PHOENIX CENTER POLICY PAPER SERIES

Phoenix Center Policy Paper Number 34

The Pricing of Pole Attachments: Implications and Recommendations

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(December 2008)

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Abstract: Today, a patchwork of regulation applies to the rates, terms, and conditions cable and telephone companies pay for access to poles, ducts, and conduits. Concerned about the differences in pole attachment rates paid by communications carriers, the Federal Communications Commission ("FCC") is currently considering whether it should adopt a new, uniform rate for pole attachment services for "broadband Internet access services." In this PAPER, we explore the optimal method of establishing rates for utility poles—Ramsey pricing—where the fixed costs of poles are allocated to firms based on the relative demand elasticities for attachments. We find that while historical differences in rates might have been compatible with Ramsey pricing when the service offerings of firms differed substantially, technological convergence dictates that these firms should pay a unified rate. Moreover, we present evidence indicating that optimal pricing principles would prescribe a significantly lower attachment rate for all broadband networks than the rates currently applied to these firms. Such a result would promote overall economic efficiency and increase consumer welfare.

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I. Introduction

The simple telephone pole has achieved an iconic status in the telecommunications industry. Tens of millions of telephone poles dot the nation, linking households and businesses to modern communications networks and the electricity grid. While remarkable in their scope and nearly ubiquitous in their presence, they are often regarded as regulatory antiques or artifacts of a bygone era. This perception is unfortunate because telephone poles remain an essential input of production for modern communications services, and the rates, terms and conditions for their use ("pole attachments") may have an important impact upon the availability and price for next-generation broadband Internet access networks.

Today, a patchwork of regulation applies to pole attachments, with dozens of regulatory bodies involved, ranging from state and local governments to the federal government. Poles are often privately owned (either by an electric utility or telephone company) and the rates, terms, and conditions over which communications companies can "attach" to privately-owned poles is directly regulated by federal and state law. In particular, Section 224 of the Communications Act requires that the rates and terms be "just and reasonable" and prescribes specific rate methodologies for some categories of service providers.[1] As a result, "cable television providers" enjoy a lower rate for pole attachments than "telecommunications providers." Moreover, "incumbent local exchange carriers" are not provided the benefit of a regulated rate at all when they seek to attach their equipment to a pole that is typically a monopoly facility. This patchwork of regulation results in widely disparate set of rates for what essentially amounts to the same input for critical communications services—a foot or two of space on a utility pole.

Concerned about the differences in pole attachment rates paid by communications carriers, the Federal Communications Commission ("FCC") is currently considering whether it should adopt a new, uniform rate for pole attachment services for "broadband Internet access services."[2] This formal regulatory review provides an opportunity to take a look at pole attachment rates as a matter of first principles. In this PAPER, we consider the implications of adopting the theoretically optimal pricing structure for pole attachments known as Ramsey pricing. Ramsey pricing is applicable for setting rates for mixed-use used facilities with fixed costs, like utility poles.

Establishing efficient rates for a mixed-use facility like utility poles can be tricky because the fixed costs of constructing the facility must be recovered from users of that facility, but doing so requires that rates deviate from the first-best optimal marginal cost rate. It is arguably the task of a regulator to divide those fixed costs among users of the facility in a way that recovers these fixed costs and maximizes welfare. Ramsey pricing achieves this goal by assigning the share of fixed costs to users of the facility in accordance with the elasticity of demand for the facility. The goal of this approach is efficiency and not uniformity—indeed, a Ramsey pricing approach allows different uses of a pole attachment to pay a substantially different share of the fixed costs of that facility.

A Ramsey pricing approach to pricing pole attachments would examine the elasticity of demand for pole attachments by the users of those poles—namely, electricity, cable, and telecommunications providers. In today's environment, with cable, telecommunications providers, and incumbent local exchange carriers all requiring poles to build advanced broadband networks that offer integrated voice, video and broadband data service platforms, a Ramsey pricing approach

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1 47 U.S.C. § 224.

2 *Implementation of Section 224 of the Act: Amendment of the Commission's Rules and Policies Governing Pole Attachments,* Notice of Proposed Rulemaking, 22 FCC Rcd 20195 (2007) ("*Pole Attachments Notice*").

would dictate that the pole attachment rate paid by all communications firms should similarly converge. Differences in the rate paid by cable, telecommunications providers, and incumbent local exchange carriers may have been justified historically when these operators sold unlike services and their demand for poles were distinct and not necessarily equivalent. However historically accurate that approach may have been twenty years ago, such differences in these services have faded, and rate differences are no longer economically efficient in the current environment. A Ramsey pricing approach to pole attachment rates would dictate that rate structure differences between providers that are all constructing integrated voice, video and broadband Internet service networks should disappear, as the FCC has proposed.

In addition, available evidence indicates that a harmonized communications industry pole attachment rate should be relatively low. The collective elasticity of demand for pole attachments in the industry may be more elastic, in an absolute and relative sense, than the elasticity for communications services when Section 224 was enacted and implemented. As a result, the FCC could justify allocating a low portion of fixed costs to communications providers and allocating more of the fixed and common costs of utility poles to services with more inelastic demand—namely, electric utilities. Such a result would promote overall economic efficiency and increase consumer welfare. Consumers are the ultimate payers of the pole attachment rates through retail prices, and Ramsey pricing is a consumer welfare maximizing rate setting methodology.

This PAPER is structured as follows. Section II provides some basic historical background information on the regulation of pole attachments, describes the hierarchical structure of pole attachment rates, and demonstrates that there is a large disparity in rates between cable, telecommunications providers, and incumbent local exchange carriers. Section II then outlines the principles of Ramsey pricing and how it would be an optimal approach for establishing pole attachment rates. Section III provides an empirical analysis of this approach and demonstrates that as services offered over communications networks are converging, pole attachment rates paid by communications network firms should similarly converge and not vary by technology. In addition, based on available evidence, Ramsey pricing indicates that it may be justifiable to increase the share of costs allocated to electric ratepayers if the collective elasticity of demand for pole attachments by the communications industry has increased since the last time this rate structure was examined.

II. Regulation of Pole Attachment Rates Under Section 224

Section 224 of the Communications Act of 1934, 47 U.S.C. §224, regulates the rates of pole attachments.[3] In particular, Section 224(b)(1) requires the FCC to ensure that the "rates, terms, and conditions" of pole attachments used for any purpose be "just and reasonable." Significantly, the Supreme Court has ruled that the FCC has broad authority to prescribe rates for communications services under this provision, noting that this area is "technical, complex, and dynamic."[4] Given this broad authority, it is important that the FCC exercise this authority properly, as pole attachments are a critical input to broadband services.

While the FCC has broad authority, the regulation of pole attachment rates, terms, and conditions is complicated by several factors. First, while utility poles are ubiquitous and critical to telephone and electric services for over a century, federal regulation of these inputs has been in place only since 1978, when Section 224 was first enacted. Prior to that time, a handful of states regulated the rates for pole attachments, and Section 224 specifically provides that federal regulation only serve as a backstop and apply only where states do not regulate pole attachments. This unique structure remains to this day. Currently, nineteen states and the District of Columbia regulate pole attachments independent of the FCC's authority.[5]

In addition to this geographic variation, pole attachment rates also vary by service provider, as a result of specific Congressional mandate. When Section 224 was first enacted in 1978, it provided a specific rate for pole attachments used to provide "cable television service."[6] Ever since, the electric utility industry has

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[3] As used in the Act and this Paper, "pole attachments" or "pole" refers to a myriad of physical assets, namely, "any attachment . . . to a pole, duct, conduits, or rights-of-way controlled by a utility." 47 U.S.C. § 224(a)(4).

[4] *NCTA v. Gulf Power,* 534 U.S. 327, 328 (2002).

[5] Those jurisdictions are: Alaska, California, Connecticut, Delaware, District of Columbia, Idaho, Illinois, Kentucky, Louisiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Oregon, Utah, Vermont and Washington. Some states use a similar methodology to the FCC's, but others charge a uniform rate to cable systems and telecommunications carriers. *See* Federal Communications Commission, Public Notice, *Corrected List of States that have Certified that they Regulate Attachments*, DA 08-653 (rel. Mar. 21, 2008) (available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-08-653A1.pdf).

[6] 47 U.S.C. § 224(d).

argued that the cable rate structure is unreasonably low.[7] In 1996, as it was promoting competition of competitive telecommunications services, Congress permitted competitive telecommunications providers to obtain access to utility poles at a regulated rate that was higher than the cable rate.[8] However, while the FCC has since extended the application of the "telecommunications services" rate to other providers, such as wireless providers,[9] incumbent local exchange companies are still often charged a higher rate for pole attachments than other telecommunications providers and cable companies.

Evidence of this variation in rates is presented in Table 1 below. Table 1 summarizes various computations of these three different average nationwide rates recently filed before the FCC. For the table, the average rate paid is expressed as the annual payments per foot of pole space. Table 1 assumes, based on historical industry data provided by the electric utility industry, that the cable operator and CLECs attachments respectively require one foot and the ILEC requires two feet of pole space.[10] In instances where the ILEC uses more or less than two feet of space, the rate differential is, of course, different.

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7 *See, e.g., FCC v. Florida Power Corp.,* 480 U.S. 245 (1987). These arguments continue today. On June 3, 2008, a coalition of electric utilities argued that the existing pole attachment rate regime "subsidiz[es] communications giants such as Comcast, Time Warner Cable and Time Warner Telecom." Letter from J. Richards, Keller and Heckman, to Chairman Kevin J. Martin, Chairman, Federal Communications Commission, WC Docket No. 07-245 (Jun. 3, 2008) (hereinafter "Coalition of Concerned Utilities Letter"), at 1.

8 47 U.S.C. §224(e) (establishing "telecommunications service" rate) and § 224(a)(5) (excluding incumbent local exchange carriers from taking advantage of the "telecommunications service" rate).

9 *See Implementation of Section 703(e) of the Telecommunications Act, Amendment of the Commission's Rules and Policies Governing Pole Attachments,* CS Docket No. 97-151, Report and Order, 13 FCC Rcd 6777 (1998) ("*1998 Implementation Order*") (subsequent history omitted) at ¶¶34-42 (extending "telecommunications" rate to wireless providers). Issues with regard to attachment of wireless facilities to utility poles unfortunately remain. For example, wireless firms state that electricity companies have denied them access to the top of poles even though FCC rules establish no such principle and that utilities use pole tops for their own wireless infrastructure. *See* Letter from L. Charles Keller, Wilkinson Barker and Knauer, to Marlene H. Dortch, Secretary, Federal Communications Commission, WC Docket No. 07-245 (May 28, 2008), at 11-12.

10 Errata Comments of the Edison Electric Institute and the Utilities Telecom Council, WC Docket No. 07-245 (Dec. 4, 2008) ("EEI Comments"), at 42 ("joint use agreements allocate 2 to 3 feet of space to the ILEC, but the ILEC may occupy only 2 feet of space in many cases. By comparison, CATVs and CLECs generally occupy only 1 foot of space").

Given these assumptions, the difference in rates paid per foot is often stark. Based on electric utility company data, the average rate paid by cable operators is $6.63 per foot, per year. Telecommunications carriers (CLECs primarily) pay about twice that, with payments falling in the $10 to $15 range. Assuming an average of two feet per attachment, the ILECs pay about $20 per foot, per year, which is about three times the rate paid by cable operators and twice that of CLECs. Even if we assume an average of three feet per ILEC attachment, the ILEC average rate remains substantially higher than the cable rate. Table 1 illustrates that industry filings show significant differences across communications providers.

Table 1. Evidence on Pole Attachment Rates, $/ foot/year

Commenter	Cable Rate	CLEC Rate	ILEC Rate
Cable Industry	$5.25	$11.97, $17.01	…
CLEC Industry	$6.46	$15.09	…
ILEC Industry	$3.26	$4.45	$13.00
Utilities	$6.63	$10.02, $15.15	$20.40

Sources: NCTA Comments in WC Docket No. 07-245, Declaration of Dr. Michael D. Pelcovits, at 9, 10; TWTC White Paper (Jan. 16, 2007), at 10; USTelecom Comments in WC Docket No. 07-245, at 8; EEI *Pole Attachments 101*, at 15 (available at: www.eei.org/industry_issues/energy_infrastructure/distribution/Pole_Attachments_101.ppt. Calculations assume 1 foot for cable and CLECs and 2 feet for ILECs (*see* EEI Comments, *supra* n. 10 at 42).

While Table 1 is expressed in terms of per-foot used, we do not mean to imply that this is the only reasonable method of calculating rates. Moreover, a few states have implemented different approaches to calculating rates than the FCC method.[11] But for the remaining states, the FCC methodology prevails and the per-foot rate differentials described in Table 1 are present.

The differences between the cable system and telecommunications carrier rates are the result of different allocations of the fixed and common costs of building and maintaining a utility pole. These differences bring to light the central issue related to the regulation of pole attachment rates—how the common

11 For example, Maine does not allocate unusable space by reference to the space actually used. Instead, Maine allocates the cost of unusable space (called "common space") by calculating rates on the basis of a current and future network design that compares the relative need for poles by electric utilities, telephone, and cable companies if those companies were to build entirely separate pole systems for their networks. Unfortunately, Maine has not re-assessed this ostensibly forward-looking network build for fifteen years. *See* Maine Public Utilities Commission, *Re: Proposed Amendment to Chapter 88, Attachments to Joint-Use Utility Poles*, Docket No. 93-087, Order (Oct. 18, 1993).

cost of building and maintaining the pole as a whole are to be allocated between electric, telecommunications, and cable providers. Each pole attachment rate contains at least two different components—the marginal cost of the attachment itself, as well as some portion of the fixed and common costs of the pole. The remainder of this Section explores this central question, because these costs need to be allocated in an efficient manner.

A. *The Treatment of the Cost of Pole Space in the Current Rate Structure*

Like many utility and communications facilities and services, the cost of a utility pole is largely fixed, with very little marginal cost. Although setting the pole rental rate at marginal cost is first-best optimal, when costs are mostly fixed this first-best optimal price is insufficient to fully recover the economic costs of production.[12] As such, an alternative to marginal cost pricing is required where prices are set above marginal cost.[13] The fixed and common costs of pole attachments are significant, and allocating them between firms is the central question in establishing efficient pole attachment rates. A typical utility pole is 37.5 feet high while only 13.5 feet constitute space usable for attachments (36% usable),[14] which means that nearly two thirds of common operating and capital costs of a pole somehow need to be allocated between electric, cable, telecommunications providers, and other attachers.

Today, the FCC allocates different amounts of these fixed costs of a pole between cable and telecommunications companies. For cable operators, Section 224 essentially caps the allocation of these costs cost based only upon the share of total usable space the cable attachment takes upon the pole.[15] Electric utilities

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[12] *See* Declaration of Dr. Michael D. Pelcovits, Appendix B to Comments of National Cable Television Ass'n, WC Docket No. 07-245 (Mar. 7, 2008), at 2.

[13] The government could subsidize the loss with general tax revenue, but this approach creates inefficiencies of its own and is not typically used in communications regulation.

[14] R. Kyle & C. Klein, *Analysis of Pole Attachment Rate Issues in Tennessee*, Tennessee Advisory Commission on Intergovernmental Relations (Mar. 2007)(available at: http://www.tennessee.gov/tacir/PDF_FILES/Other_Issues/pole%20attachment%20rate%20issues.pdf).

[15] That is, if a cable attachment takes up 10% of the total usable space on a pole, then Section 224(d)(1) requires that the cable pole attachment rate not be allocated more than 10% of the "sum of the operating expenses and actual capital costs of the utility attributable to the entire pole." 47 U.S.C. §224(d)(1). "Usable space" means the space on the pole above the minimum grade level which can be used for the attachment of wires, cables, and associated equipment. 47 U.S.C. §224(d)(2).

have repeatedly claimed that the cable rate is improper because it does not make any contribution to the operating and capital costs of the non-useable space of a pole, but this allegation is not true. Under the statute, cable providers do in fact contribute to the "operating expenses and actual capital costs of the utility attributable to the entire pole"[16]—but what the current rate structure does in practice is allocate them a significantly *smaller* amount of those expenses and costs than are allocated to telecommunications providers.

This point can be shown plainly with an algebraic expression of the statute. Let K be the capital carrying costs and operating costs attributable to the entire pole, t be the feet required by the cable system, T be the total feet of the pole, and λ be the share of usable space on the pole. The (maximum) rate for cable systems (R_C) is, then,

$$\begin{aligned} R_C &= (t/\lambda T)K \\ &= (t/\lambda T)k_U + (t/\lambda T)k_N \end{aligned} \tag{1}$$

where k_U is the cost assigned to the usable portion of the pole and k_N the non-usable portion (assuming costs are equal across such portions so that $K = k_U + k_N$). Therefore, the cable rate contributes to the costs of both the usable and non-usable portion of pole at an equal rate of $t/\lambda T$ (the share of usable space).[17] Other allocations of costs to cable companies are possible under the statute, as Section 224(d)(1) only established a cap on the fixed cost allocation for cable companies (though the FCC uses the maximum rate).

The costs of a pole are allocated to telecommunications carriers in a different manner by separating out the recovery of costs across the usable and unusable space on the pole. Expressed algebraically, the rate for pole attachments by telecommunications carriers (R_T) according to the statute is

$$R_T = (t/\lambda T)k_U + (2/3n)k_N \tag{2}$$

where n is the number of attaching entities. Here, the cost of the usable space is recovered in the same manner as for the cable system, but the allocation of unusable pole cost varies based upon the number of firms attaching to the pole

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16 47 U.S.C. § 224(d)(1).

17 If all usable space is occupied by cable systems, $t/\lambda T = 1$, then the full costs of the pole K are recovered. So, the argument that cable operators do not pay toward unused space is clearly illegitimate.

and is limited to two thirds of the total costs of such space (the second part of the right-hand side of Equation 2). Under Section 224(e)(2), if only one telecommunications firm attaches in addition to the electric company, then it must share equally two-thirds of the costs related to unusable space with the electric utility. If there are multiple telecommunications attachers, then that allocation is divided proportionately based upon the number of attachers.[18] So, in the case that an electric company, a cable company, and a telecommunications carrier all attach to the same pole, the telecommunications carrier will be allocated 22.2% of the unusable space on the pole (two-thirds divided by three) regardless as to how much space the carrier actually uses.[19] The cable company will be allocated only the portion of the costs of unused space proportionate to the proportion of usable space that the cable firm uses on the pole.

These two different ratesetting methodologies essentially ensure that telecommunications carriers bear a larger amount of the costs of the unusable space on a pole as compared to a cable company, and consequently pay a higher rate. Under plausible assumptions of the space used, only if there are nine attachers would the telecommunications rate begin to approach the cable rate.[20]

This discussion demonstrates that the central issue in establishing pole attachment rates is the allocation of the large, common cost of unusable space between attaching entities. Unlike certain claims, the current cable rate does in fact contribute to these costs, but that contribution is lower than the contribution made by telecommunications carriers. The FCC certainly can re-examine these allocations, particularly with regard to attachments made to construct multiservice, broadband Internet access networks. According to the Supreme Court, these specific rate formulas "work no limitation on §§224(a)(4) and (b)" of the Act, the two sections that represent the "theoretical coverage" of the FCC's authority and establish a general requirement for just and reasonable rates.[21] As

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18 Cable operators are counted as attachers, though their rate is not affected by the number of attaching entities.

19 47 U.S.C. §224(e)(2).

20 According to one electric utility provider, on average, even in most urban areas, the number of attaching entities average just under three. *See* Comments of American Electric Power Service Corporation, *et al.,* WC Docket No. 07-245 (Mar. 7, 2008). Based on Equation (1), the cable system pays about 7.4% of the cost of unusable space. For the right hand side of Equation (2) to equal 7.3%, *n* would need to be 9, a rather high number.

21 *NCTA v. Gulf Power,* 534 U.S. at 337.

we demonstrate below, doing so with regard to integrated communications service networks would likely be efficient.

B. *An Optimal Approach for Pole Attachment Rates*

Fortunately, pricing facilities with high fixed and low marginal costs like utility poles is familiar ground in public utility regulation. It is widely regarded that the best (most efficient) linear prices which recover costs are the inverse-elasticity prices known as Ramsey prices. Put simply, since prices above marginal cost reduce quantities purchased, if mark-ups over marginal costs are required to recover high fixed costs, then Ramsey's approach prescribes raising prices where it matters least.[22] Prices that deviate from Ramsey prices necessarily reduce consumer and aggregate welfare. Here, the consumer is the firm buying an attachment, but in a competitive and some imperfectly competitive settings, the inefficiencies arising from non-optimal pricing of inputs are, in the end, borne solely by the end-user consumer.[23]

Ramsey pricing is a staple of regulatory economics, and detailed treatments are found in such seminal regulatory texts like Brown and Sibley (1986) and Mitchell and Vogelsang (1991).[24] A published study by Huettner (1982) considers Ramsey pricing specifically for pole attachment regulation.[25]

Ramsey pricing is efficient because it minimizes the suppressive effect on consumption from raising prices above marginal costs. When fixed costs must be recovered, in the case of a utility pole, prices must be set above marginal cost, and the challenge of the regulator is to ensure that those mark-ups impact consumption to the least degree possible. Sometimes called "second-best" pricing, Ramsey pricing in fact maximizes the sum of consumer and producer

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[22] For a discussion of non-linear tariffs, *see* S. J. Brown and D. S. Sibley, THE THEORY OF PUBLIC UTILITY PRICING (1986); B.M. Mitchell and I. Vogelsang, TELECOMMUNICATIONS PRICING: THEORY AND PRACTICE (1991).

[23] Brown and Sibley, *supra* n. 22, at ch. 6. The general welfare effects in such setting can be very complex, since the prices are "second best."

[24] *Id.* at ch. 3; Mitchell and Vogelsang, *supra* n. 22, at ch. 4.

[25] D. Huettner, *Optimal Second Best Pricing of CATV Pole Attachments*, 48 SOUTHERN ECONOMIC JOURNAL 996-1015 (1982).

surplus while ensuring that the producer surplus covers fixed costs.[26] To accomplish this result, Ramsey prices are established so that all deviations of prices from marginal costs are inversely proportional to the corresponding demand elasticities.[27] By following this rule, decreases in the quantity purchased are minimized and consumer welfare is maximized.[28]

Ramsey pricing stipulates that the markup of price (*p*) over marginal cost (*c*) in market *i* is

$$\frac{p_i - c_i}{p_j} == \frac{\lambda}{\varepsilon_i} \tag{3}$$

where ε_i is the (absolute value of the) own-price elasticity of demand for market *i* and λ is a proportionality constant that adjusts uniformly across all markets so that seller profits are zero.[29] Consider some examples. If $\lambda = 0.5$ and $\varepsilon = 2$, then the price-cost margin is 0.25 (= 0.5/2). Or, if $\varepsilon = 3$, then the price-cost margin is 0.17 (= 0.5/3). The Ramsey prescription is that the more elastic the demand curve, the lower the markup over marginal cost.

If there are two markets *i* and *j*, then the relative Ramsey markups across the two markets are

$$\frac{(p_i - c_i)/p_i}{(p_j - c_j)/p_j} = \frac{\varepsilon_j}{\varepsilon_i} \tag{4}$$

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26 These prices are second best in that prices are not set equal to marginal cost. The first best prices create problems of their own, however, since they do not allow the recovery of full economic costs.

27 Brown and Sibley, *supra* n. 22, at 40.

28 The Ramsey proportional mark-up rule has the consequence that the implied reductions in output of each good are approximately proportional when compared to outputs at marginal cost prices.

29 The own-price elasticity of demand is always negative, but for expositional purposes the absolute value is often used. *Id.* at 40. Note that Equation (1) is similar to the monopoly pricing rule where the right-hand side is 1/ε. The λ term simply adjusts the monopoly profit downward (presumably) so that total revenues just equal total costs.

where $i \neq j$ and the mark-ups $(p - c)/p$ are positive and just large enough to recover all costs.[30] Continuing with our example, the ratio of elasticities is 3/2 = 1.5, and the ratio of margins from above is 0.25/0.17 ≈ 1.5. These formulae show that if prices are to be higher than marginal costs, then price increases should be placed where they matter least (i.e., where demand is relatively inelastic)—that is, the Ramsey solution.

For present purposes, it is Equation (4) that provides the most relevant guidance. The equation reveals that when two firms have similar demand elasticities for pole attachments, the price-cost margins on such attachments should likewise be similar. Alternately, if one firm has a relatively more elastic demand for the attachment, then its price-cost margin should be lower. Assuming equal marginal costs for all attachments, then the relationship between relative prices is like for the margins. Attaching entities with relative more elastic demand curves for attachments should pay a commensurately lower price for attachments. We provide calculations of Equation (4) for attaching entities later in the text.

With approximations of the relevant elasticities (ε) and marginal costs (c), Ramsey pricing can provide some guidance for the pricing of pole attachments. For present purposes, the policy implications of Ramsey pricing are straightforward. If marginal costs and elasticities are equal across firms, then prices should be equal. If marginal costs are equal and elasticities are not, then prices should be different. This simple prescription is very useful in the context of changing pole attachment rates in the current environment. We discuss these prescriptions in more detail in the next section.

III. Ramsey Pricing for Pole Attachments

As just noted, there are essentially two straightforward and highly policy relevant prescriptions from Ramsey pricing in relation to pole attachments. First, assuming equal marginal costs that are directly proportional to the number of feet required for the attachment, attaching carriers with identical demand elasticities should pay the same rate.[31] Second, users of utility poles with more

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30 Notably, these expressions are derived under simplifying assumptions. In more complex settings—such as non-constant marginal costs, interrelated demands, and so forth—the solution to Ramsey pricing is not as simple as just described. Nevertheless, for the most part, the underlying logic of Ramsey pricing is "of the same flavor." *Id.* at 41; Mitchell and Vogelsang, *supra* n. 20, at 48.

31 Likewise, if demand elasticities differ across geographic markets, then geographic price differentials may be justified.

inelastic demand curves for use of poles should bear a higher proportion of the fixed and common costs of those poles. In this Section, we examine the elasticities of demand of the various users of utility poles so that we can provide further policy guidance.

A. *Demand Elasticities for Attachments by Cable and Telecommunications Providers*

Table 2 provides typical values for the demand elasticities for the various services provided over networks attached to utility poles. The major categories are multichannel video,[32] telecommunications,[33] broadband,[34] and electricity

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32 *See* PHOENIX CENTER POLICY BULLETIN NO. 12, *Franchise Fee Revenues After Video Competition: The "Competition Dividend" for Local Governments* (2005) at Table 1 (available at: http://www.phoenix-center.org/PolicyBulletin/PCPB12Final.pdf); *Issues Related to Competition and Subscriber Rates in the Cable Television Industry, Report to the Subcommittee on Antitrust, Competition Policy and Consumer Rights,* Committee on the Judiciary, U.S. Senate, US Government Accountability Office, GAO-04-8 (2003); *Issues in Providing Cable and Satellite Services,, Report to the Subcommittee on Antitrust, Competition, and Business and Consumer Rights,* Committee on the Judiciary, U.S. Senate, US Government Accountability Office, GAO-03-130 (2002); *The Effect of Competition from Satellite Providers on Cable Rates,, Report to Congressional Requesters,* US Government Accountability Office, GAO/RCED-00-164 (2000); T. R. Beard, G. S. Ford, R. C. Hill, and R. P. Saba, *Fragmented Duopoly: A Conceptual and Empirical Investigation*, 78 JOURNAL OF BUSINESS 2377-2396 (2005); T. Chipty, *Vertical Integration, Market Foreclosure, and Consumer Welfare in the Cable Television Industry*, 91 AMERICAN ECONOMIC REVIEW 428-453 (2001); G. S. Ford and J. D. Jackson, *Horizontal Concentration and Vertical Integration in the Cable Television Industry*, 12 REVIEW OF INDUSTRIAL ORGANIZATION 501-518 (1997); R. N. Rubinovitz, *Market Power and Price Increases for Basic Cable Service Since Deregulation*, 24 RAND JOURNAL OF ECONOMICS 1-18 (1993); A. Goolsbee and A. Petrin, *The Consumer Gains from Direct Broadcast Satellites and the Competition with Cable TV,* 72 ECONOMETRICA 351-381 (2004).

33 PHOENIX CENTER POLICY BULLETIN NO. 8, *The $10 Billion Benefit of Unbundling: Consumer Surplus Gains from Competitive Pricing Innovations* (27 January 2004) (available at: http://www.phoenix-center.org/PolicyBulletin/PCPB8Final.pdf); M. Rodini, M. Ward and G Woroch, *Going Mobile: Substitutability Between Fixed And Mobile Access*, 27 TELECOMMUNICATIONS POLICY 457-476 (2003); J. Eisner, and T. Waldon, *The Demand for Bandwidth: Second Telephone Lines and On-Line Services*, 13 INFORMATION ECONOMICS & POLICY 301-309 (2001); K. Duffy-Deno, *Demand for Additional Telephone Lines: An Empirical Note,* 13 INFORMATION ECONOMICS & POLICY 283-299 (2001); D. Lynn Solvason, *Cross-sectional Analysis of Residential Telephone Subscription in Canada using 1994 Data*, 9 INFORMATION ECONOMICS & POLICY 241-264 (1997). Primary own-price elasticities are estimated to be well below 0.10. R. Crandall and L. Waverman, *Who Pays for Universal Service? When Telephone Subsidies Become Transparent* (2000) at Table 5-1 (available at: http://www.brookings.org/press/books/universal_service.htm); K. Flamm and A. Chaudhuri, *An Analysis of the Determinants of Broadband Access*, 31 TELECOMMUNICATIONS POLICY 312-326 (2007) (we note that this analysis estimates a positive an own-price elasticity of demand for dialup, forcing us to question the reliability of the estimates); G. Ford and J. Jackson, *Demand Elasticities for International Message Telephone Services*, 36 APPLIED ECONOMICS 1523-1527 (2004).

services.[35] Estimated elasticities vary across studies and time, so those listed in the table are *approximations* of the average estimated values. We also provide a approximation of the own-price demand elasticity for a bundle of triple-play services. This estimate, equal to -1.50, is a revenue-weighted average of the services making up the triple play (voice, data, and video).[36] The value given is -1.50, which is in the elastic region of demand.

Table 2. Final Service Demand Elasticities

Service	Final Service Demand Elasticity (η)
Multichannel Video	-3.00
Local Telephone	-0.10
Domestic Long Distance	-0.75
Int'l Long Distance	-0.30
Broadband	-1.50
Electricity (Usage)	-0.20
Triple Play*	-1.50

* Author calculation.

In the case at hand, it is important to recognize that the relevant elasticities, given by the terms ε_i in the equations, are the elasticities of the demand for the pole attachment, referred to as the elasticities of *derived demand*. The elasticities

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34 P. Rappoport, D. Kridel, *et al.*, *Residential Demand for Access to the Internet,* Chapter 5 in the INTERNATIONAL HANDBOOK OF TELECOMMUNICATIONS ECONOMICS, VOLUME II (G. Madden, Edward ed., Elgar 2003); R.W. Crandall, J.G. Sidak, H.J. Singer, *The Empirical Case Against Asymmetric Regulation of Broadband Internet Access,* 17 BERKELEY LAW AND TECHNOLOGY JOURNAL 953 (2002); T. Ida & T. Kuroda, *Discrete Choice Analysis of Demand for Broadband in Japan*, 29 JOURNAL OF REGULATORY ECONOMICS 5 (2006); P. Pereira & T. Ribeiro, *The Impact on Broadband Access to the Internet of the Dual Ownership of Telephone and Cable Networks* (Working Paper 2006); M. Cardona, A. Schwarz, B. Yurtoglu, and C. Zulehner, *Demand Estimation and Market Definition for Broadband Internet Services*, (Working Paper Dec. 2007)(available at http://ssrn.com/abstract=1081261).

35 D.R. Bohi and M. Zimmerman, *An Update on Econometric Studies of Energy Demand Behavior*, 9 ANNUAL REVIEW OF ENERGY 105–154 (1984); G.S. Maddala, R.P. Trost, L. Hongyi, and F. Joutz, *Estimation of Short-Run and Long-Run Elasticities of Energy Demand from Panel Data Using Shrinkage Estimators*, 15 JOURNAL OF BUSINESS & ECONOMIC STATISTICS 90–101 (1997); G. Cerrutti, *Estimating Elasticities of Residential Energy Demand from Panel County Data Using Dynamic Random Variables Models with Heteroskedastic and Correlated Error Terms*, 22 RESOURCE AND ENERGY ECONOMICS 355 (2000); M. A. Bernstein and J. Griffin, *Regional Differences in the Price-Elasticity of Demand for Energy*, National Renewable Energy Laboratory, NREL/SR-620-39512 (2006).

36 Based on expense share and elasticities of local phone ($37), long distance ($14), international long distance ($1), multichannel video ($43), and broadband ($53). Sources include TRENDS IN TELEPHONE SERVICE, www.ncta.com, and OECD Communications Outlook 2007.

in Table 2 are for the final services and are not the relevant derived demand elasticities. When only retail level elasticities are available, one must make some assumption about how those elasticities would plausibly be related to the derived elasticities necessary for the Ramsey formula for pole attachments. Under certain conditions, the elasticity of derived demand is simply the final product or service demand multiplied by the input's share of total cost.[37] Given this, we can use the elasticities in Table 2 to *approximate* the derived demand elasticities.

Assume the derived demand elasticities are simply $\varepsilon = w\eta$, where w is the share of total expenses of the pole attachments used to make a final service with elasticity η.[38] Our estimates indicate that pole attachment costs represent about 1% to 2% of total expenses for communications firms and electric utilities.[39] Given the small fraction of costs, the derived demand for pole attachments is highly inelastic for all attaching firms. The elasticities of derived demand reflect the fact that the pole attachment is necessary, so little substitution is possible. As shown in Equation (3), however, it is the *relative* values of the elasticities, not the absolute values, across attachments that determine the shares of pole costs paid in any practical application. Consequently, given the similarity of the cost shares across firm types, the relative elasticities of the final products can serve as a proxy for the derived demand elasticities for computing *relative* prices and margins (but not *absolute* prices or margins).

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37 P.R.G. Layard and A.A. Walters, MICROECONOMIC THEORY (1978), at 269.

38 *Id*.

39 We assume that electrics and ILECs attach to the 126 million poles in the U.S. (which excludes railroad-owned poles). The cable industry is assumed to attach to 67% of all poles (84 million). For the cable industry, we compute total expenses for the industry by multiplying the average expense per home passed for Comcast by total industry homes passed ($394 per home passed by 123.4 million homes passed). The cost share for cable is about 1%. For telecommunications, we assume they pay $40 per attachment. We then sum the expenses of AT&T and Verizon and assign pole costs to these carriers based on their share of access lines. The cost share is about 2%, though it would be lower if the cable rate was paid. Financial data for cable and telecommunications firms are from their 2007 Form 10-Ks. Access line data is from TRENDS IN TELEPHONE SERVICE, Federal Communications Commission (Feb. 2007). Pole data is from Pelkovits (2008), *supra* n. 10, at 6-9. For electric utilities, we assume an average attachment rate of $40 per year and divide that by total industry expenditures provided by the Energy Information Administration (www.eie.doe.gov). The cost share is about 2%. Of course, the share is dependent on the assumptions regarding attachment rates.

B. *The Consequences of Rate Uniformity and Convergence*

The convergence of communications networks means the services sold over such networks are becoming increasingly similar. As the service offerings converge, it is reasonable to expect the elasticities of demand for the services offered over the network also to converge. In the Ramsey context outlined here, this implies that the optimal prices for attachments are likewise converging.

It is interesting to note that the rate differentials created by the existing statute and regulatory scheme are loosely supported by Ramsey pricing. When the pole attachment regulatory regime was put in place, the cable and telecommunications industries were largely distinct. As shown in Table 2, under Ramsey pricing a "cable only" network would face a substantially different price for attachments than a "voice only" network. The elasticity of demand for cable services is typically estimated in the elastic range (which is sensible since cable rate are not regulated), whereas the demand elasticity for traditional voices services is highly inelastic. Assuming approximately equal cost shares, the elasticities of derived demand imply that lower rates for "cable only" networks may have been justifiable historically, but, as we discuss below, this basis for a rate differential is now largely absent.[40]

Today, however, as integrated, multi-service fiber optic networks proliferate, the differences across these communications services types have substantially disappeared. Consider a few relevant statistics: in 1978, there was no broadband and no commercial Internet. Even as the 1996 Act was being drafted and codified, broadband Internet service was largely in its infancy. In 1999, the first year for which FCC data on high-speed Internet lines is available, there were only 1.4 million cable broadband lines, about 1.0 million DSL lines, and only 2.7 million broadband lines altogether. Now, consider the contrast with today: as of June 2007, there were 34 million cable broadband lines, about 30 million DSL broadband lines, and 100 million broadband lines in the country.[41] Plainly, the communications industry has undergone a substantial transformation in a short period of time.

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40 Furthermore, in 1978, the cable penetration rate in the United States was very low (penetration was about 15%). One motivation for a preferential rate may have been to to spur cable deployment. Subscription data from www.ncta.com and housing data from census.gov, which shows 13.4 million cable modem subscribers among 88.4 million households.

41 HIGH SPEED SERVICES FOR INTERNET ACCESS, Oct. 2000 and March 2008, both at Table 1.

Furthermore, the service mix is increasingly common across communications providers. Consider the cable industry: at the end of 2002, six years after the 1996 Act was passed, Comcast had 21.3 million video subscribers, 3.6 million high-speed internet subscribers, and 1.4 million phone service subscribers.[42] As of the end of 2007, just five years later, Comcast had 24.1 million video subscribers, 13.2 million high-speed Internet subscribers, and 4.6 million phone customers. For Comcast, over the five year period, annual growth for video subscribers has been 3%, for Internet subscribers 53%, and for phone customers 46%. The ratio of commingling [(Internet + Phone Subscribers)/Video Subscribers] has risen from 0.23 in 2002 to 0.73 in 2007, and this ratio is expected to grow over time. The growth of broadband for the telephone companies is similar to cable, and now the largest telecommunications firms are offering multichannel video services.

The most obvious implication of Ramsey pricing for pole attachments is that since the communications networks are converging, and have largely converged already, the network operators are offering essentially the same set of services. Consequently, the demand elasticities for the services have likewise converged. Assuming roughly equal cost shares for pole attachments, the derived demand elasticities have also converged. The implication is clear—a more uniform rate for pole attachments should apply to modern communications networks.

Using Ramsey pricing as a guide, we have shown that a more uniform pricing of pole attachments for communications networks is grounded in economic efficiency. This uniform pricing is supported for cable, CLEC, and ILEC communications networks. Economic theory provides the efficiency motivation for a uniform broadband rate proposed by the FCC, and the Supreme Court's decision in *NCTA v. Gulf Power* appears to indicate sufficient authority for the FCC to implement a uniform rate for all communications firms.[43]

C. *The Allocation of Fixed Costs Among Electric and Communications Firms*

Communications networks are not the only users of utility poles. Electricity utilities not only are a dominant user of poles, they also are the largest owner of utility poles. Consequently, those costs not recovered from communications providers are paid, implicitly, by the electric utilities (or other pole owners). For

42 Comcast 10-K (2003).

43 *NCTA v. Gulf Power*, 534 U.S. at 336, 338-39..

example, the current telecommunications rate formula structure implies that the communications industry should bear no more than two-thirds of the fixed costs of utility poles. Inevitably, then, the FCC's (or any regulator's) decision on pricing for pole attachments implicates electric utilities and electricity rates.

Any change in the rates paid by communications providers is likely to impact attachment revenues for the electric utilities. Unsurprisingly, one coalition of electric utilities has suggested to the FCC that the rates for cable and telecommunications providers should be increased, arguing that the current structure consists of "government mandated subsidies" and that "electric consumers should not be subsidizing broadband companies."[44] These claims are largely rhetorical and not supported by economic reasoning, and the evidence suggests that raising attachment rates is likely to be contrary to Ramsey pricing principles. As Table 2 shows, the demand for broadband Internet access services is elastic (-1.5), far more so than electricity distribution (-0.20).[45]

As shown in Equation (4), these facts have implications for a Ramsey pricing approach to pole attachment rates. If the elasticity for pole attachments in the communications industry has risen relative to the electric utilities, then rates should be adjusted so as to shift more of the fixed costs of the pole to the electric utilities. Such a rate re-structure is *not* a "subsidy" from one service to another—it is the efficient method of allocating the burden of fixed costs in a way that maximizes allocative efficiency and has the least effect upon the economy as a whole.

In fact, the evidence we found on the relative derived demand elasticities for electric and communications services strongly indicates that an optimal pricing approach would asses a sharply lower per-foot rate for communications providers than for electric utilities (assuming equal marginal costs), since the optimal relative price-cost margins are proportional to the relative elasticities for the attachments (see Equation 4). An important question, then, is how do the

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44 Coalition of Concerned Utilities Letter, *supra* n. 7, at 3-4. Indeed, the Coalition provides a colorful description of what it believes to be occurring: "The Commission's current pole attachment rate methodology is akin to the utility paying full price for a car while attachers remain free to climb on board and chip in a small percentage annually for gas and other expenses." *Id.* at 6.

45 While the estimates may vary across studies and assumptions, there is little question that the demand elasticities for services such as multichannel video and broadband will be larger than for electricity service which is largely deemed a necessity. The proper elasticity for electricity service is probably the connection elasticity, which is more inelastic than that reported in Table 2.

current rates compare to the prescriptions of Ramsey pricing, and how much would they need to change to better comport with optimal pricing of the attachments? We can provide some guidance to these questions using available estimates of elasticities, costs and prices.

To begin, assume equal cost shares for all firms (say, 1.5% of costs) and a uniform marginal cost for attachments. As shown above, the end-user demand elasticity for a triple-play or broadband service has an estimated elasticity of -1.5, compared to an electricity elasticity of -0.20. Given the cost shares, the derived demand elasticities for these services are -0.0225 for communications and -0.003 for electrics. This is a substantial difference—the derived demand elasticity for pole attachments of communications firms is approximately 7.5 times greater than that of electric utilities. It follows, then, from Equation (4), that the price-cost margins between electric utilities and communications firms likewise should differ by a factor of about 7.5 ($\varepsilon_j/\varepsilon_i$ = -0.0225/-0.003 = 7.5).[46] With equal marginal costs, this implies optimal prices (per-foot) should be significantly higher for electric utilities than for communications firms. (Notably, a substantial difference in elasticities persists even under considerably different assumptions.[47]) Given these sharp differences in derived demand elasticities, optimal pricing theory prescribes that communications providers bear a relatively small share of the total costs of utility poles and electric utilities should shoulder the bulk of the costs.

Using this approach, we can analyze whether applying the cable system rate to all communications firms is consistent with optimal pricing. The cable system rate is the lowest rate currently applied to broadband providers. Assume that there is one electric utility, one cable provider, and one ILEC attached to a pole. Consistent with historical data, say the cable system needs one foot of space and

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46 Further, before the services provided over communications networks converged, the elasticity of demand for local telephone services was highly inelastic, roughly equivalent to electricity (see Table 2). Historically, allowing for joint use or cost-sharing agreements for utility poles between incumbent LECs and electric utilities were possible and likely efficient, in large part because the efficient allocation would divide fixed costs between the two could at roughly the same level. But now that the elasticity of demand for communications services has increased, those co-equal cost-sharing arrangements are now more likely to produce inefficient prices. Further, the large and growing imbalance in pole ownership between ILECs and electric utilities may also create asymmetries in the bargaining process that forms such agreements.

47 For example, if we assume a 1% share for communications firms and 2% cost share for electric utilities, the differential is 3.75.

the ILEC needs 2 feet.[48] Assume the electric utility owns the pole so that it pays all costs not paid by the communications firms. If *K* is $90, the cable operator pays $6.67, the ILEC pays $13.34 ($6.67 per foot), and the electric utility pays the residual of about $70 (or $6.67 per foot).[49] These are not the optimal prices, but an approximation of the prices paid if the cable formula is applied to all communications firms.

Are these prices consistent with optimal pricing? To make this determination, recall that the given the demand elasticities, the price-cost margin for electric utilities should be about 7.5 times larger than that for the communications firm. So, we need first to compute the price-cost margins and then make a comparison. The true marginal cost of a pole attachment is difficult to estimate precisely.[50] We know from the cable rate calculation, however, that the marginal cost must be less than $6.67, since that price level theoretically recovers the full costs of the pole attachment (so it must include some fixed costs). If we assume 20% of the carrying costs of the pole are marginal, then the marginal cost per foot of usable space is $1.3 per year (= 0.2·90/13.5). For communications firms, the price cost margin is 0.80 [= (6.67 - 1.3)/6.67], and for the electric utilities is also 0.80 [= (6.67 - 1.3)/6.67]. We can see that at the cable system attachment rate, there is no difference in the price-cost margins between the communications firms and electric utility (0.80 versus 0.80). Optimal pricing indicates the electric utility price-cost margin should be 7.5 times larger than the communications firms, so it is apparent that applying the cable rate to all communications providers is not compatible with optimal pricing. Under the cable system methodology, broadband firms pay too much.

Even if we assume that the electric utility needs only 7 feet of pole space (rather than assigning them the residual),[51] the per-foot rate is only $10 (= 70/10). Now, the price cost margin for the electric utility is 0.87 [= (10 - 1.3)/10], but the ratio of margins is only 1.08 (= 0.87/0.80), which remains far below the optimal ratio of 7.5.

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48 Kyle and Klein, *supra* n. 14, at 49.

49 The rates are based on Equations (1) and (2). The electric utility is assumed to use the remaining 10.5 feet of usable pole space.

50 *See* Kyle and Klein, *supra* n. 14, at 49, claiming marginal cost is less than $4.

51 Kyle and Klein, *supra* n. 14, at 49.

Consequently, our calculations suggest that the applying the per-foot rates of the cable rate methodology to all communications firms would be incompatible with the prescriptions of Ramsey Pricing. This cable rate still allocates too much of the fixed costs to communications firms to be socially efficient.

So what should a harmonized rate for broadband network providers be? Given a marginal cost of $1.30 per foot, Ramsey pricing implies the final per-foot rate for broadband networks that includes both this marginal cost and a proper allocation for fixed costs should be about $1.5 per foot. Commensurately, the implied rate for electric utilities would be about $8.14 per foot of pole space (at 10.5 feet used, or an implied $12.21 at 7 feet used). With these rates, the price-cost margins for pole space will be proportionate to the ratio of derived elasticity of demand for communications and electric services (0.84/0.11 = 7.5).

Importantly, to justify the current cable system rate under Ramsey pricing principles, one would need to make unrealistic assumptions about those marginal costs. Using our example above, even if one assumes that 50% of the costs of a pole are marginal (resulting in a $3.33 marginal cost per foot), the optimal communications firm rate is about $3.6 per foot, substantially lower than the $6.67 per foot rate than communications firms would if the current cable rate method were used. To get to the communications rate to match the cable system price of about $6.67 per foot, one would need to assume that approximately 95% of total pole costs are marginal and assign only 7 feet of space to the electric utility.[52] This high percentage of costs being marginal is unrealistic, especially given the supply-side nature of utility pole deployment.

We may also employ assumptions more favorable to the electric utilities. As discussed above, under certain assumption the optimal ratio of price-cost margins is only 3.75 (rather than 7.5).[53] Assuming marginal cost is 20% of carrying costs ($1.3 per foot), the optimal price for communications firms is $1.75 per foot, still well below the $6.67 per foot rate implied by the cable formula. If marginal costs are 50% of carrying costs ($3.33 per foot), then the optimal communications attachment rate is $4.10, also well below the cable formula rate of $6.67. The evidence seems to indicate that the cable formula applied broadly to communications firms would not be optimal.

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[52] At 10.5 feet, it is impossible for the cable rate to be consistent with Ramsey pricing with an elasticity ratio of 7.5.

[53] See *supra* n. 47.

Applying the current telecommunications carrier rate method to all communications firms would result in prices that are even more inconsistent with Ramsey pricing principles, since the telecommunications carrier rate is higher than the cable rate. In our example, this telecommunications carrier rate is calculated to be $15.26 per-foot for all communications firms. Electric utilities would implicitly pay *less* on a per-foot basis, only $4.21 at 10.5 feet and $6.32 at 7 feet.[54] That result is directly contrary to the Ramsey rule, as firms with inelastic demand would pay considerably less per foot for pole space than firms that have elastic demand for poles. Unless the marginal costs of electric utility attachments are substantially lower, the telecommunications rate is entirely incompatible with Ramsey pricing.

While we do not claim to have estimated highly precise values for the Ramsey prices, it seems apparent under plausible assumptions that harmonizing communications rates is necessary to adopt optimal pricing principles for pole attachments. Moreover, Ramsey pricing also would call for the re-examination of the overall allocation of the fixed costs of poles generally between the communications and electric utility industries. Economic analysis indicates that the harmonized rate for integrated voice, video and broadband Internet service networks might need to be lower than the current rates applied to any broadband provider, given plausible estimates of elasticities of demand for pole attachments between electric and communications providers. The current rates paid by communications providers appear to be too high from an economic efficiency standpoint.

IV. Conclusion

Ramsey pricing is generally viewed as an optimal method of setting rates in a way that recovers fixed costs of facilities that have multiple uses. The challenge to the regulator in this setting is to establish rates that do not unduly suppress the quantity demanded of the input while still providing for full recovery of the fixed cost of providing that input. Ramsey pricing varies the allocation of fixed costs proportionate to the elasticity of derived demand for the input from each different service. As a result, firms or classes of firms with inelastic demand for the input will pay a higher share of fixed costs than firms with more elastic demand.

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[54] Communications firms rent 3 feet at a total cost of $45.78 and the residual is $44.22 spread over 7 feet.

Our review and application of Ramsey pricing to pole attachment rates renders two key conclusions:

First, a uniform rate for all modern communications network is justified on economic efficiency grounds. Historically, the differences in rates across cable and telecommunications firms is plausibly compatible with Ramsey pricing, as the demand for cable services is much more elastic than the demand for telephone services. However, the services being offered by cable and telephone companies are converging into a triple play of voice, video, and broadband services. Along with that convergence, elasticity of demand for pole attachments for these network providers has also converged. As a result, following Ramsey pricing principles for pole attachment rates would recommend that the same rate be paid by firms that offer the same services over such broadband networks.

Second, Ramsey pricing principles and available evidence suggests that the harmonized rate for integrated voice, video, and broadband data networks should be established at level below the current telecommunications or cable rate. The allocation of the cost of unusable space needs to be allocated between electric utilities and the communications industry, and Ramsey pricing principles indicate that the FCC should re-examine this allocation in light of changes in the relative demand for pole attachments. The demand for electricity remains highly inelastic today, while the demand for broadband and triple-play communications services is relatively elastic. As a result, an efficient Ramsey pricing approach to pole attachment rates appears to support lowering the allocation of the cost of unusable space collectively paid by broadband network operators and commensurately increase the allocation of these costs to electric utility companies. Prior to setting a specific rate, however, further analysis is warranted.