Submission to Australian Energy Market Commission: *A Model of Building Blocks and Total Factor Productivity-Based Regulatory Approaches and Outcomes* Report

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Submission to Australian Energy Market Commission: *A Model of Building Blocks and Total Factor Productivity-Based Regulatory Approaches and Outcomes* Report

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The Australian Energy Market Commission (AEMC) is undertaking a review into the use of total factor productivity for the determination of prices and revenues. This review is examining whether to add a "TFP-based" option for network price regulation to Australia's current energy regulation framework. In December 2009, the AEMC issued its *Preliminary Findings: Review into the use of Total Factor Productivity for the Determination of Prices and Revenues* (the *Preliminary Findings* Report), which presents its preliminary conclusions regarding the merits of a TFP-based option. In that report, the AEMC said it found a spreadsheet model developed by Pacific Economics Group (PEG) for the Essential Services Commission of Victoria (ESC) to be useful for evaluating the merits of TFP-based and building block methodologies.

The AEMC has now undertaken spreadsheet-based research of its own on the merits of the TFP-based and building block regulatory approaches. This research has been presented in the June 2010 report *A Model of Building Blocks and Total Factor Productivity-Based Regulatory Approaches and Outcomes* prepared by Economic Insights (EI). The EI analysis is similar in some respects to PEG's spreadsheet simulations for the ESC which, as we noted at the time, was intentionally designed to be as simple, straightforward and transparent as possible. EI's analysis also considers more regulatory scenarios and a broader range of distribution businesses (DBs), so their work both builds on and extends PEG's spreadsheet model. EI's analysis also represents a step in the direction of PEG's incentive power model, which remains the most rigorous and flexible tool for evaluating the incentives and outcomes of alternative regulatory designs.[1]

I strongly support EI's spreadsheet analysis. EI's results reinforce the ESC spreadsheet results – and indeed, the entire body of research that the ESC has supported – on the merits of a TFP-based regulatory option. This submission will not critique the details of the EI approach, because any differences between EI and myself on these issues

[1] The incentive power model is based on an explicit optimising framework, which includes the role of forward-looking forecasts in the building block approach, and is therefore far more complex than a simple spreadsheet model. Brattle has presented a critique of this model, but it largely did not understand the model and its criticisms were entirely without foundation (other than the fair point that the particular model it was examining did not explicitly model the role of uncertainty and risk, although other variants of the incentive power model do consider these issues). For further details, please see Chapter Four of my April 2010 *Submission to Australian Energy Market Commission: Preliminary Findings Report.*

are minor. Instead, this submission provides auxiliary comments that are pertinent to the AEMC's completion of its Phase I review and (potentially) the commencement of Phase II work on these issues. My comments concern: 1) the implications of EI's most recent report for the TFP specification; and 2) some implications of the 2009 Victorian Bushfires Royal Commission Report (issued on July 31, 2010), particularly with respect to the depreciation of electricity distribution assets; the merits of the TFP-based option; and the desirability of having a separate TFP-based approach for Victoria's electricity distribution industry.

TFP Specification

EI's spreadsheet modeling is not focused on the TFP specification *per se*, but it does contain statements that are relevant to the debates that have taken place between EI and myself on these issues. In particular, EI writes:

> There has been some debate about whether just 'billed' outputs (ie outputs explicitly charged for) should be included in the TFP measure or whether both billed outputs and 'unbilled' outputs (ie outputs of value to the user – such as system reliability and redundancy – but which are not explicitly charged for) should be included…because marginal costs are not readily observable and their estimation would currently require the use of econometric methods, it will be *necessary* to rely on including *only* billed with outputs with revenue share weightings in TFP measures in the short to medium term (emphasis added).[2]

In practical terms, this statement indicates that the output specification for TFP measurement has now been resolved in favor of the approach I have advocated and which has been employed in the ESC's TFP research for Victoria's electricity and gas distributors. I also believe this is the conceptually correct approach for TFP-based regulatory approaches but, in any event, have always tried to focus these debates on practical rather than theoretical issues. It is therefore important to note that, in practical terms, there has now been closure on what has in reality been the main difference between EI and myself on how TFP should be measured when implementing TFP-based regulation (and which differs fundamentally with how EI measured TFP for electricity distributors in New Zealand).

[2] Economic Insights, *A Model of Building Blocks and Total Factor Productivity-Based Regulatory Approaches and Outcomes*, 29 June 2010, p. 7.

The one remaining, important difference between EI and myself regarding the TFP specification is the measurement of capital. EI has long maintained that energy infrastructure capital exhibits *no* physical decay or loss of productive services from the day this capital is installed until the day it is replaced. This is known as "one hoss shay" depreciation, and it is a necessary condition for using 'physical' metrics to measure capital, which EI also favors. If there is *any* loss of capital services while capital is in place, physical metrics should never be used to measure capital inputs.[3]

In my previous submission, I noted that EI has – literally – put forward no evidence to support this position. Moreover, my previous submission demonstrates that, even if every energy distribution asset obeys "one-hoss shay" depreciation, it is not appropriate to measure an *industry's* capital inputs using physical metrics as long as there is heterogeneity in capital retirement patterns among firms in the industry. This is sometimes referred to as the "portfolio effect," and any evidence of capital portfolio effects indicates that physical capital metrics must not be used to measure capital even if every asset exhibits one hoss shay depreciation.

Since the *Preliminary Findings* Report and EI's spreadsheet modeling, the Victorian Bushfires Royal Commission has released the findings of its investigation into bushfires in the State of Victoria. The Royal Commission report received and analysed submissions on the extent to which electricity assets, and distributors' asset management practices, may have contributed to the risk and incidence of bushfires in the State. In this regard, it should be recognised that a logical implication of EI's position on energy infrastructure depreciation is that gradual impairment and aging of distributor assets have **no** impact on the risk of bushfires. This is simply because if energy delivery assets exhibit one hoss shay depreciation (as EI contends), these assets experience absolutely no physical decay or loss of productive services from the day they are installed until the day they are replaced. The condition of every infrastructure asset is therefore, literally, the

[3] The only reasonable exception to this rule would be if monetary-based measures of capital are either non-existent or so factually suspect that physical capital metrics are more reliable. This can sometimes be the case in developing countries, or countries that have experienced in hyperinflation. These conditions do not apply to Australia; even if there is some disagreement about the quality of monetary values of initial capital stocks, most of the industry has now undergone more than a decade of reporting and regulatory reviews of the monetary value of distributors' capital expenditures.

same, and no asset is less safe now than on the day it was installed. This may sound extreme, but one hoss shay is an extreme depreciation assumption. Any increased risk of failure from an energy infrastructure asset (which can in turn be manifested as a public safety hazard) is simply incompatible with a one hoss shay pattern of depreciation.

The Royal Commission Report is replete with evidence that electricity assets deteriorate over time and, therefore, do not display one hoss shay depreciation. For example:

> "SP AusNet provided to the (Royal) Commission the results of a study of its conductor fleet, which noted, among other things, 'The primary issue facing SP AusNet is the increasing age profile and deteriorating performance (2 % per annum) of steel and copper conductor through failure…"[4]
>
> "Powercor submitted that the data show that its maintenance regime is working because 'deteriorated assets are…detected before they fail"[5]
>
> "…in severe weather conditions (in particular, high winds) deteriorated tie wires carry real potential to cause fire and are an example of a 'hidden defect.' As Professor Hastings stated '…[a broken tie is] a hidden defect because it is not an in service failure but it is this degraded state. I think a lot of the issue with distribution networks and their situation in relation to high fire danger days is related to keeping the number of these defects which have not yet progressed to failure under control or to a desirably low level"[6]

Other statements could be cited, but these findings are sufficient to show that electricity distribution assets are not characterized by one hoss shay depreciation. The distribution businesses themselves say their assets deteriorate over time, and deteriorated assets can be detected and replaced or repaired before they fail. Moreover, the Royal Commission findings show that it is frankly dangerous to assume, as EI does, that electricity distribution assets do not deteriorate since they appear to be providing power delivery services. "Hidden defects" exist before infrastructure assets progress to complete failure, and these hidden defects necessarily entail a loss of productive services (and increased risks) and physical deterioration over time.

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[4] *2009 Victorian Bushfires Royal Commission, Volume II: Fire Preparation, Response and Recovery*, p. 151.
[5] *2009 Victorian Bushfires Royal Commission, op cit*, p. 152.
[6] *2009 Victorian Bushfires Royal Commission, op cit*, p. 152-153.

In sum, I believe the Royal Commission Report provides important evidence for the AEMC to consider. The findings of the Royal Commission provide even more support for the view that that energy infrastructure assets do not exhibit one hoss shay depreciation. It follows that monetary, rather than physical, metrics should be used to measure capital when estimating TFP trends for energy utility industries.

In addition, because the PEG/ESC TFP specification embodies both monetary capital measures and the output specification which EI now says is necessary for measuring energy utility TFP in the short to medium term, the Royal Commission Report provides important support for the PEG/ESC TFP specification. This TFP specification has also been employed to estimate TFP trends for both electricity and gas distributors in Victoria. This ESC's TFP work can therefore be the foundation and starting point for a TFP-based regulatory approach in Australia. There is no need to delay eight years to implement this option, particularly since the purported need for delay rested (in part) on a TFP specification which has now been acknowledged to be impractical.

Implications

The Royal Commission Report also implicitly strengthens the rationale for adding a TFP-based regulatory option. The Commission's recommendations will lead to legislative and policy actions that put greater onus on businesses to manage their safety risks more effectively. Bolstering the safe operation of electricity distribution assets is, by its nature, an extraordinarily location-specific task. Utility managers must undertake dozens of inter-related and complex decisions that depend directly on the physical environment, particular customer locations, the condition of existing assets serving current (and projected) customers, and the opportunity to deploy new or different technologies. This requires a decentralized and highly 'granular' level of decision-making, to ensure that these decisions are undertaken in the most efficacious and cost-effective manner. Moreover, the distributors themselves are unlikely to know in advance how best to satisfy the new safety obligations, since the optimal choices for investment and operational practices will vary across space. In addition, because the enhanced safety management scheme regime is new, there is considerable uncertainty about how it will be

implemented and administered and thus even more uncertainty than under 'business as usual' about the best course of distributors' decision-making over time.

These circumstances will further complicate the operation of the building block model. Distributors' "safety management schemes" will impose additional, and relatively new, information burdens on regulators. Evaluating the safety scheme investments and operational decisions also involves far more tradeoffs and complexities than previous building block reviews. It will also be difficult for distributors to forecast these expenditures *ex ante*, since the safety regime and the businesses' response to it will both be evolving in 'real time' and cannot be forecast with certainty. The ability to assess and divine "step changes" at such a granular level is also problematic for regulators. All of these factors indicate that the traditional information asymmetries and burdens are likely to grow even more pronounced in the future, as distributors struggle to comply with new safety requirements.

These challenges can be managed more effectively under a TFP-based approach. This will be so for two reasons. First, the TFP-based approach contemplated by the AEMC will contain a capital module. This module can allow distributors to petition for relief for the larger, discrete, identifiable capital projects *after* those projects have been put in place and their costs observed. This is likely to be a more appropriate means of recovering these costs than the building block methodology, since even the distributors' responses (let alone the costs of responding) to the new safety regime are difficult to forecast in advance. Second, the costs of operational and smaller, but in aggregate significant, capital changes that may accompany the new regime can also be flowed through gradually, and directly, into the industry TFP measure over time, since they will result from industry-wide mandates. Again, because it is difficult to see how these industry-wide changes will unfold in advance, it may be more efficient for these changes to be effected incrementally through their gradual impact on the industry's measured TFP trend.

It is also important to recognise that the enhanced bushfire safety regime will be specific to Victoria, rather than to all of Australia. This implies that the costs of new safety mandates will be borne only by Victorian distributors. All else equal, the impact of new safety regulations will raise costs and slow TFP growth for Victorian distribution

businesses vis-à-vis the rest of the country. This strengthens the case for having a separate, TFP-based approach for the Victorian electricity distribution. Fortunately, such an option is feasible, since the ESC's TFP existing TFP research can provide a ready source of information on TFP trends for the Victorian distributors, and these TFP trends can be updated to include the costs of new safety mandates. However, this difference between Victorian and other Australian distributors may also imply that the nationwide TFP trend should be adjusted to remove the impact of the safety regime on TFP growth for Victoria's electricity distributors. While this would complicate the operation of a TFP-based approach, this issue is not insoluble in principle, and it could be addressed as part of the AEMC's Phase II analysis.