March 1, 2007

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

RE: Ex Parte Presentation in MB Docket No. 05-311: Response to Request by Commission Staff Regarding Clarification and Adduction of Evidence Pursuant to Commission Rules 1.1203(a)(1), 1.1204(a)(10), and 1.1206(b)

Dear Ms. Dortch:

On February 22, 2007, the Phoenix Center for Advanced Legal and Economic Public Policy Studies received a letter from Ms. Monica Desai, Chief, Media Bureau, wherein she requested that we respond to an attached peer review commentary by FCC staff economist William W. Sharkey on PHOENIX CENTER POLICY PAPER No. 22, The Consumer Welfare Cost of Cable "Build-Out" Rules. We are happy to provide our response to Ms. Desai's letter, which is attached.

The paper that is the subject of Ms. Desai's letter was, at the request of Ms. Catherine Bohigian, Chief, Office of Strategic Planning & Policy Analysis, entered into the record of MB Docket No. 05-311. MB Docket No. 05-311 is currently in the Sunshine Act period and our submission of this response is made at the direct request of Ms. Desai and is therefore related to the clarification or adduction of evidence on the record in MB Docket No. 05-311. Consequently, this submission is a permissible presentation pursuant to Rules 1.1203(a)(1) and 1.1204(a)(10), and we are filing it with the

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1 Letter from Lawrence J. Spiwak, President, Phoenix Center, to Marlene H. Dortch, Secretary, Federal Communications Commission, MB Docket No. 05-311 (Mar. 13, 2006).
Commission in accordance with Rule 1.1206(b), as required by Rule 1.1204(a)(10)(iv). Please contact me if you have any questions.

Sincerely,

Thomas M. Koutsky
Resident Scholar
March 1, 2007

Monica Desai
Chief
Media Bureau
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554


Dear Ms. Desai:

This letter is in response to your letter dated February 22, 2007, in which you provided a copy of the peer review commentary by FCC staff economist William W. Sharkey on PHOENIX CENTER POLICY PAPER NO. 22, The Consumer Welfare Cost of Cable “Build-Out” Rules, and asked for our response. The Phoenix Center is pleased that the Commission has submitted PHOENIX CENTER POLICY PAPER NO. 22 to the Commission’s “peer review” process. To our knowledge, this is the first time the Commission has bestowed this distinction on research provided by a non-governmental organization.

We could not agree more with the purpose of a comprehensive peer review process at the FCC, and we have a long history of publishing in peer-reviewed academic journals. Indeed, we value public debate of our work, as we make all Phoenix Center research (including POLICY PAPER NO. 22) available for free on our website and we openly post rebuttals and critiques. We are particularly proud that, pursuant to the Office of Management and Budget’s 2005 Final Information Quality Bulletin for Peer Review, by submitting this PAPER for peer review, the Commission apparently intends to disseminate POLICY PAPER NO. 22 and regards that PAPER as “influential.”

Moreover, we are pleased that Dr. Sharkey's comments on our paper are, for the most part, positive. Dr. Sharkey states that "intuition behind the theory [of the paper] is straightforward;" "the general structure of the theoretical model is correct, and useful for policy makers in the Commission proceeding;" and "[t]hese results could conceivably be useful to local franchise authorities is deciding whether to impose build-out requirements at a local level." Dr. Sharkey even noted that the results of our paper "could be useful to the Commission in reaching a decision in MB Docket No. 05-311." His memorandum repeatedly and directly affirms the value and utility of our analysis for the Commission's policy decisions.

Dr. Sharkey provided constructive commentary on the paper that we greatly appreciate. We provide a comprehensive response to Dr. Sharkey's review below, which we discuss in four general areas:

A. **Error in Figure 1.**

Dr. Sharkey detected a flawed graphical device that was present in Figure 1 in some earlier versions of the paper. The current version of the paper (attached) has a correct version of the figure. We have also provided that revised figure as an addendum to this letter. The flawed graphic in no way affects the conclusions of our theoretical model and results of our simulation, since the flawed graphic was inconsistent with both. Indeed, Dr. Sharkey apparently suspected that the flaws reflected in the figure were restricted to the figure, as he concludes that our general theoretical model is "correct" and our paper is "useful" for the Commission and local franchise authorities in making decisions relating to build-out policies.

B. **Approach to Post-Entry Competition.**

A second concern raised in the review is Dr. Sharkey's assertion that our paper contains a simplistic approach to post-entry competition. The study simply assumes that the function \( r(h) \) is a declining function of \( h \). While this is a plausible result that could be justified in a more rigorous setting, it is by no means the only possible solution.

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2 In fact, the legitimacy, or "correct[ness]" of our theoretical argument can be demonstrated with arguments contained in Dr. Sharkey's memo. As we state in the paper, "As the number of homes passed rises, profits fall and entry costs rise, and eventually the cost of adding another home reduces net profits \([d(h^*) - e(h^*) > d(h^* + 1) - e(h^* + 1)]\). At this point, the entrant stops expanding its network and serves \( h^* \) homes, where \( h^* \) is the number of homes passed that maximizes the entrant's net profits." We can use standard notation and rewrite the condition in the statement as, \([d(h^*) - d(h^* + 1) > e(h^*) - e(h^* + 1)]\), or \( d'(h) > e'(h) \)--that notation is precisely the same observation that Dr. Sharkey penned in his review. This restatement of the network entry condition is what we utilize in the paper's simulation for computing equilibrium network construction under the condition of free entry (e.g., no build-out requirements). There is thus no defect in the theoretical analysis or simulation, both of which are based on and utilize Dr. Sharkey's entry condition. Our error was purely presentational and limited to Figure 1.
Certainly, there are many assumptions or hypothetical situations that we could consider in simulating the extent of price competition between an incumbent cable operator and a new wireline video entrant. The assumption we made was consistent with decades of theoretical and empirical research on wireline cable competition, much of it generated by the Commission itself and relied upon by the Commission in rulemaking proceedings. We believe that building this assumption into our simulation was reasonable.

The important issue, it seems to us, is not that there are alternative assumptions about the nature of price competition but on what basis one would choose an alternative to that which we used in our simulation. Our selection of the particular price response to entry was based on the existing literature—both theoretical and empirical—addressing competition in cable markets. A sophisticated analysis of overbuild competition, recently published in the JOURNAL OF BUSINESS, provides both theoretical and empirical support for the decline of prices as overlap increases. Moreover, our assumption about competition is exactly the same as the assumption adopted by the Commission in its econometric model used to regulate cable industry rates in the wake of the 1992 Cable Act. In the Commission’s regression model used to compute the 17% price differential in competitive cable markets, the Commission quantified the effect of competition using an OVERLAP variable that measured the percent of a cable market served by two competing providers. The coefficient on the variable was negative and statistically significant, indicating that the more two rival networks overlap, the lower are prices. So, while there are an infinite number of possible strategic interactions, we feel like our assumption was reasonable, based on the available theoretical and empirical analysis of the cable industry conducted by both academics and the Commission. Undoubtedly, the idea that as the new wireline network grows larger, price competition between the incumbent cable company and the new entrant will intensify is exceedingly intuitive and plausible. Further, Faulhaber and Hogendorn (2000), under alternative strategic interactions, find similar results to ours, concluding “[a build-out rule] delays entry, delays competition, [and] actually creates an unnatural (as opposed to natural) monopoly.”

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Dr. Sharkey suggests modeling a potential alternative post-entry competition scenario. This scenario involves an assumption that the incumbent cable firm would compete aggressively on price with a new entrant that has only begun to build a network, but then that competition would cease and prices would rise to a collusive outcome once the new entrant had built to 100% of the market.\(^6\)

The underlying assumption of this alternative—that the incumbent and new entrant are more likely to settle into “a collusive duopoly outcome” once the new entrant has build-out an entire franchise area—is in and of itself a strong indictment of any “build-out” policy. If collusion between an incumbent cable company and a new entrant is more likely with complete, 100% build-out, then a build-out requirement would almost certainly harm consumers, because “collusive duopoly” cable rates would be the same as monopoly cable rates. It seems clear that consumers would be far better off with partial competitive entry, which would lower prices to competitive levels for at least some set of consumers, than they would with any build-out requirement that keeps prices at monopoly or near-monopoly levels. In a more dynamic setting, aggressive price competition may deter limited entry but collusion under build-out may allow it. Once again, we must question what consumers gain from the collusive outcome, even if entry is deterred altogether (a rather unrealistic expectation). Further, if incumbents did engage in such strategic behavior, then entrants may prefer build-out mandates as a means by which to enforce collusion and thereby allow entry. Yet, we see no entrants advocating for build-out requirements.

Clearly, Dr. Sharkey is correct that strategic behavior can take on a variety of forms. That said, we are unaware of any econometric study (or even colloquial evidence) which shows that competition between incumbent cable companies and new wireline multichannel video entrants occurs in the fashion proposed, or anything remotely close to it. Indeed, we are unaware of any research that has shown that post-entry cable “overbuild” competition exhibits price competition substantially different than what our simulation assumed. Nor is it the case that there is some obvious alternative that would radically alter our conclusions. Within the limitations of our simulation, we are unable to find any sensible pricing scenarios that alter our conclusions.

While we do limit our analysis to a single mode of price competition, we believe our approach is the most plausible one and the only assumption supported by empirical evidence (other than the assumption that entry reduces prices by the same amount regardless of overlap, an assumption that most likely increases the consumer harm from build-out), including studies conducted by the Commission. Moreover, we were certainly explicit about this assumption so that the readers, like Dr. Sharkey, could contemplate how that assumption might affect our analysis and conduct their own analysis if they so choose.

\(^6\) Dr. Sharkey proposes, “[q]uite possibly, the incumbent would compete more vigorously if only a few homes are passed by the entrant, in order to deter subsequent entry. Similarly, once significant build-out has occurred, it is possible that a collusive duopoly outcome would be more likely to occur.”
C. Supporting Data for Network Investments.

Dr. Sharkey also expresses some concern about the “lack of supporting data on the cost of network investments.” Our simulation assumes investment of $600 per home passed, and that figure has been frequently used in studies of the cable television industry, which we cited in footnote 26 of the PAPER. We believe these costs to be conservative, and to the extent the network costs are higher, the negative welfare consequences of build-out mandate are larger (and vice versa).

D. Observations on Limitations of the Simulation.

We believe our PAPER provides insight into the impact that a build-out policy would have on video competition and consumer welfare—and that such a policy could be both positive and negative. As a result, we agree with Dr. Sharkey’s statement that, “I think that it would be premature to use these results as definitive evidence that build-out requirements are always harmful.” Certainly some high-cost residents benefit in communities if an entrant enters even if a build-out requirement is imposed. But that benefit must be balanced against consumers in other communities which will see no entry at all if a build-out rule makes entry into that community unprofitable. Our model and simulation balance those benefits and costs and show that build-out mandates tend to harm more far consumers than they would help. In our benchmark case (Table 2 of the PAPER), consumers are better off in 15 of the 100 simulated markets because of a build-out requirement. But that benefit in those simulated markets is counterbalanced by consumers in the 85 simulated markets that would see entry in the absence of a build-out rule but would see no entry if build-out policies were in place. The simulation analyzes and balances the (few) markets that build-out rules benefit against the (many) markets that a build-out rule harms by precluding entry. Our benchmark case shows that there is substantially more entry overall across more markets if build-out rules are not in place. Our analysis finds that build-out requirements across many markets are, when benefits are balanced against the harms, a bad policy because it reduces aggregate consumer surplus.

Dr. Sharkey posits that “[i]f the authors of the study really believe that any plausible model of costs and duopoly competition would lead to these results, then it would have been desirable to refocus their study in order to defend this position.” Every good economic paper should prompt areas of further study and inquiry; it is not a strong critique to say that the PAPER does not answer all questions. Moreover, nowhere in the PAPER do we assert or imply that “any plausible model of costs and duopoly competition would lead to these results.” Instead, we observed that “[t]he purpose of the simulation is merely to provide an informed guess of the effects of build-out requirements.” Based on existing industry and econometric research, we put forward a plausible model and simulation that contained a substantial sensitivity analysis for our

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7 PHOENIX CENTER POLICY PAPER NO. 22 (July 2005 ed.) at 11, attached to Letter from Lawrence J. Spiwak, President, Phoenix Center, to Marlene H. Dortch, Secretary, Federal Communications Commission, MB Docket No. 05-311 (Mar. 13, 2006).
core assumptions. It is not possible to disprove, as Dr. Sharkey states, all other "plausible model[s] of costs and duopoly competition." We admit that it is clearly possible to come up with some set of conditions where build-out mandates would not be detrimental to consumers; in fact, we so stated that in the PAPER. But the purpose of research aimed at assisting policymakers, who operate in the real world, is ill-served by concocting unrealistic scenarios. The difficulty, in our opinion, is coming up with a plausible set of circumstances which render build-out mandates a consumer-friendly market intervention. We of course did not address all potential scenarios, but what we did do in our PAPER is discuss a plausible set of circumstances that reflect the reality of today’s marketplace. We believe that when considered in this light, our observations and conclusions are important and useful.

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In conclusion, the Phoenix Center is proud that the Commission has selected POLICY PAPER NO. 22 for dissemination and subjected it to its peer review process. We value public comment and input into our work product, as such comment and input invariably improves our work product.

We of course regret the inadvertent error in Figure 1 in the earlier version of our PAPER that Dr. Sharkey reviewed. We do wish to reiterate that this error has absolutely no impact on our theoretical model and simulation. We have discussed Dr. Sharkey’s other observations in detail above and we stand by our conclusions that build-out rules generally harm consumers because in the aggregate they deter wireline video entry so that consumers as a whole are harmed. While Dr. Sharkey is correct that there are many potential alternative forms of price competition, we selected the form of competition supported by the Commission’s own empirical analysis of terrestrial multichannel video competition and by a recent refereed publication in the economics literature. This assumption, like all the others, are explicitly stated and documented in the PAPER. We likewise explicitly noted the limitations of both the theoretical and simulation approach, and chose assumptions and methodologies that neither over- or under-state the implications of build-out mandates.

We believe that the important insights of POLICY PAPER NO. 22 have stood the test of time. Interested commenters have had since July 2005, when we first released the PAPER, to posit alternative scenarios or models that, when used in a theoretical model or simulation, would cast doubt that the scenarios and assumptions we have made. No one has done so. We stand by its conclusions completely and we feel that it comports with the professional standards of the economics and legal professions.

Once again, we appreciate the honor of subjecting our PAPER to this peer review process, and we stand ready to answer any further questions you may have on this

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8 Indeed, we observed that “[w]e can easily concoct examples where the build-out rule does not deter entry, which is why theory alone cannot resolve this issue.” Id. at 18. For example, if entry costs were zero and revenues (and marginal profits) always positive, build-out mandates do not reduce consumer welfare (nor do they increase consumer welfare, since build-out is the free entry equilibrium).
matter. We are very pleased that Dr. Sharkey noted that "the general structure of the theoretical model is correct, and useful for policy makers in the Commission proceeding." We look forward to Commission staff concluding the peer review process by acknowledging receipt and review of the current version of the PAPER and confirming that the corrected figure and the PAPER as a whole meet professional standards for the peer review process, as interpreted by the Commission. Indeed, we trust that our responses to the remaining comments and suggestions on the paper are sufficient and hope that the Commission fully understands that the typographical defects in earlier versions of the paper do not affect at all the theoretical argument, the simulation results, and the conclusions and observations contained therein.

Sincerely,

George S. Ford
Chief Economist

Thomas M. Koutsky
Resident Scholar

Lawrence J. Spiwak
President
In the figure, the vertical axis is price and the horizontal axis is the number of homes the entrant will choose to pass with its new network. In this table, we rank homes by (marginal) entry costs \( e'(h) \) (that is, the cost of constructing to a home increases along the horizontal axis). Since the costs of homes are ranked and the demand for the service is randomly distributed, the horizontal axis also measures the degree of system overlap. There are three curves in the figure, average profit per homes passed \( r(h) \), marginal profit per home passed \( d'(h) \), and marginal entry costs \( e'(h) \). Without a build-out rule, the entrant will service \( h^* \) homes (the intersection of the marginal profit and cost curves). Serving \( h^* \) homes—the number of homes it would serve without a build-out requirement—the entrant will have a net profit equal to the area bounded by points twv, which is clearly positive. Under a build-out rule, the entrant's net profit is the difference \( uvw - xyz \), which in this case is plainly negative. The area \( uvw \) is positive net profit \( (r > e) \) and the area \( xyz \) is the negative net profits \( (r < e) \). Since \( uvw > xyz \), the entrant would not enter under a build-out rule. Note that whether or not a build-out rule deters entry depends on the shapes of the \( r \), \( d' \) and \( e' \) curves.

1 Note that \( r(h) - h = d(h) \).
2 Net profits are calculated as: \( twv - vwh^* \).
3 Net profits are calculated as: \( uzh_0 - vyH_0 \).
4 We can easily concoct examples where the build-out rule does not deter entry, which is why theory alone cannot resolve this issue.
Phoenix Center Policy Paper Number 22:

The Consumer Welfare Cost of Cable "Build-out" Rules

George S. Ford, PhD
Thomas M. Koutsky, Esq.
Lawrence J. Spiwak, Esq.

(January 2007, Third Release)
Phoenix Center Policy Paper No. 22

The Consumer Welfare Cost of Cable “Build-out” Rules
(Third Release)

George S. Ford, PhD:
Thomas M. Koutsky, Esq.
Lawrence J. Spiwak, Esq.

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Abstract: Firms that wish to offer wireline, multichannel video programming services in direct competition with cable incumbents are being faced with calls by those incumbents and policymakers to "build-out" to entire communities as a precondition of receiving a franchise. This "build-out" requirement is often incorporated into the local cable franchising process, which the FCC over a decade ago called "the most important policy-relevant barrier to competitive entry in local cable markets." In this POLICY PAPER, we show that build-out mandates are actually counter-productive and serve primarily to deter new entry, increase the profits of incumbents, and harm consumers. With both a theoretical model and an empirical simulation, we show that build-out rules cause new video entrants to bypass certain communities entirely and sharply lower the number of communities in which new network construction would be profitable. We show that consumer welfare is likely to be higher with "free entry" policies that impose no build-out requirement.

1 Chief Economist, Phoenix Center for Advanced Legal & Economic Public Policy Studies.
2 Resident Scholar, Phoenix Center for Advanced Legal & Economic Public Policy Studies.
3 President, Phoenix Center for Advanced Legal & Economic Public Policy Studies. The views expressed in this paper are the authors' alone and do not represent the views of the Phoenix Center, its Adjunct Fellows, or any of its individual Editorial Advisory Board members. The authors would also like to thank Phoenix Center Adjunct Fellow T. Randolph Beard, PhD for his helpful comments and insights comments and analysis on particular portions of this paper. Remaining errors are ours.
I. Introduction

With the marginal cost of providing a telephone call in a free-fall, video is now the key driver for new fiber deployment in the residential market. Yet, in

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1 According to a 2002 Pew Internet & American Life Project survey, the average household spends $51 per month on multichannel video programming services, which represents a significant portion of their total communications (voice, video, Internet, wireless) spending (which averages about $122 per month per household). J. B. Horrigan, Consumption of Information Goods and Services in the United States, Pew Internet & American Life Project (2003), http://www.pewinternet.org/pdfs/PIP_InfConsumption.pdf at 28. If a new entrant cannot readily provide consumers multichannel video over an advanced network, then the prospects for success will be diminished substantially due to a reduction in the entrant’s potential revenues. Quite simply, the ability to sell video services over these fiber networks may be a crucial factor in getting those fiber networks deployed.

Regulators are not always sensitive to the importance video availability has on deployment. For example, the New York Public Service Commission issued an order recently that failed to resolve the question as to whether Verizon could sell video services over its new, all-fiber FiOS network, stating that it would resolve that question only after Verizon had constructed the fiber network and stood ready to sell video service. Declaratory Ruling on Verizon Communications, Inc.’s Build-Out of its Fiber to the Premises Network, Joint Petition of the Town of Babylon, et al., Case Nos. 05-M-0250 and 05-M-0247 (rel. June 15, 2005).
order to provide multichannel delivered video programming, a new entrant must first obtain a franchise from the local and county government in every market it wishes to serve. Very often, the franchise contract requires that the new entrant agree to geographic build-out requirements as a pre-condition to receiving a franchise, and this process results in a form of creeping governmental control. As we show in this POLICY PAPER, while these build-out requirements may have altruistic intentions behind them (e.g., preventing a “digital divide” or promoting local economic development), ex ante build-out requirements are, on average, counterproductive and serve to slow down deployment of communications networks. As a result, these build-out mandates actually reduce consumer welfare and increase the profits of incumbent providers in many communities. Build-out requirements are, therefore, a self-defeating exercise. For this reason, it should come as no surprise that the FCC found over ten years ago that


Often an agency with the power to deny an application . . . or to delay the grant of the application will grant approval only if the regulated firm agrees to conditions. . . . The firm will accept the conditions only when they make both it and the agency (representing the public or some other constituency) better off. Still, though, the agency’s options often are potent, and the grant of an application on condition may greatly increase the span of the agency’s control.

3 D. McCullagh, Bells’ Fiber Plans Spark Political Flame War, CNET News (20 April 2005) (quoting Ranking House Energy and Commerce Committee Member Ed Markey as complaining that “When a cable company wires a community, it must offer service to all households, so why [new MVPD entrants] be permitted to select which neighborhoods are wired with fiber first?”). However, numerous studies reveal there is little correlation between income and cable penetration. For a review of this literature, see R. Kieschnick and B. D. McCullough, Why Do People not Subscribe to Cable Television? A Review of the Evidence, Unpublished Manuscript (1998) at 7-8 and Appendix A (available at http://www.tprc.org/abstracts98/kieschnick.pdf).


5 While consumers do have satellite as a possible substitute to the incumbent cable operator, the U.S. General Accounting Office found that the price cuts for video services from wireline competition are approximately three times larger than those from satellite competition. See Direct Broadcast Satellite Subscribership Has Grown Rapidly, but Varies across Different Types of Markets, Report to the Subcommittee on Antitrust, Competition Policy and Consumer Rights, Committee on the Judiciary, U.S. Senate, US Government Accountability Office, GAO-05-257 (2005). As such, consumers clearly benefit significantly from terrestrial MVPD overbuild entry.
the “local franchise process is, perhaps, the most important policy-relevant barrier to competitive entry in local cable markets.”

While it may seem to be a counter-intuitive conclusion, it is important that policymakers understand the consequences that a build-out requirement will have on the ability of a firm to enter the market. This POLICY PAPER first presents in Section II a simple conceptual framework to evaluate build-out requirements in video markets. As we show, for a policymaker, a build-out requirement is a risky gamble, because while ubiquitous 100% overlap entry is possible on one hand (clearly a good result for consumers), there still exists the very real possibility that a new entrant will stay out of the market and bypass the community altogether (thus leaving consumers with the status quo). Moreover, our theoretical framework shows that incumbents and consumers cannot both benefit from a build-out rule, which leaves open the question of why both incumbents and policymakers advocate such rules.

To generate plausible estimates of the likely effects of build-out requirements on consumers and firms, Section III sets forth a computer-based simulation based on the conceptual framework outlined in Section II. This simulation answers the important empirical questions asked by the conceptual model. Our simulation reveals, under plausible circumstances, that a build-out rule results in a different form of “economic redlining”—i.e., the build-out rule has less effect on the incentives of a firm to serve the most-profitable communities, but a large effect on deployment in more marginal communities. As such, the simulation leads to the inexorable conclusion that build-out requirements are, on average, more likely to benefit incumbent firms than to increase the welfare of consumers, since such rules deter entry. In short, build-out rules conflict with the stated goals of federal, state, and local governments regarding the desire to see the construction of advanced communications networks as quickly as possible.

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7 FCC Chairman Kevin J. Martin has called “the deployment of new packetized networks throughout the nation” to be “one of the Commission’s core priorities”. Statement of Chairman Kevin J. Martin, In the Matter of Petition of SBC Communications Inc. for Forbearance from the Application of Title II Common Carrier Regulation to IP Platform Services, WC Docket No. 04-29 (May 5, (Footnote Continued . . . )
II. An Economic Analysis of Build-out Requirements

To study the impact a "build-out" rule has on the deployment decisions of a new entrant seeking to deploy an advanced fiber network, we first outline a simple, stylized economic model of sequential entry. This theoretical approach builds on the analysis of entry that we describe in detail in PHOENIX CENTER POLICY PAPER No. 21, and it shows that build-out requirements are unambiguously bad for entrants and will make entry more costly and therefore less likely. However, theory alone cannot determine what impact a build-out requirement will have on consumers and incumbents. But this theoretical model does provide guidance on what factors and relationships are important. We provide a more detailed theoretical analysis of build-out requirements in Appendix A, but we limit our attention in this text to the simpler conceptual framework.

A. The Entry Model

In PHOENIX CENTER POLICY PAPER No. 21, we show that a firm's decision to enter a market is essentially a function of the potential profits from serving the market and the costs of entering the market. Quite simply, entry will be more widespread if profits are higher and the costs of entering are lower. We now extend the analysis in POLICY PAPER No. 21 to evaluate build-out requirements.

Say there is a market of \(H\) homes served by an incumbent monopolist. The incumbent's network passes all \(H\) homes, but not all homes subscribe to the service.

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9 The monopoly assumption is for convenience. There could be more than one incumbent, or an incumbent facing limited competition from a highly differentiated product.
service. The monopolist earns profit \( m \). Costs to construct the incumbents network are sunk, and thus do not affect the marginal decisions of the incumbent. For simplicity, assume the marginal cost of a subscriber is zero and a uniform price is charged across the entire market (i.e., there is no price discrimination in the market).\(^\text{10}\)

Now, let there be a firm contemplating entry into this market. The entrant knows that the market price declines as the overlap of the entrant’s and incumbent’s networks rises, and it knows the cost of serving each of the homes.\(^\text{11}\) This price will be uniform across the entire market, even if the entrant only serves a part of the market, although the degree of that price competition will, of course, be related to how much overlap there is between the two networks.\(^\text{12}\)

Post-entry profit (the duopoly profit) of the entrant is \( d(h) \), where the entrant passes \( h \) of the \( H \) homes. Entry requires the entrant to pay entry costs \( e \), where entry costs rise with the number of homes passed. We assume the entrant will enter only if net profits are non-negative: \( d(h) - e(h) \geq 0 \). As the number of homes passed rises, profits fall and entry costs rise, and eventually the cost of adding another home reduces net profits \( [d(h^* - e(h^* = d(h^* + 1) - e(h^* + 1)] \). At this point, the entrant stops expanding its network and serves \( h^* \) homes, where \( h^* \) is the number of homes passed that maximizes the entrant’s net profits.

\(^{10}\) The assumption of zero marginal cost is for convenience. This assumption is equivalent to one where we describe “prices” or “revenues” as being net of variable costs. With zero marginal cost for the incumbent and positive entry cost for the entrant, our simulated markets are natural monopolies (it is always cheaper for the incumbent to provide the service than the entrant). Thus, we do not make total welfare calculations, since total welfare under such circumstances will be lower with entry. Even with these assumptions, the calculation of profits and consumer welfare are legitimate. Eliminating the natural monopoly problem provides nearly no benefit, yet would make the simulation much more complicated.


\(^{12}\) See Beard, Ford, Hill and Saba, id.
B. Free Entry versus Build-Out Requirements

In the absence of a build-out rule (free entry), the entrant will choose to serve $h^*$ homes and will therefore earn gross profits of $d(h^*)$. Consumer surplus rises and incumbent profits fall with entry (since price falls for all subscribers and the entrant acquires market share). Let us assume that in the absence of a build-out rule, the entrant will only serve part of the market ($h^* < H$). Because of the build-out rule, the entrant must construct a larger network to serve all $H$ homes, instead of the $h^*$ homes it otherwise would have chosen. Making the entrant build a larger network will reduce its gross profits and raise entry costs. The result is that net will profits unambiguously decline in the presence of this mandate, (that is, $d(H) - e(H) < d(h^*) - e(h^*)$), since the addition of homes above $h^*$ adds more to costs than to gross profits. Thus, at the margin, build-out rules reduce the prospects for entry. The extent of this deterrence will depend on aggregate profits, which we discuss in detail in Appendix A. Thus, the firm enters only if $d(H) - e(H) \geq 0$, which is not guaranteed (even though we assume it is profitable for the monopolist to have done so).

An entrant faced with a legally-mandated build-out requirement thus faces a tradeoff — i.e., it is forced to decide whether to enter an entire community by balancing the profits earned serving the $h^*$ homes versus the losses incurred from serving the remainder of the market (homes $h^*$ to $H$). This tradeoff is illustrated in Figure 1.

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13 This assumption keeps the analysis interesting. If $h^* = H$, then the build-out constraint is non-binding (has no effect). However, even if the entrant desires to serve the entire market today, the build-out rule is undesirable, since it always forecloses the opportunity to serve less than the entire market.

14 First, if the entrant prefers partial entry ($h^* < H$), then the build-out requirement reduces gross profits (by definition). Second, build-out requirements increase entry costs since they require the entrant to build to more homes than the entrant would willingly choose [$e(h^*) < e(H)$]. Thus, the build-out rule reduces the prospects for entry by attacking the entrant from all sides, cutting gross profits and raising entry costs.
Figure 1. The Entry Decision under a Buildout Rule

In the figure, the vertical axis is price and the horizontal axis is the number of homes the entrant will choose to pass with its new network. In this table, we rank homes by (marginal) entry costs ($e'(h)$) (that is, the cost of constructing to a home increases along the horizontal axis). Since the costs of homes are ranked and the demand for the service is randomly distributed, the horizontal axis also measures the degree of system overlap. There are three curves in the figure, average gross profit per homes passed $r(h)$, marginal gross profit per home passed $d'(h)$, and marginal entry costs $e'(h)$. Without a build-out rule, the entrant will service $h^*$ homes (the intersection of the marginal profit and cost curves). Serving $h^*$ homes—the number of homes it would serve without a build-out requirement—the entrant will have a net profit equal to the area bounded by points $twv$, which is clearly positive. Under a build-out rule, the entrant's net profit is the difference $uxv - xyz$, which in this case is plainly negative. The area $uxv$ is positive net profit ($r > e$) and the area $xyz$ is the negative net profits ($r < e$). Since $uxv > xyz$, the entrant would not enter under a

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15 Note that $r(h); h = d(h)$.
16 Net profits are calculated as: $twv^*0 - vw^*0$.
17 Net profits are calculated as: $uzh^0 - vyh^0$. 
build-out rule. Note that whether or not a build-out rule deters entry depends on the shapes of the \( r, d' \) and \( e' \) curves.\(^{18}\)

C. Summary of Build-out Effects

At this point, the consequences of the build-out rule are readily assessed. Without the build-out rule, there may be partial entry. With partial entry, the entrant will make a positive profit, the incumbent's profits will be reduced due to competition, and consumers will benefit from lower prices and higher output. The partial entry case is unambiguously better for consumers and unambiguously worse for incumbents.\(^{19}\)

But with a build-out rule, entry may still happen, or it may not occur at all. If entry occurs, then consumers will reap the full benefit of the price reduction available from 100% overlap of the networks. The price reduction with complete overlap will be larger than the price reduction consumers would see if the entrant had passed only 50% of the market. But while full entry will provide the greatest benefit to consumers, consumers will benefit only if entry occurs. Indeed, there is a very real risk that the entrant may choose to stay out of the market altogether under a build-out rule. If the entrant stays out, then the entrant obviously gets no profit, then the incumbent's profits are unchanged, and consumer surplus remains at the monopoly level. A build-out rule that deters entry provides the least benefit to consumers (none), but the most benefit to the incumbent (retention of monopoly profits).\(^{20}\)

For a policymaker, a build-out requirement is a risky gamble. The policymaker may be fortunate to be in a community in which certain neighborhoods are so profitable that a new, prospective entrant will build even if a build-out requirement is imposed. In that situation, our model shows that an incumbent cable operator facing a complete "over-build" in its community will

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\(^{18}\) We can easily concoct examples where the build-out rule does not deter entry, which is why theory alone cannot resolve this issue.

\(^{19}\) We have assumed a uniform price, so all customers in the market will benefit from partial entry, no matter how partial it is.

\(^{20}\) For this reason, the FCC determined that competitive local telephone build-out requirements constituted an unlawful barrier to entry. *Texas Build-Out Preemption Order, supra* n. 4 at ¶ 13 ("build-out requirements are of central importance to competitive entry because these requirements impact the threshold question of whether a potential competitor will enter the local exchange market at all").
face a significant reduction in profits. But what if the policymaker is wrong in this assumption? In that situation, the prospective entrant will bypass the entire community if a build-out requirement is imposed. In that latter situation, the only entity that benefits is the incumbent cable operator. Simply given the shape of the debate on this topic, in which incumbent cable operators are steadfast proponents of build-out requirements for new entrants, we are inclined to believe that the latter scenario—entry deterrence—is the far more likely in most communities.\textsuperscript{21} As a result, build-out rules, while well-intentioned when proposed by city officials and consumers, may in the end do more harm than good.

An alternative summary of the effects of the build-out requirements on the participants is provided by a matrix of preference outcomes. In Table 1, preferences are rated 1, 2, and 3, with 1 being the most and 3 the least preferred outcome. We rank the preferences of consumers, incumbents, and entrants.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Free Entry</th>
<th>Build-out Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Entry</td>
</tr>
<tr>
<td>Consumer</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Incumbent</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Consumers of course would prefer a build-out rule, but only if entry still occurs. If entry is not assured, then consumers would then clearly prefer free entry to a build-out rule that would deter entry entirely. The worst-case scenario for the consumer is a build-out rule that deters entry. In contrast, the incumbent most prefers a build-out rule with deterred entry, but prefers partial entry to a build-out rule with entry. Free entry is more desirable than a build-out rule with entry, but less desirable than a build-out rule that effectively deters entry.

The conflict between the desires of the cable incumbents and the consumers is again as apparent as it is interesting. Many policymakers and incumbent cable operators advocate build-out rules, but the effect of the rule is to harm one party and help the other, depending on whether entry occurs. Both groups are taking a

\textsuperscript{21} Cable operators, alternately, are profit maximizers and should be expected to support only those regulations that increase their profits. Since higher profits for firms means lower consumer surplus (absent quality increases), the build-out rule from the view of the cable firms cannot be welfare improving. Thus, from the perspective of the incumbent cable operators, build-out rules are advocated as a means with which to protect profits from competition.
gamble with this position—policymakers are gambling that entry will occur even with a build-out rule, but the incumbents are gambling that entry will not occur with a build-out rule.

III. Simulation of Entry under a Build-out Rule

Our entry model reveals that the key question for a policymaker is straightforward: is the entry-deterring effect of a build-out mandate sufficient to deter entry altogether? The simulation described in this section provides evidence on the entry deterring effects of build-out rules. Thankfully, the simulation is not the only evidence regarding the entry-deterring effects of build-out rules. Hazlett and Ford (2001) show, using economic theory and a statistical test, that build-out rules significantly reduce entry in cable television markets.22 Thus, the ability of such rules to deter entry has been plainly demonstrated.

This simulation of sequential entry is based on the entry game from the previous section. We stress to the reader that this is only a simulation, and we adopt a number of simplifying assumptions to ease the implementation and evaluation of the simulation. All the markets evaluated are hypothetical, as are the costs and demand relationships. We do our best, however, to avoid any assumption that will render (or tend to render) misleading inferences, and we try to calibrate the model to known values and relationships in the cable and telecommunications industries. The purpose of the simulation is merely to provide an informed guess of the effects of build-out requirements, and to illustrate clearly the tradeoff between incumbents and consumers. We focus our attention here on the main findings of the simulation, and refer the reader to Appendix B for the details on the simulation.

We are not the first to construct a simulation to evaluate entry and build-out requirements in local communications markets. Faulhaber and Hogendorn (1999) construct a simulation similar to ours, though their approach is more technical. While the focus of that study is on the prospects for a multi-firm equilibrium, the authors did simulate the effect of build-out requirements. They conclude, "[a build-out rule] delays entry, delays competition, [and] actually

creates a unnatural (as opposed to natural) monopoly." Our findings are generally consistent with this earlier research.

A. Simulation Summary

In the simulation, we have 100 markets with 1000 homes each. The incumbent has constructed network to pass all 1000 homes in all markets. We assume that 50% of households subscribe to the monopolist's service (a 50% penetration rate). Each home has its own unique capital costs; we calibrate the simulation for an average capital cost of $600, which is consistent with capital costs for a traditional cable network per home passed. These capital costs vary by home, and entry costs are lognormally distributed (similar to the shape in Figure 1). Marginal costs are assumed to be zero for both the entrant and incumbent. The incumbent has already built its network and the costs are sunk.

Now we assume that a prospective entrant is deciding whether to enter this community. In the absence of a build-out requirement, the entrant will build a network to a home as long as its net profits will increase with that construction. We assume that the entrant will take a market share of 35% of the homes it passes that subscribe to the service, which is substantially above the analysts' expectations.


24 The simulation is flexible enough to evaluate different values for both the number of markets and the homes in each. All markets, however, must be of the same size. Changing the number of markets or their size does not affect the results in any meaningful way.

25 The simulation is calibrated so that the incumbent will serve the entire market under a build-out rule, even if the incumbent prefers not to build out (which is typically the case). The 50% penetration is consistent with a major cable provider's current penetration, but the assumption is primary one of convenience. See Comcast Corporation, 2004 Form 10-K at 3 (Feb. 23, 2005) (noting 52.8% penetration in 2004).

26 T. W. Hazlett and G. Bittlemayer, The Political Economy of Cable "Open Access" 203 STANFORD TECHNOLOGY LAW REVIEW 4 (2003); M. Shapiro and D. Gall, The New Economics of Overbuilds, BROADBAND NETWORKS (2000). We recognize that these costs may be lower than current technology, but higher costs only make the deterrent effect stronger, so our assumption is conservative.

27 In effect, our cost function is driven by population density, which is known to be approximately lognormal. J. B. Parr and G. J. O’neill, Aspects of the Lognormal Function in the Analysis of Regional Population Distribution, 21 ENVIRONMENT AND PLANNING at 961-73 (1989). Appendix B contains a detailed description of the cost function.
estimates of entrant penetration in video markets. In additional simulations, we contemplate both lower and higher penetrations rates. If the aggregate market penetration is 60%, then the entrant serves 21% of homes if it passes all homes.) As we discuss in POLICY PAPER NO. 21, profits are impacted also by the degree of price competition and network overlap. As the overlap of rival networks rises, the market price will decline. Our benchmark assumption is that the full overlap price is 20% lower than the monopoly price. We also assume that as level of overlap between incumbent and entrant decreases, this price decline also will decrease in a linear fashion. It should be noted that in situations where an incumbent cable firm only sees a partial geographic entry in a market, prices are reduced throughout the market, even in areas where the entrant has not built a network. This price reduction is consistent with research of pricing behavior in the few markets that have seen cable overbuilding. Alternate assumptions on the expected price decrease are also considered. As prices fall due to competition, market penetration will rise.

With zero marginal cost, we can interpret “price” to mean the stream of gross profits from the customer (and not the monthly price). In effect, “price” is the (present value) sum of the monthly payments of the subscriber over the life of the network. Consumer reservation prices (required for consumer surplus calculations) are set so that at the monopoly price, the penetration rate is 50%. Prices are calibrated so the value of the incumbent’s cable system is $1200 per home passed (consistent with cable industry statistics).

28 Bank of America Securities, Bell Video - IPTV is Not Yet the Answer, Research Brief (June 2, 2005) (“BOA Bell Video Research Brief”) at 1 (“History has shown on numerous occasions, with limited exceptions, that new entrant linear TV competitors usually reach only 15% market share after 10 years.”).

29 See Beard, Ford, Hill and Saba, supra n. 11.

30 The demand curve is linear, with an elasticity of -1 at the monopoly price. The change in penetration for a price reduction is measured using the slope of the demand curve. Aggregate penetration at the 20% price reduction is 60%.

31 The assumption is $2400 per subscriber at the monopoly price. The assumption of zero marginal cost is equivalent to an assumption of net price, where net price is the actual price minus variable cost.

Household demand for cable service is a function of price alone. Thus, all variations in penetration across markets are based on cost, not demand factors. Therefore, we assume that the entrant will not exclude markets based on household demographics (e.g., income, race, etc.).

B. Results of the Simulation

Table 2 summarizes the results of the benchmark simulation. Prior to entry, the monopolist passes all homes (100·1000 = 100,000) and serves all markets. Consumer surplus is $60 million and the incumbent’s profits are $120 million.

In the free entry equilibrium (i.e., no build-out rule), the entrant will partially enter all 100 markets and pass approximately 60% of all homes at a cost of $18 million. Consumer surplus rises to $75 million and the incumbent’s profits fall to $94 million. Unsurprisingly, entry is good for consumers (+$26M) and bad for the incumbent (-$15M).

<table>
<thead>
<tr>
<th></th>
<th>Entrant’s Homes Passed</th>
<th>Markets Entered</th>
<th>Entrant’s Investment</th>
<th>Consumer Surplus</th>
<th>Incumbent’s Profits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monopoly</td>
<td></td>
<td></td>
<td></td>
<td>$60M</td>
<td>$120M</td>
</tr>
<tr>
<td>Free Entry</td>
<td>60,000</td>
<td>100</td>
<td>$18M</td>
<td>$75M</td>
<td>$94M</td>
</tr>
<tr>
<td>Build-out Rule</td>
<td>15,000</td>
<td>15</td>
<td>$6M</td>
<td>$64M</td>
<td>$113M</td>
</tr>
</tbody>
</table>

Notes: Reported results are based on an average of 10 runs of the simulation. Results are rounded.

With a build-out rule, however, entry is substantially curtailed. The entrant no longer enters all markets and instead now chooses to serve only 15 of the 100 markets, with total homes passed of only 15,000. Thus, 85 of the 100 markets are bypassed entirely by the new entrant, and consumers in those markets see no benefit from competition whatsoever. Consumer welfare is $64 million, down from $75 million in the free entry case. This decline in consumer surplus indicates that

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33 The simulation is calibrated to ensure that it is profitable for the monopolist to wire the entire market under a build-out rule.

34 Consumer surplus the difference between what consumers are willing to pay for a service (i.e., reservation prices) and the market price.

35 The maximum consumer welfare is about $86M (at 100% overlap).