Submission to
Productivity Commission:
Electricity Network Regulation
Draft Report

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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 a Draft Report (the Report) on this general topic in October 2012. The Report provides analysis and draft recommendations on a variety of benchmarking, regulatory, and institutional issues confronting Australia's electric power industry.

This submission presents my views on the Commission's conclusions in the Report regarding benchmarking and regulatory issues. As I noted when commenting on the Commission's previous *Issues Paper*, these views reflect my experience advising on benchmarking and related topics for nearly 20 years around the world. This includes extensive experience throughout Australia and New Zealand.

Regarding the Report's technical analysis, the Commission should be commended for undertaking a thorough review of benchmarking issues. The Commission has clearly done its homework and assimilated findings from a wide range of studies (both theoretical and empirical) on many aspects of benchmarking. Volume Two of the Report also contains valuable information on important technological developments that may be transforming the power delivery industry. Some of the Draft Recommendations regarding benchmarking (particularly Draft Recommendations 8.9, 8.10, 8.11 and 8.12) are also sound and can help provide a foundation for developing robust benchmarking studies in the future.

However, the Report fails to address, or even acknowledge, some fundamental issues about designing effective regulation for electricity networks. This is ironic, because the Report recognizes that "there are significant dangers in bolting-on 'solutions' based on benchmarking…if the surrounding regulatory edifice is rotten" (p. 71), yet in some respects the Report adopts such a "bolting-on" perspective. More specifically, the Report views cost (and perhaps reliability) benchmarking as an adjunct to a cost-based regulatory regime. Within this cost-based regulatory framework, benchmarking is viewed as a tool that can help regulators identify the Holy Grail of efficient costs, which they can, in turn, translate into efficient prices for regulated services.

This viewpoint ignores one of the most significant debates prior to and following Australia's early energy privatizations in the mid 1990s. In doing so, the Report fails to revisit and articulate the original vision that prompted much of the original energy reforms a decade and half ago. Now on the cusp of further potential privatizations, Australia runs the risk of repeating the same mistakes that will undermine the long-term interests of taxpayers and consumers.

The main deficiency of the Report is that it fails to consider the potential for external, TFP-based benchmarks to be integrated into a rule-based regulatory framework that encourages distributors to deliver greater *value*, and not just lower costs, to their customers. This is particularly important given the technological developments that are described in Volume Two of the Report and the obvious need for the industry and markets to evolve by engaging with consumers and offering new value-added products and services. Regulators or governments cannot simply mandate these outcomes; they can only establish appropriate institutional frameworks that encourage businesses to provide long-run value to customers. As Nobel Laureate economist Douglass North has written:

> "(D)ifferent institutional rules will produce different incentives… the particular institutions will not only determine the kinds of economic activity that will be profitable and viable, but also shape the adaptive efficiency of the internal structure of firms and other organizations… rules that encourage the development and utilization of tacit knowledge and therefore creative entrepreneurial talent will be important for efficient organization."[1]

More than ever, governments and consumers need an energy delivery industry and broader energy market that aligns the interests of consumers and businesses rather than encouraging perpetual, zero-sum regulatory games financed by ever greater exactions on the ratepayer. The existing regulatory and institutional rules have led to the

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[1 1] D. North, *Institutions, Institutional Change, and Economic Performance*, Cambridge: Cambridge University Press, p. 81. While the term "tacit knowledge" can be used in different ways, it most often refers to productive knowledge that is embedded in organizations and firms and takes effect through those organizations' routines and internal processes. In this sense, productive tacit knowledge is closely related to the idea of a productive "corporate culture."

situation Australia now faces, and I believe the Commission should advocate fundamental regulatory changes necessary to create the energy grid and marketplace of the future. This includes giving government an opportunity to reset its long-run regulatory vision; articulate how external regulation helps to deal with many of the intractable issues confronting the industry, including creating appropriate investment incentives and integrating infrastructure with energy market objectives; and recommending a transition path towards an external form of regulation that builds on the extensive work done on this issue in Victoria (and referenced in my previous submission). It is important for this transition to begin quickly and not to wait many years for data sources to be perfected.

In this submission, I begin by describing the problems with appending benchmarking to cost-based regulation. I then discuss why the difficulties of cost-based regulation are likely to become more severe in the future given the technological changes that are taking place in the power delivery industry. This section also addresses the deficiencies of attempting to rectify the problems of cost-based regulation through some of the institutional and governance solutions suggested in the Draft Report, in part by considering the US regulatory experience. Next, I address the merits of developing an alternative, "external" regulatory model. Finally, I respond to a few, miscellaneous points from the Draft Paper and present brief concluding remarks.

Benchmarking and Cost-Based Regulation

A good reflection of the Report's attitude regarding the role of benchmarking appears in Section 2.7, entitled "What is at stake?" The Report addresses this question by noting that "the electricity network industry commands a large amount of resources and provides services throughout the economy. This suggests potentially large benefits from reducing even small (cost) inefficiencies, let alone those of the magnitude suggested by some participants….(t)he incorporation of benchmarking into incentive regulation (or even the publication of benchmarking results) attempts to eliminate such inefficiencies" (pp. 111-112).

The ellipsed portion of this passage elaborates by noting that, like the problems of unhappy families in *Anna Karenina*, inefficiency can be manifested in many ways. The Report cites six sources of inefficiency: 1) premature investment in capital; 2) inefficient use of existing capital (*e.g.* because of poor maintenance practices); 3) excess capital spending, or "goldplating"; 4) poor project management leading to excessive capital investment costs; 5) excessive or poor use of labor; and 6) paying excessive prices for labor or capital inputs.

However, identifying and quantifying each of these potential inefficiencies would be a formidable task for even the most sophisticated benchmarking analyst. These challenges are magnified in a regulatory context, because utilities will naturally respond to any study which alleges that they are efficient by challenging the evidence and perhaps commissioning counter studies. Regulators would then be forced into resolving extraordinarily complex and murky technical debates on benchmarking methods. This process could even encourage regulators to bore into the minutiae of utility decision-making, particularly if a study suggests that inefficiency has arisen because businesses "invest prematurely," have excessive costs "due to poor project management," or similar factors that indict the choices of utility managers.

Regulatory second-guessing and micro-management of this kind is expressly contrary to the purpose of incentive regulation. Incentive regulation is designed to create the right incentives for utilities to be efficient, so that they will be encouraged to use the knowledge of their businesses in a way that creates value for both customers and shareholders. When regulation is designed in this manner, regulators can be more certain that the regulatory framework itself is consistent with achieving regulatory objectives. There is accordingly less need for them to undertake the detailed cost examinations and prudency assessments that have long been central to cost of service regulation and which regulators are, frankly, not well-positioned to undertake, since they will always know less about the businesses they regulate than utility managers. These so-called information asymmetries are the fundamental reason that cost of service regulation has poor incentive properties and why economists have advocated alternative regulatory methods that create better incentives.[2]

Not to put too fine a point on it, the Report appears to view benchmarking as a tool regulators can use to improve their reviews of the prudence of utility costs. Prudence reviews are an element of cost of service regulation, not incentive regulation. In fact, incentive regulation can be interpreted as a *substitute* for prudency reviews since they are alternate means of achieving the same objective (*i.e.* efficient utility operations).

The Report may have been led to this position because it has not recognized that the building block approach to incentive regulation is reminiscent of cost of service regulation as traditionally practiced in North America. Bolting benchmarking onto the building block model does not change this fundamental affinity. Under both cost of service and building block regulation, regulators establish revenue requirements for a specific firm that are just sufficient to recover that particular firm's costs. The main difference is that the building block approach sets a defined period between regulatory reviews (or a defined period for "regulatory lag"), which creates somewhat stronger incentives for operating efficiently while the plan is in effect.

However, like traditional cost of service regulation, building block regulation does not create strong incentives for longer-run dynamic efficiency. One important reason is that both regulatory systems link returns directly to the regulated asset base (RAB) and the regulatory-determined company specific costs. As cost-based regulatory systems become more mature and regulators remove (arbitrarily or otherwise) the "transient" rents, networks will then have little incentive to reduce capital expenditures and, indeed, are rewarded when RAB increases. In that environment, networks have little to gain and much to lose from any actions that reduce RAB. This becomes particularly important given the new technological environment in which power delivery networks are operating, as will be explained further in the next section.

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[2] The practice of incentive regulation in Australia has been plagued by similar problems. For example, Victoria discovered that its building block model did not create "neutral incentives for expenditure on capex and opex" (p. 181 of The Report), even after "efficiency carry-over mechanisms" were appended to this cost-based approach in order to rectify the lack of "neutrality" between incentives to control capital and operating expenditures; see http://www.royalcommission.vic.gov.au/getdoc/d09c58ae-4770-4cae-9435-586148b53398/PAL.019.001.0636.

The need to determine "regulated" asset bases and operating costs can also raise cost allocation issues, particularly if networks are providing both regulated and non-regulated services. Costs of inputs that are used to provide regulated and non-regulated services must be allocated in some way. Such allocations are inherently arbitrary and usually controversial, since network managers have incentives to allocate the largest possible share to the regulated business. New and competitive market opportunities can also be pursued through unregulated affiliates, but this can create new controversies surrounding the pricing of utility-affiliate transactions.

Cost-Based Regulation and the Evolving Electric Power Industry

Cost-based regulation is particularly problematic given the current technological evolution of electricity networks. While the Report discusses a number of these technological developments, at times it appears to assume that networks simply provide the infrastructure necessary to connect energy producers with consumers but otherwise have little role to play in achieving broader energy market objectives. For this reason, the Report appears to take it for granted that electricity networks are and always will be natural monopoly networks, even in light of current technological changes.

This view fails to appreciate networks' potential contribution in both upstream and downstream energy markets. If they are properly motivated, networks can help the entire energy value chain respond to new policy demands and at the same time be regulated and provide an effective open access regime Moreover, energy networks can make these contributions without receiving either direct or indirect subsidies from the public. Well-designed regulatory frameworks that use external performance metrics such as *industry* total factor productivity (TFP) trends – not company-specific benchmarks - can encourage behavior that rewards networks for taking risks, investing in non-network solutions , integrating into existing competitive markets and thereby promoting broader energy market goals. Before we examine why this is the case, it will be instructive to review some recent technological developments that have important implications for how Australia and other advanced nations can achieve their energy efficiency objectives. Some of this discussion echoes points made in the Report, but it will be valuable to review these features before discussing their implications for appropriate regulation.

Advanced Metering Infrastructure or AMI is critical for both the current and future energy marketplace. At its most basic level, AMI is designed to automate the process for recording customers' power consumption, but it can also create a much wider array of benefits. AMI systems generally involve three interrelated components. The first is the metering units themselves, which are far more sophisticated than the "accumulation meters" that have essentially been in place since the industry's inception. The second is the information networks that are used to transmit data on customer consumption to the utility. Some AMI networks also allow data to flow in two directions, from the customer to the company and from the company to the customer. The third component is the meter data management system, where data on customer consumption and market conditions are stored and accessed.

AMI provides a number of benefits to energy distribution networks. Automated meter reading saves costs that would otherwise be incurred from manual meter reads. AMI can also provide "real time" information on the operation of the distribution system, which allows companies to locate faults that lead to power interruptions more quickly and accurately. In addition to enhancing the reliability of service provided to customers, better information on fault location can be used to optimize the size and dispatch of work crews, thereby reducing operating costs. AMI can also monitor the loading and condition of distribution system components, which can help companies optimize their inspection and maintenance cycles as well as extend the periods for replacing capital equipment. Automated meter reads also tend to improve billing accuracy and the timeliness with which bills are produced, thereby improving cash flow and the quality of billing service provided to customers.

In addition to providing these benefits for energy networks and their customers, more sophisticated metering systems will be increasingly necessary for distributors to cope with the more diverse and "distributed" (*i.e.* less centralized) nature of new generation technologies. Nearly all distribution systems are "radial" or designed for power to flow in one direction (from the bulk transmission system to the end user). Distributed generation (DG) units that are connected to the distribution network can lead to power flows in more than one direction, potentially decreasing the stability of electrical systems. This can affect the extent to which connected loads and generators interact with each other and, particularly when outages occur, the presence of DG units can lead to broader system instabilities. DG can also complicate the restoration of service whenever faults on distribution lines occur.

AMI is critical for helping distributors cope with these challenges. "Real time" information on the loading of distribution system components can be critical for monitoring the impact of DG units on the stability of the overall distribution system and for efficiently dispatching a portfolio of renewable (including wind) and distributed generators. Distribution AMI investments are therefore an important and increasingly essential complement to the renewable and DG units that are becoming more prominent in the energy marketplace.

There are a range of available AMI vendors, employing different technologies and offering diverse functionalities. The broadband, two-way communication systems tend to be the most expensive but also offer the greatest functionalities in terms of network "intelligence" and being able to monitor and optimize system conditions. These more advanced AMI technologies tend to promote energy efficiency objectives most effectively, since they lead to fewer line losses (*i.e.* energy that is generated but lost during delivery to end-users), unnecessary outages and other inefficiencies that contribute to greenhouse gas emissions (GHG). As discussed, the choices for networks' initial AMI technologies can have important implications for longer-range energy efficiency and GHG objectives. In general, the business case for more sophisticated AMI systems is enhanced when distributors are integrated into related activities like retailing, since such vertical integration allows a company to capture a greater range of the benefits created by these systems.

Given the significant benefits from AMI, the fact that networks and retailers have not invested in large scale AMI voluntarily may be seen as somewhat surprising. One important part of the reason is that, as suggested above, AMI tends to create "split benefits," or benefits that are distributed among multiple parties rather than captured entirely by the network undertaking the investment. An ability to integrate across different businesses would help companies consolidate those benefits and thus more willing to undertake AMI investments but, as we will explain, such integration has been discouraged by network regulation and the risk-averse corporate and financial structures it has spawned.

Another issue regarding AMI deployment is standardization. There are currently no industry AMI standards, and the multiplicity of AMI technologies and vendors may lead to incompatibility of the equipment used by different players in the marketplace. In addition to encouraging investment in the more sophisticated systems, vertical integration by the distributor among all aspects of the AMI infrastructure (meters, communication systems and meter data management systems) is a straightforward method for reducing concerns about standards and interoperability.

The lack of agreement on AMI standards also raises an important issue about risk. In mandated AMI rollouts, governments and regulators are inevitably drawn closer into making decisions about AMI technologies and ensuring compatibility among different market agents. The costs of these decisions are passed through to customers in regulated network rates. Because AMI investments can have implications throughout the energy marketplace, there are considerable risks to getting the technology decisions "wrong." These risks under mandated programs are ultimately borne by consumers, unlike more market-oriented arrangements where networks would act voluntarily and take a greater share of risks. Networks have much stronger incentives to invest efficiently when they bear the risks and reap the rewards of their own decisions. In fact, mandating AMI rollouts and shifting risks to customers is an example of what economists refer to as "moral hazard," or the possibility that agents will act sub-optimally when the risks of their actions are redistributed to other parties. For companies to be willing to take risks, however, there must be a compensating potential for greater upside returns, which is typically not possible under the building block regulatory methods used to regulate Australian networks.

Distributed Generation I have already mentioned the increasing importance of DG, but the relationship between DG and network infrastructure is complex. As discussed, AMI investments can help distributors cope with the challenges of managing distribution systems when distributed and renewable generation sources are being dispatched. But at the same time, DG units can provide voltage control and ancillary services such as spinning reserves that can help networks manage system stability.

Energy networks can therefore benefit directly from owning, operating and dispatching DG units.

It should also be recognized that DG can serve as a substitute for energy network investments. Because DG is located closer to customer loads than more centralized generation sources, the need for transportation capacity to move power from supply to demand points is reduced. Networks can therefore use DG to avoid or defer the investments that would otherwise be needed to augment energy transportation capacity. Locating generation closer to end uses also reduces line losses and the energy that must be generated to meet final demands, thereby contributing to lower GHG emissions. Greater reliance on DG also reduces the need for, and defers investment in, larger generation stations, which again increases the probability that cleaner technologies will be utilized when those investments are ultimately made. All of these factors demonstrate that DG can be an important "input" into network operations, with positive benefits in terms of operational flexibility and promoting energy market objectives. Properly motivated networks would consider DG when evaluating investment choices and indeed design their networks to facilitate the range of distributed generation sources that increasingly become available. .

However, the current, cost-based regulatory system inadvertently discourages such considerations and similar actions that can improve overall system efficiency and energy conservation goals. One particularly negative consequence of cost-based, building block regulation is that it can prevent networks from integrating efficiently across different elements in the energy value chain. More generally, cost-based regulation discourages networks from offering the full range of services that can create value for both shareholders and customers.

Consider the case of a distributor owning and operating a DG unit. As discussed, DG can be used to enhance the stability of network operations, reduce the need for network investments and, of course, generate and sell energy to end users. However, networks have financial incentives to forgo DG investments whenever they reduce the network's overall regulated asset base or reduce "distributed" energy sales. A DG investment would in fact reduce the RAB whenever the incremental cost of the DG investment was less than the incremental cost of network expansions – but this is exactly the condition that needs to be satisfied for DG to be a more cost effective and efficient solution for meeting infrastructure needs! Cost-based, building block regulation therefore discourages networks from providing integrated value solutions that involve infrastructure and energy assets, and encourage them to remain locked into traditional, "natural monopoly" business models of providing only ostensibly "least cost" regulated infrastructure.

In addition, under building block regulation, cost allocation issues will arise when the DG unit is used to support regulated operations and sell energy in non-regulated markets. The network is also unlikely to capture all the benefits of DG energy sales in related markets; especially since a "regulated" asset was used to provide competitive services, the network may have to pass some of DG sales revenues through to regulated customers in the form of lower network charges. For all these reasons, building block regulation creates inherent incentives for networks to forgo DG investments when these investments are more economical than network expansions. A failure to invest efficiently in DG would also lead to the loss of the auxiliary energy efficiency and conservation benefits that have been discussed.

These perverse incentives can be further "locked in" as utility financial structures and corporate cultures adapt to the incentives created by the building block model. Since building blocks tend to discourage dynamic efficiency and prudent risk taking (*e.g.* through efficient vertical integration), capital markets will as they have done over time inevitably establish highly geared (*i.e.* leveraged through debt), risk-averse business models and management styles. An example might be a privatized enterprise where retail is separated from distribution operations, with the remaining network financed largely through bonds and the residual equity marketed as a "widows and orphans" stock to investors with a low risk appetite. By having little equity, the network business is relatively capital constrained and thereby lacks the resources and flexibility to pursue somewhat riskier investments, such as distributed generation, which can have important spillover benefits for the broader marketplace.

This can be contrasted with the experience immediately after privatization in Victoria where various networks (at that time integrated with retailing operations) pursued a variety of ventures that leveraged company expertise and assets into competitive market applications. Examples included advising customers on efficient lighting applications, providing HVAC maintenance and installation, energy service company operations, developing private networks, and participating in cogeneration, geothermal heating and cooling projects. These efforts required equity and were generally successful, but were largely abandoned after the regime increasingly took on cost-based characteristics. Capital markets concluded that returns would be driven more directly by the approved forecast regulatory revenues. A different regulatory approach that did not focus directly on maximizing the approved WACC on the regulatory asset base may have encouraged the businesses to remain more integrated and active across a range of businesses in the broader energy marketplace, which in turn could contribute to enhanced energy efficiency across the entire value chain on both the supply and demand sides of the marketplace.

Cost-based regulation is also likely to make it more difficult for regulators to evaluate the appropriateness of network capital investments as wind and micro renewable generation investments proliferate. For example, as discussed, AMI can be critical for helping networks manage their operations under these circumstances, but there is considerable uncertainty about the AMI technologies and investments that are most appropriate in a given instance. Under building block regulation, the burden ultimately falls on regulators for determining efficient investment levels, and this task will become more complex as renewable and distributed generation becomes more common. The information asymmetry problem and associated potential for gaming may become even more pronounced in the future under cost-based regulation.

It should be noted that none of the problems of evaluating technological changes under cost-based regulation can be significantly ameliorated through benchmarking. Benchmarking models are almost invariably estimated using historical data, which necessarily assumes that they reflect the nature and cost relationships inherent in historical technologies. Benchmarking models estimated using historical data cannot, by definition, reflect the technological relationships of new technologies that have not yet been deployed. It is very difficult to see how benchmark-based evidence will help regulators sort through the myriad difficulties (including those noted above) related to assessing investments that incorporate new and emerging technologies. More fundamentally regulators are not capable of assessing R&D as an approved element of building block calculations, given that R&D is generally pursued on the promise (as distinct from the guarantee) of superior returns.

Without addressing the focus and design of the regulatory regime, refinements to the resourcing of the Australian Energy Regulator or consumer groups (*e.g.* Draft Recommendations 21.1, 21.2 and 21.3) will do little over the longer term than create better funded adversaries. Increasing dollars for regulatory reviews will expand the amount of paper to be read and information to be assimilated, and it may increase the contentiousness of the process. It will not, however, help regulators in their search for the Holy Grail of efficient costs since this is a fruitless quest.

The US experience with cost-based regulation demonstrates the fecklessness of attempting to find efficiency through funding. California, for example, is one of the best-funded regulatory environments in the world. Dan Fessler was a Commissioner on the California Public Utilities Commission in the mid-1990s, and in a 1998 letter to Victoria's Office of the Regulator General (later to become the Essential Services Commission) he describes his experience with cost of service regulation as follows:

> In California, cost of service ratemaking was premised on a test year which developed revenue projections using a methodology functionally identical to the building block approach tentatively embraced by your Office. My alarm stems from the fact that I have been down that road and inhabited that dwelling. I can recommend neither the journey nor the destination. I have found such a regulatory approach to be an expensive gambit in the quest of an ultimately dysfunctional outcome.
>
> Irrespective of theory and what are undoubted good intentions, the products of cost of service ratemaking are both diseconomic and dysfunctional. Over time the dynamics engender an increasingly intrusive regulatory staff matched against an increasingly sophisticated array of utility game players. On the day I took up my duties at the Commission I found a professional staff in excess of 1200 at least half of whom were at various stages of careers focused on rate setting activities. Each utility had officers and staff formed into a "regulatory affairs" office dedicated to the preparation and litigation of rate issues. The irony was that both of these camps were ultimately financed by exactions on end users, termed "ratepayers." And what did they buy with their money? An endless exercise which focused the attention of management on building a "rate base." In such a setting, earnings were not generated through efficiency gains but on the magnitude of qualified investment. When challenged, a "reasonableness review"

> inevitably turned into a confrontational, trial type proceeding which, over time, engendered practices and a language built on acronyms to the point that "regulatory speak" ousted English. With the vocabulary no longer intelligible, it is little wonder that the public soon lost focus and interest. Price signals and fundamental costs were buried in "rates" that invariably rose.
>
> Indeed, if possible, the long term outcome was worse that I have depicted. About three years into my six year term it dawned on me that the grunts and groans of the classical antagonists bore a telling resemblance to professional wrestling. Included in the choreographed action were such third party interests as suppliers, unions, and others who inhabited the "cost column." Along with the utilities they asked "high" just as the regulatory staff inevitably recommended "low." Equally certain was the outcome: "middle." In this subjective, cost plus exercise terms like "efficiency" and "innovation" did not intrude.[3]

The Potential Benefits of External Regulation

"External" regulation is an alternative method for regulating energy networks. Compared to building blocks, external regulation creates maximum incentives for utilities to pursue profit-maximizing activities in both regulated and non-regulated markets. This will in turn lead to efficient integration across various businesses in which networks may achieve economies of scope (*i.e.* unit cost reductions that result from increasing the number of services provided by a firm) and, in the process, increase efficiency in upstream and downstream energy markets. External regulation finesses the cost allocation issues that bedevil such diversification under cost-based regulatory approaches, while also providing a light-handed but effective constraint on utilities' ability to exercise market power for natural monopoly services.

External regulation can overcome these concerns since, unlike building block regulation, it does not link overall price changes to each company's allocated cost of service. After initial cost-based prices are established, external regulation updates prices using information on industry TFP and input price trends. This approach is explicitly designed to mimic the operation and outcome of competitive markets, where the change in prices charged by a competitive industry is equal to the trend in that *industry's* unit cost, rather than the unit cost of any particular firm. The benefits of *industry* productivity growth are then passed to customers over time in the form of slower price growth.

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[3] Letter from Daniel Wm. Fessler to John C. Tamblyn, September 21, 1998.

However, because the industry unit cost trend is insensitive to action of individual firms, companies in competitive markets have strong incentives to improve their productivity.

External regulation uses these insights to operationalize the terms of CPI-X formulas. The values chosen for the CPI-X formula reflect the industry's historic trends in input prices and productivity. It is important to emphasize that *industry* rather than individual company measures are relevant for calibrating the CPI-X formula. This is necessary to comply with the competitive market paradigm, because the prices facing any firm in a competitive market are external to its costs or efficiency. Prices in competitive markets evolve in response to industry-wide trends in unit costs which, in turn, depend on industry input price and productivity trends.

Compared with a building block approach, external regulation can simultaneously enhance performance incentives, facilitate marketing flexibility, and reduce regulatory cost. Using data that are "external" to the firm in the CPI-X formula serves to break the direct link between a utility's own cost and marketing performance and its allowed prices. Because prices are based on external data, unit cost reductions do not decrease allowed price changes but go straight to the bottom line. This creates optimal incentives to control costs and pursue revenue generating activities in other markets.

Within this broader energy market context, external regulation can create positive incentives for networks to take actions that contribute to broader energy policy objectives. External regulation can therefore be an important complement to many current policy initiatives that are designed to remove *disincentives* for firms to pursue new opportunities efficiently. Compared to building blocks, external regulation creates positive incentives for utilities to pursue profit-maximizing activities in both regulated and non-regulated markets. This will in turn lead to efficient integration across various businesses in which networks may achieve economies of scope and, in the process, increase efficiency in upstream and downstream energy markets.

External regulation may further enhance performance by allowing many operating restrictions to be relaxed. This is especially true of marketing flexibility and operations in competitive markets. When utility revenues are based on external indexes rather the company's own costs, prices of monopoly services can be insulated from the company's involvement in competitive markets. This reduces, but doesn't eliminate, concerns about cross subsidies and the impact of uncertain competitive market initiatives on core customer tariffs. Networks will always try to find ways to mask their efficient cost levels in order to reduce the extent to which their own costs are reflected in lower prices or lead to more efficiency gains transferred to customers. But while this incentive never goes away entirely, it is greatly diminished under external regulation. The reason is that under building blocks regulation, there is a direct link between a company's costs and its prices. This link is broken under external regulation, and the way a company reports its costs (*e.g.* through changes in the allocation of overhead costs or transfer pricing arrangements) will affect the company's own prices only to the extent that its own costs affect the industry TFP trend. Under external regulation, networks cannot affect their prices to the same extent as under building block regulation unless the cost reallocations take place repeatedly, which would make them easier for regulators to detect. Thus while regulators must still be vigilant about how networks use their assets in competitive markets, their job should become easier under external regulation because it reduces networks' ability to profit from cost misallocations.

The combination of stronger performance incentives and reduced regulatory costs can have a salutary effect on utility management and corporate cultures. Managers are likely to be more effective as attention shifts towards the marketplace from the regulatory process. Stronger incentives to perform may also develop skills that can facilitate expansion of the utility business via mergers and acquisitions and successful involvement in other markets.

All of these features become more important when competitive pressures increase. Competitive environments require companies to react quickly and nimbly to unexpected developments. In energy markets, these developments include commercial opportunities and public demands for networks to promote conservation and energy efficiency. By mitigating concerns with cost allocations and reducing regulatory cost, external regulation can allow energy networks to be more active – and successful - in a broader array of energy markets.

Networks will also be far more motivated to pursue competitive market ventures under external regulation than building block regulation. Because allowed prices do not depend directly on allocated cost or revenues, networks have strong incentives to use their assets and expertise to generate revenues in related markets. Accordingly, external regulation can be instrumental for facilitating efficient diversification and integration of activities across the energy value chain.

Returning to the DG example considered earlier, networks under external regulation will evaluate DG versus network investments on the basis of relative incremental costs and revenues (including the extra revenues the network can earn from selling DG energy in related markets) rather than their impact on RAB. Networks would select DG investments when they are more cost effective in meeting investment needs and providing new sources of revenues, as would a firm operating in a competitive market. Efficient DG investments would also be likely to have a range of positive spillover benefits for the broader energy marketplace.

Response to Miscellaneous Points

Although this submission cannot address the entire Report in depth, they were a few additional points in the Report which I believe merit a brief response:

- Section 3.1 involves a discussion on "The characteristics of electricity networks," and concludes with the statement that "For the immediate future, it is likely that without regulation, electricity networks could exercise substantial and enduring market power. (In this respect, they are not like innovating businesses that create momentary rents that competing innovative rivals then bid away – as in many electronic products or drugs.)"

  I agree that most electricity networks will continue to exercise monopoly power for the foreseeable future. The issue is not if those networks will be regulated but how. At the same time, it should not be assumed that an industry that was once a natural monopoly will always remain a natural monopoly. This has obviously not been the case with many telecommunications services. There are a number of important technological innovations taking place for energy delivery networks that may someday radically diminish their market power, at least for certain customers and in certain situations. It is important for regulators to be cognizant of these developments (as the Commission clearly is) and not adopt regulatory approaches that unwittingly lock utility services into a "natural monopoly" cost structure.

- Page 165-168 discuss data problems and the implications for benchmarking. It should be noted that the impact of data errors and/or cost misallocations by utilities is greater under cost-based regulation than under external, productivity-based regulation. The reason is that under cost-based regulation, cost misallocations (assuming they are not identified and corrected) are immediately reflected in the allocated cost of service and therefore the price of service; this is not the case under productivity-based regulation. The appendix to this submission presents a mathematical analysis depicting and describing these differences.

- Page 198 discusses some of the controversies regarding determination of the WACC. It is worth noting that PEG has often used an economy-wide return on capital as the "return" measure in our TFP and benchmarking work. This represents the average return to capital in the entire economy, and it is a good proxy for the competitive rate of return overall, which is consistent with the "competitive market paradigm" typically used to calibrate external, regulatory approaches. Using this return measure in TFP and benchmarking studies eliminates much of the endless and futile debate regarding the appropriate value of the WACC, which is itself an abstraction far removed from the concrete financing decisions of privatized and government-owned businesses

Conclusion

Benchmarking can be an important tool for establishing the empirical parameters of an external, performance-based regulatory system. This includes parameters on industry TFP trends, as well as benchmark-based estimates of a utility's cost performance which is used to inform the choice of productivity "stretch" factors that are set *ex ante* and not adjusted on the basis of the utility's actual productivity growth under an incentive regulation plan. My previous submission provided references to a wealth of information that explains these points in detail, and also provides a significant amount of information on how to implement an external, productivity-based regulatory regime. This includes discussion on how to transition from cost-based to external, productivity-based regulation. The precise details of such a regime, including appropriate transition strategies, need to be assessed on a case by case basis, but again the referenced materials should be useful in helping the Commission work through these details. I strongly urge the Commission to recommend that benchmarking be integrated into an external, productivity-based regulatory regime rather than as a tool designed to identify the efficient costs of a given utility by evaluating the prudence of its operations. Unfortunately, the latter perspective appears to be implicit in much of the Commission's *Draft Report* and in so doing fails to provide Governments and the community with an integrating vision that will align the long terms interests of consumers and business.

Appendix: Cost Misallocations and the Impact on Prices

Let P_t = Price period t

C_t = Cost period t

Q_t = Quantity period t

$\widetilde{C}_t$ = Cost misallocation in period t

$\widetilde{P}_t$ = Price after misallocation in period t

Cost-Based Regulation

Under cost-based regulation, the price before misallocation is given by

$$P_t = \frac{C_t}{Q_t}$$

The price after misallocation is given by

$$\widetilde{P}_t = \frac{C_t + \widetilde{C}_t}{Q_t}$$

The impact of misallocation on final price (in percentage terms)

$$= \frac{\widetilde{P}_t - P_t}{P_t}$$

$$= \frac{\widetilde{C}_t}{C_t}$$

Also, the amount of cost misallocation in percentage terms equals

$$\frac{C_t + \widetilde{C}_t - C_t}{C_t} = \frac{\widetilde{C}_t}{C_t}$$

Therefore, the percentage increase in costs dues to misallocation exactly equals the percentage increase in price due to misallocation. Cost misallocations lead to a one to one, direct correspondence in prices under cost-based regulation.

Productivity-Based Regulation (PBR)

In PBR, where X is equal to the industry TFP trend computed over a period of *N* years, the percentage impact of industry cost misallocations on price will equal the impact (in percentage terms) of costs misallocations on the industry's TFP trend.

$\Delta TFP_t = \Delta Q_t - X_t$ by definition, where

$$\begin{aligned}\Delta TFP_t &= \textit{percentage change TFP in year t}\\ \Delta Q_t &= \textit{percentage change output in year t}\\ \Delta X_t &= \textit{percentage change input in year t}\end{aligned}$$

Also, $\Delta C_t = \Delta X_t + \Delta W_t$ using indexing (Divisia) logic

Where $\begin{aligned}\Delta C_t &= \textit{percentage change cost in year t}\\ \Delta W_t &= \textit{percentage change input price in year t}\end{aligned}$

Therefore

$$\therefore \Delta TFP_t = \Delta Q_t - (\Delta C_t - \Delta W_t)$$

The TFP trend in year *t*, computed over last *N* years, is given by

$$\Delta TFP^{trend} = \frac{\sum_{j=t-N-1}^{t} \Delta TFP_j}{N}$$

It was shown above that cost misallocations lead to the following percentage change in costs

$$Cost = \frac{\tilde{C}_t}{C_t}$$

This implies that following rates of change in industry TFP, with and without cost misallocation.

$$\Delta TFP_t \text{ without misallocation} = \Delta Q - \left(\Delta C_t - \Delta W_t\right)$$

$$\Delta TFP_t \text{ with misallocation} = \Delta Q - \left(\Delta C_t + \frac{\tilde{C}_t}{C_t} - \Delta W_t\right)$$

The difference of cost misallocations on TFP growth in year *t* is therefore $-\frac{\tilde{C}_t}{C_t}$. It follows that cost misallocations in year *t* lead to a percentage decrease in TFP in that year exactly equal in magnitude (but opposite in sign) to the percentage increase in costs. Because price changes are equal to CPI inflation minus X, cost misallocation would lead to the same impact on price under productivity-based regulation as under cost-based regulation if price changes in *t* reflected only TFP changes in *t*. However, price changes in year *t* depend on the TFP *trend* as of year *t*, which is computed over the last *N* years. The impact of cost misallocation in year *t* on TFP trend in year *t* can be determined from the formulas below.

$$\text{TFP trend without misallocations} = \frac{\sum_{j=t-N-1}^{t} \Delta TFP_j}{N}$$

$$\text{TFP trend with misallocations} = \frac{\sum_{j=t-N-1}^{t} \Delta TFP_j - \frac{\tilde{C}_t}{C_t}}{N}$$

$$\textit{Difference} = -\frac{\tilde{C}_t / C_t}{N}$$

Therefore, in productivity-based regulation, cost misallocations in a given year lead to $1/N$ the impact on prices in year *t* as they would under cost-based regulation, where *N* is the number of years used to compute the industry TFP trend. Hence if the TFP trend is computed over the last 10 years, cost misallocations have only 10% as much impact on prices as under cost-based regulation. Companies would therefore have to misallocate costs by same amount in each of the last 10 years to raise prices by as much as the one-time misallocation under cost-based regulation. Also, of course, under productivity-based regulation, ΔTFP depends on the industry's reported costs and cost-based regulation depends on a company's own reported cost. Under PBR, all companies in the industry must therefore collude every year to lower measured TFP and raise prices. This is much more difficult – and costly – than simply misallocating the company's own costs.