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Debunking the mythology of PBR in electric power

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ABSTRACT

PBR in the electric power industry has failed to gain the traction that incentive regulation experienced in the telecommunications industry. We do not believe institutional differences between the two industries fully explain why PBR has not gained the footing that the economics literature suggests that it should. It is time to debunk several myths that pervade industry and regulatory thinking on the merits of PBR that have had a deleterious effect on its adoption.

1. Introduction

In our recent article in this journal, we discussed myriad issues regarding the adoption of broad-based indexed PBR plans (e.g., price caps, revenue caps) in the electric power industry, particularly as it relates to the value of the *X* factor.[1,2] In that article, we argue that, despite an apparent regulatory aversion, a negative value of the *X* factor was reasonable and appropriate and, in fact, reflects the actual increases (or, in some cases, were less than the actual increases) in prices or revenues once all relevant information was considered. Following the publication of our recent article, the Massachusetts Department of Public Utilities rendered a decision in the Eversource proceeding and, in fact, adopted a negative *X* factor largely along the lines of what we proposed.[3] This marks the first time that a regulatory commission in North America has adopted an explicit negative *X* factor for electricity distribution.

In that proceeding we addressed several misconceptions about indexed PBR. In this article, we set forth and then debunk some of the common myths or misconceptions we have encountered regarding indexed PBR plans. These include:

Myth 1: Regulatory mandates are interchangeable with enhanced incentives in eliciting superior utility performance.

- Myth 2: There is no future for indexed PBR in the electric industry.
- Myth 3: Conservation and other societal goals cannot be achieved with indexed PBR.
- Myth 4: Negative *X* factors imply the industry is becoming less efficient.
- Myth 5: Negative *X* factors provide benefits to utilities that rightfully belong to consumers.
- Myth 6: Consumers are always better off with earnings sharing mechanisms.

Before proceeding to address these myths, we present a brief review of PBR mechanics to set the stage for the discussion that follows and to render this article self-contained.

2. Review of indexed PBR mechanics

As described in our previous article, broad-based indexed PBR plans take different forms,[4] including price caps, revenue caps, and revenue-per-customer caps.[5] The latter two are common in the electric power industry because they do not encourage demand growth and are therefore more compatible with conservation measures.

The maximum annual increase in the regulated firm's average prices (in the case of price caps), or revenues (in the case of revenue caps) are

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[1] Mark E. Meitzen, Philip E. Schoech, and Dennis L. Weisman, The Alphabet of PBR in Electric Power: Why X Does Not Tell the Whole Story, *The Electricity Journal*, 30 (2017) 30–37.

[2] The *X* factor determines the trajectory of prices/revenues over the course of the PBR term after controlling for inflation (i.e., real prices/revenues). Hence, a positive (negative) *X* factor allows prices/revenues to increase slower (faster) than the rate of inflation, abstracting from the other components of the PBR plan discussed below.

[3] Final Order, D.P.U. 17-05, Massachusetts Department of Public Utilities, Nov. 30, 2017.

[4] A broad-based PBR plan is one that permits substantial variation in the earnings of the regulated firm and does not link the variation explicitly to specific performance dimensions (e.g., service quality and reliability).

[5] In this article, we focus primarily on price caps for expositional purposes. However, our analysis applies equally to revenue caps and revenue-per-customer caps.

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Table 1
Relationship between I and X factors.

I Factor	*X* Factor
Industry Input Inflation, I_I	$X(I_I) = TFP_I$
Economy-Wide Output Inflation, I_E	$X(I_E) = (TFP_I - TFP_E) + (W_E - W_I)$

capped by an inflation index (*I*) less an adjustment factor (commonly referred to as the productivity factor or total factor productivity (TFP) growth) designed to calibrate the cap to be consistent with the prices or revenues being capped (*X*).[6,7] The "$I - X$" adjustment formula follows from the basic idea that in a competitive market (which economic regulation seeks to emulate), average productivity gains in the industry are passed on to consumers in the prices that they pay for service after controlling for inflation. Firms that generate higher than average productivity are rewarded with higher profits while firms with lower than average productivity are penalized with lower profits. The basic idea behind PBR is to more closely emulate the incentive structure of firms operating in a competitive market.

PBR formulae also typically incorporate *Z* factors, which allow the rate adjustment formulae to reflect one-time, exogenous events beyond the regulated firm's control (e.g., changes in tax or environmental policy).[8] In addition, it is common in PBR plans to include a stretch factor (*S*) in the rate adjustment formula to reflect the increased productivity growth that is expected from the change from traditional cost-of-service regulation (COSR) to PBR. As explained in our previous article, in the electric power industry, capital expenditures have been a continuing challenge for utilities in that the standard price cap formulae, premised on a non-negative *X* factor and therefore declining real rates, does not generate sufficient revenues to finance required infrastructure replacement and modernization. Hence, it is increasingly common in the electric power industry to include a supplemental capital factor (*K*) in the PBR formula. Thus, in the case of price caps, the full rate adjustment formula is given by[9]

$$\%\Delta P = I - X - S + Z + K, \tag{2.1}$$

where$\%\Delta P$ is the annual percentage change in price.

Focusing on *I* and *X*, there are two general approaches to specifying *I* – the industry input inflation approach and the economy-wide output inflation approach – and, depending on which approach is chosen, *X* will take a specific form.

The industry input inflation approach is currently used in some Canadian plans. The main drawback to this approach is that there are typically no credible, timely matches for industry input inflation available from published government sources. Therefore, an industry input inflation measure must be constructed or approximated by other means.

The economy-wide output inflation approach has been used in most U.S. plans for telecommunications and electric utilities, and typically the gross domestic product price Index (GDP-PI) is used as the *I* factor. The GDP-PI approach has the advantages of generally exhibiting less volatility than industry input inflation, which regulators value, and being more readily available from government sources.

The parameters included in *X* depend on the specification of the inflation term, *I*. If *I* is a measure of industry input prices, *X* is determined by expected industry total factor productivity growth (TFP):

$$X(I_I) = TFP_I. \tag{2.2}$$

Conversely, if *I* is a measure of economy-wide output price growth (such as the GDP-PI), then *X* consists of a differential in expected productivity growth between the industry and the overall economy ($TFP_I - TFP_E$), and a differential in input price growth between the overall economy and the industry ($W_E - W_I$)[10]:

$$X(I_E) = (TFP_I - TFP_E) + (W_E - W_I) \tag{2.3}$$

Table 1 from our previous article, which is reproduced here, summarizes the relationship between the specification of *I* and *X*.[11]

3. Myth 1: regulatory mandates are interchangeable with enhanced incentives in eliciting superior utility performance

It is common in regulatory proceedings to encounter the perspective that PBR is not necessary to induce superior performance on the part of the utility. The regulator can simply mandate that the utility operate efficiently.

There are two problems with this perspective. First, it is generally recognized that the utility has superior information to the regulator in terms of detailed knowledge of its operations and potential for improving efficiency.[12]

> Effective regulation of operating expenses and capital outlays would require a detailed, day-by-day, transaction-by-transaction, and decision-by-decision review of every aspect of the company's operation. Commissions could so only if they were prepared completely to duplicate the role of management itself. This society has never been willing to have commissions fill the role of management and doubtless with good reason: it is difficult to see how any company could function under two separate, coequal managements, each with an equally pervasive role in its operations.
>
> Alfred E. Kahn, The Economics of Regulation: Principles and Institutions, Volume I, New York: John Wiley & Sons, 1970 at 29–30.

Second, efficiency, much like the competitive dynamic itself, is a process of innovation and discovery. A properly designed PBR plan provides the utility with the incentives to leverage its informational advantage to discover superior methods of operating performance.

In spite of the fact that incentive regulation can be a "win-win"

[6] Jeffrey Bernstein and David Sappington, Setting the X Factor in Price Cap Regulation Plans, *Journal of Regulatory Economics*, Volume 16(1), July 1999 at 5–25.

[7] In the United States, the *X* factor is typically set to reflect expected industry productivity growth. Whereas, in Europe, the *X* factor tends to be more of a negotiated value. Stephen Littlechild, 1983. *Regulation of British Telecommunications' Profitability*. Department of Industry: Report to the Secretary of State; and Michael Crew and Paul Kleindorfer, Incentive Regulation in the United Kingdom and the United States: Some Lessons, *Journal of Regulatory Economics*, Volume 9(3), 1996 at 281, 220.

[8] The PBR formula may also include a *Y* factor to account for recurring expenditures over which the utility has no control (e.g., transmission charges) and therefore the utility is allowed a full pass-through.

[9] In the case of revenue caps, $\%\Delta R$ would replace$\%\Delta P$ on the left-hand side of the formula.

[10] For a description of the relationship between the specification of *I* and *X*, see Laurits R. Christensen, Philip E. Schoech and Mark E. Meitzen (2003),Telecommunications Productivity, in *Traditional Telecommunications Networks* (Gary Madden, ed.). Cheltenham, UK, Northampton, MA: Edward Elgar at 100–119.

[11] It can be shown that the *X* factor is invariant to the choice of the inflation index only under the restrictive condition that $W_I = I_E$, which implies that input price growth is equal to the economy-wide output inflation.

[12] As Professor Alfred Kahn has observed:

> Manifestly, the operating expenses and capital outlays of public utility companies are by far the most important component of their rate levels, on the one hand, and the efficiency with which they make use of society's resources on the other. Therefore, in terms of their quantitative importance, it would be reasonable to expect regulatory commissions to give these costs the major part of their attention. But in fact they have not done so; they have given their principal attention instead to the limitation of profits. The reasons for this perverse distribution of effort illustrate once again the inherent limitations of regulation as an institution of effective social control of industry.