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# Electricity Distribution X Factors for the NT's Third Regulatory Period

Report prepared for
**Utilities Commission**

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**Contact: Dr Denis Lawrence**
Email: denis@meyrick.com.au
Phone: +61 438 299 811

**GHD Pty Ltd**
Level 5, 66 Smith Street, Darwin, NT 0800, AUSTRALIA
Tel +61 8 8982 0100 Fax +61 8 8981 1075
ABN 39 008 488 373 Web www.ghd.com.au

**Meyrick Consulting Group Pty Ltd trading as Meyrick and Associates**
6 Kurundi Place, Hawker, ACT 2614, AUSTRALIA
Tel +61 2 6278 3628 Fax +61 2 6278 5358
ABN 60 113 345 743 Web www.meyrick.com.au

# CONTENTS

# EXECUTIVE SUMMARY

For the price control mechanism for the third regulatory period for electricity distribution in the Northern Territory, the Utilities Commission (UC 2008) indicated that it would set an initial or '$P_0$' price adjustment based on building blocks analysis for 2008–09 and an X factor comprising three components. The X factor is thus of the form $X_1 + X_2 – X_3$ where: $X_1$ is the difference between the TFP growth for the electricity distribution industry in Australia and that for the economy as a whole; $X_2$ is the difference between the best observed opex partial productivity level in comparable electricity distribution businesses (EDBs) in Australia and that of Power and Water Power Networks (PWPN); and $X_3$ is the difference between the input price growth for PWPN and that for the economy as whole.

The UC has engaged the GHD Meyrick alliance to advise it on the appropriate values of the three X factor components. The UC has concurrently engaged ACIL Tasman to advise it on the appropriate size of the overall building blocks–based $P_0$ adjustment.

GHD Meyrick recommends an X factor for the Northern Territory's third regulatory period of –0.85 per cent (ie a real price increase of 0.85 per cent or a nominal price increase of CPI+0.85 per cent) derived as follows:

(a) $X = X_1 + X_2 – X_3$ = 0 per cent + 0.25 per cent – 1.1 per cent = –0.85 per cent.

### *$X_1$ factor*

GHD Meyrick's assessment is that TFP growth rates of 0.9 and 0.7 per cent per annum are reasonable estimates of the electricity distribution industry's and the economy's TFP performance, respectively, in recent years. This is based on trend growth rates of 0.9 per cent for the electricity distribution industries in New Zealand (Meyrick 2007b) and the US (PEG 2008b) and a range of 0.4 to 1.3 per cent for sustainable TFP growth in Victoria (PEG 2008a), and average MFP growth since 2000 for the market sector as constructed by the ABS (2007a). While this would produce a productivity differential of 0.2 per cent, GHD Meyrick recommends that the $X_1$ factor be set at zero. This is a conservative decision in favour of PWPN in recognition of the data uncertainties involved.

### *X2 factor*

To form a recommendation for the $X_2$ factor, GHD Meyrick has updated the analysis in Meyrick (2003a). PWPN has the highest unit opex of the 13 included EDBs, even after allowing for PWPN's adverse operating conditions and transmission equivalent operations. We adopt the conservative policy of taking the average of the four rural EDBs that have the most similar customer densities to PWPN as the relevant benchmark. These EDBs are Ergon

Energy, Country Energy, Powercor and SP AusNet. For PWPN to reach the same unit opex as its four peers, after allowing for PWPN's adverse operating conditions and transmission equivalent operations, it would have to reduce its unit opex by around 27 per cent. It should be noted that the identified reduction in annual unit opex is larger than that identified in Meyrick (2003a) because PWPN understated its corporate overhead and IT services cost allocation s in the earlier benchmarking study.

GHD Meyrick recommends retaining the conservative $X_2$ factor of 0.25 per cent from the second regulatory period to account for 10 percentage points of the identified 27 per cent opex efficiency gap over a 10 year period. The remaining 17 percentage points of the identified efficiency gap (representing \$9.54 million based on the 2009 proposed opex of \$56.4 million) should be incorporated in the $P_0$ price change at the start of the third regulatory period.

This recommendation is based on setting the conservative benchmark of the average opex efficiency of the four EDBs with customer density closest to PWPN and assuming those EDBs have had no opex partial productivity growth since 2003.

### *X3 factor*

GHD Meyrick considers that extrapolation of the EGW sector Labour price index differential relative to the Labour price index for All industries for the period 2002–07 represents the best forecast of the opex price differential for the third regulatory period. Similarly, we consider that extrapolation of the EGW sector Capital goods price index differential relative to the Capital goods price index for All industries for the period 2002–07 represents the best forecast of the capital price differential for the third regulatory period.

Between 2002 and 2007 the Labour price index for Electricity, gas and water increased by an average annual rate of 4.59 per cent compared to an increase for All industries of 3.72 per cent (ABS 2008) producing a labour price differential of 0.89 per cent. This labour price differential is also of similar magnitude those obtained from recent forecasting exercises.

The capital goods price index for Electricity, gas and water increased annually by 5.27 per cent on average between 2002 and 2007 compared to an increase of 4.07 per cent for All industries producing a capital input price differential of 1.19 per cent (ABS 2007b). Based on available electricity industry capital price forecasts, our use of the ABS (2007b) EGW capital price index growth for 2002–07 to forecast electricity distribution capital prices for the third regulatory period is conservative in favour of PWPN.

Assuming that opex accounts for one third of electricity distribution costs while capital costs account for the remaining two thirds this produces an overall input price differential or $X_3$ factor estimate of 1.1 per cent.

# 1 INTRODUCTION

The Utilities Commission (UC) is currently conducting a price review to reset parameters for the Northern Territory's third electricity distribution regulatory period to run for five years from 1 July 2009.

In the reset for the second regulatory period commencing in July 2004, the UC (2004) adopted CPI – X price cap regulation with an initial price adjustment (termed a 'Z factor') based on a building blocks assessment of the distribution business's costs in 2003–04 and an escalation or X factor based on two productivity components. The first of these, the $X_1$ factor, was based on 'X factors typically applying to comparable best practice (i.e., efficient) network service providers in other jurisdictions' (UC 2004, p.4). The second, the $X_2$ factor, was based on the observed gap between the distribution business's operating and maintenance expenditure ('opex') and comparable best practice in other Australian jurisdictions. A key source of information for the UC's specification of the $X_2$ factor was a confidential report undertaken by Meyrick and Associates ('Meyrick') for the distribution business, Power and Water Corporation's Power Networks ('PWPN'), and the UC assessing PWPN's opex efficiency (Meyrick 2003a).

In its decision paper on the price control mechanism for the third regulatory period, UC (2008) indicated that it intended to adopt a broadly similar approach, but with a number of refinements, to resetting the price control parameters. There will again be an initial or '$P_0$' price adjustment based on building blocks analysis for 2008–09 and an X factor now comprising three components of the form $X_1 + X_2 – X_3$ where: $X_1$ is the difference between the TFP growth for the electricity distribution industry in Australia and that for the economy as a whole; $X_2$ is the difference between the best observed opex partial productivity level in comparable electricity distribution businesses (EDBs) in Australia and PWPN's opex partial productivity level; and $X_3$ is the difference between the input price growth for PWPN and that for the economy as whole.

The UC has engaged the GHD Meyrick alliance to advise it on the appropriate values of the three X factor components. The UC has concurrently engaged ACIL Tasman to advise it on the appropriate size of the overall building blocks–based $P_0$ adjustment.

This report provides GHD Meyrick's recommendations on the three X factor components and the reasoning behind those recommendations. The following section of the report reviews the rationale behind productivity–based regulation, the approach adopted in the Northern Territory and GHD Meyrick's brief. Sections 3 to 5 analyse each of the X factor components in turn, including an update of relevant sections of the Meyrick (2003a) report, while conclusions are drawn in section 6.

# 2 PRODUCTIVITY–BASED X FACTORS

## 2.1 Rationale for productivity–based regulation[1]

The principal objective of CPI–X regulation is to mimic the outcomes that would be achieved in a competitive market. Competitive markets normally have a number of desirable properties. The process of competition leads to industry output prices reflecting industry unit costs, including a normal rate of return on the value of assets after allowing for risk. Because no individual firm can influence industry unit costs, each firm has a strong incentive to maximise its productivity performance to achieve lower unit costs than the rest of the industry. This will allow it to keep the benefit of new, more efficient processes that it may develop until such times as they are generally adopted by the industry. This process leads to the industry operating as efficiently as possible at any point in time and the benefits of productivity improvements being passed on to consumers relatively quickly.

Because infrastructure industries such as the provision of electricity distribution networks are often subject to decreasing costs, competition is normally limited and incentives to minimise costs and provide the cheapest and best possible quality service to users are not strong. The use of CPI–X regulation in such industries attempts to strengthen the incentive to operate efficiently by imposing similar pressures on the network operator to the process of competition. It does this by constraining the operator's output price to track the level of estimated efficient unit costs for that industry. The change in output prices is 'capped' as follows:

(1) $$\Delta P = \Delta W - X \pm Z$$

where $\Delta$ represents the proportional change in a variable, P is the maximum allowed output price, W is a price index taken to approximate changes in the industry's input prices, X is the estimated productivity change for the industry and Z represents relevant changes in external circumstances beyond managers' control which the regulator may wish to allow for. There are several alternative ways of choosing the index W to reflect industry input prices. Perhaps the best way of doing this is to use a specially constructed index which weights together the prices of inputs by their shares in industry costs. However, this price information is often not readily or objectively available, particularly in regulatory regimes that have yet to fully mature. A commonly used alternative is to choose a generally available price index such as the consumer price index.

In choosing a productivity growth rate to base X on, the productivity growth rate should be external to the individual firm being regulated and instead reflect industry trends at a national

[1] This section draws on Meyrick and Associates (2003b).

or even international level. This way the regulated firm is given an incentive to match (or better) this productivity growth rate while having minimal opportunity to 'game' the regulator by acting strategically.

The framework that underlies the CPI–X approach can be illustrated as follows. We start with the index number definition of TFP growth:

(2) $$(1 + \Delta TFP) \equiv [Y^1/Y^0]/[X^1/X^0]$$

$$= \{[R^1/R^0]/[P^1/P^0]\}/\{[C^1/C^0]/[W^1/W^0]\}$$

$$= \{[M^1/M^0][W^1/W^0]\}/[P^1/P^0]$$

where the superscripts represent different time periods, Y is total output quantity, X is total input quantity, P is the output price index, W is the input price index, R (C) is revenue (cost), M is the markup and R = MC. As a normal return on assets (after allowing for risk) is included in the definition of costs, a firm earning normal returns will have a markup factor of one while a firm earning excess returns will have a markup of greater than one. Rearranging the above equation gives:

(3) $$P^1/P^0 = \{[M^1/M^0][W^1/W^0]\}/ (1 + \Delta TFP)$$

where $W^1/W^0$ is the firm's input price index (which includes intermediate inputs). Equation (3) is approximately equivalent to:

(4) $$\Delta P = \Delta M + \Delta W - \Delta TFP.$$

Thus, the admissible rate of output price increase $\Delta P$ is equal to the rate of increase of input prices $\Delta W$ less the rate of TFP growth $\Delta TFP$ (provided the regulator wants to keep the monopolistic markup constant so that $\Delta M = 0$, eg if an initial period $P_0$ change has been used to remove excess or deficient returns). Equation (3) or its approximation (4) is the key equation for a productivity–based regulation framework: the term $W^1/W^0$ would be an input price index of the firm's peers and the term $\Delta TFP$ would be the average TFP growth rate for the firm's peers. The markup growth term could be set equal to zero under normal circumstances and, since the initial building blocks review is intended to ensure efficient costs are covered, we exclude it from the following presentation.

The next issue to be considered in operationalising (4) is the choice of the price index to reflect changes in the industry's input prices, W. The most common choice for this index is the consumer price index (CPI). But this is actually an index of output prices for the economy rather than input prices. Normally we can expect the economy's input price growth to exceed its output price growth by the extent of economy–wide TFP growth (since labour and capital ultimately get the benefits from productivity growth). We assume that the markup factors for the economy as a whole are one so that the counterpart to equation (2) applied to the entire economy becomes:

(5) $$P_E^1/P_E^0 = [W_E^1/W_E^0]/\ \Delta TFP_E.$$

Substituting the rate of change of the CPI for the economy–wide output price index on the left hand side of (5) and rearranging terms leads to the following identity:

(6) $$1 = [CPI^1/CPI^0]\ \Delta TFP_E/[W_E^1/W_E^0].$$

Substituting the right hand side of (6) into (2) produces the following equation:

(7) $$\begin{aligned} P^1/P^0 &= \{[CPI^1/CPI^0]\Delta TFP_E\ /[W_E^1/W_E^0]\}\{W^1/W^0\}/\ \Delta TFP \\ &= [CPI^1/CPI^0][\Delta TFP_E\ /\Delta TFP]\{[W^1/W^0]/[W_E^1/W_E^0]\}. \end{aligned}$$

Approximating the terms in (7) by finite percentage changes leads to the following:

(8) $$\Delta P = \Delta CPI + [\Delta W - \Delta W_E] - [\Delta TFP - \Delta TFP_E]$$

so that the X factor is defined as:

(9) $$X \equiv [\Delta TFP - \Delta TFP_E] - [\Delta W - \Delta W_E].$$

This equation is often referred to as the 'differential of a differential' equation. What equation (9) tells us is that the X factor can effectively be decomposed into two terms. The first differential term takes the difference between the industry's TFP growth and that for the economy as a whole while the second differential term takes the difference between the firm's input prices and those for the economy as whole. Thus, if the regulated industry has the same TFP growth as the economy as a whole and the same rate of input price increase as the economy as a whole then the X factor in this case is zero. If the regulated industry has a higher TFP growth than the economy then X is positive, all else equal, and the rate of allowed price increase for the industry will be less than the CPI. Conversely, if the regulated industry has a higher rate of input price increase than the economy as a whole then X will be negative, all else equal, and the rate of allowed price increase will be higher than the CPI.

If all firms in the industry are operating at similar levels of efficiency initially then a common X factor can be applied to all firms. However, until incentive regulation has been operating consistently for a prolonged period, there is likely to be a wide spread of productivity levels for individual firms. Differential X factors are often used initially in this circumstance.

The differential X factor approach has usually been adopted where industry wide data are used to determine the productivity growth rate and input price growth rate in determining the X factor for a number of firms in the industry in the early stages of incentive regulation. This approach has been adopted in New Zealand where 28 electricity distribution businesses (EDBs) were first subject to a price 'threshold' in 2004 (see Meyrick 2003c). The differential

X factor is then used to tailor the regulatory regime to the circumstances of each particular firm (or a small number of groups of firms) by taking account of productivity levels as well as productivity growth rates. Normally, firms that have low productivity levels are potentially capable of achieving higher productivity growth rates. This is because they can make some easy gains by removing the slack from their operations to mimic the operations of the industry's best performers. Consequently, they can achieve productivity growth in excess of the rate of technological change for the industry for an interim period while they catch up to the productivity levels of the best performing firms. The differential X factor is sometimes restricted to focus on a subset of inputs, usually opex.

To implement incentive regulation in the form outlined above requires information on the TFP performance and input price changes of the firm, its peers and the economy as a whole. Operating environment differences also play an important role in determining TFP levels and have to be allowed for in the analysis.

## 2.2 The Northern Territory Approach

UC (2008) indicated that, for the third regulatory period, the X factor would be decomposed into three components as follows (where the differential term is restricted to cover opex only, as in the second regulatory period):

(10) $$X \equiv (\Delta TFP_I - \Delta TFP_E) + y.(PFP_B - PFP_f) - (\Delta W_I - \Delta W_E)$$

$$\equiv X_1 + X_2 - X_3$$

where:

$\Delta$ represents the proportional change in a variable

TFP = Total Factor Productivity

PFP = Partial Factor Productivity of Opex

W = an input price index

y = a factor determined in conjunction with the efficiency assumption used for the Po building blocks exercise, the time period over which the remaining efficiency gap will be removed and what proportion of total costs opex accounts for ($0<y<1$)

the I subscript denotes the industry's value for a variable

the E subscript denotes the economy as a whole's value for a variable

the B subscript denotes the best observed practice in the industry for a variable

the f subscript denotes the regulated firm's value for a variable.

Equation (10) shows that the X factor can effectively be decomposed into three component factors:

- an $X_1$ factor, being the difference between the industry's TFP growth and that for the economy as a whole;
- an $X_2$ factor, being the difference between the best observed opex partial productivity level and the firm's opex partial productivity level; and
- an $X_3$ factor, being the difference between the firm's input price growth and that for the economy as whole.

In principle, the $X_1$ factor used for the second regulatory period was the sum of the $X_1$ and $X_3$ factors now being proposed for the third regulatory period. In practice, as the 2004 Reset implicitly assumed that $X_3$=0, the $X_1$ factors in the second and third regulatory periods are empirically equivalent and so can be directly compared.

## 2.3 Asset base roll forward

In its initial regulatory proposal PWPN (2008) criticised the UC's proposed regulatory approach on the grounds that it did not allow for the regulatory asset base (RAB) to be rolled forward through the regulatory period. Specifically, PWPN (2008, p.20) claimed that the UC's proposed approach:

> 'Does not roll forward Power and Water's RAB between each year of the regulatory control period, meaning that Power and Water's asset base is not assumed to grow in real terms at all over the regulatory period. This is at odds with what Power and Water considers will be the case. The proposed method therefore does not meet Power and Water's requirements to maintain financial capital maintenance, because Power and Water will essentially only receive a return on, and of, capital for 2008-09 expenditure (and the RAB at the start of the regulatory control period), not on its forecast rolled forward RAB.'

These criticisms are based on a misunderstanding of the UC's proposal. While the UC is proposing to align revenue with efficient, building block based costs for the first year of the regulatory period by application of a $P_0$ tariff adjustment, tariffs are then adjusted for the remainder of the regulatory period on the basis of a weighted average price cap using productivity–based methods. Because a price cap mechanism is being used, revenue is set on a per unit of output basis rather than as an absolute amount (as would be the case if a revenue cap was being used instead of a price cap). This means that as output grows over time, then so does allowed revenue and, correspondingly, allowed costs. Thus, the real RAB is allowed to grow in line with output (adjusted for forecast productivity growth) rather than being held constant in real terms as implied by PWPN.

In productivity analysis the value of the capital stock (the equivalent of the RAB) is rolled forward using actual capital expenditure and an assumed rate of economic depreciation. The annual user cost of capital is then determined by multiplying the value of the capital stock each year by the depreciation rate plus a rate reflecting the opportunity cost of capital. This, thus, allows a return of and return on capital in a process broadly equivalent to the building blocks method. The main difference between productivity and building block based methods is that the productivity method sets the future change in allowed revenue (and, thus, costs) on the basis of industry–wide developments rather than specific forecasts of the business's own costs.

It should also be noted that, under a building block approach, the regulator would not simply set prices that recover the business's expected costs in any case. Rather, it would undertake a thorough review of whether those costs were prudent and efficient.

## 2.4 GHD Meyrick brief

### *Approach to determining $X_1$*

The UC has requested GHD Meyrick to advise it on recent productivity growth trends and provide a recommendation on the components that make up the $X_1$ factor as set out in equation (9) above and the reasons for those recommendations. In forming its view of an appropriate electricity distribution productivity growth rate, GHD Meyrick was asked to consider the following sources:

- evidence from recent Australian electricity distribution price and revenue cap decisions;
- research sponsored by the Essential Services Commission on electricity distribution TFP and critiques of that research[2];
- the final Meyrick (2003c) report to the Commerce Commission on electricity distribution productivity performance in New Zealand;
- Meyrick's recent update for the Commerce Commission of its New Zealand electricity distribution productivity analysis (Meyrick 2007b);
- evidence from recent electricity distribution regulatory decisions and productivity analyses in the UK, Europe and North America; and

[2] See http://www.esc.vic.gov.au/public/Energy/Regulation+and+Compliance/Reports+and+Investigations/Total+Factor+Productivity+(TFP)/Total+Factor+Productivity+-+TFP.htm

- any other sources GHD Meyrick considers relevant to the subject, including information on Power and Water Networks' productivity performance, if available and sufficiently robust.

In forming its view of an appropriate economy–wide productivity growth rate, GHD Meyrick was asked to consider the following sources:

- Australian Bureau of Statistics estimates of market sector multifactor productivity growth; and
- other estimates of economy–wide productivity growth including Meyrick's study for the Productivity Commission (Diewert and Lawrence 2005).

### *Approach to determining $X_2$*

In determining the value of $X_2$ for the second regulatory period, the UC based its decision on information contained in Meyrick (2003a), a confidential benchmarking report prepared for PWPN and the UC. This report assessed the magnitude of operating environment factors that increased PWPN's opex costs compared to other Australian electricity distribution businesses. It then calculated a gap between PWPN's opex costs adjusted for operating environment differences and Australian best practice.

The UC has requested GHD Meyrick to:

- undertake an update of the 2003 Meyrick analysis for PWPN's opex productivity gap, taking account of operating environment differences using updated data for PWPN and data for other businesses rolled forward adjusting for price movements and/or (where practical) using estimated industry productivity growth; and
- provide a recommendation regarding the value of the $X_2$ component as set out in equation (1) of the Final Decision, and the reasons for that recommendation (including the desirability of retaining the value of the $X_2$ component used for the 2004 Reset versus changing it to another value based on the updated analysis).

### *Approach to determining $X_3$*

In its submission on the 2009 Regulatory Reset Issues Paper, PWPN drew attention to expected higher rates of increase in distribution input prices over the next regulatory period, particularly labour prices. The UC has asked GHD Meyrick to assess available information on forecast increases in electricity distribution input prices and economy–wide input prices drawing on:

- forecasts of electricity distribution input price growth and economy–wide input price growth presented in recent regulatory reviews;
- other forecasts of macroeconomic conditions; and,
- information supplied by Power and Water.

After assessing this information GHD Meyrick has been asked to provide a recommendation on whether the price differential component of equation (9) should take on a non–zero value in the third regulatory period and the reasons for that recommendation.

# 3 THE $X_1$ FACTOR

## 3.1 Electricity distribution productivity growth

In arriving at a recommendation for the $X_1$ factor, GHD Meyrick has reviewed recent Australian regulatory decisions regarding electricity distribution X factors (and reported productivity growth assumptions embedded in those decisions), recent electricity distribution TFP studies in Australia, New Zealand and North America, PWPN's own TFP performance and estimates of Australia's economy–wide multifactor productivity growth.

### *Regulatory X factors*

Recent Australian electricity distribution decisions have ranged from real price reductions with $P_0$s of up to 17 per cent and then X factors of 2.5 per cent (ie CPI–2.5) in Victoria (ESC 2005) to real price increases with $P_0$s of up to –7 per cent and then X factors of up to –2.5 per cent (ie CPI+2.5) in NSW (IPART 2004). Queensland (QCA 2005) has also allowed real price increases by setting X factors of up to –5 per cent while the ACT (ICRC 2004) and South Australia (ESCoSA 2005) have both set smaller $P_0$ price reductions and then set the X factor equal to CPI, thus holding real prices constant in subsequent years. Since these jurisdictions have used the building blocks method where the X factor effectively acts as a smoothing mechanism, it is difficult to draw implications from these decisions regarding TFP growth rates other than that some states see the need for real price increases resulting principally from increased capital expenditure programs. By implication, these states see electricity distribution TFP worsening.

However, the most recent electricity distribution decisions in Queensland, Tasmania and the ACT have all incorporated opex partial productivity growth forecasts of 1 per cent per annum (QCA 2005). Furthermore, in its current regulatory proposal to the Australian Energy Regulator (AER), NSW–based Integral Energy (2008, p.13) has incorporated what it describes as 'aggressive productivity savings'. Similarly, NSW–based Country Energy (2008, p.55) has identified 'productivity gains due to the refinement of existing work practices'. The evidence from building block decisions and proposals since the UC's second regulatory period reset is, thus, mixed.

### *Australasian TFP studies*

The two major electricity distribution TFP studies that have been done in Australasia are Pacific Economics Group (PEG 2008a) relating to Victoria and Meyrick (2003c, 2007b) relating to New Zealand. The PEG study covers the period 1995 to 2006. It includes four outputs (peak throughput, off–peak throughput, customer numbers and peak demand as a proxy for system capacity) and two inputs (constant price opex and constant price depreciated asset value). The PEG specification has been extensively critiqued by Meyrick (2005b,c).

PEG found high TFP growth rates in the five years following privatisation in 1995 followed by a period of only modest growth through to 2005. The latest PEG results show a large TFP increase of nearly 6 per cent in 2006. Such a high TFP growth rate in one year is implausible for electricity distribution businesses that have been privatised for over a decade – indeed this rate is similar to those observed in the first two years following privatisation. Until this result and the data on which it is based can be tested, GHD Meyrick recommends treating it with the utmost caution.

PEG (2008a) reports an annual average TFP growth rate of 1.7 per cent for Victoria. However, this includes two of the years of high TFP growth following privatisation and the questionable result for 2006. A more reasonable basis on which to form forecasts of sustainable TFP growth would be to take the period since 2000 which excludes the temporary increase in TFP growth following privatisation. Including the high (reported) TFP growth year of 2006 this produces an average annual TFP growth rate of 1.3 per cent while excluding 2006 produces an average TFP growth rate of only 0.4 per cent.

Meyrick (2003c) constructed detailed estimates of productivity growth for New Zealand's 29 electricity distribution businesses for the period 1996 to 2003. It includes three outputs (throughput, customer numbers and total MVA–kilometres as a proxy for system capacity) and five inputs (constant price opex, overhead line capacity, underground line capacity, transformer capacity and constant price other capital asset value). The trend TFP growth rate for this period was found to be 2.1 per cent per annum. These results form the basis of the Commerce Commission's current price thresholds regulatory regime.

Meyrick (2007b) updated the earlier TFP study to include the years up to 2006. TFP was found to have fallen in each of the years 2004 and 2005 due largely to increased opex. The increased opex appears to result from increased maintenance on the relatively large former United Networks system following its sale in 2003 and from the installation of geographic information systems. However, if transformer capacity is included in the system capacity output measure then TFP remains relatively flat after 2003 as installed transformer capacity increased rapidly from around 2001 onwards. The trend rate of TFP growth from 1996 to 2006 is 0.9 per cent per annum using the more conservative 2003 output specification.

### *North American TFP studies*

The most recent information on US electricity distribution TFP growth rates can be found in PEG (2008b) where estimates based on a sample of 69 businesses covering the period 1988 to

2006 are presented. It includes only two outputs (throughput and customer numbers) and two inputs (constant price opex and constant price depreciated asset value). The average annual TFP growth rate for the period 1995 to 2006 is 0.88 per cent while a deceleration for more recent years is also observed with the average growth rate for 2000 to 2006 being 0.75 per cent. PEG (2008b) also presents electricity distribution TFP estimates for the Canadian province of Ontario. The recent data for Ontario is limited and only covers the years 2002 to 2006. PEG found TFP growth for Ontario was flat over this period. In conjunction with London Economics International, Meyrick has also constructed TFP estimates for Ontario and found TFP to have declined slightly over the 2002 to 2006 period (LEI 2008).

### *PWPN's TFP performance*

GHD Meyrick has constructed a TFP series for PWPN covering the years 2000 to 2008. Data for the years 2000 to 2003 initially came from a major benchmarking study of Australian EDBs undertaken by Meyrick (2005a). On 27 May 2008 the UC provided PWPN with a data request to supply relevant data for the years 2003 to 2008. PWPN provided an incomplete data response on 4 July 2008 that was not consistent with the data PWPN had supplied to Meyrick (2005a). On 9 July GHD Meyrick requested PWPN to reconcile the two data series. PWPN responded on 4 September 2008 with modified data for the years 2000 to 2003, the narrower coverage of which was said to be on a comparable basis with that supplied to the UC for the current reset. However, the opex series presented by PWPN showed erratic movements and was higher than that supplied to Meyrick (2005a) for a broader coverage of activities.

ACIL Tasman has reviewed the PWPN opex series and found that it included different treatments of corporate overheads and IT services through time. ACIL Tasman has supplied a consistent opex series for the years 2005 to 2009. For the purposes of this analysis, GHD Meyrick has used the UC's smoothed and extended (back to 2003) version of the ACIL Tasman opex series. Opex for the years 2000 to 2002 is scaled up by the increase reported for 2003 when consistent cost allocations are used.

GHD Meyrick also asked PWPN to clarify some anomalies regarding 2002 line lengths and to confirm a reported 27 per cent increase in distribution transformer capacity for 2008 on 4 September 2008 but no response has yet been received.

The GHD Meyrick TFP analysis of PWPN uses a similar specification to that used in Meyrick (2003c, 2005a and 2007b) with the same three outputs. The input specification differs marginally in that there are now four inputs (constant price opex, overhead line capacity, underground line capacity and transformer capacity) with the annual user cost of the residual other capital component being combined with that for transformers. The specification details are as follows:

*Throughput*: The quantity of the EDB's throughput is measured by the number of gigawatt hours of electricity supplied. This is similar to the output measures used in most early TFP studies of distribution.

*System line capacity*: The quantity of the EDB's system capacity is measured by its total MVA kilometres. The MVA kilometres measure seeks to provide a more representative measure of system capacity than either line length alone or the simpler kilovolt kilometres measure. The conversion factors used are the same as those used by Meyrick and Associates (2003c) which are based on an engineering assessment by Parsons Brinckerhoff Associates (2003). They reflect the fact that the effective capacity of an individual line depends not only on the voltage of the line but also on a range of other factors, including the number, material and size of conductors used, the allowable temperature rise as well as limits through stability or voltage drop.

*Connections*: Connection dependent and customer service activities are proxied by the distributor's number of connections.

*Output weights*: To aggregate a diverse range of outputs into an aggregate output index using indexing procedures, we have to allocate a weight to each output. For most industries which produce multiple outputs these output weights are taken to be the revenue shares. However, in this case we cannot observe separate amounts being paid for the different output components. Instead we use the estimated output cost shares derived from an econometric cost function. The most relevant Australasian study available is that of Meyrick (2003c) which estimates a cost function for a relatively large database of New Zealand EDBs. This produces an output cost share for throughput of 22 per cent, for system line capacity of 32 per cent and for connections of 46 per cent.

*Total distributor revenue*: This is taken to be DUOS charges.

*Operating expenditure*: The opex cost covers distribution activities only and excludes all capital costs and transmission fees. It includes all directly employed labour costs, contracted services and materials and consumables costs associated with operating and maintaining the distribution service. The quantity of the EDB's opex is derived by deflating the opex series by the ABS (2008) Labour price index for the Electricity, gas and water sector.

*Overhead network*: The quantity of poles and wires input in the overhead network is proxied by the EDB's overhead MVA kilometres.

*Underground network*: The quantity of underground cables input is proxied by the EDB's underground MVA kilometres.

*Transformers*: The quantity of transformer and other capital inputs is proxied by the rated MVA capacity of the EDB's installed zone substation and distribution transformers.

*Input weights*: The value of total costs is formed by summing the estimated value of opex and 12.5 per cent of the total RAB. We assume a common depreciation rate of 4.5 per cent and an opportunity cost rate of 8 per cent for capital assets. Input weights were then formed from the share of the cost of each of the four inputs in total cost.

*Indexing method*: The chained Fisher index is used. This is the method now preferred by statistical agencies as it satisfies the highest number of desirable axiomatic properties (see Diewert 1993).

The results of the TFP analysis of PWPN are presented in table 1. PWPN's TFP increased by a trend rate of 1.1 per cent per annum between 2000 and 2008. This resulted from a trend 1.7 per cent per annum increase in output quantity and a 0.6 per cent per annum trend increase in input quantity. TFP increased steadily to 2006 and then flattened out in 2007 and 2008 due to increased opex expenditure and the large reported increase in distribution transformer capacity in 2008. This is reflected in the partial productivity indexes also presented in table 1.

Table 1: **PWPN TFP, output, input and partial productivity indexes, 2000–2008**

| Year | *TFP* | *Output* | *Input* | *PP Opex* | *PP OH Lines* | *PP UG Lines* | *PP Transf'ers* |
|---|---|---|---|---|---|---|---|
| 2000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 2001 | 1.0236 | 1.0081 | 0.9848 | 1.0822 | 1.0004 | 0.9795 | 0.9755 |
| 2002 | 1.0678 | 1.0253 | 0.9602 | 1.1878 | 1.0129 | 0.9942 | 0.9826 |
| 2003 | 1.0768 | 1.0491 | 0.9743 | 1.1852 | 1.0330 | 1.0097 | 0.9940 |
| 2004 | 1.0828 | 1.0611 | 0.9800 | 1.1727 | 1.0361 | 1.0815 | 0.9784 |
| 2005 | 1.0780 | 1.0726 | 0.9950 | 1.1587 | 1.0456 | 1.0837 | 0.9716 |
| 2006 | 1.1012 | 1.1043 | 1.0029 | 1.1802 | 1.0767 | 1.1124 | 0.9854 |
| 2007 | 1.1010 | 1.1197 | 1.0170 | 1.1775 | 1.0838 | 1.0999 | 0.9967 |
| 2008 | 1.1005 | 1.1486 | 1.0438 | 1.1886 | 1.0968 | 1.1165 | 0.9327 |

These results are likely to understate PWPN's true productivity growth over this period because no account is taken of the contribution of increased transformer capacity to the system capacity output which is based solely on growth in line capacity. Despite using this conservative output measure, PWPN's TFP growth performance over this period has been somewhat better than that exhibited by the New Zealand and US electricity distribution industries and close to the upper range of PEG (2008a) results for Victoria for 2000 onwards.

### *Other limitations in specifying output in TFP analyses*

Apart from the need to ideally include transformer capacity in the system capacity output measure noted above, there are two other notable limitations in current electricity distribution output specifications. Firstly, in productivity–based regulation, service quality should ideally be included in productivity measurement as an additional output variable. This is because providing a more reliable service will require more inputs to be used and, unless reliability is included as an output, the business will not receive any recognition or 'credit' on the output side for the better quality service while being 'penalised' for their higher input usage. However, there are a number of difficulties including reliability measures in the productivity measurement framework. This is because reliability measures involve improvements being decreases in the variable (eg SAIDI and SAIFI) rather than increases as in the productivity framework. A satisfactory way of converting reliability measures into a format consistent with the productivity framework has yet to be devised. An additional issue to be resolved is what output weight should be assigned to a measure of reliability.

A related problem within the productivity framework is how to treat businesses that have invested in providing a higher level of security in their systems. For instance, if a business improves its system to achieve an 'n–2' rather than 'n–1' standard or invests heavily in undergrounding, it will face the same problem as that identified above in that it will receive no output recognition for this but be 'penalised' on the input side in current productivity specifications. But this higher level of 'insurance' may be valued by customers in which case it should ideally be recognised as increased output. This issue may be separate from the reliability issue identified above as the 'insurance' provided by these actions may not end up being reflected in differential reliability performance if the potential risks being covered do not come to pass. There will, of course, be difficulties in separating this 'insurance' effect from ones of EDB inefficiency and asset 'gold plating'.

Until ways of expanding current output specifications to include these aspects are devised, GHD Meyrick believes that it is appropriate to adopt a conservative approach in setting X factor parameters to avoid EDBs being penalised for increased input use that is contributing to increased output of currently unmeasured output components.

## 3.2 Economy–wide productivity growth

Australian Bureau of Statistics estimates of the overall Australian market sector's multifactor productivity (MFP[3]) have also shown some deceleration over the past decade with an average annual growth rate of 1.4 per cent for the period 1995 to 2006 but only 0.9 per cent for the period 2000 to 2006 and 0.7 per cent for the period 2000 to 2007 (ABS 2007a). Market sector MFP declined marginally in 2005 and again in 2007.

[3] MFP is essentially similar to the TFP concept discussed here except that intermediate inputs are deducted from outputs in MFP (ie a value–added output measure is used) whereas they appear explicitly as inputs in the TFP measures. All else equal, MFP measures will produce somewhat higher growth rates than TFP measures.

GHD Meyrick recommends using the official ABS MFP measure as the proxy for economy–wide TFP growth in calculating the $X_1$ factor. The Diewert and Lawrence (2005) study for the Productivity Commission produced alternate economy–wide productivity estimates for Australia but the Diewert–Lawrence database has not been updated beyond 2003–04 and updating the database and analysis is beyond the scope of the current project. The ABS MFP estimates, by contrast, currently run to 2006–07 and updates to 2007–08 will be released in November 2008.

### 3.3 Recommendation for $X_1$

GHD Meyrick's assessment is that TFP growth rates of 0.9 and 0.7 per cent per annum are reasonable estimates of the electricity distribution industry's and the economy's TFP performance, respectively, in recent years. This is based on trend growth rates of 0.9 per cent for the electricity distribution industries in New Zealand (Meyrick 2007b) and the US (PEG 2008b) and a range of 0.4 to 1.3 per cent for sustainable TFP growth in Victoria (PEG 2008a), and average MFP growth since 2000 for the market sector as constructed by the ABS (2007a). While this would produce a productivity differential of 0.2 per cent, GHD Meyrick recommends that the $X_1$ factor be set at zero. This is a conservative decision in favour of PWPN in recognition of the data uncertainties involved.

Furthermore, the recommendation is also conservative in favour of PWPN when PWPN's TFP performance of 1.1 per cent per annum since 2000 is considered. As noted above, GHD Meyrick believes that it is appropriate to allow a margin for recent increased input usage possibly contributing to increases in currently unmeasured (in TFP analysis) outputs such as reliability and system 'security'.

# 4 THE $X_2$ FACTOR

In determining the value of $X_2$ for the second regulatory period, the UC based its decision on information contained in the confidential Meyrick (2003a) benchmarking report earlier prepared for PWPN and the UC. This report assessed the magnitude of operating environment factors that increased PWPN's opex compared to other Australian EDBs. It then calculated a gap between PWPN's opex adjusted for operating environment differences and Australian best practice based on a confidential productivity database covering 11 electricity distribution businesses. The adjusted O&M productivity gap was estimated at 20 per cent in 2002. The UC allocated half this gap to its first year 'Z' ($P_0$) factor adjustment and the remaining half to be removed over a 10 year period by the $X_2$ factor. Taking account of the opex share of total costs and a degree of rounding down, this produced an $X_2$ factor of 0.25 per cent.

Meyrick (2003a) included estimates, prepared jointly with PWPN, of the impact of nine operating environment factors that increase PWPN's opex relative to other Australian EDBs. These factors included:

- higher costs of labour, materials and spares;
- lightning strikes;
- equipment wear and tear;
- vegetation trimming;
- termite related costs;
- bats and other animals;
- cyclones and flooding;
- labour productivity in hot weather; and,
- high earth resistivity.

The impact of these factors on PWPN's opex in 2002 was estimated to be around $6 million. This was deducted from PWPN's opex before comparisons with the other EDBs were made. Meyrick (2003a) also made an allowance for costs which might be relevant to a Transmission Network Service Provider in other jurisdictions from those which would be specifically incurred and recovered by an EDB acting in this role alone. The efficiency gap was calculated on the basis of opex per unit of a comprehensive output index comprising throughput, customer numbers and total MVA–kilometres as a proxy for system capacity.

The UC requested GHD Meyrick to undertake an update of the relevant parts of Meyrick (2003a) based on data to be supplied by PWPN and assessed by GHD Meyrick, as foreshadowed in UC (2008). The UC forwarded GHD Meyrick's data request to PWPN on 27 May 2008, asking for a response by 4 July 2008. This request invited PWPN 'to raise, discuss and, most importantly, quantify in a rigorous fashion, any factors which might increase its operations and maintenance costs compared to those likely to be experienced by other Australian distribution businesses'. Despite being afforded nearly 6 weeks to reply, PWPN's response of 4 July contained no quantification of operating environment factors but noted 'Power and Water would be pleased to work with GHD Meyrick to assist it to quantify the incremental costs associated with the identified features'. On 9 July GHD Meyrick sought to meet with PWPN but PWPN indicated its priority was to prepare its regulatory proposal and that a meeting would not be convenient. Instead PWPN undertook to attempt to quantify the operating environment factors. As PWPN could not locate any of its working papers from its input to Meyrick (2003a), GHD Meyrick provided PWPN with an early stage 'Discussion Paper' it had from the 2003 Meyrick exercise.

PWPN provided its attempt to quantify relevant operating environment factors to the UC on 8 August 2008. Twelve operating environment factors were listed and quantified as follows:

| *Factors causing extraordinary opex* | *2008–09* |
|---|---|
| 1. Materials and spare parts costs | $0 |
| 2. Unplanned outages due to wet season weather conditions | $282,350 |
| 3. Equipment wear and tear due to climatic conditions | $2,034,085 |
| 4. Vegetation trimming | $2,928,571 |
| 5. Termites | $1,148,552 |
| 6. Bats and Birds | $770,909 |
| 7. Cyclones and flooding | $1,063,053 |
| 8. Reduction in labour productivity | $1,052,785 |
| 9. High earth resistivity | $632,411 |
| 10. Higher costs resulting from inability to recruit staff in some locations | $2,508,000 |
| 11. Higher labour costs in the Northern Territory | $0 |
| 12. Differences in overhead capitalisation | $7,966,200 |
| Total quantified extraordinary opex | $20,386,916 |

On 15 August 2008 GHD Meyrick, through the UC, sought clarification of a number of items in the PWPN estimates, including apparent errors that had been made in two of the items. GHD Meyrick also again invited PWPN to provide quantification of those items it had not provided estimates for – GHD had noted to PWPN on 8 July that 'if we do not have quantitative estimates from Power and Water of the impact of these factors in 2008 then we will have to err on the side of discounting the importance of these factors'. In its reply of 4 September 2008 PWPN acknowledged the errors identified by GHD Meyrick but did not provide any additional quantification of those items not previously quantified.

In the following section we provide our assessment of PWPN's claimed opex disadvantages due to adverse operating environment conditions.

## 4.1 Assessment of PWPN's operating environment claims

### *Materials and spare parts costs*

PWPN notes that it is not feasible to have stores in regional depots because of their small size. It also notes the small size of its spare parts requirements and, thus, notes:

- high transport costs relative to interstate companies, and
- inability to access economies of scale in purchasing spares items.

However, it recognises that 'It is very difficult to quantify the total impact on Power and Water of the higher transport costs … (which) tend to manifest in higher quotes for outsourced maintenance services'.

PWPN notes such costs 'are difficult to transparently identify' and hence makes no claim for this disability.

GHD Meyrick accepts that no claim is made.

### *Unplanned outages due to wet season weather conditions*

PWPN notes higher incidence of lightning in the Northern Territory, both in the number of lightning days and the number of ground strikes recorded. This results in two elements of the claim for extraordinary circumstances:

- a greater number of crew call–outs for restoration or repairs, and
- reduced life of equipment (noted as relevant to circuit breakers), presumably because of more frequent operations.

PWPN notes that of the 1,275 call–out for outages during 2007, 284 were for 'unplanned outages related to wet season weather conditions'. It costs for callouts based on 3 men for 2 hours at the relevant hourly rate of $50.75, resulted in a claim for $86,481 in extraordinary costs.

PWPN also claims reduced life for its 66 kV and 11 kV circuit breakers. It notes a 'normal' life of 50 years, but claims that 'lightning strikes cause reductions in the useful life of circuit breakers in the Northern Territory .. to 30 years'. It enumerates the relevant breakers, and assigns an indexed capital cost to derive a 'total value of circuit breakers' of some $9.8 million. A fraction of 20/50 of this figure is taken as the (overall) cost of reduced life, and divided by 20 to form an amount claimed as the annual cost of $195,868 to be regarded as an extraordinary opex item.

GHD Meyrick accepts the claim associated with wet season call–outs, but believes that reduced life expectancy of equipment would better be taken into account in the relevant life expectancy factor in the calculation of depreciation, rather than being a direct transfer into annual opex.

GHD Meyrick notes that a similar calculation for reduced life appeared in draft papers associated with the 2003 review, but that the item was not claimed in the final submission.

GHD Meyrick thus accepts only the amount of $86,481 associated with call–outs, rather than the combined total of $282,350 as claimed.

### *Equipment wear and tear due to climatic conditions*

PWPN notes the significantly higher levels of UV radiation, temperature and humidity as having 'an adverse effect on the life of distribution assets in the Northern Territory'.

In particular, 'high humidity levels result in accelerated corrosion of steel poles'. Thus, steel poles in the NT have a 30 year life, compared with 60 years in southern states.

PWPN notes the maturity of its pole population (having been largely replaced following the 1975 Cyclone Tracey destruction) and claims a normal failure rate of 0.5 to 1.0 per cent per annum for poles in a mature utility. It claims a failure rate around 1.5 per cent per annum, applies this to a pole population of 37,500 with a replacement cost derived by escalation from the 2003 review of $5,798 per pole. It claims 50 per cent of this replacement cost is extraordinary, resulting in a claim for $1,630,819 per annum in its opex.

A second result of the climatic conditions is the need for rehabilitation (rather than replacement) of rusted poles. PWPN has a two year contract for such work, which it regards as being 'ongoing, … (and) … in addition to the general pole replacement costs'. It claims half the two year contract cost – an amount of $403,267 per year – as an ongoing item of opex.

GHD Meyrick notes that the 2003 Discussion paper considered the "extraordinary" cost of premature pole replacement (then some $1,365,750) on the basis of a similar calculation of 50 per cent of the cost of replacing 1.5 per cent of the pole population per year. But this item was not reflected in PWPN's final input to Meyrick (2003a), possibly with the recognition that reduced life might be reflected elsewhere, or in recognition of the common practice of capitalising pole replacement.

GHD Meyrick does not regard this pole replacement element as appropriate for inclusion in opex in the current review.

The other item represents a specific contract for attention to poles in a (rusted) condition not generally experienced elsewhere. The annual cost of a current contract is claimed, and GHD Meyrick accept this as appropriate.

The resulting reduced amount of $403,267 is accepted, rather than the claimed $2,034,085.

### *Vegetation trimming*

PWPN's response noted the need for more frequent trimming operations due to high vegetation growth rates in the Darwin/Katherine areas resulting from hot and wet climatic conditions. The Darwin/Katherine cutting cycle is noted as one major cut each year plus four minor cuts whereas southern states are noted as having a typical cutting cycle of once per year. PWPN notes the cost of their major trim as equivalent to three minor cuts, so that the Northern Territory cutting cycle is equivalent to seven minor cuts per year, compared with Southern states single major cut equivalent to three NT minor cuts. PWPN thus claim that four–sevenths of the Northern Territory vegetation trimming expenses can be regarded as extraordinary in comparison with 'southern' levels of trimming.

GHD Meyrick accepts this claim in principle, and notes the further PWPN advice that 'the current vegetation trimming contract of $5.1 million reflects market rates following a tender process in line with the Northern Territory Government's procurement procedures framework'.

PWPN thus claims extraordinary circumstances costs of four sevenths of this amount – being $2,928,571 and GHD Meyrick accepts this claim.

### *Termites*

PWPN notes the presence in the Darwin area of 'a particularly voracious genus of termite, known as *Mastotermies Darwiniensis*' which requires the use of specially sheathed underground cable which 'adds to capital and operations and maintenance costs due to the requirement for special procedures during installation, maintenance and repair'. PWPN notes an additional cost for purchase of sheathed cable and applies a similar amount extra for the care associated with its installation (to ensure no damage to the protective sheath) and subsequent maintenance and repair.

A claim of 4.5 per cent of this additional capital amount is claimed as representing 'the additional maintenance expense in removal and replacement of sheaths during scheduled and unscheduled repairs and maintenance'. The claim is calculated using an escalation of 5 per cent per year from the rate reported in the 2003 analysis, but uses a different claimed length of affected cable. GHD Meyrick accepts the claim in principle, but has reduced the escalation factor from the previous marginal cost of termite sheathing to 3.5 per cent. The original rate of $3.50, escalated by 3.5 per cent for six years, and applied to a cable length stated as 1,385 km results in extra cost for cable supply of some $5,985,815 and a similar amount claimed and accepted for difficulties in installation. Applying a 4.5 per cent rate to this total results in an extraordinary amount of $536,293 which GHD Meyrick accepts. It is marginally below the PWPN claim of $584,650 based on 5 per cent annual escalation.

PWPN makes a further claim for the costs of 'termite inspections on underground equipment (especially pillars) once every three years' compared with a fifteen year inspection cycle for similar equipment noted in southern states. The claim attributes 15 per cent of the cyclic underground maintenance costs to the termite problem, and claims that 80 per cent of this fraction should be regarded as extraordinary. Based on cyclic maintenance costs given as $4,699,183, the 15 per cent allocation and 80 per cent extraordinary fraction results in a claim of $563,902.

GHD Meyrick accepts this claim, so that a total amount for termite impact is accepted as $1,100,195 (being the summation of the above allowed amounts) compared with PWPN's claim for $1,148,552 based on the higher escalation rate.

### *Bats and birds*

PWPN notes a problem in the northern region as numerous outages are directly caused by large numbers of bats and birds causing shorts between conductors and cross arms. One solution noted is the installation of insulator covers but where covers have not yet been installed, increased call–outs result.

The cost for installation of covers is noted as having increased by 2.5 per cent per year from the rate quoted for 2003, to some $226 per pole. The annual number of poles fitted with covers has remained constant at 3,200 poles per year, for a claimed extraordinary expense of $723,649. GHD Meyrick accepts the basis of this claim.

Where covers have not yet been fitted, faults result in a crew call–out. PWPN compares the call–out rate between wet and dry season and claims that '10 per cent of the difference between wet and dry season call–outs are attributed to bats and other animals'. Based on PWPN wage and on–cost rates, the 160 extra call–outs attributable to bats and birds is claimed at $47,260. GHD Meyrick accepts the basis of this claim.

However, GHD Meyrick notes that in Meyrick (2003a) only two thirds of the calculated amount was claimed by PWPN 'as some other utilities suffer similar problems with bats or other birds or animals'.

On this occasion GHD Meyrick has again applied a two thirds factor, reducing PWPN's claim from the $770,909 resulting from the summation of the items above, to a figure of $513,939.

### *Cyclones and flooding*

PWPN notes the impact of periodic cyclone, flooding and high wind conditions in the Northern Territory on the distribution system. In 2003 PWPN highlighted the probability of a natural disaster with costs of the order of $20–30 million every 25 years, with an implicit annual contingency amount of some $1 million.

Noting that 100 kilometre per hour winds occur on average 12 times a year in the Northern Territory, compared with once a year in the southern states, PWPN claimed eleven twelfths of the $1m as extraordinary – an amount of $916,667.

On this occasion PWPN has escalated this amount at 2.5 per cent per year, and claims an extraordinary amount of $1,063,053.

GHD Meyrick accepts this claim as a provision for opex related to extreme weather.

### *Reduction in labour productivity due to adverse outdoor working conditions*

PWPN notes a 'significant physiological impact on labour productivity due to hot and humid outdoor working conditions' due to high temperatures, high humidity and consistently high levels of UV radiation, together with the absence of cooling sea breezes.

During the build–up and wet seasons, 'linesmen are unable to continue working safely for long periods due to a combination of nearby lightning, rain, excessive body sweat and the requirement to work on steel poles' and PWPN claims, as in 2003, that during the 6 month wet season 'a three man linesman team is generally required to do the work that a two man team would do in the dry season, for safety reasons'.

Productivity during the wet season is, thus, claimed as 66 per cent of dry season productivity, a reduction of 34 per cent. Because the wet season is only half the year, the claimed productivity reduction amounts to 17 per cent.

PWPN thus claimed 17 per cent of the annual total wages bill in Darwin and Katherine of $6,192,851 for the disability – an amount of $1,052,785.

GHD Meyrick notes that in Meyrick (2003a) there was a recognition that linesmen comprise around one third of the wages bill, so that a further factor of one third was then applied.

When questioned, PWPN stated it 'would agree if Meyrick and the Utilities Commission again applied a one third factor'. This results in an amount of $350,928 for reduced productivity – an amount which GHD Meyrick is prepared to accept.

### *High Earth Resistivity*

PWPN notes that many areas of the northern regions are characterised by soil types with very high resistivity, requiring additional earthing at substations and for transmission lines. Additional opex derives from the depth and extent of necessary earthing and the need to maintain and repair these more extensive installations. The installed cost differential between the 'southern' earthing installation of 4 rods to a depth of 1.2 metres and the necessary NT standard of 4 earths at 4 metres was taken in 2003 as $2,100. PWPN has escalated this figure (only slightly) to $2,194.50 at present. To calculate an annual opex, PWPN applies a common opex factor of 4.5 per cent to the additional (capital) cost for the 6,404 installed earths in the NT. PWPN thus claims an amount of $632,411 as the additional annual cost of more extensive earthing requirements.

GHD Meyrick accepts this claim.

### *Higher costs from inability to recruit staff in some locations*

PWPN notes the difficulty in recruiting skilled staff such as linesmen and engineers to regional and remote areas and 'engineers and other professional and technical staff based in Darwin are therefore required to travel to regional centres to undertaken the necessary work'.

There are four items within this claim:

- intra–territory travel costs – claimed as an estimated $28,000 for flights to Alice Springs and Tennant Creek
- the use of an additional 10 fleet vehicles to support travel – claimed originally as $2,343,000 representing vehicle leases, fuel and repair and maintenance of vehicles. Included in this amount was $1.8 million 'extraordinary cost … for vehicle leases' associated with the 'additional 10 fleet vehicles required to support this travel'. Also claimed was $500,000 for fuel and $43,000 for vehicle maintenance

  GHD Meyrick questioned this amount as appearing excessive, and PWPN revised the claimed cost down to $137,500 for the ten vehicles, plus additional fuel costs of $40,336 for a revised claim for fleet vehicles of $177,836.

- accommodation costs for staff travel were estimated as requiring an extraordinary cost amount of $113,000 per year

- travel allowance costs, paid in accordance with the Union Collective Agreement, were claimed at an estimated $24,000.

The summation of these amounts, with the reduced vehicle amount discussed above, is $342,836 and GHD Meyrick accepts this revised claim.

### *Higher labour costs for workers in the Northern Territory*

PWPN discusses its recent agreement to increases of 4 per cent in 2007-08 and 3 per cent per annum to 2010–11 in salaries and allowances as ‘a result of an increased demand for employment in the Northern Territory infrastructure, construction and mining sectors by employers who are competing for skilled personnel directly with Power and Water’.

PWPN noted that it considers that ‘costs are influenced by this factor’ but noted that it ‘cannot demonstrate it in an empirical way and as such has elected not to assign a value to this factor’.

GHD Meyrick accepts that no amount is claimed. It should also be noted that this item overlaps with the input price differential or $X_3$ factor discussed in section 5.

### *Differences in overheads capitalisation*

PWPN considers that ‘its treatment of corporate overhead costs (i.e. corporate management, support and administration costs) increases its operating and maintenance expenditure compared to its interstate peers’. In particular, Power and Water expenses all corporate overheads (and allocates them to its various businesses in accordance with its Approved Cost Allocation Methodology). Thus, the share allocated to PWPN is included in its operating budget (and represents about 30 per cent of its total opex budget), while other businesses, under Chapter 6 of the NER, are free to determine whether to capitalise or expense some or all of their corporate overheads.

In its calculations, PWPN notes an allocated amount of $13,277,000 being ‘total corporate overheads 2007–08 for NW’. It claims that ‘other distribution companies expense around 40 per cent of overhead expenses’ and would thus allocate $5.31 million as an expense item. It thus claims the excess of the Power and Water allocation as being an ‘extraordinary cost’.

GHD Meyrick must accept that this allocation *is* included in the opex budget and costs, and thus recognises in principle an amount greater then would be expected elsewhere. GHD Meyrick does, however, regard a 50 per cent allocation as more likely representative and hence reduces the ‘extraordinary’ fraction from 60 per cent to 50 per cent in the absence of evidence provided by PWPN. The amount accepted is, thus, reduced to $6,638,500 rather than the $7,966,200 claimed.

*Summary of the GHD Meyrick assessment*

The following table brings together the PWPN claims for extraordinary conditions affecting their opex and the amounts which GHD Meyrick regard as acceptable.

Table 2: **PWPN quantified opex due to operating environment conditions, 2008–09**

| *Factors causing extraordinary opex* | *PWPN claim* | *GHD Meyrick acceptance* |
|---|---|---|
| 1. Materials and spare parts costs | $0 | $0 |
| 2. Unplanned outages due to wet season weather conditions | $282,350 | $86,481 |
| 3. Equipment wear and tear due to climatic conditions | $2,034,085 | $403,267 |
| 4. Vegetation trimming | $2,928,571 | $2,928,571 |
| 5. Termites | $1,148,552 | $1,100,195 |
| 6. Bats and Birds | $770,909 | $513,939 |
| 7. Cyclones and flooding | $1,063,053 | $1,063,053 |
| 8. Reduction in labour productivity | $1,052,785 | $350,928 |
| 9. High earth resistivity | $632,411 | $632,411 |
| 10. Higher costs resulting from inability to recruit staff in some locations | $2,508,000 | $342,836 |
| 11. Higher labour costs in the Northern Territory | $0 | $0 |
| 12. Differences in overhead capitalisation | $7,966,200 | $6,638,500 |
| Total quantified extraordinary opex | $20,386,916 | $14,060,182 |

GHD Meyrick thus accepts that PWPN faces increased opex in 2008–09 due to operating environment conditions not faced by its peers of $14.1 million.

## 4.2 Identifying achievable performance gaps

Meyrick (2003a) compared PWPN's adjusted opex costs per unit of a comprehensive output index comprising throughput, customer numbers and system capacity proxied by total MVA–kilometres with per unit opex of 10 other Australian EDBs. PWPN's opex was adjusted for operating environment factors and the transmission functions performed by PWPN. The data for PWPN related to 2001–02 while that for the other EDBs ranged from 1998 calendar year data to 1999–2000 financial year data. All data were converted to 2001–02 prices.

Meyrick (2005a) presented the results of an updated benchmarking study covering 13 of Australia's then 15 EDBs with results presented for 2003. PWPN participated in this study but the operating environment adjustments of the earlier study were not made. The UC has requested GHD Meyrick to include PWPN data for 2009 adjusted for operating environment effects in the analysis presented in Meyrick (2005a). Since undertaking a full update of the Meyrick electricity distribution database covering all Australian electricity distribution businesses would involve a disproportionate commitment of resources, PWPN's adjusted opex for 2009 will be compared with the other EDBs' actual opex for 2003.

To facilitate comparisons GHD Meyrick has deflated PWPN's opex for 2009 to 2003 prices using the ABS (2008) Electricity, gas and water (EGW) sector Labour price index (series A2248226V). The Labour price index is assumed to increase at the same annual rate in 2009 as it did in 2008. The EGW Labour price index increases by 31 per cent between 2003 and 2009 compared to an increase of 26 per cent for the equivalent Labour price index for All industries and an increase of only 16 per cent for the equivalent consumer price index.

As well as adjusting prices to 2003 levels it has also been necessary to consider movements in EDB opex partial productivity levels between 2003 and 2009. As noted in section 3.1, the most recent electricity distribution decisions in Queensland, Tasmania and the ACT have all incorporated opex partial productivity growth forecasts of 1 per cent per annum (QCA 2005). For Victoria, PEG (2008a) present a reported decrease in opex of 9 per cent in 2006 leading to a very large reported opex productivity increase of over 13 per cent in that year and an increase of over 10 per cent between 2003 and 2006. GHD Meyrick finds such a high opex partial productivity growth rate in one year implausible for electricity distribution businesses that have been privatised for over a decade and, until this result and the data on which it is based can be tested, recommends treating it with the caution. However, the PEG (2008a) result clearly lends support to the proposition that EDB opex partial productivity has been increasing rather than decreasing since 2003.

In NSW IPART (2004) recommended EDB real price increases for the current regulatory period resulting principally from increased capital expenditure programs. Analysing the actual and forecast data presented in IPART (2004) and associated documents and used in Meyrick (2005a) for the three NSW EDBs, we find that EnergyAustralia's opex partial productivity was forecast to decline by a total of 6 per cent between 2003 and 2008 but Integral Energy's opex partial productivity was forecast to increase by a total of 12 per cent between 2003 and 2008 and Country Energy's opex partial productivity to increase by 9 per cent. PWPN's operations are more likely to be comparable to those of Integral Energy and Country Energy than those of EnergyAustralia. Furthermore, in its current regulatory proposal to the Australian Energy Regulator (AER), Integral Energy (2008, p.13) has incorporated what it describes as 'aggressive productivity savings'. Integral Energy (2008, p.14) notes:

> 'To ensure the ongoing efficiency incorporated in the efficient base year, the following productivity savings and efficiencies have been applied over the 2009 regulatory control period:
>
> - 2% reductions in labour costs across all business units each year;

- Increases in costs above inflation for non-labour components of operating expenditure have been offset by productivity improvements;
- Expected savings arising from the continued rollout of the Risk and Condition Based Maintenance approach to asset management; and
- Reductions in combined capital and operating expenditure programs due to the "trade offs" arising from effective asset management.'

Similarly, Country Energy (2008, p.55) has identified 'productivity gains due to the refinement of existing work practices' and Country Energy (2008, p.63) forecasts positive improvements in opex partial productivity of up to 1 per cent for each year of the next regulatory period.

While GHD Meyrick believes the bulk of available evidence points to opex partial productivity increases for EDBs between 2003 and 2009, in this case we have made the conservative assessment (in favour of PWPN) that the opex partial productivity of the interstate EDBs in Meyrick (2005a) remains unchanged. We thus make no adjustments for interstate productivity growth when comparing PWPN's 2009 adjusted opex (in 2003 prices) with the other EDBs' actual 2003 opex.

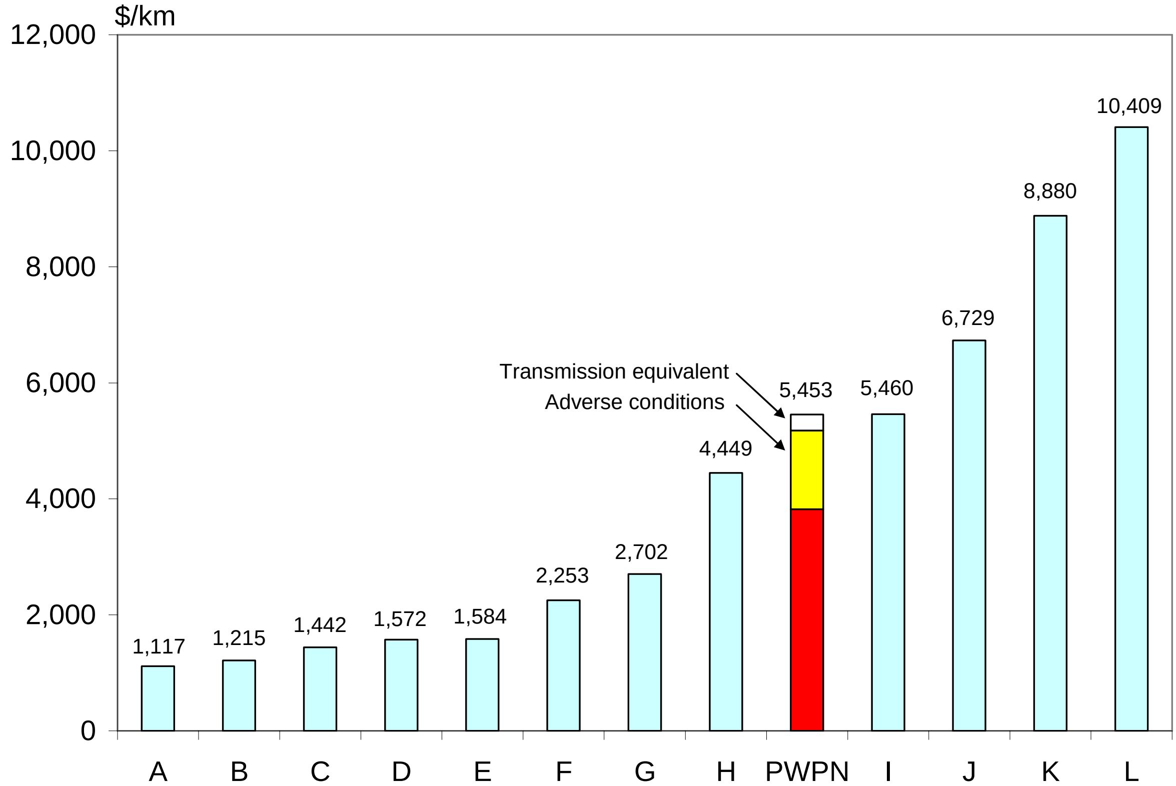
As noted in section 3.1, the opex series presented by PWPN exhibited a number of erratic movements and has been reviewed by ACIL Tasman who have assessed PWPN's opex in 2009 to be $56.4 million. This figure is used as the starting point in the following analysis. It should be noted that this figure includes more explicit recognition of allocated corporate overheads and IT services which were significantly understated in the data supplied to Meyrick (2003a). The PWPN opex efficiency gaps identified in Meyrick (2003a) are, thus, likely to be correspondingly understated.

While PWPN did not quantify an adjustment for its 'transmission equivalent' operations, in the interests of being conservative in favour of PWPN, GHD Meyrick has adjusted PWPN's opex downwards by 5 per cent in recognition of the extra functions PWPN performs relative to interstate EDBs. This is the same approach adopted in Meyrick (2003a) but in this case the 5 per cent adjustment is made to total opex and not opex net of the identified operating environment factors. This is equivalent to assuming that the quantified operating environment factors apply only to PWPN's distribution operations. Again, this assumption is conservative in favour of PWPN. After adjusting for transmission equivalent operations and taking the GHD Meyrick figure of $14.1 million for operating environment factors presented in section 5.1, PWPN's adjusted electricity distribution opex for 2009 is $39.6 million.

Proceeding in a similar fashion to Meyrick (2003a), we use the comprehensive output index of Meyrick (2005a) in comparing multilateral unit opex for the 13 EDBs taking account of the component of PWPN's opex attributable to the adverse conditions it faces. The specification of the comprehensive output index is presented in section 3.1. It incorporates more recent results than that used in Meyrick (2003a). The multilateral unit opex series is derived by dividing distribution opex by the comprehensive multilateral output index and rebasing so that PWPN has a value of one.

Before moving on to look at multilateral unit opex, however, we first look at the narrower component measures of opex per network kilometre, opex per gigawatt–hour and opex per customer taking the 'adverse conditions' identified above into account. Opex per network kilometre is presented in figure 1.

Figure 1: **Opex per network kilometre accounting for adverse conditions (2003 prices)**

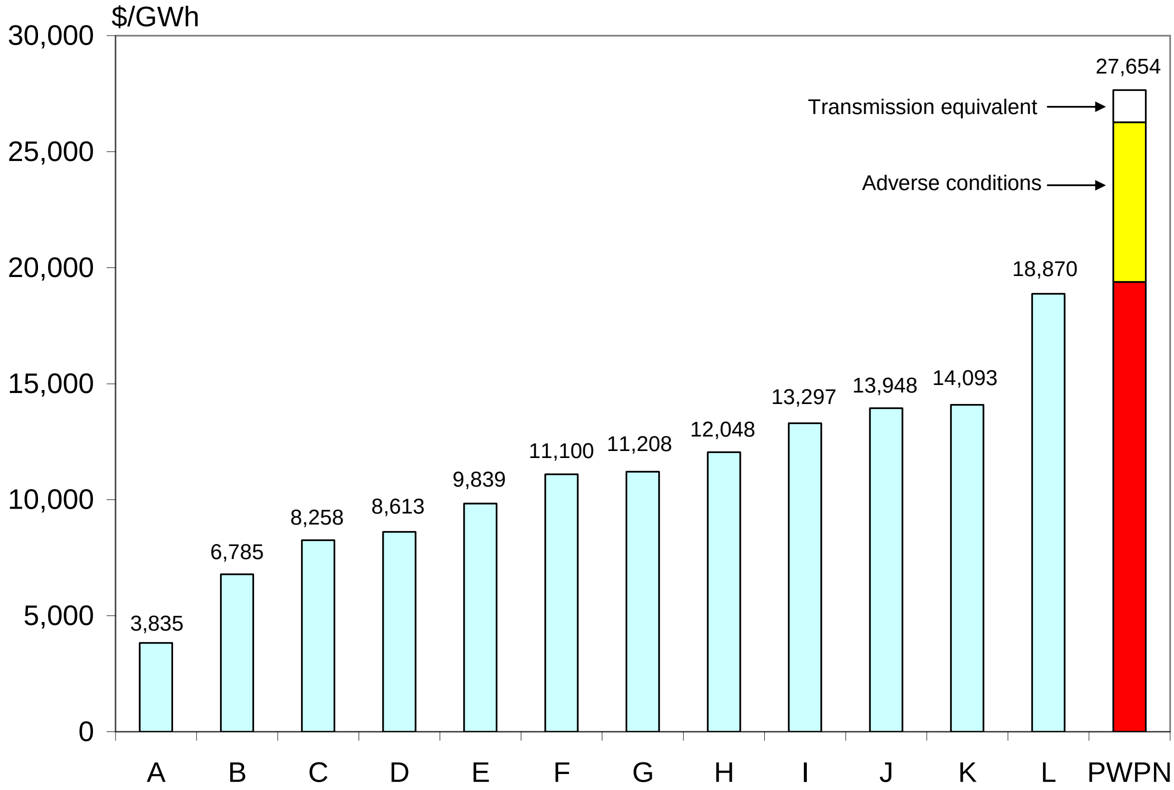



*Source*: Analysis undertaken by GHD Meyrick updating Meyrick (2003a, 2005a).

Allowing for PWPN's adverse operating conditions and transmission equivalent operations reduces its 2009 opex per network kilometre from $5,453 to $3,822 (in 2003 prices). This reduction still leaves PWPN ranking eighth of the 13 EDBs on this indicator and does not change its position relative to the six EDBs with significant rural operations who all have opex per network kilometre of less than $2,500. PWPN's adjusted opex per network kilometre is over double the average of the six lowest scores on this measure but is still well below the three highest cost EDBs using this measure.

Opex per gigawatt–hour taking PWPN's adverse conditions into account is presented in figure 2. Deducting the portion of PWPN's 2009 opex per GWh due to its adverse operating conditions and transmission equivalent operations to put it on a like–with–like basis with the other 12 EDBs reduces its annual opex per GWh from $27,654 to $19,383 (in 2003 prices). Even after making this adjustment PWPN still has marginally the highest opex per GWh. PWPN's adjusted opex per GWh is some 38 per cent higher than an average of the five predominantly rural EDBs' scores on this measure.

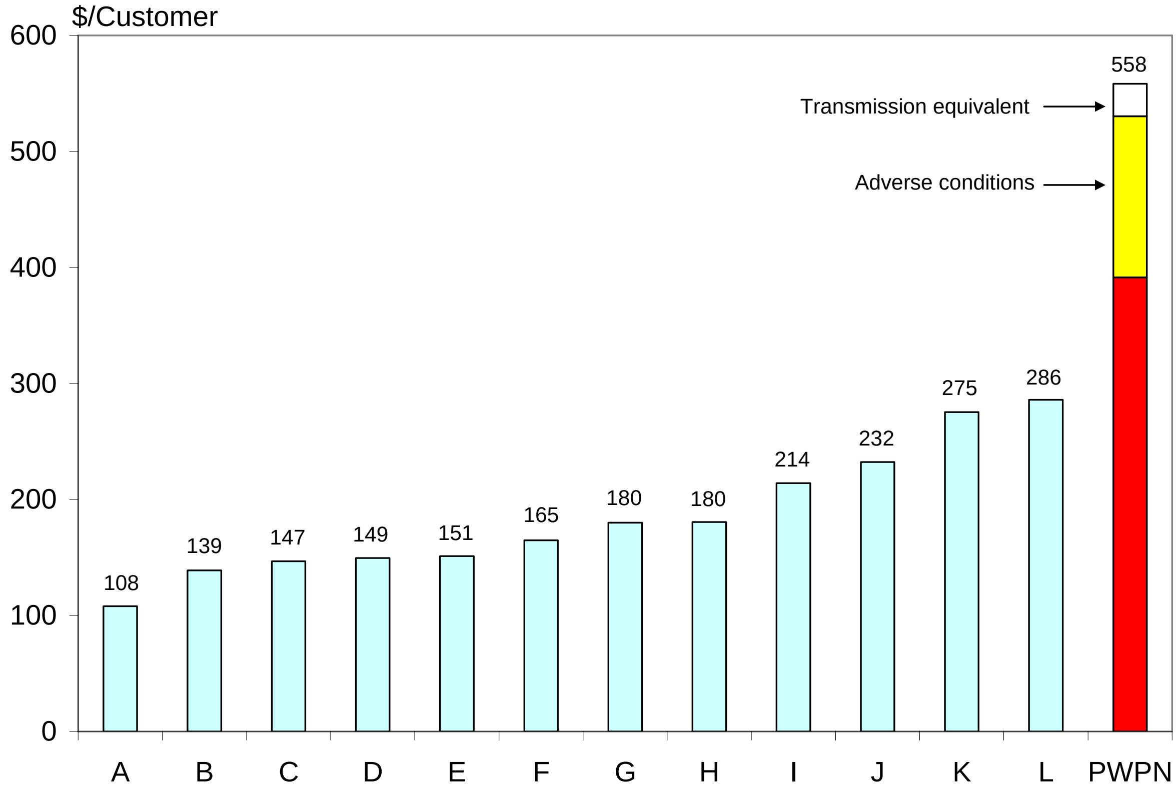
Figure 2: **Opex per GWh accounting for adverse conditions (2003 prices)**




*Source*: Analysis undertaken by GHD Meyrick updating Meyrick (2003a, 2005a).

Opex per customer taking PWPN's adverse conditions into account is presented in figure 3. The opex per customer measure generally favours the urban EDBs with all the predominantly rural based EDBs having annual opex per customer in excess of $180. At $558 PWPN has by far the highest annual opex per customer. Deducting the portion of PWPN's opex per customer due to its adverse operating conditions and transmission equivalent operations to put it on a like–with–like basis with the other 12 EDBs reduces its annual opex per customer from $558 to $391 (in 2003 prices). Even after allowing for these factors PWPN still has the highest opex per customer. PWPN's adjusted opex per customer is over 70 per cent higher than an average of the five predominantly rural EDBs' scores on this measure.

Figure 3: **Opex per customer accounting for adverse conditions (2003 prices)**




*Source*: Analysis undertaken by GHD Meyrick updating Meyrick (2003a, 2005a).

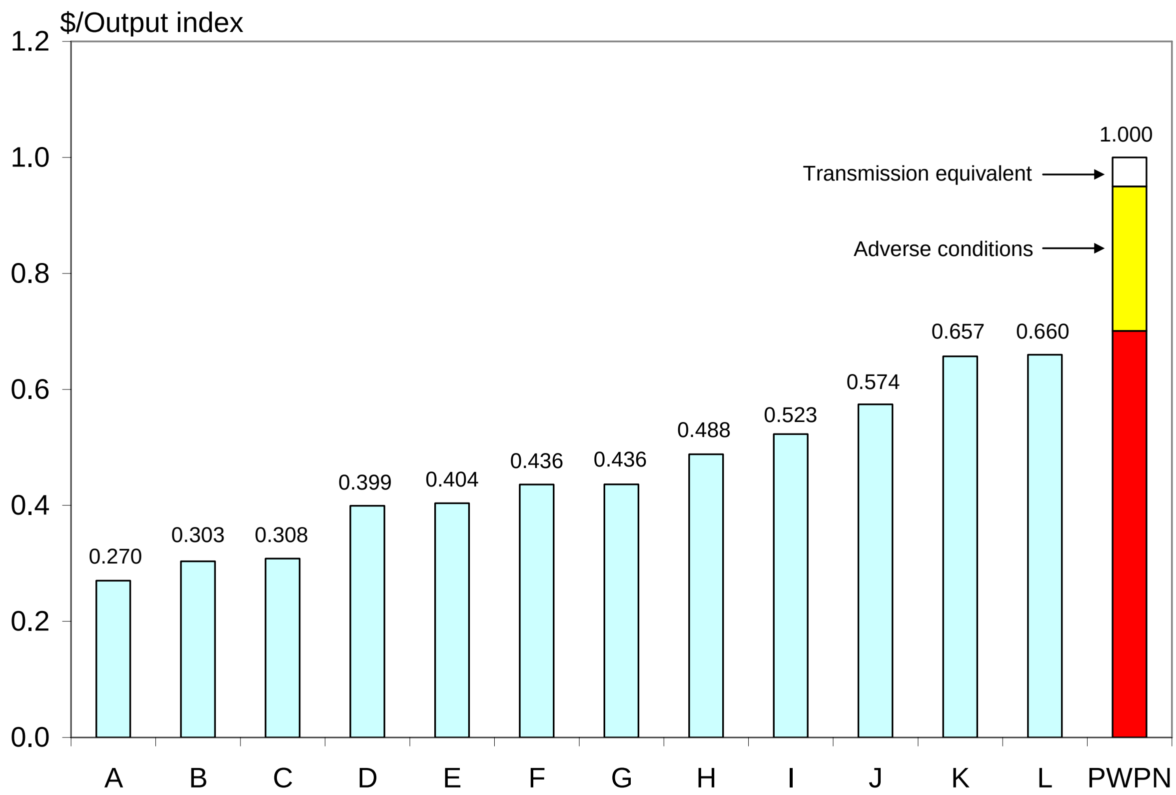
None of the three component parts of multilateral unit opex – opex per network kilometre, opex per gigawatt–hour or opex per customer – provides a satisfactory basis for identifying best practice and efficiency gaps. This is because none of these measures adequately captures the range of an EDB's output dimensions and each tends to favour either urban or rural EDBs. By combining the major output dimensions in a rigorous and objective manner, multilateral unit opex provides a more reasonable basis for identifying both best practice and subsequent efficiency gaps.

The multilateral unit opex index favours neither urban nor rural EDBs. This specification has the advantage of incorporating key features of the main density variables (customers per kilometre and energy delivered per customer) and thus goes part way to adjusting for these operating environment differences.

The results of the annual multilateral unit opex comparisons are presented in Figure 4 indexed so that PWPN has a value of one. PWPN has the highest annual multilateral unit opex, even after allowing for PWPN's adverse operating conditions and transmission equivalent operations. The EDB with the lowest observed multilateral unit opex has a different structure to the other 12 EDBs and has had to make many assumptions to present data on a similar basis to the other EDBs. In Meyrick (2003a) we adopted the conservative policy of taking the second lowest score as a reasonable estimate of Australian best practice. However, in this report we believe it is more appropriate to take an average of the four EDBs that have the most similar customer densities to PWPN as the relevant benchmark. We exclude Western Power which has a similar customer density to PWPN but which was part of a vertically integrated utility in 2003 and so may be less comparable with standalone EDBs. The remaining four EDBs with customer densities similar to PWPN are Ergon Energy, Country Energy, Powercor and SP AusNet. Using the average of the efficiency scores of these four EDBs is again a conservative choice in favour of PWPN.

The average multilateral unit opex index of the four EDBs with similar customer density to PWPN is around 0.43 compared to PWPN's unadjusted index of 1.00 and its adjusted index of 0.70 after allowing for adverse operating conditions and transmission equivalent operations. Consequently, for PWPN to reach the same multilateral unit opex as its four peers it would have to reduce its unit opex by around 27 per cent.

Figure 4: **Multilateral unit opex (index)**




*Source*: Analysis undertaken by GHD Meyrick updating Meyrick (2003a, 2005a).

It should be noted that the identified reduction in annual unit opex is larger than that identified in Meyrick (2003a) because PWPN understated its allocated corporate overhead and IT services costs in the earlier benchmarking study.

## 4.3 Recommendation for $X_2$

In translating identified performance gaps judged to be under management control into 'X' factors for use in CPI–X price cap regulation, it is necessary to form a view on the timeframe required for the performance gaps to be removed. If the timeframe is set too short there is scope for the EDB to be placed under excessive financial stress and for service quality to drop substantially as maintenance programs are terminated to meet overly onerous annual cost reduction targets. This runs the risk of consumers seeing quick price reductions but at the expense of receiving a degraded product in the future.

Conversely, setting the timeframe too long may place little pressure on the DB to reduce costs and see consumers paying more than they should be for many years. This would be contrary to the principles of effective regulation which require that regulated prices be based on efficient forward looking costs, with any inefficient costs being to the cost of shareholders, not network users.

In capital intensive infrastructure industries like electricity supply with relatively long–lived assets, sufficient time has to be allowed to optimise assets in synchronisation with reductions in opex. Meyrick (2003a) identified a ten year timeframe as being likely to be a reasonable timeframe for this to occur in. Any shorter than this was thought to place system integrity and service quality at risk if relatively large reductions in opex were being contemplated. Any longer than this was thought to be overly generous to the EDB.

UC (2004) adopted a 10 year timeframe and decided to allocate half of the 20 per cent opex efficiency gap identified in Meyrick (2003a) to the $X_2$ factor with the remaining half being accounted for in the initial $P_0$ price change. After some rounding down, an $X_2$ of 0.25 per cent was set to account for 10 percentage points of the then identified 20 per cent opex efficiency gap over 10 years.

While 5 years of the original 10 year adjustment period has now passed, GHD Meyrick believes it is appropriate to retain a 10 year adjustment timeframe from the start of the third regulatory period given that PWPN has undertaken some restructuring during the second regulatory period and given the new information regarding previous understatement of some allocated overhead costs. Consequently, GHD Meyrick recommends retaining the conservative $X_2$ factor of 0.25 per cent to account for 10 percentage points of the identified 27 per cent opex efficiency gap. The remaining 17 percentage points of the identified efficiency gap (or $9.54 million based on the 2009 total opex of $56.4 million) should be incorporated in the initial $P_0$ price change at the start of the third regulatory period. This recommendation is based on setting the conservative benchmark of the average opex efficiency of the four EDBs with customer density closest to PWPN and assuming those EDBs have had no opex partial productivity growth since 2003.

# 5 THE $X_3$ FACTOR

The X factor used in the second regulatory period effectively assumed that the input price differential between electricity distribution and the economy as a whole was zero. Recent regulatory decisions have recognised that electricity (and gas) distribution are now facing relatively high input price pressures (see AER 2007, 2008; ESC 2008). Competition for skilled engineering workers, particularly from the mining sector, has led to high rates of wage increase for linesman and other skill types employed by distribution businesses. Similarly, increases in metals prices have led to increasing capital inputs prices for distribution businesses. The difference between electricity distribution capital input prices and those of the economy as a whole has been further widened by the relatively low proportion of the capital stock in electricity distribution accounted for by computerised equipment, the price of which has increased less than other types of capital.

These input price pressures for electricity distribution have emerged in the relatively recent past and are forecast to continue in at least the medium term. There is, therefore, now a case for including a non–zero input price differential or $X_3$ factor.

## 5.1 Identifying input price differentials

### *Opex prices*

In arriving at a recommendation for the $X_3$ factor, GHD Meyrick has reviewed recent labour price index movements (at the national level) for the Electricity, gas and water sector and for All industries published by the ABS. Between 2002 and 2007 the Labour price index for Electricity, gas and water increased by an average annual rate of 4.59 per cent compared to an increase for All industries of 3.72 per cent (ABS 2008) producing a labour price differential of 0.89 per cent. Since labour costs account for the majority of opex and in the absence of detailed information on how electricity distribution materials and services input prices differ from those of the economy as a whole, we use this labour price differential as representative for the opex component of electricity distribution costs for the third regulatory period.

The labour price differential of 0.89 per cent based on extrapolating recent historical experience is also of similar magnitude to labour price differentials obtained from recent forecasting exercises. For instance, in a recent report for SP AusNet, BIS Shrapnel (2007) forecast Average weekly earnings growth in the Australian Electricity, gas and water sector of 5.7 per cent per annum for the period 2008–13 and of 5.2 per cent for the economy as a whole producing a labour price differential of 0.5 per cent per annum. BIS Shrapnel (2007) also presented forecasts for the respective Labour price indexes of 4.9 per cent and 4.2 per cent for the same period producing a labour price differential of 0.7 per cent.

In recent work for the AER, Econtech (2007) has produced Average nominal wage growth forecasts for the period 2006–16 of 5.7 per cent per annum for the Australian Electricity, gas and water sector and of 4.6 per cent for the economy as a whole producing a labour price differential of 1.1 per cent per annum.

In work for the NSW EDBs, CEG (2008) recently produced a synthesis of forecasts for EGW wages and a sample of raw materials price forecasts. CEG forecast an average nominal EGW sector wage growth of 5.7 per cent for 2008–13 and average nominal 'general' wage growth of 4.5 per cent for the same period producing an implied differential of 1.2 per cent. It should be noted that for non–labour items CEG (2008) only produces raw materials price forecasts. There is no information on how the EGW sector would be affected by these price increases relative to the economy generally or on how these raw materials price changes map into average opex and capex prices actually faced by EDBs.

The 4.59 per cent nominal EGW Labour price index growth rate we assume here as being representative of overall opex prices based on extrapolating EGW labour price increases from the 2002–07 period is similar in magnitude to the nominal opex price increase of 4.5 per cent forecast for Victorian GDBs in Meyrick (2007a).

### *Capital prices*

The capital goods price index for Electricity, gas and water increased annually by 5.27 per cent on average between 2002 and 2007 compared to an increase of 4.07 per cent for All industries producing a capital input price differential of 1.19 per cent (ABS 2007b). We use this capital goods price differential as representative for the capital component of electricity distribution costs for the third regulatory period.

There is very limited forecast information available on how EDBs' capital prices compare with those for the economy as a whole. However, there have been some recent forecasts of capital expenditure nominal prices for electricity distribution and transmission businesses. The nominal EGW capital price index growth of 5.27 per cent for the period 2002–07 exceeds the average nominal raw materials price forecasts presented by CEG (2008) for copper, aluminium, steel and construction costs for the period 2008–13. It also exceeds the capital price escalators forecast by Evans and Peck (2007) for electricity transmission for ElectraNet for the period 2008–13. Evans and Peck presented nominal forecasts of 4.6 per cent and 5.1 per cent based on probabilities of 50 per cent and 80 per cent, respectively, that the escalation rate would not exceed the value identified. In reviewing this work the AER (2007) relied on advice from SKM (2007) that the Evans and Peck methodology did not place adequate weight on the possibility of commodity price reductions and relied too heavily on general, rather than electricity industry specific, price indexes. Instead, SKM (2007) forecast that nominal capital input price increases facing electricity transmission businesses over the period 2008–13 would average 3.9 per cent.

Based on available electricity industry capital price forecasts, our use of the ABS (2007b) EGW capital price index growth for 2002–07 to forecast electricity distribution capital prices for the third regulatory period is conservative in favour of PWPN.

Another issue that needs to be considered is whether the capital input price differential should be applied to all of the capital base. Since most of the EDB's asset base is sunk, most of the EDB's actual capital costs will not be affected by real price increases for capital. To recognise real price increases for the entire asset base would be likely to lead to returns to the EDB in excess of those required by the financial capital maintenance principle (unless revaluation gains are explicitly recognised as income). In this case we do not have sufficient information to tailor the capital input price differential to only part of the asset base so we adopt the conservative approach of applying the differential to the entire asset base. Again, this decision is likely to favour PWPN.

## 5.2 Recommendation for $X_3$

GHD Meyrick considers that extrapolation of the EGW sector Labour price index differential relative to the Labour price index for All industries for the period 2002–07 represents the best forecast of the opex price differential for the third regulatory period. Similarly, we consider that extrapolation of the EGW sector Capital goods price index differential relative to the Capital goods price index for All industries for the period 2002–07 represents the best forecast of the capital price differential for the third regulatory period.

GHD Meyrick assume that opex accounts for one third of electricity distribution costs while capital costs account for the remaining two thirds. Using this weighting produces an input price differential or $X_3$ factor estimate of 1.1 per cent calculated as follows:

(11) $X_3$ = 1/3 x 0.86 per cent + 2/3 x 1.19 per cent = 1.08 per cent.

# 6 CONCLUSIONS

GHD Meyrick recommends an X factor for the Northern Territory's third regulatory period of –0.85 per cent (ie a real price increase of 0.85 per cent or a nominal price increase of CPI+0.85 per cent) derived as follows:

(12) $X = X_1 + X_2 – X_3$ = 0 per cent + 0.25 per cent – 1.1 per cent = –0.85 per cent.

GHD Meyrick's assessment is that TFP growth rates of 0.9 and 0.7 per cent per annum are reasonable estimates of the electricity distribution industry's and the economy's TFP performance, respectively, in recent years. This is based on trend growth rates of 0.9 per cent for the electricity distribution industries in New Zealand (Meyrick 2007b) and the US (PEG 2008b) and a range of 0.4 to 1.3 per cent for sustainable TFP growth in Victoria (PEG 2008a), and average MFP growth since 2000 for the market sector as constructed by the ABS (2007a). While this would produce a productivity differential of 0.2 per cent, GHD Meyrick recommends that the $X_1$ factor be set at zero. This is a conservative decision in favour of PWPN in recognition of the data uncertainties involved.

To form a recommendation for the $X_2$ factor, GHD Meyrick has updated the analysis in Meyrick (2003a). PWPN has the highest unit opex of the 13 included EDBs, even after allowing for PWPN's adverse operating conditions and transmission equivalent operations. We adopt the conservative policy of taking the average of the four rural EDBs that have the most similar customer densities to PWPN as the relevant benchmark. These EDBs are Ergon Energy, Country Energy, Powercor and SP AusNet. For PWPN to reach the same unit opex as its four peers, after allowing for PWPN's adverse operating conditions and transmission equivalent operations, it would have to reduce its unit opex by around 27 per cent. GHD Meyrick recommends retaining the conservative $X_2$ factor of 0.25 per cent to account for 10 percentage points of the identified 27 per cent opex efficiency gap. The remaining 17 percentage points of the identified efficiency gap (or $9.54 million based on the 2009 total opex of $56.4 million) should be incorporated in the initial $P_0$ price change at the start of the third regulatory period.

GHD Meyrick considers that extrapolation of the EGW sector Labour price index differential relative to the Labour price index for All industries and the EGW sector Capital goods price index differential relative to the Capital goods price index for All industries for the period 2002–07 represent the best forecasts of the input price differentials for the third regulatory period. Assuming that opex accounts for one third of electricity distribution costs while capital costs account for the remaining two thirds this produces an overall input price differential or $X_3$ factor estimate of 1.1 per cent.

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