dot{W}_{OM}^* , where the weights in the price index are the efficient cost shares.

The next step is to multiply the numerator and denominator of the first term on the right-hand side of (6) by the sum of the output cost elasticities:

$$(7) \quad \begin{aligned} \dot{C}_{OM} &= \sum_i \varepsilon_{Y_i} \cdot \sum_i \left(\varepsilon_{Y_i} / \sum_i \varepsilon_{Y_i} \right) \cdot \dot{Y}_i + \dot{W}_{OM}^* + \sum_m \varepsilon_{X_{K,m}} \cdot \dot{X}_{K,m} + \sum_n \varepsilon_{Z_n} \cdot \dot{Z}_n + \dot{g} + \dot{\eta}. \\ &= \sum_i \varepsilon_{Y_i} \cdot \dot{Y}^e + \dot{W}_{OM}^* + \sum_m \varepsilon_{X_{K,m}} \cdot \dot{X}_{K,m} + \sum_n \varepsilon_{Z_n} \cdot \dot{Z}_n + \dot{g} + \dot{\eta} \end{aligned}$$

$$\begin{aligned}\dot{C}_{OM} &= \sum_i \varepsilon_{i Y_i} \cdot \dot{Y}^\varepsilon + \dot{W}^* + \sum_m \varepsilon_{X_{K,m}} \cdot \dot{X}_{K,m} + \sum_n \varepsilon_{Z_n} \cdot \dot{Z}_n + \dot{g} + \dot{\eta} + \dot{Y}^\varepsilon - \dot{Y}^\varepsilon \\ &= \dot{W}_{OM}^* + \dot{Y}^\varepsilon - (1 - \sum_i \varepsilon_{i Y_i}) \cdot \dot{Y}^\varepsilon + \sum_m \varepsilon_{X_{K,m}} \cdot \dot{X}_{K,m} + \sum_n \varepsilon_{Z_n} \cdot \dot{Z}_n + \dot{g} + \dot{\eta}.\end{aligned}$$

where Y^ε is an output quantity index where the weights for each output are the relevant cost elasticity divided by the sum of the output cost elasticities.

We next make use of the definition of opex partial productivity which is the ratio of an output index to an index of opex. The growth rate of this partial productivity index is given by:

$$(8) \quad P\dot{F}P_{OM} = \dot{Y}^\varepsilon - \dot{X}_{OM}.$$

The growth rate of opex quantity is given by:

$$(9) \quad \dot{X}_{OM} = \dot{C}_{OM} - \dot{W}_{OM}.$$

The input weights here are actual opex cost shares. Combining equations (8) and (9) we have:

$$(10) \quad P\dot{F}P_{OM} = \dot{Y}^\varepsilon - (\dot{C}_{OM} - \dot{W}_{OM})$$

If we assume that optimal and actual cost shares are equal, from equations (5) and (10) we have:

$$(11) \quad P\dot{F}P_{OM} = (1 - \sum_i \varepsilon_{i Y_i}) \cdot \dot{Y}^\varepsilon - \sum_m \varepsilon_{X_{K,m}} \cdot \dot{X}_{K,m} - \sum_n \varepsilon_{Z_n} \cdot \dot{Z}_n - \dot{g} - \dot{\eta}$$

And, hence:

$$(12) \quad \dot{C}_{OM} = \dot{W}_{OM} - P\dot{F}P_{OM} + \dot{Y}^\varepsilon.$$

This is the result presented in (1) above where the proportional change in opex is equal to the proportional change in an index of opex prices less the proportional change in the partial productivity of opex plus the proportional change in an index of output quantities. The partial productivity of opex can be seen from (11) to incorporate a range of factors including scale economies, capital interaction effects, the impact of changes in operating environment factors, technological change and changes in efficiency levels. No additional allowance, thus, needs to be made for any of these factors as they should be captured by the change in opex partial productivity.

The PEG (2004) approach to calculating the roll-forward of opex can, thus, be seen to be well grounded in economic theory.

2.2 The ESC (2005) approach

In its draft and final reports for the EDPR the ESC (2005a,b) used a different formula for the rate of change. The ESC formula used in the EDPR final report is:

$$(13) \quad \Delta \text{Real Opex} = \Delta \text{Inverse Opex Partial Productivity} - \Delta \text{Incremental Opex Price}$$

This formula gives the confusing result that a positive value implies a decrease in opex requirements and a negative value implies an increase in opex requirements. The ESC (2005b) then adds on the Δ Output Quantity term in a separate section of the report. The ESC (2005a) argued incorrectly that future output changes were already included in the inverse partial productivity of opex and so could be ignored. The ESC acknowledged this error in an open letter dated 27 July 2005 and proposed instead to include the output growth term using cost-based shares to form a total output index from throughput, customer numbers and peak demand.

The rationale behind (13) is not well explained in ESC (2005b) and, unlike the PEG (2004) approach, appears to be lacking in rigorous justification. The ESC (2005b, p.211) attempts to justify its use of an ‘incremental’ change in the price of opex as follows:

‘The change in partial factor productivity reflects the increase in labour rates over the 2000–04 period. To calculate the rate of change for the 2006–10 regulatory period, it is necessary to also include the incremental change in the labour rate increase that is expected relative to the 2000–04 period.’

No explanation is given for this and it appears hard to justify this approach as it implies that only an acceleration in the opex price change should be included in the rate of change formula. However, the ESC (2005b, p.211) goes on to state that the base for calculating this ‘increment’ is the ‘actual labour rate increases reported in the Victorian budget papers’. The only labour rate figures that could be found from an examination of the Victorian budget papers relate to the overall labour cost index and these are of similar magnitude to the 3.43 per cent quoted by the ESC. Thus, the ‘increment’ actually used appears to be the forecast electricity distribution wage rate growth relative to the historical growth in the average cost of labour in all industries. This figure is then multiplied by the estimated share of labour costs in opex. No allowance is made for changes in the price of non-labour opex. This differs from the PEG (2004) approach outlined above where the nominal change in the opex price (both labour and non-labour) is included and then the change in the CPI is deducted.

A further problem with the approach used in ESC (2005b) relates to the method used to form the inverse opex partial productivity measure. The measure used is not a sound index measure as it is formed from separate weighted average changes in output quantities divided by change in opex quantity measures for each of the DBs and then these are weighted together using shares in average real opex. An accurate index formula would have the output component weighted by revenue shares, not opex shares, and allow for year-to-year changes in weights. Sufficient information was available to form either a Fisher or Törnqvist index which has superior accuracy and theoretical justification.

Given the lack of rigorous justification advanced for the approach to calculating the rate of change used in ESC (2005b) and the comprehensive justification given for the approach used in PEG (2004) we proceed on the basis of the PEG (2004) approach and recommend that the ESC adopt this methodology in calculating the rate of change component in the GAAR. That is, the PEG approach provides the best estimates arrived at on a reasonable basis as required by the Gas Code.

For comparison purposes only we also present results in section 6 based on the ESC (2005b) approach but these are multiplied by minus one to put them on the more intuitive basis of a positive value implies an increase in opex requirements as in PEG (2004). We also include the change in output quantity term so that like can be compared with like.

We turn now to examine the three components of the complete opex rate of change formula.

3 OPEX PRICE CHANGES

Meyrick and Associates (2007) has reviewed available price indexes that aim to reflect GDB opex prices. PEG (2006a) developed a detailed opex price deflator for electricity DBs. It is made up of a 62 per cent weighting on the Electricity, gas and water sector Labour cost index with the balance of the weight being spread across five Producer price indexes covering business, computing, secretarial, legal and accounting, and advertising services. Minor adjustments were made to tailor the national index to Victorian conditions. We requested information from the GDBs on their estimated direct and indirect labour shares in opex and these are consistent with the figure used by PEG (2006a). Since the functions of electricity and gas distribution are broadly analogous, the PEG (2006a) deflator is considered the best currently available for GDB opex as well.

ESC (2005b) acknowledged that electricity DBs have come under increasing labour price pressures in recent years. Using a range of information sources, including confidential Enterprise Bargaining Agreement outcomes supplied by the DBs, the ESC concluded that labour prices in the electricity distribution sector were likely to increase by 5 per cent per annum during the 2006–10 period.

The Victorian GDBs have also reported similar labour price pressure in recent years and this is expected to continue through the period of the next GAA. Given the similarities in the functions of electricity and gas DBs and the similar types of technical labour required by each, we would expect similar labour and opex price experience between the two industries.

Before quantifying the extent of likely labour price increases, we have to decide which is the appropriate measure of labour prices to use. The two most commonly used measures are average weekly ordinary time earnings (AWOTE) and the labour price index (LPI),

previously known as the labour cost index. AWOTE shows average employee earnings from working the standard number of hours per week and includes agreed base rates of pay, over-award payments, penalty rates and other allowances, commissions and retainers, bonuses and incentive payments (including profit share schemes), leave pay and salary payments made to directors. It excludes overtime payments, termination payments and other payments not related to the reference period.

The LPI, on the other hand, is a measure of changes in wage and salary costs based on a weighted average of a surveyed basket of jobs. It excludes bonuses and also excludes the impact of changes in the quality or quantity of work performed and compositional effects such as shifts between sectors and within firms.

AWOTE is, thus, more likely to accurately capture compositional changes in the workforce. This means it will capture the effect of upskilling as employers rely less on unskilled labour and as capital is progressively substituted for labour. Moreover, AWOTE will better reflect labour price pressures in a tight labour market as it picks up the effect of employers prematurely promoting individuals they want to retain and ‘reclassifying’ jobs as a means of paying staff more to prevent them from being poached by other organisations. The LPI will fail to capture these important characteristics of a tight labour market situation in a particular industry as it uses a fixed basket of job classifications that is not updated to reflect changing circumstances. The LPI may, however, be a better indicator of underlying wage inflation in the economy as a whole even though it is not a good indicator of wage pressures in industries facing labour shortages (BIS Shrapnel 2007).

There have been two recent studies forecasting the size of labour price increases in the Electricity, gas and water (EGW) sector over the next several years. BIS Shrapnel (2007) have undertaken a study for the three Victorian GDBs while Access Economics (2006) undertook a study on behalf of the Australian Energy Regulator.

BIS Shrapnel (2007) forecast that wages growth in the EGW sector will continue to outpace national wages growth over the next 6 years with the EGW AWOTE increasing by 5.7 per cent per annum. The Australian economy is forecast to remain strong with consumer demand, investment, public expenditure and employment all growing solidly and GDP growth is expected to accelerate as resource export capacity comes on stream. Capacity constraints and labour shortages are expected to maintain inflationary pressures. Growth is expected to moderate slightly during 2008–09 but to resume strongly in 2009–10 and following years leading to another round of tightening labour markets and an upsurge in wage inflation.

Skill shortages have been evident in the EGW sector in recent years as demonstrated by the increase in vacancies in the sector. Latest government labour data shows that all states are experiencing shortages in the engineering trades, four states are experiencing shortages of gas

fitters and shortages in the electrical trades are widespread. The EGW sector is competing with the fast-growing mining and construction sectors and with manufacturing for skilled engineering labour.

Other key factors driving up EGW sector wages have been the increase in infrastructure maintenance programs and ongoing industry restructuring. Following key privatisations in the 1990s, many utilities downsized their workforces, reduced capital expenditure and contracted out key functions. As labour shortages have begun to bite, some utilities have moved to restore their in-house capabilities. Combined with the entry of new players, particularly in the energy retail sector, and increased competition through product differentiation, the demand for both technical and customer service staff has increased significantly. The demand for staff with similar skills to those required by the GDBs has been further increased by the trend to building gas-fired power stations and the need for many electricity utilities to refurbish their networks, many of the key assets of which are nearing the end of their expected lives. The increasing demand for high levels of reliability in the essential EGW industries is also further increasing labour demand.

BIS Shrapnel (2007) expects all these factors to contribute to ongoing wages pressures in the EGW sector that exceed those in the economy as a whole.

The earlier Access Economics (2006) study recognised many of the same influences as those highlighted in the BIS Shrapnel report but predicted that labour shortages in the EGW sector would be quickly overcome and EGW wages growth would only remain above the national average for around 3 years and then actually be less than the national average for several years. The EGW wages growth rate predicted by Access Economics for the 2008 to 2012 period is just under 4 per cent per annum.

Given the underlying drivers outlined above, the Access Economics (2006) forecast appears to significantly underestimate likely wage pressures and labour market conditions in the EGW sector are likely to remain tight for considerably longer than the three year period predicted by Access. As noted by BIS Shrapnel (2007, p.33), the Access analysis appears to underestimate the major phase of network infrastructure upgrades, refurbishment and maintenance now underway and the associated trend to increase in-house capabilities. The importance of maintaining high reliability levels in these essential infrastructure industries also limits the ability of utilities to further delay capital works programs until labour shortages have passed. All these factors point to continuing high wages growth in the sector in excess of the national average.

BIS Shrapnel (2007, p.36) also note that Access Economics (2006) appears to overestimate the scope for ongoing high levels of national productivity growth as a mitigating influence on wages growth. Access assume ongoing productivity growth of 2.1 per cent per annum – the

same as in the 1990s – while BIS Shrapnel assume it will revert to its longer run rate of 1.6 per cent per annum. BIS Shrapnel base their lower forecasts on the following premises:

- most of the major microeconomic reforms, particularly in the labour market, have now been implemented;
- the information and communications technology revolution of the 1990s is unlikely to be repeated, at least at the same rate, over the next decade;
- there is little spare capacity in the labour market with Australian workers already working long hours and unemployment being at relatively low levels; and,
- there are relatively long training lags in increasing the supply of skills currently in short supply.

The arguments BIS Shrapnel advance all appear to be sound and we believe the BIS Shrapnel forecasts represent the best estimates of future labour price increases in the EGW sector. We, therefore, assume that GDB wage rates will increase by 5.7 per cent per annum over the course of the next GAA.

While labour costs make up 62 per cent of the PEG (2006a) opex price index, we also need to allow for changes in the range of producer price indexes that make up the other 38 per cent of the index. Over the period 2000 to 2005 these producer price indexes increased at a weighted average rate of 2.6 per cent per annum, around the same rate as the CPI. We assume that this growth rate will continue over the period of the next GAA. It should be noted that this is likely to be a conservative assumption as the accelerating labour price pressures in both the economy and the EGW sector identified above could also place upward pressure on the growth rates of these producer price indexes.

Combining our forecasts for EGW sector labour and non-labour opex costs, the overall GDB opex price is expected to increase by 4.52 per cent per annum over the next GAA period.

4 OPEX PARTIAL PRODUCTIVITY CHANGES

In implementing the rate of change in the EDPR, ESC (2005b) argued that the appropriate partial productivity measure to use was that for the Victorian electricity distribution industry over the preceding 5 year period, 2000 to 2004. Using the industry rather than DB-specific productivity growth rate is consistent with the basic tenets of incentive regulation in that individual DBs have less scope to influence the industry average figure and so it can be considered largely exogenous to the DB. However, it cannot be assumed that past productivity performance will be a good guide to achievable future productivity performance following a time of rapid reform or when future growth prospects are likely to be constrained.

A useful illustration of this point can be found in the PEG (2006a) electricity DB productivity study undertaken for the ESC. In the 6 year period from 1995 to 2000 the electricity distribution industry's opex partial productivity increased at an extremely high annual rate of 10.87 per cent. Such high partial productivity growth rates are achievable for a short period following major reforms when the DBs are starting from relatively low productivity levels. The new ownership is able to implement easy 'catch-up' gains to remove the grossest inefficiencies quickly. However, over time the DBs move closer to best practice and their productivity growth will become constrained by the rate of technological change in the industry. Given the mature nature of the technologies used in energy distribution, the rate of technological change for these industries will be relatively low.

A further complication is that initial periods of intense cost cutting can often 'overshoot' the longer term sustainable level of input use. This is because the new owners are not fully familiar with the business and may be responding to short term incentives to maximise profits rather than to provide a reliable, high quality service in the longer term. This may also result from privatisation occurring at a time of surplus capacity in the industry and, as that capacity is fully utilised or as assets near the end of their useful lives, input use will have to increase to allow higher levels of maintenance and asset refurbishment.

These effects are clearly visible in PEG (2006a). If we move on from the period of very high opex partial productivity growth up to 2000, the average opex partial productivity growth rate for the 5 year period 2000 to 2004 was -0.02 per cent, ie a marginal *decline* in productivity. It should be noted this rate differs from the growth rate of 0.83 per cent used by ESC (2005b) – this is most likely due to the simplified method used in ESC (2005b) to form the opex partial productivity and the use of updated data in PEG (2006a). If we extend the period to cover the 6 years 2000 to 2005, the average growth rate of opex partial productivity in PEG (2006a) becomes -0.58 per cent. And if we look at the most recent 5 year period in PEG (2006a), 2001 to 2005, the average annual opex partial productivity growth rate becomes -1.49 per cent. Thus, extrapolating the historic rate of opex partial productivity growth forward as a predictor of achievable future productivity can be seen to be hazardous. In fact, if the historic average opex partial productivity growth rate had been used in the rate of change formula at a point in time early in the reform cycle, it would have led to unrealistically high and unachievable productivity targets being set.

The need for caution in drawing implications about future achievable productivity growth rates from the high historic growth rates found in the Victorian electricity distribution industry was recognised in an earlier report by PEG (2005) which made the following observation:

'In Victoria, meanwhile, the 1995–2003 sample period for which data are

currently available happens to begin with the privatization of the industry. The stronger performance incentives generated by operating as a private business subject to price control regulation are likely to have triggered a burst in the O&M productivity of some DBs. With each passing year of rapid PFP growth it is likely that the DBs as a group came closer to the efficiency frontier and found it more difficult to achieve incremental productivity gains.’ (PEG 2005, p.10)

Rather than relying on historical productivity growth rates, account has to be taken of forward-looking information in setting productivity forecasts and targets.

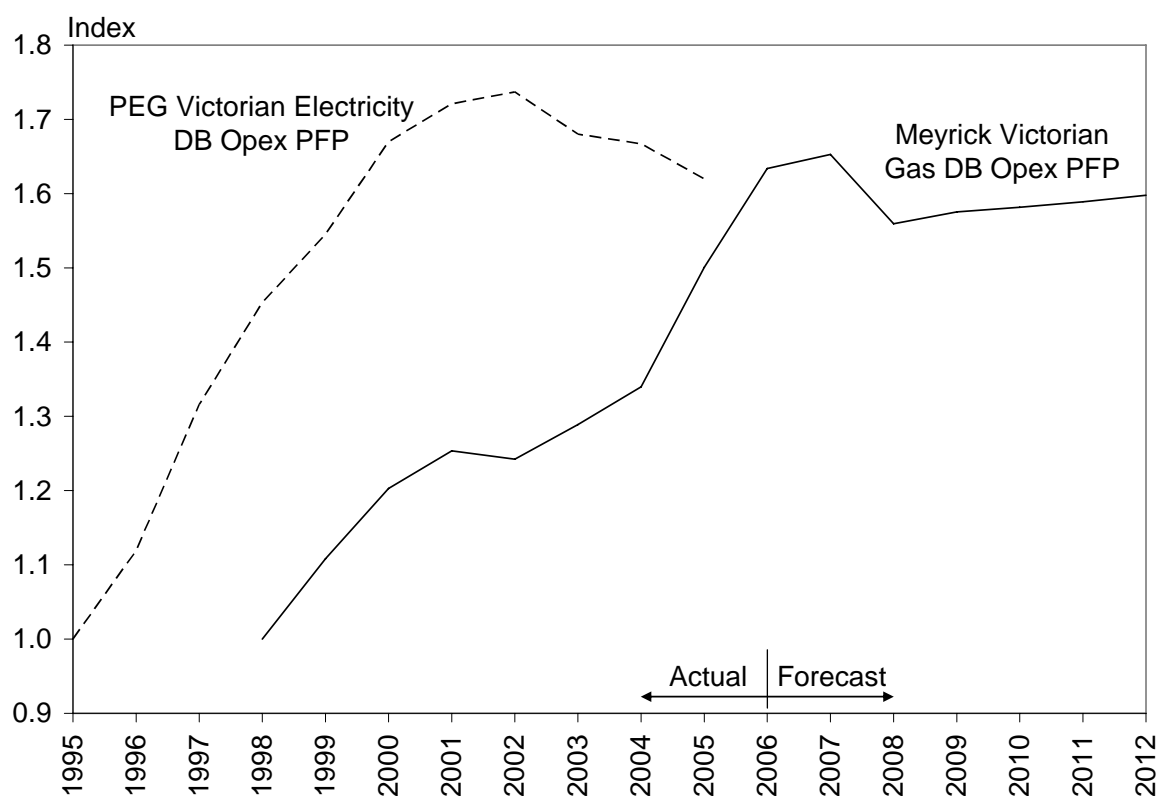
It is for this reason that Meyrick and Associates (2007) presented both historical and forecast estimates of the GDBs’ productivity. The first major finding of this study was that the Victorian gas distribution industry has exhibited strong TFP growth over the 9 years since privatisation. TFP has grown at an average annual rate of 2.7 per cent. Most of the high TFP growth rate has been achieved by reductions in GDB opex which has fallen on average by 4 per cent annually in constant price terms. All three GDBs have achieved average annual opex partial productivity growth rates in excess of 6 per cent for the past 9 years. Capital partial productivity growth, on the other hand, has been relatively flat as the GDBs have continued expanding their pipeline networks and replacing ageing low pressure mains with high pressure mains.

The second key finding of the study, however, was that GDB productivity growth is expected to slow considerably over the next 6 years based on current forecasts of GDB outputs and inputs. Such high rates of opex partial productivity growth as those achieved up to 2006 cannot be achieved indefinitely and the ability to further reduce overall opex will be constrained given a range of more costly safety and compliance requirements expected to come into effect over the next few years. The combination of the convergence effect (whereby productivity growth becomes constrained by the rate of technological change in the industry once all identifiable inefficiencies are removed) and the anticipated changes to the safety and compliance requirements GDBs will face are expected to reduce annual TFP growth to around 0.1 per cent going forward. The scope to further reduce opex is expected to be limited and opex partial productivity growth is forecast to reverse and decline by around 0.3 per cent per annum on average over the period 2006 to 2012. For the period 2008 to 2012, after the new compliance requirements have taken effect, the opex partial productivity growth rate is forecast to recover to an average increase of around 0.4 per cent per annum.

It is instructive to compare the Victorian GDB opex partial productivity index from Meyrick and Associates (2007) with that for the Victorian electricity distribution industry in PEG (2006a). The indexes for the two industries are both plotted in figure 1. Opex partial

productivity for both industries increased by around 70 per cent in the several years following privatisation – in the case of electricity distribution between 1995 and 2002 and in the case of gas distribution between 1998 and the present. However, electricity distribution opex partial productivity has progressively declined by a total of 7 per cent between its peak in 2002 and 2005, the latest year results are currently available for. Gas distribution opex partial productivity is forecast to peak in 2007 before declining in 2008 due mainly to the enforcement of new safety and traffic compliance requirements. From 2008 onwards, gas opex partial productivity is forecast to resume its increase but at a much lower rate than that achieved in the 9 years since privatisation. This pattern is broadly consistent with the electricity distribution opex partial productivity performance observed since 2002. In fact, the continuing declines in electricity distribution opex partial productivity since 2002 reported in PEG (2006a) indicate that the forecasts of reduced gas distribution opex partial productivity growth in Meyrick and Associates (2007) may be overly optimistic.

Figure 1: **Gas and electricity distribution opex partial productivity indexes for Victoria, 1995–2012**



Source: Meyrick and Associates (2007) and PEG (2006a)

BIS Shrapnel (2007) also estimates that future labour productivity in the EGW sector will only increase by around 0.8 per cent per annum over the next 6 years. This figure has been

calculated independently using national accounts data on gross value added and employment. BIS Shrapnel (2007, p.28) made the following observations:

‘The strong growth in productivity achieved in the second half of the 1980s and during the 1990s flowed from the corporatisation and privatisation of the (mainly) public sector utilities which forced them to become more efficient. The move to enterprise bargaining during the 1990s also contributed to the increased efficiency, with many of the productivity gains coming from the elimination of inefficient manning practices and other significant one-off gains. This saw employment in the sector more than halve by the late 1990s and output per employee more than triple....

‘However, the relatively ‘easy’ efficiency enhancing measures have now been implemented — with ‘all the low hanging fruit having now been picked’, further productivity gains are now likely to be much harder to achieve over the medium term. Indeed, the significant labour shedding — which drove the productivity gains in the 1987 to 2000 period — was probably overdone, as suggested by the solid growth in employment despite low output growth since 2000/01... a number of the utilities have had to increase employment levels to address both run-down infrastructure and the need for new connections to service the large growth in new housing over the first half of the decade. With a number of utilities across several states expected to maintain — or even increase — major capital works, upgrading of infrastructure and maintenance programs over the next few years, employment levels are expected to at least hold at around current levels, before easing later this decade. However, only modest growth in output is expected over the medium to long term — meaning that only relatively weak growth in productivity will result, given some minor growth in employment.’

Despite using completely different data sources, this finding generally supports the future productivity growth rates calculated in Meyrick and Associates (2007) using current forecasts of GDB inputs and outputs.

Support for expected opex partial productivity improvements of the order of around 1 per cent per annum can also be found in the energy distribution decisions of other Australian regulators – and this is despite the DBs in those states being less advanced in the reform process than the Victorian GDBs. For instance, recent electricity distribution decisions in Queensland, Tasmania and the ACT have all incorporated opex partial productivity targets of 1 per cent per annum (QCA 2005). Other jurisdictions such as New South Wales have not included explicit productivity targets in their recent decisions but have allowed DBs to keep

the benefit of efficiency improvements until the end of the regulatory period at which they would be shared with consumers. It should be noted that including a productivity target equal to the full extent of expected productivity improvement is equivalent to passing the full benefit of productivity improvements straight through to consumers. The ACT utility regulator, the ICRC (2004, p.84), stated that it was of the view that the 1 per cent opex partial productivity factor represented ‘appropriate sharing of the benefits between consumers and ActewAGL over the regulatory control period’.

North American gas distribution decisions have generally included relatively low acknowledged productivity trends reflecting the more mature nature of the North American industry. For instance, decisions for Boston Gas covering the periods 1997 to 2003 and 2004 to 2013 included productivity trends of 0.4 and 0.6 per cent per annum, respectively (PEG 2006b). Another Massachusetts GDB decision, that for Berkshire Gas, included a productivity trend of 0.4 per cent per annum covering the period 2002 to 2011. Californian decisions for San Diego Gas and Electric and Southern California Gas have included productivity trends of 0.7 and 0.5 per cent, respectively, while Canadian decisions for Consumers Gas and Union Gas in Ontario have included productivity trends of 0.6 and 0.9 per cent, respectively.

The productivity growth rates reported in North American regulatory decisions are consistent with those found for US GDBs over the decade 1993 to 2003 in PEG (2004). Based on a sample of 75 US GDBs, PEG found an average annual TFP growth of 0.7 per cent and an average annual opex partial productivity growth rate of 0.8 per cent.

These lower productivity trend growth rates are closer to what we would expect the underlying rate of technological change to be in this industry and reflect the fact that North American GDBs are likely to have converged closer to that rate than the less mature Australian and New Zealand GDBs. Of the Australian and New Zealand GDBs we would expect the Victorian GDBs to be closest to the point of convergence given that the reform process is far more advanced in Victoria than elsewhere.

Table 1: Opex partial productivity growth rates in gas and electricity distribution

Sector	Jurisdiction	Source	Period	Rate
Gas	Victoria	Meyrick (2007)	2006–12	–0.3 – 0.4
Gas	Victoria	BIS Shrapnel (2007)	2008–13	0.8 (Labour)
Gas	USA and Canada	PEG (2006b)	1997–2013	0.4 – 0.9
Electricity	Victoria	PEG (2006a)	2002–05	–1.5
Electricity	Victoria	ESC (2005b)	2000–04	0.8
Electricity	Qld, ACT, Tas, NSW	Regulators	Current price controls	0 – 1
Electricity	USA	PEG (2004)	1993–2003	0.8

On the basis of the available evidence, we conclude that the high rates of opex partial productivity growth observed in the Victorian gas distribution industry in the period since privatisation are unlikely to be sustainable going forward, just as they were not sustainable for a long period in the Victorian electricity distribution industry. A number of independent exercises have forecast a marked slow down in future gas distribution opex partial productivity growth rates to rates close to those observed in the mature North American industry.

On the basis of the evidence reviewed in this section and summarised in table 1, we recommend that the rate of change formula use an annual opex partial productivity growth rate of 0.8 per cent. This rate is consistent with other available information on forecast productivity growth rates for the Victorian industry and those achieved in the mature North American industry. It is also similar in magnitude to those used by other Australian regulators for energy distribution industries far less advanced in reform than Victoria and is similar to that used by the ESC (2005b) in the EDPR. It should be noted that it is somewhat higher than the future opex partial productivity growth rate calculated from Meyrick and Associates (2007) of 0.4 per cent for the period 2008 to 2012 based on current forecasts of GDB input and output levels and, thus, is likely to contain a ‘stretch’ element.

5 OUTPUT QUANTITY CHANGES

ESC (2005b) used a simplified indexing procedure to weight together forecast growth in three output components – customer numbers, energy consumption and peak demand – to form a measure of the output quantity driver on electricity distribution opex costs. Peak demand was included as a proxy for system capacity. Weights for the three electricity DB outputs were obtained from a cost function study in PEG (2004).

We use the gas distribution total output index presented in Meyrick and Associates (2007). This is a chained Fisher index of three output components – throughput, customer numbers and system capacity – using the GDBs’ current forecasts for the period 2008 to 2012. The system capacity measure used is the volume of gas held within the gas network converted to standard cubic meters using a pressure correction factor based on the average operating pressure. The volume of the distribution network is calculated based on pipeline length data for high, medium and low distribution pipelines and estimates of the average diameter of each of these pipeline types.

The weights used to form the overall index are derived from the cost function reported in Meyrick and Associates (2007). The weights are based on output cost shares for throughput of 13 per cent, for customer numbers of 49 per cent and for system capacity of 38 per cent.

The forecast average annual total output change for the Victorian distribution industry as a whole for the period 2008 to 2012 is 1.77 per cent. Of the individual GDBs, Multinet has the lowest forecast average annual output growth at 0.83 per cent while Envestra and SP AusNet are both considerably higher at 2.44 per cent and 2.12 per cent, respectively.

6 CONSUMER PRICE INDEX

BIS Shrapnel (2007) reports forecasts of headline CPI inflation for the next 7 years and uses these to convert its nominal wage increase forecasts reported in section 3 into real terms. The CPI is forecast to increase at an average annual rate of 2.83 per cent between 2008 and 2012. This is somewhat higher than the figure of 2.5 per cent used by the ESC in the EDPR but reflects the effects of gathering wage pressures in the economy.

To be consistent with the nominal wage rate increase forecasts used in forming our forecast of opex price increases, we adopt the BIS Shrapnel (2007) forecast annual CPI increase of 2.83 per cent in forming our rate of change recommendation.

7 RECOMMENDATION AND CONCLUSIONS

Having reviewed the PEG (2004) and ESC (2005b) approaches to constructing the opex roll forward formula, we conclude that the PEG (2004) formula is firmly based in microeconomic theory and is consistent with regulatory practice in other jurisdictions as demonstrated by PEG. The formula used in ESC (2005b) is poorly explained and not rigorously justified using microeconomic theory. We conclude, therefore that the appropriate roll-forward formula to use in the GAAR is the PEG (2004) formula.

Having discussed the three primary parameters that feed into the full rate of change formula in the preceding sections we can now quantify the appropriate change in real opex over the years 2008 to 2012. The change can be calculated as follows using the PEG (2004) formula:

$$\begin{aligned}
 \Delta \text{Real Opex} &= \Delta \text{Price Opex} - \Delta \text{Opex Partial Productivity} + \Delta \text{Output Quantity} - \Delta \text{CPI} \\
 &= 4.52\% - 0.80\% + 1.77\% - 2.83\% \\
 &= 2.66\%
 \end{aligned}$$

That is, taking account of forecast changes in opex real prices, forecast improvements in opex partial productivity after allowing for the impact of the convergence effect and increased compliance and safety requirements facing the GDBs, and forecast increases in output quantities, real opex should increase by 2.66 per cent per annum for the Victorian gas distribution industry as a whole. Given the different output growth rates expected for the three GDBs, the changes in real opex are 3.33 per cent, 1.72 per cent and 3.01 per cent for Envestra, Multinet and SP AusNet, respectively.

If forecast opex partial productivity improvements are realised then the benefits of efficiency improvements will be passed on to consumers immediately for the industry as a whole. If the GDBs can exceed this rate of opex partial productivity growth there is scope to share the benefits of efficiency improvements between consumers and shareholders. However, as discussed in section 4, the previous high rates of opex partial productivity growth in the Victorian industry are unlikely to continue given the experience of other distribution industries following major reforms, particularly given the experience of the Victorian electricity distribution industry where opex partial productivity has actually *declined* significantly (ie growth rates have become negative) over the last 5 years after initial strong growth following privatisation.

While we do not support the use of the ESC (2005b) rate of change formula, it is useful to compare the result above with that which would be obtained using the same method as that used in the EDPR. For comparability, we multiply the ESC measure by –1 and include the growth component so that it can be interpreted as an overall result and where a positive value means an increase in opex requirements. The ESC formula produces the following:

$$\begin{aligned} \Delta\text{Real Opex} &= -1 * (\Delta\text{Inverse Opex Partial Prod'y} - \Delta\text{Incremental Price Opex}) + \Delta\text{Output Qty} \\ &= -1 * (1.08\% - 1.24\%) + 1.77\% \\ &= 1.93\% \end{aligned}$$

The inverse opex partial productivity is calculated using the same weighted average formula as that used by the ESC although, as noted in section 2, this is relatively inaccurate compared to using either the Fisher or Törnqvist indexes. The ‘incremental’ price of opex is calculated as the difference between the forecast change in EGW AWOTE for 2008–12 (the best measure of wage inflation in a tight labour market as noted in section 3) of 5.7 per cent and the Victorian LPI (the best measure of underlying wage inflation and what appears to have been used by ESC 2005b) for 2002–06 of 3.7 per cent (BIS Shrapnel 2007, p.20). This produces an average annual change in real opex requirements of 1.93 per cent for Victoria and of 2.60 per cent, 0.99 per cent and 2.28 per cent for Envestra, Multinet and SP AusNet, respectively.

Using the same underlying data, the ESC (2005b) approach can be seen to significantly understate real opex requirements going forward compared to the PEG (2004) approach. Given the sound theoretical underpinnings of the PEG (2004) approach we recommend that the GAAR opex roll forward be calculated using this formula. This produces an average annual real opex roll forward growth rate of 2.66 per cent for the overall Victorian gas distribution industry once real opex price increases, opex partial productivity improvements and output growth are accurately allowed for.

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