Incentive Regulation in Network Industries: Experience and Prospects in the U.S. Telecommunications, Electricity, and Natural Gas Industries

ROSS C. HEMPHILL

Christensen Associates

MARK E. MEITZEN*

Christensen Associates

PHILIP E. SCHOECH

Christensen Associates

Abstract

We trace the development of incentive regulation in the U.S. telecommunications, electricity, and natural gas industries. Telecom has moved much more in the direction of pure price cap regulation. Incentive regulation in electricity and gas has generally not strayed far from rate-of-return regulation. Reasons for these differences include differences in regulatory commitment, industry concentration, technological change and productivity growth, service quality concerns, and externalities. We conclude that electricity and gas can evolve to purer forms of price caps as they gain more experience with incentive regulation, and if the unique features of these industries are considered in plan design.

1 Introduction

Incentive regulation is typically understood to be a form of regulation that provides the regulated firm with the types of earnings incentives found in a competitive market and allows the firm, to some degree, to respond to those incentives. Generally, incentive regulation represents an evolution in regulatory approach from more traditional forms of regulation such as rate-of-return or cost-based regulation. There are many types of regulatory mechanisms that come under the label of incentive regulation, representing various degrees of departure from more traditional regulatory approaches. These include pricing flexibility for competitive services, earnings sharing, price freezes for non-competitive services, and price caps.[1]

Various forms of incentive regulation have been present in U.S. network industries for almost 30 years. During the 1980s, the first such instance occurred in the post-Staggers Act railroad industry, which implemented a type of price cap called the rail cost

*Contact author. Mailing address: 4610 University Avenue, Suite 700, Madison, WI 53705. E-mail: memeitzen@LRCA.com We appreciate the helpful comments of Dianne Christensen, Rita Sweeney, Dennis Weisman, and an anonymous referee. All errors are the authors'.

[1] A description of various types of regulatory plans can be found in Sappington and Weisman (1996) and Vogelsang (2002).

adjustment factor (RCAF). Since that time, a variety of mechanisms have been adopted in network industries such as the telecommunications, electricity, and natural gas industries. There have even been proposals to implement price cap regulation for the U.S. Postal Service.[2]

The purpose of this paper is to trace the development of incentive regulation in the U.S. telecommunications, electricity, and natural gas industries.[3] We choose these industries because they are currently in various stages of regulatory evolution and they have implemented a representative sample of mechanisms. We will note the similarities and differences in approaches found in these industries and offer explanations. Among the questions we address are the following:

- What are the unique features of the industry that shaped the development of incentive regulation?
- How has competition evolved and how has it influenced the structure of regulation?
- What has been the role of regulation and legislation in promoting competition and incentive regulation?

The U.S. telecommunications industry has had some form of incentive regulation for a longer period of time than either the electricity or natural gas industries. In answering the questions above, we will assess whether telecom is a good model for these other industries.

In Section 2, we provide a brief overview of the evolution of incentive regulation in these industries and describe the most common forms of incentive regulation in these industries. Section 3 offers explanations for the similarities and differences. Section 4 assesses future prospects for each of these industries.

2 Evolution of incentive regulation

To gain a perspective on existing regulation and its likely future direction in these industries, it is useful to trace its development to its current state. In doing so, we will consider how factors such as industry market structure, technological change, and competition have shaped the form of industry regulation. None of these factors is necessarily exogenous to the form and evolution of industry regulation and, in fact, these factors may be inextricably tied to the form of regulation. For example, while competition has been an increasing presence in all of these industries, in many instances the increasing competition has been at least partly the result of regulatory initiatives.[4]

[2] In 1995, Rep. John McHugh (R-NY) introduced HR3717, which would have established a price cap mechanism for the U.S. Postal Service. Similar bills have been introduced since that time, but none have been passed into law.

[3] In the electricity and natural gas industries, incentive regulation is more commonly referred to as performance based regulation (PBR).

[4] As we discuss below, legislative (for example, the Telecommunications Act of 1996) and judicial (for example, the divestiture of AT&T) initiatives have also played a role in the development of competition.

2.1 Telecommunications

2.1.1 Industry structure

The U.S. telecommunications industry is regulated under dual jurisdictions, federal and state. The Federal Communications Commission (FCC) regulates interstate services of local exchange carriers (LECs) – mostly interstate long distance access services. Previously, the FCC also regulated interstate long distance services of interexchange carriers, notably AT&T, prior to the deregulation of that market. State regulatory commissions primarily regulate the intrastate services of LECs, which include local services, intrastate long distance services, and intrastate access services. This dual jurisdiction is an important feature of the industry and there has often been a divergence between federal and state regulatory approaches. Another important distinction is between larger LECs, such as the former Bell operating companies, and smaller, largely rural, LECs. Generally, competitive pressures and regulatory responses have been greatest for the larger LECs while evolution for the smaller LECs has not always been as great nor has it necessarily taken the same form. Our discussion will focus on the larger LECs.

The promotion of competition has been a long-standing, stated policy goal of federal regulation and most state regulation of the telecommunications industry. The reasoning behind this goal has generally been that competition, or regulation that attempts to produce competitive outcomes, results in greater economic efficiency and consumer welfare. In large part, the policy goal of promoting competition has been driven by the federal government with the U.S. Department of Justice pursuing the divestiture of AT&T in the early 1980s[5] and with the passage of the 1996 Telecommunications Act ("Telecom Act") by Congress.[6] In its AT&T Price Cap Order, the FCC noted the benefits of competition:

> [T]his Commission's efforts were devoted to structuring regulatory policies that affirmatively promote competition, that rely on competitive forces as an effective means of assisting us in achieving our statutory goals, or that attempt to emulate the operations of a competitive market. The public interest rationale for applying this competition-based regulatory model is readily understandable. Companies subject to competition are forced to operate in ways that generally result in just, reasonable, and non-discriminatory rates. Although firms operating in a competitive environment simply are attempting to maximize their profits, the various means each uses to achieve this result – innovating, enhancing efficiency, providing quality services – benefit consumers individually and society as a whole.[7]

The FCC noted that technological developments in the 1950s and 1960s began to lower the barriers to entry into the industry and increase competitive pressures. For example, microwave and satellite technologies allowed many large-scale users of telecommunications services to efficiently provide their own services rather than purchase them from AT&T. In addition, developments in computer technology and its adaptation for communications systems also contributed to greater competitive pressures.[8]

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[5] *U.S. v. Am. Tel. & Telegraph Co* (1982).
[6] *Telecommunications Act of 1996* (1996).
[7] Federal Communications Commission (1989) (AT&T Price Cap Order), para. 25.
[8] AT&T Price Cap Order, para. 22.

The industry's pricing structure also contributed to competitive pressures.[9] The telecom industry had traditionally supported its universal service mandate with an elaborate system of cross-subsidies. Many of the high-margin services that often allowed basic services to be priced below their costs were targets of competitive pressures. These services generally included long distance, special access, and other high-volume, high-margin services primarily to business customers.

Various structural and regulatory policies have been used to promote competition in the telecommunications industry. Regarding structural policies, the divestiture of the Bell System presents the primary example. The less competitive local exchange segments of the Bell System's operations were spun-off into the Regional Bell Operating Companies (RBOCs) from the more competitive long-distance operations. The RBOCs, in turn, underwent a degree of structural separation as competitive aspects of their operations, such as publishing and customer premises equipment, were placed in structurally separate subsidiaries. More recently, the Telecom Act has attempted to alter the structure of the LEC industry by introducing greater degrees of competition into those segments of the LEC markets (primarily the local exchange operations) that had not been traditionally subject to a great deal of competition.[10] Included in the Telecom Act's provisions are the requirements that incumbent LECs provide their services at wholesale rates to retail resellers and that incumbent LECs lease components of their networks (unbundled network elements or "UNEs") to competitors.[11]

2.1.2 Industry regulation

Various forms of incentive regulation have been used to regulate non-competitive segments of the telecom industry, and when these segments have exhibited sufficient competitive features, they have often been deregulated. For example, after divestiture, AT&T went through a transitional period of price cap regulation until it was eventually deregulated in the mid-1990s. The LECs have also been regulated under various price cap plans and other forms of incentive regulation at the federal and state levels.

In the 1980s, the FCC recognized the superiority of incentive regulation over traditional rate-of-return regulation. Consistent with its stated preference for competitive markets, the FCC stated that incentive regulation could more accurately replicate the dynamics of a competitive market.[12] The FCC first adopted price cap regulation for AT&T interstate services in 1989[13] and then for large LEC interstate services in 1990.[14] The LECs subject to the FCC's price cap plan were primarily the RBOCs and other large LECs, such as GTE. The smaller, more rural LECs remained under more traditional forms of regulation. The LEC services regulated under the FCC's price cap plan are interstate access services that are primarily purchased by interexchange carriers.

A significant difference between the FCC price cap plans for AT&T and the LECs was the inclusion of earnings sharing in the LEC plan. The original AT&T price cap

[9] For example, see Sappington and Weisman (1996, 31).
[10] While there was growing competition in high-volume, high-margin segments of LEC markets (primarily for services to business customers), relatively little competition existed in local residential services markets.
[11] These provisions of the Telecom Act have been viewed as methods of promoting the development of facilities-based competition.
[12] AT&T Price Cap Order, para. 36.
[13] AT&T Price Cap Order.
[14] Federal Communications Commission (1990) (LEC Price Cap Order).

formula was a straightforward "I – X" formula, where "I" was a general measure of economy-wide output inflation (the GDPPI) and "X" was an offset to the measure of inflation. In the case of the original FCC plan, X was based on industry productivity performance and was also referred to as the "productivity factor" or the "productivity offset."[15] In addition to the I - X formula, the FCC's original LEC price cap plan also included an earnings sharing mechanism (ESM) as a "regulatory backstop" or "automatic stabilizer." The FCC stated that the reasons for implementing an ESM for the LEC price cap plan were largely due to variability in the productivity estimates for individual LECs that were available at the time, and the resulting uncertainty over what the value of the LEC industry X factor should be.[16] The FCC recognized that while an ESM would provide some protections to consumers (and the LECs), the use of an ESM would dampen the LECs' economic incentives relative to a pure price cap plan:

> In fashioning the backstop plan for LEC price caps, we have sought to balance competing goals. On the one hand, the benefits of increased productivity promised by the price cap program depend upon the creation of new profit incentives for the LECs. A backstop mechanism may dampen the LECs' risks and rewards and thus reduce the incentives of a "pure" price cap plan. On the other hand, any price cap plan must be consistent with the goals of the Communications Act, assuring just and reasonable rates and the continued availability of quality services. A backstop mechanism can help ensure that the plan fairly shares the risks and rewards of future productivity gains between the LECs and customers, even in the unpredictable and varying circumstances of future years. A backstop mechanism can also serve to ensure that application of the formula does not subject any price cap LEC to depressed earnings over an extended period of time that could impair such a LEC's ability to provide quality service to local subscribers.[17]

Prior to its 1997 review of the LEC price cap plan, the FCC provided the LECs with a number of options they could choose from regarding the value of the X factor and the structure of the ESM. Generally, the LECs could choose to be regulated by a higher X factor in return for less stringent sharing obligations. In its 1997 review of the LEC price cap plan, the FCC eliminated the ESM and implemented a single X factor applicable to all price cap LECs.[18] In 2000, the CALLS Proposal adopted by the FCC established a phase-out of the X factor for local switching and switched transport once rates reached specified target levels, and a five-year phase-out for special access.[19]

State regulators are primarily responsible for overseeing the LECs' local, intrastate long distance, and access services. States have adopted a number of regulatory schemes that can be generally classified as some form of incentive regulation. These include rate

[15] The FCC's current X factor for the LECs was originally based on a controversial productivity methodology adopted by the FCC. The FCC's analysis was subject to a court challenge and the U.S. Court of Appeals for the D.C. Circuit remanded the matter back to the FCC for further explanation. However, before the FCC proceeding to resolve the matter was completed, the various parties to the proceeding reached a compromise, the "CALLS Proposal," which established the value of the X factor. The FCC was explicit that the X factor it adopted from the CALLS Proposal was no longer based on productivity, but rather was a transitional mechanism to achieve a reduction in selected rates. See *USTA v FCC*, and Federal Communications Commission (2000).

[16] The FCC stated it did not have the same level of corroboration for LEC productivity performance as it did for AT&T's productivity performance when it established AT&T's price cap plan. See, AT&T Price Cap Order, para. 703.

[17] LEC Price Cap Order, para. 121.

[18] Federal Communications Commission (1997).

[19] Federal Communications Commission (2000).

freezes, ESMs, and price caps. In addition, there are still some states using rate-of-return regulation.[20]

Ai and Sappington (2002) surveyed the various state regulatory schemes for LECs, categorizing the schemes as follows:

- Rate of return
- Rate case moratoria (that is, rate freeze)
- Earnings sharing
- Price cap
- Other[21]

With data through 1999, Ai and Sappington found that states using rate-of-return regulation had fallen from 50 in 1985 (the first year of their data) to 12 by 1999. In the late 1980s and early 1990s, rate freezes and earnings sharing were the most prevalent forms of state incentive regulation. Rate case moratoria were present in 10 states in 1987 but had declined to one state by 1999. ESMs peaked at 22 states in 1993 and had declined to one state by 1999. The pattern of rate case moratoria and ESMs is paralleled by the development of state price cap plans. Price caps first appeared at the state level in 1990 (in one state) and had spread to 35 states by 1999.[22] Sappington has recently updated this table through 2002 and found that price cap states had increased to 38 while rate of return states had fallen to eight. Rate case moratoria and ESMs were each present in one state in 2002.[23]

2.2 Electricity

2.2.1 Industry structure

The U.S. electricity industry has been in a state of structural transition over the past decade. It is evolving from firms that vertically integrated the functions of generation, transmission, distribution, and retailing, and sold bundled products and services to consumers. These firms held franchise rights to serve retail consumers within statutorily defined geographic areas.[24] The power delivered to retail customers was generated by the firms' own power plants or via "purchased power" under contract from a third party. Through the 1980s, such power transactions almost always took place between two cooperating, not competing, utilities.

During the past decade, the structure of the industry has been changing. Generation is being unbundled from the other services and sold through competitive wholesale markets.

[20] In their 1997 article, Donald and Sappington concluded that a state was more likely to select incentive regulation for its telecom industry in any year: (1) when it has employed incentive regulation in the past; (2) when Republicans control both the executive and legislative branches of government (but Democrats have controlled them historically); and (3) as the firm's earnings under rate of return increase toward the industry average.

[21] The "Other" category refers to Nebraska, which largely deregulated the state's industry in 1987.

[22] Ai and Sappington, Table 1. What is not described in Ai and Sappington's Table 1 is the variety of different plans implemented by the states. For example, not all price cap plans are structured the same and the services regulated by the plans are not the same across states.

[23] Sappington (2003, Table 1). Two states were in the "Other" category in 2002.

[24] The economic rationale for vertical integration is discussed in more detail in Joskow (1996).

Transmission is being priced to help facilitate the wholesale markets, and the Federal Energy Regulatory Commission (FERC) is encouraging changes to the basic business model that manages this service. Also, a number of state jurisdictions are phasing in the unbundling of retail energy service from the remaining monopoly distribution function.

The electricity industry has been predominantly investor-owned with only about 20% of the generation and distribution in the U.S. being provided by publicly-owned entities. These investor-owned utilities (IOUs) have been regulated by both state and federal agencies. Rate-of-return regulation has been used by these agencies in their oversight of the IOU tariffs. Because of the poor incentive properties associated with cost-based regulation, regulatory agencies have spent considerable resources monitoring franchise utility investment and operating costs.

Electricity prices fell steadily from the early 1900s through the early 1970s.[25] During this time the U.S. electric power sector had one of the highest rates of productivity growth of any major industry in the U.S. economy.[26] Then due to escalating energy prices, high interest rates, tightened environmental standards, and very large investments in nuclear power plants the price of electricity increased dramatically beginning in the mid 1970s and carrying through to the late 1980s in some regions.[27]

The Public Utility Regulatory Policy Act of 1978 (PURPA) made many changes to the electric utility industry that eventually led to the significant structural changes still ongoing today. Among the most significant changes brought about by PURPA was the requirement that franchise utilities purchase power produced by certain "Qualifying Facilities" (QFs) that were primarily cogenerators and small power plants built and operated by independent power producers (IPPs). The legislatures and regulatory agencies of several large industrial states (including New York, Massachusetts, and California) interpreted this aspect of PURPA in a manner that required the utilities to sign long-term (20-year to 30-year) contracts at prices which ultimately exceeded costs or market levels. The result was a dramatic increase in non-utility generation during the late 1980s and through the 1990s.[28]

The Energy Policy Act of 1992 (EPAct92) included provisions that removed legal barriers to utilities and non-utilities having ownership interests in IPPs. It also expanded the FERC's authority to require utilities to provide open access transmission service (wheeling) to support wholesale power transactions. EPAct92 created a new class of electricity generators called "Exempt Wholesale Generators" (EWGs) whose owners and operators are exempt from the provisions of the Public Utility Holding Company Act (PUHCA), which had significant barriers to entry into the IPP business by utilities and non-utilities alike.

FERC industry restructuring initiatives followed the passage of EPAct92. In 1995, the FERC issued two major sets of new rules: Order 888 "Promoting Wholesale Competition through Open Access Non-Discriminatory Transmission Service by Public Utilities," and Order 889 "Open Access Same-Time Information Systems." Order 888 requires all transmission owners to file pro forma open access transmission tariffs with the FERC. Order 889 requires each public utility (or its power pool) to participate in an Open Access

[25] U.S. Department of Energy (2002).
[26] Joskow (2000).
[27] Edison Electric Institute (1999).
[28] Hemphill (1996).

Same-Time Information System (OASIS), which provides electronic information on transmission capacity, prices, etc to help facilitate market operations.

In many states, the FERC initiatives led to major regulatory reforms and industry restructuring efforts.[29] Independent System Operators (ISOs) were established to manage the transmission facilities and in some cases, to administer real-time energy markets. Changes included generation divestiture, retail access in some cases, various levels of default service obligations, restrictions on affiliate marketing activities, and provisions for the recovery of stranded costs.[30]

2.2.2 Industry regulation

Not only has industry restructuring resulted in a major change in the way electricity is produced, delivered, and transacted, it has also resulted in changes in the way the industry is being regulated. The provision of electricity services is increasingly viewed from an unbundled perspective. This is true regardless of whether state jurisdictions have chosen to implement retail competition. Because generation is being sold through increasingly competitive wholesale markets, the provision of this service requires progressively less regulatory oversight. Transmission services are being regulated at the federal level through the evolving business structure of an independent transmission provider (ITP). Distribution services and other customer services will continue to be regulated at the state level although some predict that ultimately certain customer services will be provided competitively.

Although there has been significant change in the electricity industry over the past two decades, there has been relatively limited application of incentive regulation to the major services provided. The question of why this is the case is the topic of the next section.

There are 28 electric utilities in the U.S. with some form of incentive regulation, covering 16 state jurisdictions. However, most of these are utilities that have agreed to rate freezes (or rate case moratoria), with over three-fourths of these utilities operating under some form of an ESM.[31] Although ESMs can arguably be a necessary transitional step toward a broad-based incentive regulatory structure and provide marginal incentives for efficiency and innovation, they are clearly a variation of rate-of-return regulation. Furthermore, there is some evidence that rate freezes over a sustained period of time can create perverse incentives for the firm that are detrimental to customer welfare.[32]

A few major attempts at establishing price caps for large integrated utilities were initiated in the early 1990s, of which, the Central Maine Power experience arises as the most cited success story in the electricity industry.[33] A number of initiatives, such as the

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[29] Major restructuring movements occurred in 11 states between 1995 and 1997. One of these states, California, has since reversed its movement towards competition. Several other states have begun implementing lesser reforms but are still moving forward. Another five that initially announced a movement towards competition have pulled back or slowed their efforts.

[30] Stranded costs are defined as the difference between the revenues that would be recovered under business as usual rate-of-return regulation where the utility is assured of full cost recovery and the revenues that would be collected under open markets.

[31] Sappington *et al*. (2001).

[32] Isaac (1991) presents a case study concerning a Tucson Electric Power price freeze in the 1980s that resulted in a very large rate increase at the end of the term and ultimately the sale of the company.

[33] For a full description of this program, see Synapse Energy Economics, Inc. (1997).

comprehensive price cap program proposed by Niagara Mohawk Power Corporation in 1994, were rejected or significantly reduced in scope.[34]

Regulation of the electricity industry in California is of particular interest given the catastrophic events that occurred in that state's industry in 2000, leading to the question whether incentive regulation played a role in that crisis. During 2000, both Southern California Edison (SCE) and San Diego Gas & Electric (SDG&E) were operating under a price cap mechanism for their distribution services, while Pacific Gas & Electric (PG&E) continued with rate-of-return regulation. When there were extremely high price spikes in the California wholesale electricity market that year, state policy makers froze overall retail prices. This severely limited the utilities' ability to recover the high commodity costs, which drove PG&E to bankruptcy and nearly did the same for SCE. SDG&E was faced with the same pressures as the other California utilities but was able to maintain a stronger financial position due to legislative action that allowed it to book a portion of its under-collection of commodity costs as "regulatory assets," which were eventually recovered from ratepayers.[35]

The California debacle was the product of fatally flawed public policy that created, among other things, a disconnect between competitive wholesale electricity markets and regulated retail rates.[36] Although, some commentators have alluded to incentive regulation as being partly to blame for the financial problems faced by these utilities, it was clearly not a primary reason for the industry's crisis as evidenced by the fact that PG&E was regulated under rate-of-return regulation, and arguably suffered most severely from the situation.[37]

There is a growing interest in the application of incentive regulation to the pricing of network transmission services. The recent actions of the FERC have made it clear that it envisions a larger application of incentive-based schemes, which are also termed performance-based regulation (PBR) plans. In Order 2000, the FERC states:

> The Commission's current interest in PBR stems from the proposition that PBR will allow the Commission to rely on market-like forces, to the maximum extent possible, to create incentives for RTOs to efficiently operate and invest in the transmission system. This does not mean that we expect that transmission services will be provided in competitive markets any time soon, or at all. We recognize that transmission service will retain most or perhaps all of the characteristics of a natural monopoly for the foreseeable future, and that some type of explicit price regulation will therefore be required to prevent monopoly abuse. But we believe that PBR, especially if accompanied by explicit and well-designed incentives, may provide significant benefits over traditional forms of cost-of-service regulation.[38]

In its 2002 Notice of Proposed Rulemaking regarding Standard Market Design the FERC, when asking for comment on the role that can be played by a profit-seeking

[34] A description of the elements of these programs can be found in Hill (1995).
[35] See Jurewitz (2002).
[36] A complete guide to the events that transpired in California during (and as a result of) the summer of 2000 is found in Sweeney (2002).
[37] The difficulties caused by the wholesale price spikes could have been addressed through a properly structured price cap mechanism. For example, the inflation term ("I") in the price cap formula could be based on an index of input prices faced by California utilities. Under such a formula, increases in wholesale electric prices would have led to an increase in the inflation index, and a consequent increase in the price cap (and allowable retail rates).
[38] Federal Energy Regulatory Commission (2000, 538).

enterprise as an ITP, clearly ties such an arrangement to a performance-based regulatory structure:

> We seek comment on whether an ITC that has no ties to a Market Participant, as defined in this proposal, is sufficiently independent to act as the Independent Transmission Provider. The ITC may hold grid assets such as transmission facilities and Congestion Revenue Rights and may be allowed a performance-based ratemaking program. Thus the Commission is concerned that the ITC may unduly discriminate in favor of its own transmission interests when carrying out operational and planning decisions in its role as Independent Transmission Provider.[39]

Although these statements by the FERC are not as strong as the FCC's actions during the 1980s in terms of directly effectuating change, they provide a clear signal to the owners and providers of transmission service that a new regulatory structure is in the best interests of the industry.

2.3 Natural gas

2.3.1 Industry structure

Similar to the electricity industry, the natural gas industry has been undergoing unbundling and restructuring over the past 25 years with relatively limited application of broad-based incentive regulatory mechanisms. The nature of this industry is fairly simple. Natural gas is explored and produced at the wellhead, transported by pipelines to the city gate where distribution companies deliver it to consumers at the burner tip. Storage of gas, for purposes of meeting the highly seasonal demands of the market, occurs as part of the pipeline or distribution functions.

Up until the 1980s, the industry structure was monopolistic. Pipeline companies were the only entities to buy gas at the wellhead and sell to the distributors, and only distributors could sell retail to the end users. In other words, customers had no choice regarding who supplied their natural gas. This began changing in 1978 with passage of the Natural Gas Policy Act, which gradually ended federal control (by 1985) over the wellhead price of "new" gas but kept in place wellhead price controls for older vintages of gas.[40] Over time, this created a more liquid market for wellhead gas supplies.

In 1985, the FERC established a voluntary program that encouraged natural gas pipelines to offer "open access" transportation service for natural gas bought directly by end users from producers.[41] This action began the separation of the pipeline companies' merchant and transportation functions, and it initiated reform of the natural gas industry's regulatory structure. In 1989, Congress lifted all remaining price controls over gas supplied at the wellhead, and in 1992, the FERC ordered interstate pipelines to unbundle their sales, transportation, and storage functions and provide these on a non-discriminatory basis.[42] These actions essentially ensured that all natural gas suppliers would compete for gas sales on an equal footing.

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[39] Federal Energy Regulatory Commission (2002, 76). An ITC is an "independent transmission company," a profit-seeking entity that owns and operates transmission facilities but is unaffiliated with other aspects of the market. In this Order, the FERC introduced the generic term "independent transmission provider (ITP)" referring to an organization qualified by the FERC to provide transmission services. Whether an ITC can be an ITP is currently the subject of discussion in this docket.

[40] *Natural Gas Policy Act of 1978.*

[41] Federal Energy Regulatory Commission (1985).

[42] *1989 Natural Gas Wellhead Decontrol Act*, and Federal Energy Regulatory Commission (1992).

Large industrial customers began competitively buying their natural gas at this time and competitive choice programs have become more and more available to smaller customers in subsequent years. As of December 2002, all but 17 states have implemented or are planning to implement some degree of competitive choice for residential customers in their jurisdictions. In all, some 13 million of the 60 million residential customers in the U.S. will have competitive choice within the next year.[43]

2.3.2 Industry regulation

It is safe to say that the natural gas industry has applied PBR to various components of service but comprehensive price cap programs covering all services remain relatively rare. In addition, it appears that in recent years the Canadian natural gas industry has led its U.S. counterpart in embracing comprehensive price cap mechanisms.

Only 12 U.S. jurisdictions have some form of incentive regulation in place for distribution companies. In all these cases, the incentive mechanism is limited to the gas purchase costs and most of these mechanisms include an ESM.[44] In the U.S., there are two major natural gas utilities with more comprehensive PBR programs: Boston Gas Company's rates for local distribution service are regulated by a five-year performance-based rate plan;[45] and the Sempra-owned gas utilities in California are also continuing a more comprehensive PBR program.[46]

2.4 Summary

Various structural and regulatory policies have been used to promote competition in the U.S. telecommunications industry over time. Incentive regulation has been applied as a transitional mechanism for those segments of the industry not ready for deregulation. Furthermore, incentive regulation plans have generally evolved from those with elements of rate-of-return regulation (for example, ESMs) to a purer form of price cap regulation. The widespread use of price caps to regulate larger LECs at the federal and state levels can largely be attributed to the strong initial support for price caps demonstrated by the FCC. However, there is still a sizable portion of the industry, notably the smaller rural LECs, who tend to be regulated under forms of regulation closer to rate of return.[47]

The U.S. electricity industry is in the midst of a metamorphosis in which generation is being transitioned to a competitive market structure and retail competition is being introduced by some (but certainly not all) state jurisdictions. There is recognition that essential changes are needed in the basic business model and regulation of transmission services. Thus far, the industry has seen only limited application of incentive regulation and this is heavily laden with ESMs. The most significant signal of change has come recently in decision language from the FERC regarding the regulation of transmission services. However, no direct application of a broad-based incentive regulatory structure for transmission has been proposed to date.

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[43] Based on December 2002 DOE/EIA data. For updated information, see http://www.eia.doe.gov/oil_gas/natural_gas/restructure/restructure.html.

[44] McDermott (2002).

[45] Keyspan *Annual Report*. 2002.

[46] Sempra. *Financial Report*. 2002.

[47] While there are over 1,000 rural LECs, they account for only approximately 10% of the access lines in the U.S.

Natural gas in the U.S. has undergone a transition similar to electricity in which the source of supply has become competitive and the major transportation functions have been unbundled from other services. Competition is also growing in the provision of retail services, although it is far from universal across all jurisdictions. Similarly, incentive regulation has had limited application in this industry.

3 Analysis

While there have been substantial changes in U.S. telecom, electricity, and gas distribution regulation, the telecom industry has moved much more in the direction of pure price cap regulation. The electricity and gas industries have taken more tentative steps toward price cap regulation, and significant portions of these industries still are under rate-of-return regulation. To the extent that incentive regulation has been implemented in the electricity and gas distribution industries, it has typically not strayed far from rate of return, as ESMs are the most prevalent type of incentive regulation found in these industries.

Sappington and Weisman conclude that while there are general principles of incentive regulation that transcend industry boundaries, there are a number of reasons why incentive regulation plans may differ across industries, including characteristics of the industry, regulatory goals, and regulatory resources:

> [I]ncentive regulation is not a one-size-fits-all proposition. Although there are some general principles of incentive regulation that transcend industry boundaries, the ideal incentive regulation policy for any particular industry will depend on the characteristics of that industry.[48]
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> [T]he best incentive regulation plan in any setting depends critically upon regulatory goals and regulatory resources. As goals and resources differ, so will the best regulatory policy.[49]

Among the factors contributing to differences in the adoption of incentive regulation plans across the U.S. telecom, electricity, and gas distribution industries are differences in regulatory commitment and support (including commitment to existing regulation), technological change and productivity growth, industry concentration, service quality concerns, and industry externalities.

3.1 Regulatory commitment

Differences in the goals and commitment of the federal regulators for these industries appear to be key factors contributing to the differences observed in the adoption and form of incentive regulation across the industries. The FCC played a significant role in the adoption of price cap regulation in the telecom industry. In dealing with the increasingly competitive nature of this industry, the FCC recognized the superiority of incentive regulation over traditional rate-of-return regulation:

> Our experience administering rate-of-return regulation lead us to conclude that this methodology has certain inherent flaws. … [T]his type of regulation presents carriers with certain incentives – to pad their rates and forgo efficient innovation, for example – that are perverse when viewed from

[48] Sappington and Weisman (1996, 15).
[49] Sappington and Weisman (1996, 333).

> a public interest perspective. These incentives would exist even if technology and industry boundaries were to remain stable, …[50]
>
> The attractiveness of incentive regulation lies in its ability to replicate more accurately than rate of return the dynamic, consumer-oriented process that characterizes a competitive market. …The system also is less complex than rate-of-return regulation and easier to administer in the long run, which should reduce the cost of regulation.[51]

After initial success in establishing price cap regulation for AT&T, the FCC implemented price cap regulation of LEC interstate services. Subsequently, many states followed the FCC's lead in regulating LEC intrastate services.

Until recently, no single regulatory authority appears to have played nearly as significant a role for electricity and gas distribution as the FCC did for telecom in the 1980s. As described above, during the 1980s the FERC unbundled the natural gas transportation industry and introduced competition in the gas wellhead supply market without applying a broad-based incentive program. The FERC is currently directing the restructuring of wholesale electricity markets. While its decision language favors incentive regulation of transmission services, such a program has yet to be implemented for an independent transmission provider. Price cap regulation of electric and gas utilities has taken place at the state level. These state plans have generally been proposed by the utilities, and no state agency appears to have embraced the goal of price cap regulation as strongly as the FCC did.

Regulatory commitment and support of incentive regulation in the electricity industry was dealt a blow by the crisis that hit the California industry in 2000. Regardless of the actual causes, the California crisis brought into question the efficacy of industry restructuring in many other jurisdictions across the country and significantly slowed the movement towards the introduction of competition. It also increased the apprehension of utilities and regulators to change from the status quo, including the form of regulation.

In contrast to the differences in policy goals and commitment by regulators of these industries in the United States, British regulators established price caps for all three sectors in a relatively short period of time. Much of this difference can be attributed to strong political support and the fact that utility regulation was a new creation for the once state-owned, but now privately-held British industries. Conversely, the adoption of incentive regulation in the U.S. typically requires changes in the existing regulatory paradigm. Not only does this require educating people on the presumed advantages of incentive regulation, but it also requires battling the inertia, institutions, and political power of the embedded system.

In their comparison of the United States and Britain, Crew and Kleindorfer have attributed much of the difference in the adoption of price cap regulation between the United States and the United Kingdom to the strong role played by the Conservative Government in promoting price caps in the U.K. and the legacy of rate-of-return regulation in the U.S.[52] Vogelsang has also noted the impediment to the adoption of incentive regulation created by existing rate-of-return regulation in the United States:

> In the U.K., incentive regulation has accompanied privatization and liberalization in the main public utility industries, such as telecommunications, gas, water, and electricity. In the U.S., incentive regulation has facilitated liberalization and partial deregulation in telecommunications.

[50] AT&T Price Cap Order, para. 33.
[51] AT&T Price Cap Order, para. 36.
[52] Crew and Kleindorfer (1996, 211-213).

> Because of preexisting rate-of-return regulation the shift to incentive regulation was harder in the U.S. and led to more compromises than in countries with less regulatory traditions.[53]

Newberry observes that when British industries were privatized, they initially considered rate-of-return regulation but, largely based on the U.S. experience, quickly dismissed it. He compares U.S. rate-of-return and British price regulation, noting differences in regulatory goals between the two systems and the evolutionary nature of U.S. regulation versus the "clean slate" starting point of British regulation:

> Rate-of-return regulation *evolved* through a series of landmark court cases in the United States to provide procedural fairness in the allocation of rents accruing to franchise monopoly investor-owned utilities, but it has been criticized for its inefficiency. Price regulation was *designed* in the United Kingdom to create an efficient system of regulation to enable publicly owned utilities to be transferred to private ownership, but it has been criticized for its lack of fairness.[54]

In addition, Newberry concludes that the British approach of regulation by price caps in a legally enforceable contract is also better-suited to the British form of government:

> In the United States, the regulatory compact is sustained by the separation of the judiciary from the legislative and executive branches of the government, by the Constitution, and by a well-developed body of administrative procedures that specify how regulatory agencies must behave, how they are to reach decisions, and how they may be challenged.[55]
>
> If legislation can be changed easily with a change in government, then enshrining the detailed restraints on regulation in the law will not provide much security. If in addition the country lacks a tradition of administrative procedures and regulatory case law built up over time, as in the United States, then it may be necessary to restrain opportunism by specifying the rights of the utility in contracts. The British case demonstrates why this has been the preferred method of specifying regulation. Britain has chosen a high-powered regulatory scheme which is potentially vulnerable to opportunism. Parliament is sovereign and can thus overrule previous legislation, making legislative commitment low. The courts are, however, independent, and well able to uphold contracts, and the main body of regulation is therefore included in the licenses granted to the utilities.[56]

The combination of a lack of existing regulatory institutions with widespread adoption of incentive regulation is also apparent in the Canadian natural gas and electricity industries. In Canada, there are two major natural gas companies that have incentive regulatory mechanisms applied to the distribution components of service. Union Gas Limited has implemented a three-year price cap mechanism with a pass-through of market-based commodity-related costs.[57] Enbridge Gas Distribution Inc. is regulated by an incentive mechanism for the operations and maintenance component of its cost of service.[58]

The Ontario Energy Board (OEB) began restructuring the electricity industry in its province several years ago. As part of this restructuring, the rates of many distribution utilities (approximately 270) were going to be regulated for the first time by the OEB as opposed to having the rates set by Ontario Hydro, the monopoly supplier in the province.[59] To do this, the OEB adopted a generic incentive regulatory plan that is applied

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[53] Vogelsang (2002, 6).
[54] Newberry (1999, 50).
[55] Newberry (1999, 55).
[56] Newberry (1999, 56-57).
[57] For a complete description of this price cap program see Hemphill and Schoech (2000).
[58] The Enbridge program is described in http://www.oeb.gov.on.ca/html/en/industryrelations/ongoingprojects_pbr.htm.
[59] Ontario Energy Board Staff Report (1998).

to all distribution utilities in its jurisdiction. This plan includes a generically determined productivity factor applied to all utilities, accompanied by an ESM. This regulatory approach was chosen after evaluating a number of alternatives, including the implementation of traditional rate-of-return regulation. In its Decision, the OEB stated:

> [PBR] provides the utilities with incentive for behaviour which more closely resembles that of competitive, cost-minimizing, profit maximizing companies. Customers and shareholders alike can gain from efficiency enhancing and cost-minimizing strategies that will ultimately yield lower rates with appropriate safeguards for service quality.[60]

The OEB case again demonstrates a situation where the industry did not have a long history of rate-of-return regulation and therefore was not embedded in this traditional paradigm. The OEB was regulating these electric utilities for the first time, and was relatively unencumbered with a long institutional history of one form of regulation.

3.2 Technological change/productivity growth

Differences in technological change and productivity growth have likely played a role in the differences in the adoption of incentive regulation across these industries in the U.S. The U.S. telecom industry has had strong total factor productivity growth since the end of World War II. The trend rate in annual productivity growth has been in the 3% to 3.5% range during this period, compared to a 1% average rate of productivity growth for the overall U.S. economy.[61] This productivity growth provided opportunities for the provision of new services and cost (and price) reductions. However, regulatory bodies realized that without some liberalization in regulation that would allow firms to reap at least some of the rewards (that is, greater profits), the incentives to innovate and reduce costs would be blunted.[62] At the same time, given the rate of productivity growth in the industry, it was feasible to establish price cap plans that would lead to constant or declining rates for most customers. Therefore, one of the factors motivating the FCC to adopt price caps was that they were seen as a method for promoting the benefits of the industry's rate of innovation and productivity growth, and for sharing these benefits between producers and consumers:

> In addition to lower rates, consumers will receive other benefits as a result of incentive regulation implemented through price caps. First, for example, they will receive assurances of rate stability that do not exist under existing regulation. … Second, price cap regulation should spur innovations that result in consumers enjoying a wider range of high quality services at cost-effective prices. This spur to innovation should occur because, quite simply, carriers operating under price caps can make more money in the short term than under existing regulation if they respond to consumer demand for more and better services. And these are just the direct consumer benefits. The incentives for greater efficiency and innovation established by price caps should provide indirect benefits for society as a whole.[63]

After World War II, the U.S. electricity and gas distribution industries had productivity growth rates similar to those achieved by the telecom industry, largely because output growth was very high. But since the 1970s output growth has slowed, resulting in lower rates of productivity growth. In recent years, productivity growth for

[60] Ontario Energy Board (2000).
[61] Telecommunications industry productivity results come from United States Telecom Association (2000) and Christensen, Christensen and Schoech (1981).
[62] Braeutigam and Panzar (1993).
[63] AT&T Price Cap Order, para. 43.

these industries has averaged about 0.5% per year,[64] meaning that price cap plans over an extended period of time would need to allow for nominal price increases. Furthermore, under current electricity and gas distribution restructuring, the business segment ripest for price cap regulation is distribution. Many observers do not see the same potential for innovation in these distribution services as was seen for the telecom industry.[65]

In contrast, the initial British price cap plans for electricity and gas distribution had substantial X-factors, leading to real price declines.[66] This suggests that the privatization of those British companies led to substantial productivity improvements, greater than those achieved by U.S. firms during the corresponding period.

3.3 Other factors

Associated with the strong role played by the FCC in the telecom industry is the fact that telecom is much more concentrated than either the electricity or gas industry. At the time of divestiture, eight local exchange carriers served approximately 90% of subscribers.[67] Since that time, mergers have reduced the number of large local exchange carriers down to four.[68] Presumably, the widespread adoption of state price cap plans is, at least partially, due to this concentration as these companies have pursued consistency in regulation across the states that they serve. On the other hand, the electricity and gas industries are much more balkanized, and the institutional incentives to adopt common regulatory regimes across states are much smaller.

Other factors that have limited the acceptance of price cap regulation in the electricity and gas distribution industries have been service quality objectives and environmental concerns.[69] Concerns about maintaining service quality have been a focal point in discussions of electricity transmission and distribution price cap plans. Relatively speaking, such concerns were not a key element of early telecom price cap deliberations by the FCC.[70] Given the fact that degradation of service quality could have disastrous consequences over a large area, regulators appear hesitant to proceed aggressively in establishing price caps for transmission and delivery services. The electricity and natural gas industries are also more concerned with limiting the negative externalities associated with pollution and resource depletion. Concerns that price caps or other forms of incentive regulation may lead to incentives to promote increased electricity and gas usage and greater negative externalities have prompted political factions to resist regulatory

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[64] Productivity measures for the electricity and gas industries (SIC 49) were obtained from the Bureau of Labor Statistics' website: http://www.bls.gov/mfp/home.htm.

[65] See Gorte *et al*. (2001).

[66] See Newberry (1999, 115).

[67] The seven original RBOCs and GTE.

[68] BellSouth, Qwest, SBC, and Verizon.

[69] While these issues may have also existed in the British and Canadian examples discussed above, the absence of entrenched regulatory structures in these cases presumably helped facilitate the design of regulatory plans to accommodate such issues, instead of these issues being an impediment to regulatory reform.

[70] The original FCC price cap plans for AT&T and the LECs relied primarily on the existing FCC service quality monitoring programs with some modifications. See AT&T Price Cap Order, paras.1148-161, and paras. 557-562, and LEC Price Cap Order, paras. 332-364. Some states implemented service quality mechanisms as part of their price cap plans. Sappington (2003) reports mixed findings in his review of the effects of incentive regulation on telecom service quality, with some dimensions of service quality appearing to improve and others deteriorate.

reform.[71] The telecom industry does not face these negative externality problems. If anything, the externalities arising from telecom usage appear to be positive instead of negative.[72]

Uncertainty is also a likely factor that has limited the adoption of incentive regulation, particularly price caps, in the U.S. electricity and natural gas industries. As we have discussed, the most prevalent form of incentive regulation currently in these industries is the ESM, which is in many cases attached to a rates freeze or a rate case moratorium. Other than the often-cited Central Maine Power program, there are no broad-based applications of price caps in the U.S. electricity industry. There has been limited application of price caps to natural gas delivery services. Those that have been implemented include an ESM. The reliance on ESMs is apparently due to uncertainty regarding the cost structure and productivity performance of electric and gas utilities, as well as uncertainty regarding the likely performance of purer forms of price cap regulation. As our review of the telecom industry has demonstrated, the FCC and many states had similar concerns in the early stages of local exchange carrier price cap regulation, and also implemented ESMs. As the telecom industry gained more experience with price cap regulation, ESMs were eliminated from the plans.[73]

4 Prospects

Presumably, the trend of increasing competition and deregulation will continue in the U.S. telecom industry. To the extent regulation is required it will likely be some form of price cap regulation. There is no evidence that this industry will revert to rate-of-return regulation or incentive plans, such as ESMs, that have significant elements of rate-of-return.[74]

In the U.S. electricity industry, there are prospects for the application of incentive regulation for transmission and distribution services, but the evolution to pure price caps may be slow. Crew and Kleindorfer recently suggested that once the unbundling of generation (the fuel-intensive component of electricity service) is complete, incentive regulation is a natural fit for the distribution and transmission components.[75] This suggestion can be partially corroborated by the observation that the limited application of incentive regulation has tended to occur in electric utilities that are well into unbundling

[71] See Centolella (1994 and 1996).

[72] For example, Kahn and Shew (1987, 241) discuss positive externalities associated with telephone services and related pricing issues:

> The simplest and most familiar case for pricing residential access or basic service well below marginal cost is that subscription to telephone service yields benefits to others. When an individual connects to the network, it increases the value of the service to others, because it increases the number of people they can reach by phone.

[73] However, unlike the FCC's original LEC price cap plan, none of the electric and gas price cap plans have adopted the "menu" approach where the utility is offered options regarding the tightness of the price cap and the degree of earnings sharing.

[74] Tardiff and Taylor (2003) find that telecom price regulation at the state level is tending to focus on an increasingly narrower set of non-competitive services with remaining services being removed from price regulation.

[75] Crew and Kleindorfer (2002).

of services and deregulation of generation. Furthermore, the FERC's inclination towards using an incentive mechanism to regulate the operations and pricing of ITPs has strong support among regulatory economists. Joskow has encouraged the FERC to move to incentive regulation of transmission.[76] And McDermott and Peterson closely tie efficiency in the provision of transmission services with an incentive regulatory structure.[77]

Yet, the inability thus far to derive an incentive regulatory structure that is mutually acceptable to electric utilities and regulators leaves many to suspect that what occurred in telecommunications may not be directly transferable to electricity. In particular, there seems to be more uncertainty on the part of regulators regarding the application of price caps to electric utilities than there was regarding the telecom industry. This has led to price cap plans of relatively short duration (followed by cost-of-service filings), as well as the use of ESMs. However, this may be largely a function of the industry's learning curve with incentive regulation. In the case of the telecom industry, ESMs disappeared and the duration of the price caps lengthened as regulators had more experience in the application of price caps to the industry. One might expect the same may prove true for the electric utility industry.

Issues have arisen in the electric utility industry that either did not arise or were not as important in the telecom industry, and these issues will require nuanced approaches. One major concern is the overriding need for system reliability. While some telecom price cap mechanisms have incorporated elements that penalize poor service quality, electric utility price cap plans will need to include elements that provide the right "price signals" to the utility for system reliability. It appears likely that these plans will also require some targets and a reward structure for implementing demand side management. Finally, there are rate structure issues that will need to be addressed, particularly for distribution service. Without any restrictions on rate rebalancing, many distribution companies would base their rate structure largely on monthly fixed access charges. This may be politically unpalatable, both because such a rate structure may adversely affect low income users and because environmentalists may conclude that the utilization of natural resources is being under-priced. In the telecom industry rate restructuring was eventually accepted, with special programs established to maintain universal service. A similar route could be explored for the electric utility industry.

The U.S. gas distribution industry has many of the same characteristics as the electric distribution service. System reliability is important (though not as critical an issue as is currently the case in electricity transmission). The issues of rate restructuring and regulatory uncertainty are also present. Inasmuch as these two industries face similar problems, we would expect that they may follow similar paths in regulatory evolution.

The question is whether either electricity or gas distribution will evolve to a purer form of price caps over time as the telecom industry did. We believe that this evolution can occur as these industries gain more experience with incentive regulation and if the unique features and concerns of the industries are considered in plan design. A comparison of the U.S. and British experiences indicates that institutional factors related to the legacy of previous regulatory regimes are important for understanding the adoption patterns of incentive regulation plans in the U.S. telecom, electricity and gas distribution

[76] Joskow (1999).
[77] McDermott and Peterson (2002).

industries. Despite the unique characteristics of these industries, the lack of entrenched regulatory institutions in Britain was a primary reason why these industries were all regulated under price caps when privatized.[78] Although all three U.S. industries had a legacy of rate-of-return regulation, presumably the U.S. telecom industry and its regulators were forced to overcome this institutional inertia because of the technological change and competitive pressures experienced by the industry. A key question for the U.S. electricity and natural gas industries is whether they can overcome these institutional factors and move forward with incentive regulation.

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[78] As discussed above, a similar conclusion can be drawn with regard to electricity distribution utilities in Ontario.

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