Submission to Productivity Commission: *Electricity Network Regulation* Issues Paper

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INTRODUCTION

The Australian Government has asked the Productivity Commission (the Commission) to review the use of benchmarking as a means of achieving the efficient delivery of network services and electricity infrastructure. The Commission released an Issues Paper on this topic (as well as on the effectiveness of regulatory arrangements for interconnectors) in February 2012. The Issues Paper provides an introduction and overview of benchmarking in electricity regulation and presents specific issues/questions on which it welcomes comment and formal submissions.

This submission presents my own views about the potential role of benchmarking in electricity network regulation. It also directs the Commission to a number of studies in Australia and elsewhere that pertain to benchmarking. There has been considerable amount of work on these issues in several jurisdictions that could be of value to the Commission's inquiry, yet little of it was referenced in the Issues Paper.

I should note these comments reflect my work advising on benchmarking and related topics for nearly 20 years around the world. I have given expert witness testimony more than 30 times on benchmarking, total factor productivity (TFP) measurement, and the application of such metrics to energy utility regulation. I have also advised energy utilities and/or regulators on these issues in every State in Australia, as well as in New Zealand, the US, Canada, Japan, Germany, the UK, Mexico, Argentina, Bolivia, Jamaica, and Curacao. My assignment in Germany is perhaps particularly notable, since I was the leader of an international consortium advising the newly-created energy network regulator (the Bundesnetzagentur) on the worldwide experience with benchmarking in energy regulation and the lessons that could be gleaned from this experience and incorporated in Germany's newly-established regulatory framework.

RELEVANT RESEARCH IN AUSTRALIA AND ELSEWHERE

A significant amount of work has been undertaken on TFP measurement for electricity distributors in Victoria. I managed a series of projects on this issue, first on behalf of the electricity distribution businesses, and later on behalf of the Essential

Services Commission of Victoria (ESC), over the period between 2001 and 2009. This work showed that it is currently feasible to measure TFP growth for Victoria's power distributors accurately. Indeed, the empirical output of these projects certainly provides a strong foundation for a TFP-based approach to energy network regulation in Victoria, and perhaps in other States as well.

The main reports from these series of projects are the following:

1. *Incentive Regulation and External Performance Measures: Operationalising TFP – Practical Implementation Issues* (June 2001)
2. *TFP Research for Victoria's Power Distribution Industry* (December 2004)
3. *Incentive Power and Regulatory Options in Victoria* (May 2005)
4. *TFP Research for Victoria's Power Distribution Industry: Update*, (April 2006)
5. *TFP Research for Victoria's Power Distribution Industry: 2005 Update*, (November 2006)
6. *TFP Research for Victoria's Power Distribution Industry: 2006 Update*, (February 2008)
7. *TFP Research for Victoria's Power Distribution Industry: 2007 Update*, (December 2008)

If the Commission does not have copies of any of these papers, I would be happy to provide one.

In addition, on behalf of the ESC, I managed a research project estimating TFP growth for gas distributors in Victoria. I also worked co-operatively with ESC Staff to estimate TFP growth for a national sample of electricity distributors. I will not discuss these projects further since the Commission's current inquiry pertains only to electricity rather than gas distribution, and because data constraints limited the quality of our preliminary estimate of TFP growth for Australia's national power distribution industry.

Two of the papers cited above are primarily conceptual in nature. One of these is the first cited paper which, as the title suggests, was primarily a discussion of issues that would be involved with the practical implementation of a TFP-based approach rather than the "practical implementation" itself. This paper provided both an introduction and kind of a roadmap for the later empirical work that we undertook.

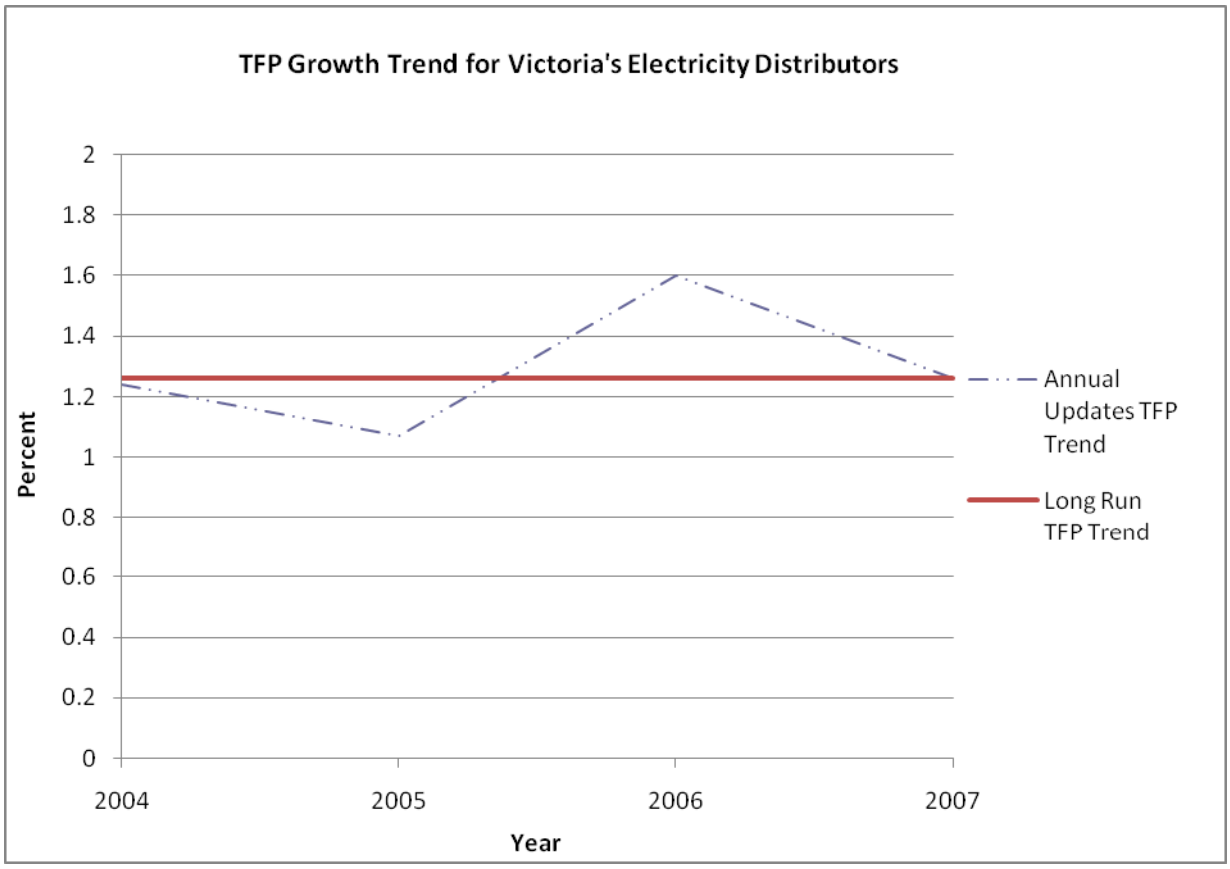
The second conceptual paper is *Incentive Power and Regulatory Options in Victoria*. In this report, we developed a complex but extremely flexible mathematical model which could be used to simulate how an average utility would respond to changes in its regulatory environment. This model was used to simulate the impact of different incentive regulation options on customer prices and utility profits under different regulatory approaches. One outcome of this report was that a "TFP-based" approach to regulation would generally yield better outcomes for consumers and companies than would various "building block" approaches to incentive-based, CPI-X regulation.

The other five papers cited above all develop estimates of TFP trends for Victoria's electricity distributors and provide evidence on the regulated price trends that would have been generated for Victoria's electricity distribution industry if a "TFP-based" approach had been used to set the business's network prices. The most comprehensive of these reports is the first one prepared in December 2004, *TFP Research for Victoria's Power Distribution Industry*. This report discusses our TFP methodology in detail, estimates TFP growth for each of Victoria's electricity distributors and for the industry as a whole between the time of privatization in 1995 and 2003, and provides a host of supporting analyses. The subsequent reports update our estimates of industry TFP trends to include data for 2004, 2005, 2006, and 2007, respectively.

The outcome of this work is a rigorous estimate of electricity distribution TFP trends in the State that, over time, shows the emergence of a long-term TFP trend for the industry. To estimate this trend, however, it is necessary to measure the Victorian TFP trend from 1998 rather than 1995, since there was an identifiable, one-time "burst" of TFP growth between 1995 and 1998 (following privatization) which will not be repeated and is therefore not representative of the long-term trend. This fact was discussed extensively in PEG's 2004 TFP report and has been evident in every reported TFP update in subsequent years.

Our work shows a clear trend emerging for electricity distribution TFP growth in Victoria. This is reflected in the graph below, which shows the annual average TFP growth for the Victorian electricity distribution industry, as this trend is updated annually for new information. The value for 2004 reflects average TFP growth for the industry from 1998 through 2004. The 2005 observation is equal to average TFP growth from

1998 to 2005. Similarly, the 2006 and 2007 observations are equal to the average growth in TFP for Victorian electricity distributors from 1998 through each of these respective years. This graph represents the actual "price path" that would result if PEG's TFP study was, in fact, used in a TFP-based methodology, and PEG's TFP index was updated annually to roll in new Victorian data.



Average TFP growth for Victorian electricity distributors was 1.24% over the 1998-2004 period, 1.07% over 1998-2005, 1.60% over 1998-2006, and 1.26% over 1998-2007. We believe this price path is relatively stable. It should also be noted that the volatility depicted above almost certainly exaggerates the volatility that would, in fact, result if PEG's TFP specification was employed throughout Australia in a TFP-based approach. The reason is that the TFP growth trends plotted above correspond to average growth rates over six, seven, eight and nine year periods, respectively. TFP series almost

always become more volatile as fewer years are used to compute the trend. I generally recommend that a minimum of nine years be used to compute a long-run industry TFP trend. Therefore, the series above reflects more volatility than would likely be experienced if PEG's TFP specification was extended to all of Australia and ten or more years of Victorian data were initially used to compute this trend.[1]

Nearly all of this work was finalized at the time Victoria's Department of Primary Industries (DPI) submitted a rule change application to the Australian Energy Market Commission (AEMC) to allow a TFP-based methodology to be used to set electricity distribution prices. This rule change application quickly led the AEMC to undertake a broad review into the use of TFP. In its Final Report, the AEMC concluded that a TFP-based regulatory option could create stronger performance incentives and improve the welfare of customers. However, instead of amending the rules to allow for the immediate implementation of a TFP-based regulatory option, the AEMC began a multi-year period for collecting the data that it believed would be necessary to implement a TFP-based approach. The rationale for this delay was that the AEMC believed it would be necessary for consistently-defined data to be gathered throughout Australia before accurate TFP measures could be calculated for the industry.

The AEMC's review of TFP-related issues also led to a significant amount of debate between Economic Insights (EI) and myself, primarily regarding TFP measurement. Some of this debate drew on similar debates between EI and myself in two other jurisdictions: New Zealand and Ontario, Canada. The Commission has referenced one EI report from New Zealand, but for completeness it should also be aware of the following reports I prepared both in New Zealand and Ontario, as well as submissions I authored and which were presented during the AEMC review:

[1] Economic Insights argued that my TFP specification was volatile and purported to demonstrate its volatility by presenting a figure showing year-to-year changes in TFP growth for Victoria's electricity distributors. However, any TFP series will look volatile if you plot annual changes in TFP, which is why a multi-year average of TFP growth is needed and used to compute long-term TFP trends for regulatory applications. Moreover, the issue that ever needs to be considered when assessing the volatility of a given TFP specification is the volatility of the multi-year trend in the index, not the year-to-year changes in TFP, since only the former measure will actually be used to set allowed changes in prices.

AEMC Review

1. Essential Services Commission *Submission to Review into the use of Total Factor Productivity for the determination of prices and revenues: Framework and Issues Paper* (March 2009)
2. Supplemental submission and spreadsheet-based models showing the impact on prices and earnings of TFP-based and building block approaches to CPI-X regulation (May 2009)
3. *Submission to Australian Energy Market Commission: Design Discussion Paper* (October 2009)
4. *Submission to Australian Energy Market Commission: Preliminary Findings Report* (April 2010)

New Zealand

1. *X Factor Recommendations for New Zealand Electricity Distribution Price Controls* (July 2009)
2. *Reset of Default Price Path for Electricity Distribution Businesses: Submission to the Commerce Commission* (August 2009)

Ontario

1. *Calibrating Rate Indexing Mechanisms for Third Generation Incentive Regulation in Ontario: Report to the Ontario Energy Board* (February 2008)
2. *Defining, Measuring and Evaluating the Performance of Ontario Electricity Networks: A Concept Paper, Report to the Ontario Energy Board* (April 2011)

Again, if the Commission does not have copies of any of these referenced papers, I would be happy to provide one. The last paper cited above could be particularly helpful to the Commission's inquiry, since it is intended to be a reference document designed to help interested parties understand and evaluate the complexities that arise in discussions and applications of benchmarking and TFP measures.

TFP MEASUREMENT ISSUES: RESOLVED AND OUTSTANDING

There were four primary practical differences between the EI and myself regarding TFP specifications: 1) the use of physical or monetary metrics to measure capital input quantities; 2) the merits of adding unbilled outputs to the output quantity specification; 3) the use of revenues or marginal costs to weight output quantities; and 4) the complexity of the X factor formula and its ability to deal with firm-specific issues. This last issue is on the border between being 'practical' and 'conceptual,' but I will address it here since it does pertain to practical issues regarding TFP measurement.[2]

At the end of the AEMC review, three of these issues were effectively resolved in favor of the TFP specification I favored in the review and that I implemented in fact when estimating TFP for Victoria's electricity distributors. These issues were the choice of the output specification (resolved to use "billed" outputs entirely); the choice of weights applied to these outputs when developing an overall output quantity index (resolved to use revenue shares rather than estimates of marginal costs); and the complexity of the X factor formula and its ability to deal with firm-specific issues (resolved that both approaches can in principle deal with firm-specific issues, but doing so requires X factors that are "tailored" to individual companies using either econometric methods or by estimating TFP for different groups of "peer" utilities which are subsets of the entire industry).[3]

One implication of the debates before the AEMC is that they show, for practical applications of TFP measures in utility network regulation, it is not true that "meaningful aggregate output measures are not necessarily easy to define," as the Issues Paper states on p. 10. The Issues Paper cites an EI paper from New Zealand to support this claim, but EI itself chose not to rely on any of the analyses developed in that theoretical paper when

[2] There were also some more theoretical or conceptual debates between EI and myself, although by and large EI appears to have abandoned the most fundamental conceptual critiques they lodged against my TFP work and specification, which is appropriate since they were entirely without merit. For the sake of clarity, EI should acknowledge for the record that this is the case.

[3] EI contends that it changed its specification with respect to outputs and output weights to be consistent with my specification only for practical reasons, but in fact there are significant conceptual problems in their treatments of outputs as well, at least with respect to TFP measurement to be used for setting regulated prices; for further details, see the August 2009 New Zealand paper or April 2010 AEMC submission cited above.

it came time to make a practical choice for measuring output. The most meaningful, and appropriate, measures of aggregate output to be developed in regulatory applications of TFP are those employed in my TFP work for Victoria's electricity distribution industry.

The one, remaining unresolved issue at the end of the AEMC review concerned the measurement of capital. EI continued to advocate physical metrics, while I continued to advocate deflated monetary values of capital expenditures, as the most appropriate measures for capital input. I welcome further inquiry by the Commission on this issue, for EI personnel are for all intents and purposes alone in their view on capital measures. For a comprehensive summary of the debate between EI and myself on this issue, the Commission can review Appendix Two of the *Concept Paper* I submitted in Ontario. I strongly encourage the Commission to evaluate this issue objectively and come to its own conclusions with respect to the best measure of capital inputs for benchmarking and TFP applications in regulation; a definitive analysis and statement by the Commission on how best to measure capital for regulatory applications of TFP and benchmarking would be a significant step forward in Australia.

DO DATA NEED TO BE IMPROVED BEFORE TFP-BASED REGULATION CAN BE APPLIED IN AUSTRALIA?

My most fundamental concern with the AEMC Review was is its conclusion that a TFP-based regulatory option cannot be implemented for at least eight years. This conclusion was motivated by the need to develop a "robust and credible data-set" used to estimate industry TFP trends. Obviously, it is desirable to have high quality data, and it is acknowledged that data quality needs to be improved in Australia. But the AEMC's conclusion that TFP-based regulation must essentially commence with eight years of fresh data is both unnecessary and undesirable, for a number of reasons.

One is that data quality is even more important for building block regulation, where regulated prices depend directly on the reported costs of individual companies. In building block regulation, data errors lead directly to price "errors." This is not necessarily true in TFP-based regulation, where price changes depend on industry-wide changes in TFP and input prices. In spite of the data problems that currently exist, the

AER is now using existing data to set prices under the building block methodology. Clearly, waiting for better data to become available is not an option for applying building blocks. If the current (imperfect) data are good enough to be used for setting regulated prices under the building block method, then these *same data* are good enough to use for calculating TFP trends. Indeed, since the regulatory consequences of using imperfect data are greater under building block than TFP-based regulation, data concerns actually argue for TFP-based regulation to be implemented more rather than less rapidly. Doing so reduces the potential for data "errors" to be directly reflected in regulatory prices.

In addition, it is not clear that current data will necessarily bias the computation of industry TFP trends. Indeed, industry TFP trends will not be biased by inconsistent or non-comparable data *if* those inconsistencies are random across utilities in the industry. Whenever this is true, data discrepancies or errors will tend to balance out across the cross section of firms, leaving the TFP index for the entire industry to be a good measure of the industry's "real" index (*i.e.* the TFP index that would be measured using an internally consistent and comparable dataset across the industry). Moreover, the impact of data errors for any individual company to impact *industry* TFP is clearly diminished by the fact any individual company will be small relative to the industry.

In addition, for data errors to have a material impact on the TFP trend, they would have to impact the growth rate of TFP, not (in most instances) the level of the TFP index in any year. For example, if a data error in one year was entirely reversed in the following year, and both years were included in the sample period used to compute the TFP trend, the TFP trend would be unchanged. Even a one-time error in the *industry* (as opposed to individual company) data used to calculate TFP in any given year will have a smaller impact on the TFP trend, since flawed data from a single year will be averaged in with industry data from other years when computing the industry's TFP growth rate over a multi-year period.

It should be recognized, however, that errors in *industry* data will be more of a concern when they take place in either the starting or ending years of the sample used to calculate the TFP trend. When this occurs, errors in the level of the TFP index are likely to have a greater impact on the computed TFP trend. This assumes that the TFP trend

will in fact be calculated directly using from the index data, rather than via an auxiliary regression.

In sum, it should be recognized that for data errors to impact the measured TFP trend, they would have to be: 1) systematic across the industry, rather than relevant to any individual company's data; 2) systematic regarding the *direction* of the bias (*e.g.* making industry costs too high), otherwise errors by some companies in one direction will at least partially offset errors in the other direction by other sampled companies; and 3) impact the industry's TFP growth *rate* rather than index level in any given year. All of these factors tend to reduce the regulatory impact of data errors compared with the building block methodology, which establishes a direct link between each individual company's data and that company's regulated prices.[4]

Because adopting TFP-based regulation quickly will create broader benefits, a strong case can be made for using the TFP research I conducted in Victoria as a base for further investigation into external benchmarks by the Commission. These data are generally reliable on an industry-wide basis, and they have led to generally reliable measures of long-term TFP trends for electricity distribution in one major Australian State. This information can potentially be augmented using data from electricity distributors in other Australian jurisdictions that, after further inspection, are deemed to be sufficiently accurate, or do not satisfy the criteria specified above which would lead to biases in TFP trend measures. There is no need to make the "perfect" (*i.e.* the perfect dataset) the enemy of the good TFP research that already exists for electricity distributors in Australia and which can be the basis of further investigation and application.

[4] It may be interesting to consider an example where systematic data errors did impact the measured TFP trend. The example is when EI personnel first estimated TFP trends for electricity distributors in New Zealand in 2003. The sample period (1996 to 2002) contained a structural change in the electricity distribution industry, where distributors that were previously combined distribution-retailing utilities had to decide whether to be a "lines" business or a retailing business, and divest their other operations accordingly. This change in the structure of the industry led some distributors that chose to become pure lines businesses to report markedly lower costs in the year they divested their retailing businesses, since the distributors now avoided the costs of these retailing operations. In its original industry TFP study, EI personnel did not appropriately account for this structural shift and included some of those cost reductions in its measure of electricity distribution costs. These errors in EI's measure of industry costs were translated directly into greater input quantity reductions and therefore more rapid industry TFP growth than was warranted with accurate industry cost data. This error was: 1) systematic, because it impacted multiple companies; and 2) pointed in a single direction *i.e.* divesting retailing operations only leads companies to avoid the costs of retailing.

APPLICATION OF OTHER BENCHMARKS TO ELECTRICITY DISTRIBUTION REGULATION

The Commission will no doubt have noticed that, up to this point, my comments have been focused on only one type of "benchmark": industry TFP trends. As the Issues Paper notes, there are in fact a wide variety of other benchmarking approaches and metrics that could be employed. I again recommend that the Commission review the Concept Paper I submitted in Ontario for a detailed review of the merits of alternative benchmarking methodologies and their application in utility regulation. To conclude this submission, I will make a few remarks about principles that should be kept in mind when any type of external benchmark (other than the TFP-based regulatory option) is used to set or update regulated prices.

In principle, benchmarking can play a potentially valuable role in promoting effective regulation. Benchmarking can be a tool for ensuring that regulation replicates the operation and outcomes of competitive markets. Creating incentives for utility operations that are comparable to competitive markets would ultimately create benefits for both consumers and shareholders. Thoughtful and rigorous benchmarking studies can be helpful for establishing objective performance standards that strengthen incentives and increase the potential benefits from utility services.

While this potential exists, it must also be recognized that benchmarking is simply a tool, and like any regulatory tool it can be abused. Inappropriate benchmarking can be destructive and contrary to the goal of effective regulation. For example, "bad" benchmarking studies can set unrealistically demanding performance standards. Such standards can lead to prices that do not recover the costs of even an efficiently run company. While this may be corrected over time (*e.g.* in an updated benchmarking study), there may still be lasting damage. Utilities are highly capital-intensive enterprises and continually raise debt and equity capital. The use of inappropriate benchmarking studies by regulators can raise a utility's cost of capital as investors demand risk premiums to compensate for heightened regulatory risks. These higher costs would ultimately be reflected in higher prices. Bad benchmarking studies can therefore reduce long-run benefits to both customers and shareholders.

Benchmarking that is biased in favor of companies can lead to similarly undesirable results. Here, customers would either pay unreasonable prices for utility services or shareholders would enjoy superior returns even though the utilities do not exhibit superior performance. Ultimately, benchmarking must be designed so that returns are commensurate with performance. Any benchmarking approach that is not compatible with this goal does not promote sound public policy.

In light of these concerns, it should always be remembered that benchmarking can either promote or frustrate effective regulation depending on how it is applied. By increasing risk, "bad" benchmarking applications may unintentionally raise costs and therefore frustrate rather than promote desired regulatory objectives. Benchmarking is therefore a double-edged sword, and its impact depends on the understanding and care with which it is wielded in practice.

It is widely believed that effective utility regulation should replicate the operation and outcomes of competitive markets. One reason is that competitive market forces create maximum incentives to operate efficiently.[5] Economic theory has also established that competitive markets often create the maximum amount of benefits for society. For these and related reasons, a "competitive market paradigm" is useful for establishing effective performance standards. It may be valuable, then, to consider how competitive markets operate and the implications for setting appropriate benchmark-based standards in utility regulation.

One important aspect of competitive markets is that prices are external to the costs or returns of any individual firm. By definition, firms in competitive markets are not able to affect the market price through their own actions. Rather, in the long run, the prices facing any competitive market firm will change at the same rate as the growth in the industry's unit cost.

Competitive market prices also depend on the *average* performance in the industry. Competitive markets are continually in a state of flux, with some firms earning

[5] Firms in competitive markets that do not produce efficiently have lower profits as sales are lost to more efficient rivals. Reduced profits, in turn, create pressures to reduce costs. Similarly, firms that choose non-optimal prices or do not produce the products that consumers demand lose sales to competitors. Profits thereby decline, leading to changes in marketing behavior that satisfy consumer demands.

more and others less than the "normal" rate of return on invested capital. Over time, the average performance exhibited in the industry is reflected in the market price.

Taken together, these features have the important implication that in competitive markets, returns are commensurate with performance. A firm can improve its returns relative to its rivals by becoming more efficient than those firms. Companies are not disincented from improving efficiency by the prospect that such actions will be translated into lower prices because the prices facing any individual firm are external to its performance. Firms that attain average performance levels, as reflected in industry prices, would earn a normal return on their invested capital. Firms that are superior performers earn above average returns, while firms with inferior performance earn below average returns. Regulation that is designed to mimic the operation and outcomes of competitive markets should allow for this important result.

There are many ways to set long-run cost standards. One relatively risky approach, which involves a very strong application of the competitive market paradigm, is to set a long-run regulatory standard whereby regulated rates reflect performance levels that would be expected for an average firm in a competitive industry. Economic research may be helpful in determining this target. For example, competitive markets can be examined to establish how close firms are, on average, to superior performers in the industry. This can provide evidence of the impact that competition ultimately has on the performance of a typical firm relative to the industry's superior performing firms.

Benchmarking can also be useful in achieving this objective. Benchmarking can assess utility performance levels relative to the norm and superior performance levels in the industry. Benchmarking can therefore set objective performance targets that are superior to the industry norm and that move utilities in the direction of better performance levels that would be expected under competition.

While this approach has some conceptual appeal, it also entails considerable risks. Most importantly, it places great weight on knowledge that is difficult to attain and inherently uncertain, such as the relationship between average and superior performance levels in competitive industries. It also relies heavily on the accuracy of benchmarking methods. These methods are particularly uncertain about what constitutes the industry's performance "frontier." This approach will therefore be especially risky if regulators

believe that regulation should move all companies to the frontier. Overall, this method places a premium on sharing speculative performance gains with customers and therefore puts utilities at risk if these gains do not materialize.

A simpler and less risky approach is to include a stretch factor component to the X factor in a multi-year, CPI- X rate adjustment formula. Benchmarking can be used to inform the value of the stretch factor as well as determine when it is appropriate to remove the stretch factor. For example, the stretch factor can be eliminated when benchmarking studies demonstrate that the company's cost performance is significantly lower than expected, by a certain threshold amount (say 10% below the predicted cost of service). This result implies that the utility's customers are already benefiting from superior performance levels. Like the first option, this benefit-sharing approach does not depend directly on the company's actual performance gains, but it places less emphasis on speculative and uncertain information.

Ontario's third generation incentive regulation plan for electricity distributors does, in fact, use benchmarking evidence to inform the relative valuations of stretch factors. Distributors are assigned into one of the three efficiency "cohorts" depending on how they perform on two separate benchmarking studies. Relatively more efficient distributors were assigned lower stretch factors. Implicitly, this approach is consistent with designing rate regulation to encourage energy networks to improve their cost performance and to reward them when they do.

Many paths can be taken towards using benchmark-based performance standards to encourage long-run cost performance objectives. When evaluating different alternatives, regulators should consider how options differ in terms of risk and information requirements. The approach that is most appropriate in any given situation will depend on a number of factors, including the institutional environment and the amount and quality of data that are available. In all cases, however, several factors should be kept in mind when making the competitive market paradigm operational.

First, in competitive markets, movements towards long-run efficiency levels will take place gradually. One reason is that adjusting company operations to achieve greater efficiencies is usually costly. Companies must in general devote resources towards improving their performance, and payoffs from those actions in improved efficiency

typically take time to materialize. This process can be expected to be especially long for industries such as electricity distribution where assets are dedicated to serving particular customers (*e.g.* directly delivering to a customer's premises) and therefore have less value in alternative uses. It is particularly costly to adjust operations in this case since many assets have secondary market values far below their current values. Discarding existing capital can therefore lead to large capital losses which, in turn, tends to increase the rigidity of capital stocks. For this and related reasons, any movement towards benchmark-based performance targets should take place gradually.

It should also be remembered that price levels in competitive markets reflect the industry's average efficiency performance. This means that firms with superior performance earn above average returns. This is true even in the long run. This implies that it is not reasonable to impose "frontier" performance standards on all firms in the industry since this does not allow returns to be commensurate with performance. Companies must always have "room" to outperform the benchmark that is reflected in the prices they face. This enables the firm to be appropriately rewarded for superior performance. If the industry's best-observed practice is imposed on all firms, any firm that fails to achieve this standard will earn below average returns. This would be true even for superior performers that nevertheless fall short of the industry's best performance. This outcome is clearly contrary to having returns be commensurate with performance and thus is not consistent with effective regulation.

It is also important to recognize that there will be considerable uncertainty about what constitutes a "frontier" performance level. Targets established through benchmarking should be cognizant of this uncertainty. Regulators should not impose performance standards for which there is significant probability that well-managed utilities will fail to achieve these targets. The benchmarks should therefore make appropriate allowance for the uncertainty associated with attaining the target performance levels.

Finally, it should be recognized that using benchmarking as a tool to second-guess utilities' expenditure forecasts in the fundamentally cost-based, building block approach to CPI-X regulation largely misses the point about the potential value of a TFP-based regulatory approach. Our incentive power work (including the incentive power report

previously referenced in this submission) shows that TFP-based regulation can create far stronger incentives and long-run benefits for customers and utility shareholders than building block regulation. This conclusion will almost certainly remain true when building block regulation uses benchmarking in an attempt to overcome information asymmetries and discover a utility's "efficient" costs. As explained in my initial submission in the AEMC review, TFP-based regulation represents an alternative and more effective means of overcoming information asymmetries, to the ultimate benefit of all stakeholders.