

BEFORE THE  
FEDERAL COMMUNICATIONS COMMISSION  
WASHINGTON, D.C. 20554

In the Matter of	)	
	)	
Implementation of the Local Competition Provisions in the Telecommunications Act of 1996	)	CC Docket No. 96-98
	)	
	)	
Interconnection between Local Exchange Carriers and Commercial Mobile Radio Service Providers	)	CC Docket No. 95-185
	)	

**AFFIDAVIT OF**

**THOMAS M. JORDE, J. GREGORY SIDAK, AND DAVID J. TEECE**

**IN RESPONSE TO**

**SECOND FURTHER NOTICE OF PROPOSED RULEMAKING**

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## INTRODUCTION

1. In response to the Supreme Court’s January 1999 decision in *AT&T Corp. v. Iowa Utilities Board*,<sup>1</sup> which struck down the FCC’s interpretation in the *Local Competition First Report and Order*<sup>2</sup> of the “necessary” and “impair” requirements of section 251(d)(2) of the Telecommunications Act,<sup>3</sup> the Commission now seeks comments in this *Second Further Notice of Proposed Rulemaking* on “how the unbundling obligations of the [Telecommunications Act of 1996] can best facilitate the rapid and efficient deployment of all telecommunications services,

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1. 119 S. Ct. 721 (1999).

2. Implementation of the Local Competition Provisions in the Telecommunications Act of 1996 and Interconnection Between Local Exchange Carriers and Commercial Mobile Radio Service Providers, First Report and Order, CC Dkt. Nos. 96-98, 95-185, 11 F.C.C. Rcd. 15,499 (1996) [hereinafter *Local Competition First Report and Order*].

3. 47 U.S.C. § 251(d)(2).

including advanced services.”<sup>4</sup> To assist the Commission in answering that question, the United States Telephone Association (USTA) has asked us to analyze how the Commission’s interpretation of the “necessary” and “impair” standards are likely to affect innovation, investment, and product development in the U.S. telecommunications industry.

2. The application of time-tested economic theory to the telecommunications industry allows us to conclude that mandatory unbundling at prices computed on the basis of the total element long-run incremental cost (TELRIC) of the various network elements belonging to an incumbent local exchange carrier (ILEC) will adversely affect the ILEC’s incentives not only to upgrade or maintain existing facilities, but also to invest in new facilities. Mandatory unbundling at TELRIC prices also will encourage competitive local exchange carriers (CLECs) to deviate from the socially optimal level of investment and entry. Finally, the confluence of mandatory unbundling and other Commission policies aggravate the distortion of investment decisions.

### QUALIFICATIONS

3. My name is Thomas M. Jorde. I am professor of law, University of California at Berkeley. I specialize in antitrust, intellectual property, and civil procedure. I am cochair of Boalt Hall’s Program in Technology and Law. I am also president of LECG, Inc., an economic consulting firm. I received A.B. and J.D. degrees from Yale University.

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4. See Implementation of the Local Competition Provisions in the Telecommunications Act of 1996 and Interconnection Between Local Exchange Carriers and Commercial Mobile Radio Service Providers, Second Further Notice of Proposed Rulemaking, CC Dkt. Nos. 96-98, 95-185, ¶ 3 (released Apr. 16, 1999) [hereinafter *SFNPRM*].

4. I have served as a law clerk to Justice William Brennan, U.S. Supreme Court; special assistant to the Bureau of Competition of the Federal Trade Commission; special master in the U.S. District Court for complex antitrust legislation; and as a private mediator.

5. I have written extensively and testified before Congress on the subject of competition policy and innovation, and I have presented “The Changing Nature of Competition in a Global and Innovation-Driven Age” and “Antitrust, Innovation and Competitor Cooperation” at the Federal Trade Commission. Relevant books include *Antitrust, Innovation, and Competitiveness* (Oxford University Press 1992), with David J. Teece; and *Intellectual Property in the New Technological Age* (Little, Brown & Co. 1997), with Mark Lemley, Peter Menell, and Robert Merges. Published articles of mine that are relevant to this proceeding include, “Rule of Reason Analysis of Horizontal Arrangements: Agreements Designed to Advance Innovation and Commercialize Technology,” 61 *Antitrust Law Journal* 2 (1993), with David J. Teece; “Assessing Market Power in Regimes of Rapid Technological Change,” 2 *Industrial and Corporate Change* 3 (1993), with Raymond Hartman, David J. Teece, and Will Mitchell; “Antitrust Policy and Innovation: Taking Account of Performance Competition and Competitor Cooperation,” 147 *Journal of Institutional and Theoretical Economics* 120 (1991), with David J. Teece; “Summary Judgment in Antitrust Cases: Understanding *Monsanto* and *Matsushita*,” 36 *Antitrust Bulletin* 271 (1991), with Mark Lemley; “Innovation and Cooperation: Implications for Competition and Antitrust,” 4 *Journal of Economic Perspectives* 3 (1990), with David J. Teece; and “Innovation, Dynamic Competition, and Antitrust Policy,” 13 *Regulation* 35 (1990), with David J. Teece.

6. My name is J. Gregory Sidak. I am the F. K. Weyerhaeuser Fellow in Law and Economics at the American Enterprise Institute for Public Policy Research (AEI) in Washington, D.C., where I direct AEI's Studies in Telecommunications Deregulation. I am also a senior lecturer at the Yale School of Management, where I teach a course on telecommunications regulation and strategy with Professor Paul W. MacAvoy. In addition to holding those two academic positions, I am a managing director of LECG, Inc.

7. I have worked in the federal government on three occasions. From 1987 to 1989, I was deputy general counsel of the FCC. From 1986 to 1987, I was senior counsel and economist to the Council of Economic Advisers in the Executive Office of the President. From 1981 to 1982, I served as a law clerk to Chief Judge Richard A. Posner during his first term on the U.S. Court of Appeals for the Seventh Circuit. In addition to having worked in government, I have previously worked, as an attorney in private practice, on numerous antitrust cases and federal administrative, legislative, and appellate matters concerning telecommunications and other network industries.

8. My academic research concerns regulation and strategy in telecommunications and other network industries, antitrust policy, and constitutional law issues concerning economic regulation. I am the coauthor of four books concerning pricing, costing, competition, and investment in regulated network industries: *Deregulatory Takings and the Regulatory Contract: The Competitive Transformation of Network Industries in the United States* (Cambridge University Press 1997), with Daniel F. Spulber; *Toward Competition in Local Telephony* (MIT Press & AEI Press 1994), with William J. Baumol; *Transmission Pricing and Stranded Costs in the Electric*

*Power Industry* (AEI Press 1995), also with Professor Baumol; and *Protecting Competition from the Postal Monopoly* (AEI Press 1996), also with Professor Spulber. I am also the author of a fifth book, *Foreign Investment in American Telecommunications* (University of Chicago Press 1997), and of more than thirty scholarly articles in law reviews and economics journals. Some of those articles are directly relevant to the issues of investment, innovation, and competition posed by this proceeding.<sup>5</sup> I am the editor of *Is the Telecommunications Act of 1996 Broken? If So, How Can We Fix It?* (AEI Press 1999), *Competition in International Telecommunications* (AEI Press forthcoming 1999), and *Telecommunications Deregulation in Germany and the United States* (AEI Press forthcoming 1999).

9. I have testified before the U.S. Senate and House of Representatives. My writings have been cited by the Supreme Court, including Justice Breyer's opinion in the 1999 decision in *AT&T Corp. v. Iowa Utilities Board*. My writings also have been cited by the lower federal and state supreme courts and by state and federal regulatory commissions.

10. I have been a consultant on regulatory and antitrust matters to the Antitrust Division of the U.S. Department of Justice, to the Canadian Competition Bureau, and to more than thirty companies in the telecommunications, electric power, natural gas, mail delivery, broadcasting, newspaper publishing, and computer software industries in North America, Europe, Asia, and Australia.

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5. See Abbott B. Lipsky, Jr. & J. Gregory Sidak, *Essential Facilities*, 51 STAN. L. REV. 1185 (1999); J. Gregory Sidak & Daniel F. Spulber, *The Tragedy of the Telecommons: Government Pricing of Unbundled Network Elements Under the Telecommunications Act of 1996*, 97 COLUM. L. REV. 1081 (1997); J. Gregory Sidak & Daniel F. Spulber, *Givings, Takings, and the Fallacy of Forward-Looking Costs*, 72 N.Y.U. L. REV. 1068 (1997); J. Gregory Sidak, *Debunking Predatory Innovation*, 83 COLUM. L. REV. 1121 (1983).

11. From Stanford University, I earned A.B. (1977) and A.M. (1981) degrees in economics and a J.D. (1981) in law. I was a member of the *Stanford Law Review*.

12. My name is David J. Teece. I am Mitsubishi Bank Professor, Haas School of Business, and director, Institute for Management, Innovation and Organization, University of California at Berkeley. I am also chairman of LECG, Inc. I have been a full professor at Berkeley since 1982. Before that, I was assistant and then associate professor of business economics at the Graduate School of Business, Stanford University. I received my Ph.D. in Economics from the University of Pennsylvania in 1975. As an industrial organization economist, I have studied the economics of technological change, competition policy, and business strategy issues for over two decades.

13. At U.C. Berkeley, I was the cofounder of the Management of Technology Program, a joint program between the School of Business and College of Engineering, and of the Consortium on Competitiveness and Cooperation, a multicampus research program linking scholars at Berkeley, Stanford, Columbia, Harvard, and Wharton who have deep and enduring interests in the long-run performance of the United States in the global economy. I am also chairman of the Consortium for Research on Telecommunications Policy Program, a multicampus research group with active nodes at U.C. Berkeley, the University of Michigan, and Northwestern University.

14. My research has been centrally concerned with the relationship between the structure of firms (especially the scope of their activities) and their economic performance, particularly their capacity to develop and introduce new technologies. I have had a special interest in innovation, organizational structure, and antitrust. I have testified before Congress on regulatory policy and

competition policy and am the author or coauthor of over 100 books and scholarly articles. Books of mine that are relevant to this proceeding include *Strategy, Technology, and Public Policy* (Edward Elgar Publishing 1998); *Fundamental Issues in Strategy* (Harvard Business School Press 1994), with Richard P. Rumelt; *Antitrust, Innovation, and Competitiveness* (Oxford University Press 1992), with Thomas M. Jorde; and *The Competitive Challenge: Strategies for Industrial Innovation and Renewal* (1987). Relevant articles include “The Meaning of Monopoly: Antitrust Analysis in High-Technology Industries,” 43 *Antitrust Bulletin* 801 (1998), with Mary Coleman; “Telecommunications in Transition: Unbundling, Reintegration, and Competition,” 4 *Michigan Telecommunications and Technology Law Review* 4 (1995); “Competition and Unbundling in Local Telecommunications: Implications for Antitrust Policy,” published in *Towards a Competitive Telecommunications Industry: Selected Papers from the 1994 Telecommunications Research Conference* (Gerald Brock, ed., Lawrence Erlbaum Associates 1995), with Robert G. Harris and Gregory L. Rosston; and “Competition and Cooperation: Striking the Right Balance,” *California Management Review* (Spring 1984), with Thomas M. Jorde. I am also the founding editor of the economics journal *Industrial and Corporate Change*, published by the Oxford University Press.

15. Throughout the 1980s and 1990s, I have provided expert testimony on numerous occasions to the FCC, other state and federal regulatory agencies, the federal courts, and foreign regulatory bodies and courts on the competitive and strategic implications of regulatory and anti-trust proceedings concerning both wireline and wireless telecommunications. That testimony has frequently encompassed the interplay between regulation and incentives for innovation, investment, and new product development. For example, I submitted testimony on behalf of AT&T in

the divestiture case, *United States v. AT&T Corporation*; on behalf of Ameritech in support of its Customers First Plan; and, more recently, on behalf of Bell Atlantic and GTE in support of their proposed merger.

16. We file this affidavit in our individual capacities and not on behalf of the University of California, the American Enterprise Institute, or the Yale School of Management.

### SUMMARY OF CONCLUSIONS

17. Section 251(d)(2) of the Telecommunications Act directs the Commission to consider “at a minimum” the “necessary” and “impair” standards when deciding whether to mandate unbundling of a network element. It is a sign of FCC’s blindness to the costs of mandatory unbundling that the *Second Further Notice of Proposed Rulemaking* can only envision the phrase “at a minimum” adding considerations that would *increase* the likelihood of mandatory unbundling.<sup>6</sup> Any considerations that might decrease the likelihood of mandatory unbundling, such as the effect of unbundling on innovation, appear outside the scope of the current debate. Yet, the *Antitrust Guidelines for the Licensing of Intellectual Property* suggest the goals of encouraging innovation and promoting the public interest are inextricably connected.<sup>7</sup> We submit, therefore, that innovation is exactly the “something more” that the

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6. *SFNPRM*, *supra* note 4, at ¶ 30 (“Commenters should specifically identify any factors deemed sufficiently important in meeting the goals of the 1996 Act to require the unbundling of a network element, even if such unbundling did not otherwise meet the ‘necessary’ or ‘impair’ standards of sections 251(d)(2)(A) or (B) standing alone.”).

7. U.S. Department of Justice & Federal Trade Commission, *Antitrust Guidelines for the Licensing of Intellectual Property* §1.0 & n.1 (patents, copyrights, trade secrets, and know-how agreements) [hereinafter *Intellectual Property Guidelines*]. The *Guidelines* state: “The intellectual property laws and the antitrust laws share the common purpose of promoting innovation and enhancing consumer welfare.” *Id.* at §1.0.

FCC should consider when identifying which network elements shall be subject to mandatory unbundling at regulated prices.

18. Mandatory unbundling of network elements at total element long-run incremental cost (TELRIC) prices will diminish the incentives of both ILECs and CLECs to invest in existing facilities and new technologies. The Commission must therefore carefully weigh that cost against the putative benefits of any limiting principle that it promulgates to implement the “necessary” and “impair” standards of section 251(d)(2) of the Telecommunications Act. A firm’s investment decisions are based on its careful weighing of the expected returns from the investment against the firm’s weighted-average cost of capital. The mandatory unbundling rules that the Commission tentatively adopts, or hints in the *Second Further Notice of Proposed Rulemaking* that it will adopt, would decrease the incentives of both ILECs and CLECs to invest in existing facilities and new technologies by lowering the expected returns and increasing the weighted-average cost of capital for each group of firms.

19. In Part I of this affidavit, we explain that government-mandated unbundling decreases an ILEC’s incentives to invest in the upgrade and maintenance of *existing* facilities by reducing the *ex ante* payoffs of such investments.<sup>8</sup> Mandatory unbundling also distorts an ILEC’s

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8. The passage of the Telecommunications Act of 1996 has caused this disincentive to ILEC investment to be analyzed extensively in the scholarly literature on regulatory economics. See J. GREGORY SIDAK & DANIEL F. SPULBER, *DEREGULATORY TAKINGS AND THE REGULATORY CONTRACT: THE COMPETITIVE TRANSFORMATION OF NETWORK INDUSTRIES IN THE UNITED STATES* (Cambridge University Press 1997); ALFRED E. KAHN, *LETTING GO: DEREGULATING THE PROCESS OF DEREGULATION, OR: TEMPTATION OF THE KLEPTOCRATS AND THE POLITICAL ECONOMY OF REGULATORY DISINGENUOUSNESS* (Institute of Public Utilities and Network Industries, Michigan State University 1998); Debra Aron, Ken Dunmore & Frank Pampush, *The Impact of Unbundled Network Elements and the Internet on Telecommunications Access Infrastructure*, HARV. INFORMATION INFRASTRUCTURE PROJECT (Dec. 4, 1997); Robert W. Crandall, *Managed Competition in U.S. Telecommunications* 17 (AEI-Brookings Joint Center for Regulatory Studies, Working Paper 99-1, Mar. 1999); Jerry Hausman, *Valuing the Effect of Regulation on New*

incentives with respect to investment in *new* technologies. In addition to lowering the expected returns of investment in existing facilities and new technologies, mandatory unbundling at regulated prices also raises an ILEC's weighted-average cost of capital.

20. In Part II, we examine how mandatory unbundling distorts the investment incentives of CLECs. First, mandatory unbundling at TELRIC prices encourages CLECs to delay entry into the local services market. Second, a generous unbundling policy encourages CLECs to demand a "bug free" version of the ILEC's network element and to request, at no cost to the CLEC, the offering of unbundled network elements (UNEs) from the ILEC with no intention of actually using them. Third, mandatory unbundling at TELRIC prices diminishes a CLEC's incentive to provide "plain old telephone service" (POTS) by innovative means. For example, an ill-conceived unbundling policy can undermine a CLEC's efforts to deploy POTS over a digital subscriber line (DSL) without the use of any circuit-switching apparatus.

21. In Part III, we discuss how mandatory unbundling and other Commission policies adversely interact to distort further the investment decisions of ILECs and CLECs. Relying on intellectual advances in antitrust analysis,<sup>9</sup> innovation markets,<sup>10</sup> and real-option theory,<sup>11</sup> we dis-

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*Services in Telecommunications*, BROOKINGS PAPERS ON ECON. ACTIVITY: MICROECONOMICS, 1997; Jerry Hausman, *Regulation by TSLRIC: Economic Effects on Investment and Innovations*, MULTIMEDIA UND RECHT, Mar. 1999, at 22; Robert G. Harris & C. Jeffrey Kraft, *Meddling Through: Regulating Local Telephone Competition in the United States*, 11 J. ECON. PERSP. 93 (1997).

9. See *Intellectual Property Guidelines*, *supra* note 7.

10. See THOMAS M. JORDE & DAVID J. TEECE, ANTITRUST, INNOVATION, AND COMPETITIVENESS (Oxford University Press 1992); see also THOMAS M. JORDE, MARK LEMLEY, PETER MENELL & ROBERT MERGES, INTELLECTUAL PROPERTY IN THE NEW TECHNOLOGICAL AGE (Little, Brown & Co. 1997).

11. See, e.g., Aron, Dunmore & Pampush, *supra* note 8, at ¶ 6. For the fundamentals of decisionmaking under uncertainty, see AVINASH K. DIXIT & ROBERT S. PINDYCK, INVESTMENT UNDER UNCERTAINTY (Princeton University Press 1994); Avinash K. Dixit & Robert S. Pindyck, *The Options Approach to Capital Investment*, HARV. BUS. REV., May-June 1995, at 105.

cuss in qualitative terms the direction and potential magnitude of those various effects. First, we demonstrate that the relationship between retail rates and costs in a particular geographic market strongly influences the entry decision of CLECs. Second, unbundling requirements at the input level eliminate bundling opportunities in the end-user market that would increase competition and thus benefit consumer welfare. Third, the Commission should address and resolve the commitment problem associated with its discretion to unbundle additional elements in the future.

22. In Part IV we examine recent innovations in several network elements, including switches, loops, transmission facilities, and digital subscriber line access multiplexers. Mandatory unbundling of those elements at TELRIC prices would jeopardize each of those innovative developments and thus threaten consumer welfare over the longer term.

23. We conclude that the Commission should not interpret the “necessary” and “impair” requirements of section 251(d)(2) to mandate unbundling of facilities that an ILEC has created through new or relatively recent investments. In such cases, the disincentive effects on both ILECs *and* CLECs are so great that the damage that would be done to the competitive process would be severe. Moreover, excessive unbundling of that sort would violate the stated policies in the Telecommunications Act of 1996 “to preserve the vibrant and competitive free market that presently exists for the Internet and other interactive computer services, unfettered by Federal or State regulation”<sup>12</sup> and “to encourage the rapid deployment of new telecommunications technologies.”<sup>13</sup> The Commission should therefore decline to promulgate rules mandating the unbundling

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12. *See* 47 U.S.C. § 230(b)(2).

13. *See* Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56, 56 (preamble).

of network elements in which the ILEC has invested to provide advanced services,<sup>14</sup> as the agency proposed to do in another proceeding in 1998.<sup>15</sup>

### I. THE EFFECT OF MANDATORY UNBUNDLING ON THE ILEC'S INVESTMENT DECISION

24. Investment results from voluntary exchange.<sup>16</sup> A firm's decision to invest in facilities and innovative activity depends upon its weighing the probability of earning excess return from such investment against the risk of investment loss.<sup>17</sup> For example, any basic textbook on corporate finance will instruct managers to make an investment only if that investment has a positive net present value (NPV), or alternatively if the expected rate of return on that investment exceeds some appropriate measure of the firm's weighted-average cost of capital.<sup>18</sup> Other texts are even more explicit: "[S]enior management's most important job must be to maximize its firm's current market value."<sup>19</sup>

25. To formalize that investment rule, one must define several parameters. Let  $p(b)$  be the probability of the "bad state of the world" and  $p(g)$  be the probability of the "good state of the

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14. See 47 U.S.C. §§ 10(a), 11, 403.

15. See Deployment of Wireline Services Offering Advanced Telecommunications Capability, Memorandum Opinion and Order, and Notice of Proposed Rulemaking, CC Dkt. Nos. 98-147, 98-11, 98-26, 98-32, 13 F.C.C. Rcd. 24,011, 24,055-57 at ¶ 95-96 (1998) [hereinafter *Advanced Capability Memorandum Opinion and Order*]. In that proceeding, the FCC established seven conditions to govern the circumstances under which an ILEC's "advanced services affiliate" is deemed not to be an ILEC and, therefore, not subject to the unbundling requirements of section 251(c)(3). *Id.* at 24,055-57 ¶ 96.

16. See SIDAK & SPULBER, *supra* note 8, at 109.

17. *Id.* at 423-25.

18. See RICHARD A. BREALEY & STEWART C. MYERS, PRINCIPLES OF CORPORATE FINANCE 181 (McGraw-Hill 4th ed. 1991). The weighted-cost of capital for a firm is a weighting of the common equity and debt cost of capital according to the capital structure of the individual firm. See, e.g., STEPHEN A. ROSS, RANDOLPH W. WESTERFIELD & JEFFREY JAFFE, CORPORATE FINANCE 161-88 (Irwin McGraw-Hill 5th ed. 1999).

19. See G. BENNET STEWART III, THE QUEST FOR VALUE: A GUIDE FOR SENIOR MANAGERS 1 (HarperCollins 1990).

world.” Similarly, let  $r(b)$  be the return in the “bad state of the world” and  $r(g)$  be the return in the “good state of the world.” Finally, let  $c$  be the ILEC’s weighted-average cost of capital. The *expected* return to the investment is simply the average return over all possible outcomes (in this case, we have assumed for simplicity only two possible outcomes), weighted by their respective probabilities, or  $p(b) \times r(b) + p(g) \times r(g)$ . An ILEC will invest in a project if and only if  $p(b) \times r(b) + p(g) \times r(g) > c$ .<sup>20</sup>

26. Many economic theories cannot be practically applied to the real world. The investment rule described above, however, represents a guiding principle in the discipline of corporate finance. Telecommunications executives making multibillion-dollar investments recognize and act upon the importance of that fundamental principle. In late 1998, for example, AT&T’s chief executive officer succinctly described the effect that mandatory unbundling of the cable television infrastructure would have on his company’s incentives to invest: “No company will invest billions of dollars . . . if competitors which have not invested a penny of capital nor taken an ounce of risk can come along and get a free ride in the investments and risks of others.”<sup>21</sup>

## **A. How Mandatory Unbundling at TELRIC Prices Affects Expected Returns**

### **1. Investments to Lower the Marginal Costs of Existing Services**

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20. See, e.g., BREALEY & MYERS, *supra* note 18, at 181.

21. See C. Michael Armstrong, *Telecom and Cable TV: Shared Prospects for the Communications Future*, as delivered to the Washington Metropolitan Cable Club (Nov. 2, 1998) (available on AT&T’s website at <http://www.att.com/speeches/98/981102.maa.html>).

27. Mandatory unbundling decreases an ILEC's incentive to invest in upgrading its existing facilities by reducing the *ex ante* payoffs of such investment. Requiring a firm to grant to its competitors unbundled access to its facilities at TELRIC-based rates greatly reduces, if it does not eliminate entirely, the probability of excess return; such mandatory unbundling thus eliminates the ILEC's incentive to invest in existing facilities.<sup>22</sup> It makes no economic sense for the ILEC to invest in technologies that lower its own marginal costs so long as competitors can achieve the identical cost savings by regulatory fiat. Thus, by ensuring that the ratio of marginal costs between an ILEC and its competitors is always constant, mandatory unbundling at TELRIC prices destroys the ILEC's incentive to continue investing in cost-reducing improvements to its own existing network facilities.<sup>23</sup> The regulator may respond by *compelling* investment—that is, conscripting private capital. But that “fix” would merely heap one regulatory distortion upon another and hasten disinvestment.

28. The disincentive that mandatory unbundling creates for investment has direct competitive consequences. For example, over the past several years, ILECs have been extending fiber in the network and replacing copper in the loop. Those upgrades have produced a number of positive benefits for end-users. Fiber is more reliable than copper wire, and it has higher quality in terms of cross-talk, signal-to-noise ratios, and other factors.<sup>24</sup> The investment also has had the advantage of decreasing the ILEC's marginal costs, and that cost reduction has made the ILEC's

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22. See, e.g., Sidak & Spulber, *The Tragedy of the Telecommons*, *supra* note 5, at 1158–61.

23. See SIDAK & SPULBER, *supra* note 8, at 545–57; Sidak & Spulber, *The Tragedy of the Telecommons*, *supra* note 5, at 1158–61; KAHN, *supra* note 8, at 101–03; Harris & Kraft, *supra* note 8, at 93.

24. For a comparison of the quality characteristics of fiber-optic networks and copper-based networks, see REGIS J. BATES & DONALD GREGORY, *VOICE AND DATA COMMUNICATIONS HANDBOOK* 631 (McGraw-Hill 1998).

network more competitive with the networks that CLECs have been constructing. For example, one competitive access provider (CAP), Teleport Communications Group (TCG), stated in a 1996 securities prospectus:

The Company uses the latest technologies and network architectures to develop a highly reliable infrastructure for delivering high-speed, quality digital transmissions of voice, data and video telecommunications. The basic transmission platform consists primarily of optical fiber equipped with high capacity SONET equipment deployed in self-healing rings. These SONET rings give TCG the capability of routing customer traffic simultaneously in both directions around the ring[,] thereby eliminating loss of service in the event of a cable cut.

. . . Redundant electronics, with automatic switching to the backup equipment in the event of failure, protects against signal deterioration or outages. Continuous monitoring of system components focuses on proactively avoiding problems rather than just reacting upon failure.<sup>25</sup>

TCG further stated that one factor that promoted competition in local telecommunications markets after the AT&T divestiture was “technological advances in the transmission of data and video requiring greater capacity and reliability levels than copper-based ILEC networks were able to accommodate.”<sup>26</sup> TCG, which has since merged into AT&T, noted in 1996 that “CAPS generally offered . . . improved reliability in comparison to [sic] the ILECs,” but that “[i]n recent years, the ILECs steadily have been increasing the amount of fiber used in their networks, thereby decreasing the competitive advantage held by the CAPs in the special access and private line markets.”<sup>27</sup>

29. The existing and planned entry by CLECs into local telecommunications markets shows that the new technologies available to CLECs offer cost and performance advantages over

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25. TELEPORT COMMUNICATIONS GROUP, INC., PROSPECTUS FOR 23,500,000 SHARES OF CLASS A COMMON STOCK 50 (June 3, 1996). Since the enactment of the Telecommunications Act, the acronym CAP has given way to CLEC, which is a term of art in the 1996 legislation.

26. *Id.* at 42.

27. *Id.*

existing technologies currently used by ILECs. Moreover, because the largest of the CLECs have been acquired since 1996 by interexchange carriers (IXCs)—MFS by what is now MCI WorldCom, and TCG by AT&T<sup>28</sup>—the disincentive that mandatory unbundling creates for ILEC investment in network upgrades directly affects the robustness of competition between ILECs and the nation’s two largest IXCs. In its *Second Further Notice of Proposed Rulemaking*, the Commission “seek[s] comment on the relevance, if any, to the interpretation of the ‘necessary’ and ‘impair’ standard, that we are reexamining these issues today, more than three years after passage of the Act.”<sup>29</sup> The recent entry of the major IXCs into the local access market should force the Commission to reexamine the meaning of “impairment” in that new competitive context.

30. If the Commission were to adopt a nationwide rule mandating unbundling of the loop at a TELRIC price, then the ILEC’s benefits to investing in fiber upgrades would decrease. In particular, any advantages that the ILEC might achieve in marginal costs would be eliminated. Therefore, according to the investment decision articulated above, the ILEC’s economic justification for incurring that cost would erode. Consumer welfare would fall in the amount of the portion of the cost savings that the ILEC otherwise could pass onto consumers. Moreover, end-users would have to defer the benefit of increased quality and reliability.

## **2. Investments in Unproven Technologies to Provide New Services**

31. By reducing returns to investment in general, mandatory unbundling at TELRIC prices is likely to reduce direct innovation by the ILEC in the form of research and development,

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28. For a review of the consolidation in the CLEC industry, see Sterling Perrin, *The CLEC Market: Prospects, Problems, and Opportunities*, TELECOMMUNICATIONS INT’L, Nov. 1, 1998, at 41.

29. *SFNPRM*, *supra* note 4, at ¶ 14.

creation of intellectual property, and general product development. As two of us have previously written: “To maintain adequate incentives to invest in innovative activity, without providing government subsidies, free riding must be curtailed. This rationale is how economists justify patents, copyrights, trade secrets, and other aspects of intellectual property law.”<sup>30</sup> The *Intellectual Property Guidelines*, issued by the Department of Justice and the Federal Trade Commission in 1995, echo this concern and emphasize that it is consonant with the consumer-welfare goals of the anti-trust laws:

The intellectual property laws and the antitrust laws share the common purpose of promoting innovation and enhancing consumer welfare. The intellectual property laws provide incentives for innovation and its dissemination and commercialization by establishing enforceable property rights for the creators of new and useful products, more efficient processes, and original works of expression. In the absence of intellectual property rights, imitators could more rapidly exploit the efforts of innovators and investors without compensation. Rapid imitation would reduce the commercial value of innovation and erode incentives to invest, ultimately to the detriment of consumers. The antitrust laws promote innovation and consumer welfare by prohibiting certain actions that may harm competition with respect to either existing or new ways of serving customers.<sup>31</sup>

Firms undertake innovative activities in the pursuit of higher returns, through the development of products having either unique qualities or superior quality-to-price ratios. Any requirement to share those innovative developments will therefore reduce the incentives to create them in the first place. In his separate opinion concurring in the Court’s holding on “necessary” and “impair” in *Iowa Utilities Board*, Justice Breyer warned that “a sharing requirement may diminish the original owner’s incentive to keep up or to improve the property by depriving the owner of the fruits of

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30. See JORDE & TEECE, *supra* note 10, at 52.

31. *Intellectual Property Guidelines*, *supra* note 7, at § 1.0.

value-creating investment, research, or labor.”<sup>32</sup> He further observed that this disincentive to investment increases with the technological sophistication of the network elements potentially subject to the mandatory unbundling rule:

[A]s one moves beyond the sharing of readily separable and administrable physical facilities, say, to the sharing of research facilities, firm management, or technical capacities, these problems can become more severe . . . . Nor can one guarantee that firms will undertake the investment necessary to produce complex technological innovations knowing that any competitive advantage deriving from those innovations will be dissipated by the sharing requirement. The more complex the facilities, the more central their relation to the firm’s managerial responsibilities, the more extensive the sharing demanded, the more likely these costs will become serious. And the more serious they become, the more likely they will offset any economic or competitive gain that a sharing requirement might otherwise provide.<sup>33</sup>

As Justice Breyer makes clear, the long-term harm to consumer welfare from reduced innovation may vastly exceed the short-term benefits from more rapid imitation of the fruits of prior innovative activity.

32. Technological progress in telecommunication network services has yielded new techniques, such as asymmetric digital subscriber line (ADSL), which has enabled ILECs to deliver advanced data services. ADSL uses the existing copper pair serving homes and businesses “to provide customers network access to the Internet and other popular multimedia and data services at speeds 50 times faster than an ordinary phone line.”<sup>34</sup> Several ILECs have deployed

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32. *Iowa Utilities Board*, 119 S. Ct. at 753 (Breyer, J., concurring in part and dissenting in part) (concurring).

33. *Id.* at 753-54 (citing 1 HAROLD DEMSETZ, OWNERSHIP, CONTROL, AND THE FIRM: THE ORGANIZATION OF ECONOMIC ACTIVITY 207 (1988)).

34. *See* AMERITECH CORP., 1998 SEC FORM 10-K, at 21 (1999) (glossary).

ADSL, and, as of May 1999, consumers had begun to adopt the services supported by that technology.<sup>35</sup>

33. Because of such progress, the Commission is now considering whether it should lengthen the list of network elements subject to mandatory unbundling pursuant to the “necessary” and “impair” standards of section 251(d)(2). The *Second Further Notice of Proposed Rule-making* states:

We also see nothing in the statute or the Supreme Court’s opinion that would preclude us from requiring that loops that must be unbundled must also be conditioned in a manner that allows requesting carriers supplying the necessary electronics to provide advanced telecommunications services, such as digital subscriber line technology (xDSL).<sup>36</sup>

Under such a scenario, an ILEC would be compelled to share the following network elements with its competitors:

- *Dark fiber.* This is fiber that does not have connected to it the electronics required to transmit data on such fiber.<sup>37</sup>
- *Packet switching.* This is a method of transmitting messages as digitized bits, assembled in groups called “packets” or “cells.” These packets and cells contain industry-standard defined numbers of data bits, along with addressing information and data integrity bits. The switching (or routing) of the packets or cells of data replace the cir-

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35. For example, it is reported that 20 percent of Bell Atlantic customers in New York and Boston will be served by central offices equipped for ADSL by the end of 1999, and that 80 percent of those customers are expected to be served by the end of 2000. See Brian Quinton, *ADSL picks up more speed*, TELEPHONY, Apr. 5, 1999, at 6.

36. *SFNPRM*, *supra* note 4, at ¶ 32. See also *id.* at ¶ 34 (seeking comment on whether to “modify the definition of ‘loops’ or ‘transport’ to include dark fiber”); *id.* at ¶ 35 (seeking comment on mandatory unbundling of DSLAMs and packet switches).

circuit-switching of traditional voice telephone calls. Packet and cell switching is considered to be a more cost-efficient method of delivering voice and data traffic than circuit switching.<sup>38</sup>

- *Digital subscriber line access multiplexers (DSLAMs)*. The DSLAM concentrates the data traffic from multiple DSL loops onto the backbone network for connection to the rest of the network. The DSLAM provides back-haul services for packet, cell, and/or circuit-based applications through concentration of the DSL lines onto 10Base-T, 100Base-T, T1/E1, T3/E3, or ATM outputs.<sup>39</sup>

In addition, some CLECs and even state lawmakers have urged that an ILEC be subjected to mandatory unbundling of the portion of spectrum above 4 kHz on its subscriber line, a practice that has been dubbed “spectrum sharing” or “bandwidth sharing” or “line splitting.”<sup>40</sup> In 1999, the

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37. See INTERMEDIA COMMUNICATIONS INC., 1999 SEC FORM 10-K, at 53 (1999) (glossary).

38. *Id.* at 54. See generally J. Gregory Sidak & Daniel F. Spulber, *Cyberjam: The Law and Economics of Internet Congestion of the Telephone Networks*, 21 HARV. J.L. & PUB. POL’Y 327 (1998) (discussing packet-switched and circuit-switched networks).

39. PARADYNE CORPORATION, THE DSL SOURCE BOOK 27 (2d ed. 1998) (available at [http://www.paradyne.com/sourcebook\\_offer/index.html](http://www.paradyne.com/sourcebook_offer/index.html)).

40. For example, the California state legislature is considering such a policy:

If the Federal Communications Commission does not adopt an order on or before January 1, 2000, with regard to its proceeding entitled “In the Matters of Deployment of Wireline Services Offering Advanced Telecommunications Capability,” CC Docket No. 98-147, adopted March 18, 1999, that the Public Utilities Commission expeditiously examine the technical, operational, economic, and policy implications of line sharing and, if the Public Utilities Commission determines it to be appropriate, adopt rules to require incumbent local exchange carriers in this state to permit competitive data local exchange carriers to provide high bandwidth data services over telephone lines with voice services provided by incumbent local exchange carriers.

A.B. 991, Calif. Legis., 1999-2000 Reg. Sess., §2(b), lines 4-17 (amended Apr. 22, 1999). See also Comments of Covad Communications Co., Deployment of Wireline Services Offering Advanced Telecommunications Capability, CC Dkt. 98-147, at 48 (received Sept. 25, 1999); Comments of E.Spire Communications, Inc., Deployment of

FCC found that this proposed regulatory intervention would be technically feasible.<sup>41</sup> That conclusion was portentous, for it is a prerequisite to any subsequent Commission order of mandatory unbundling of wireline bandwidth at regulated prices.

34. When investing in a particular technology to support a new service, an ILEC bears two risks. First, consumers may not adopt the service as widely as informed parties envision at the time that the ILEC must commit to its investment. Second, consumers may adopt the product, but with a different supporting technology. In the best-case scenario, when the new service is widely adopted by consumers and the technology chosen by the ILEC proves to be the most effective, a policy of mandatory unbundling enables the CLEC to purchase the ILEC's unbundled element at cost, as set by TELRIC. Alternatively, if either of the risks eventuates, then the CLEC does not bear any of the cost; to the contrary, the ILEC's shareholders bear the entire cost of the unsuccessful investment. Thus, mandatory unbundling at TELRIC is equivalent to the government's grant to the CLEC of a *free option* to consume, at incremental cost, the fruits of the ILEC's investment.<sup>42</sup> Of course, that option is not "free" in terms of either its private costs to ILEC shareholders or its social costs to consumer welfare because of the ILEC's diminished levels of investment in innovation.

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Wireline Services Offering Advanced Telecommunications Capability, CC Dkt. 98-147, at 36-37 (received Sept. 25, 1999); Comments of Northpoint Communications, Inc., Deployment of Wireline Services Offering Advanced Telecommunications Capability, CC Dkt. 98-147, at 38-39 (received Sept. 25, 1999). The label "spectrum sharing" is unfortunate because it is likely to cause confusion about the access line (wireless versus wireline) being unbundled.

41. See Deployment of Wireline Services Offering Advanced Telecommunications Capability, First Report and Order and Further Notice of Proposed Rulemaking, CC Dkt. No. 98-147, at ¶ 78, ¶¶ 102-07 (released Mar. 31, 1999) [hereinafter *Advanced Services FNPRM*].

42. See Hausman, *Valuing the Effect of Regulation on New Services in Telecommunication*, *supra* note 8; Hausman, *Regulation by TSLRIC*, *supra* note 8.

35. Thus, the Commission's imposition of mandatory unbundling aimed at unproven technologies that are necessary to support new services would severely damage the ILEC's incentives to invest. Suppose, for example, that an ILEC has an opportunity to make a \$100 investment in a new technology such as asynchronous transfer mode (ATM) switches.<sup>43</sup> Suppose further that, in the absence of mandatory unbundling, the firm will receive with equal probabilities a payoff of \$90 or \$150. We hypothesize that the \$90 payoff corresponds to a future where internet protocol (IP) routers are the superior packet-switching technology, while the \$150 payoff corresponds to an outcome where ATM switches are indeed the superior technology.<sup>44</sup> Assuming that the ILEC's cost of capital is 15 percent, the ILEC would make that investment in the absence of mandatory unbundling at TELRIC prices, as its expected rate of return would exceed its cost of capital. The expected revenue would be \$120 ( $= 50\% \times \$90 + 50\% \times \$150$ ), which would imply an expected return of 20 percent. The expected excess return does *not* imply or assume that the ILEC possesses market power of any sort.<sup>45</sup> As noted above, any rational firm will seek to invest in projects when the expected return exceeds the firm's cost of capital.

36. To extend the example of an ILEC's investment in ATM switches, consider now the case where the ILEC must provide CLECs unbundled access to ATM switches at TELRIC prices. In the adverse case, where the ILEC selects a technology that turns out to be inferior in

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43. ATM is a high bandwidth, low-delay, connection-oriented, packet-like switching and multiplexing technique. See BATES & GREGORY, *supra* note 24, at 693-94.

44. For an overview of the pros and cons of those two packet-switching alternatives, see Susan Breidenbach, *Switching Grows Up: The Entire Report*, NETWORK WORLD, May 4, 1998 (available at <http://www.nwfusion.com/news/0504switch9.html>).

hindsight, its payoff is likely to remain the same, as CLECs will not demand access to an inferior technology. The payoff in the favorable case, however, is substantially lower than it would be in the absence of mandatory unbundling. TELRIC is based upon the ILECs' current effective cost of capital, which is 15 percent in our example. Therefore, the TELRIC-based price for the network element will be set to permit an *ex post* rate of return on capital of 15 percent. Thus, the ILEC will be limited to earning a 15 percent return on the network element that the ILEC uses to supply new services to end-users, as well as only a 15 percent rate of return on compulsory access to that network element that the ILEC provides to CLECs. A rational ILEC will expect that outcome and correctly calculate that the introduction of mandatory unbundling with TELRIC prices will cut the *ex ante* expected return on investment from 20 percent to 2.5 percent. The calculation is straightforward. Half of the time, IP routers are the preferred technology, giving the ILEC a payoff of \$90. The other half of the time, ATM switches are the better technology, but TELRIC unbundling lowers the *ex post* payoff to \$115 (an *ex post* return of 15 percent). The *ex ante* expected return is therefore 2.5 percent ( $50\% \times \$90 + 50\% \times \$115 = \$102.50$ ). Given a cost of capital of 15 percent, the ILEC will rationally decline to invest in ATM switches. In addition, the amount of investment in ATM switches would fall relative to investment in IP routers. Thus, mandatory unbundling of selected elements not only lowers overall investment in that element, but also distorts investment choices toward elements that are believed to be less susceptible to mandatory unbundling.

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45. See David J. Teece & Mary Coleman, *The Meaning of Monopoly: Antitrust Analysis in High-Technology Industries*, 43 ANTITRUST BULL. 801, 820-22 (1998) (distinguishing monopoly rents from Schumpeterian returns

37. Through a second example, we can further explore the asymmetric effect of mandatory unbundling on investments in advanced services and new technology. Suppose that the Commission requires an ILEC to offer unbundled access to DSLAMs. If DSL is not widely adopted by consumers, perhaps because it becomes eclipsed by cable modems over cable television networks, then CLECs will not demand unbundled access to the DSLAMs, and the ILEC will unilaterally bear the risk of consumer rejection. Alternatively, if DSL is widely adopted by consumers, then CLECs, by obtaining unbundled DSLAMs at TELRIC prices, will be able to compete away any risk reward that the ILEC would hope to earn on its investment in an uncertain technology. In practice, the ILEC will earn at most its cost of capital. The ILEC cannot know with certainty, however, whether DSL will be widely adopted by consumers. Therefore, in the presence of mandatory unbundling, the ILEC will rationally expect that regulation will greatly diminish the reward for successful innovation. The ILEC will therefore choose to reduce investments in the new technology or avoid such investments altogether.

38. An additional disincentive can arise from the interplay of TELRIC pricing rules and the declining path of costs over time in markets subject to technological progress. Regulators set TELRIC prices on the basis of their estimates of the forward-looking cost of investment.<sup>46</sup> Telecommunications equipment is generally subject to its own version of Moore's Law,<sup>47</sup> with rapidly

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from innovation).

46. See *Local Competition First Report and Order*, *supra* note 2, 11 F.C.C. Rcd. at 15,541 ¶ 79.

47. Gordon Moore, the cofounder of Intel Corporation, predicted in 1965 that

computer chip complexity would double every twelve months for the next ten years. Ten years later his forecast proved true. He then forecasted that the doubling would occur every two years

declining costs over time for capacity.<sup>48</sup> Indeed, this kind of productivity growth is the premise for ILEC price-cap regulation.<sup>49</sup> An ILEC will correctly expect that (1) the forward-looking cost of investment in a facility will decline over time; and (2) TELRIC rules applied every year over the life of the asset in an *ex post* manner will ratchet down to a new, lower forward-looking cost, such that the ILEC will be denied an opportunity to recover its cost of capital.<sup>50</sup>

39. To apply this lesson to ILEC investment in new technologies, we return to our earlier example. Recall our previous hypothetical investment opportunity, requiring an outlay of \$100 today (for example, for a line card for a DSLAM). Suppose that the price of that unit is expected to decline at a rate of 2 percent per year in real terms, owing to productivity improvements in manufacturing. Because TELRIC prescribes the use of the *current* forward-looking cost applied to past investment, the TELRIC cost basis for the investment calculated in 2002 would only be \$94 in constant real terms.<sup>51</sup> Modifying our previous example to include that reduced TELRIC cost basis, we see that the ILEC's *ex ante* expected return for the third year is as low as *negative*

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for the next ten years. Again history demonstrated his accuracy. The average of the two estimates is often stated as doubling every 18 months.

HARRY NEWTON, *NEWTON'S TELECOM DICTIONARY* 508 (Miller Freeman 15th ed. 1999).

48. See Jerry Hausman, *Cellular Telephone, New Products, and the CPI*, 17 J. BUS. ECON. & STAT. 188 (1999).

49. See ROBERT W. CRANDALL & LEONARD WAVERMAN, *TALK IS CHEAP: THE PROMISE OF REGULATORY REFORM IN NORTH AMERICAN TELECOMMUNICATIONS* 75-96 (Brookings Institution 1995); DAVID E. M. SAPPINGTON & DENNIS L. WEISMAN, *DESIGNING INCENTIVE REGULATION FOR THE TELECOMMUNICATIONS INDUSTRY* 80-88 (MIT Press & AEI Press 1996).

50. See SIDAK & SPULBER, *supra* note 8, at 419-25; Sidak & Spulber, *Givings, Takings, and the Fallacy of Forward-Looking Costs*, *supra* note 5, at 1139-45; Affidavit of Jerry Hausman on Behalf of the United States Telephone Association, Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, CC Dkt. No. 96-98 (F.C.C. May 1996); Letter from Alfred E. Kahn to Hon. Reed E. Hundt, then-Chairman of the FCC (Jan. 14, 1997); KAHN, *supra* note 8. This effect has been called "anticipatory retardation."

51. Projecting a 2 percent annual decline in cost in real terms over the three years between 1999 and 2002, we obtain a price in 2002 of \$94 (= \$100 ÷ 1.023).

1 percent—a loss of capital, let alone a denial of any opportunity to earn a competitive return on capital.<sup>52</sup> The ILEC would therefore be forced *ex post* to unbundle the element at a rate that makes the ILEC's investment unprofitable *ex ante*. No reasonable firm would choose to invest under those conditions. Consumers suffer as a result, because the mandatory unbundling deters efficiency-enhancing investments.

40. Therefore, the combination of TELRIC pricing and expected declines in forward-looking costs compounds the disincentive effect of mandatory unbundling on investment in new technologies. Although the Commission has recognized the possibility that it would be necessary to incorporate higher-than-customary rates of depreciation and return in its TELRIC calculations,<sup>53</sup> it has yet to change historical depreciation in its actual implementation of its policy on mandatory unbundling. Thus, the disincentive effects of a properly computed forward-looking TELRIC are compounded by the improper use of historical depreciation schedules that often have been deliberately elongated by state regulators to keep local rates low.<sup>54</sup> Those considerations imply that the Commission should allow ILECs to make investments in advanced services in a regulatory environment in which the market will entirely determine the eventual rate of return. That conclusion holds with even greater force when one recognizes, as is documented by the earlier quotes from the SEC filings of the CAPs that were subsequently acquired by AT&T and MCI

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52. The payoff to the “adverse” technology is unaffected (IP routers are the preferred technology, giving the ILEC a payoff of \$90 with 50 percent probability). The other half of the time, ATM switches are the better technology, but mandatory unbundling at forward-looking TELRIC prices reduces the ILEC's *ex post* payoff to \$108 (the projected cost basis of \$94 plus a return of 15 percent). The *ex ante* expected return therefore falls even lower, to negative 1% (50 % x \$90 + 50% x \$108 = \$99).

53. See *Local Competition First Report and Order*, *supra* note 2, 11 F.C.C. Rcd. at 15,849 ¶ 686.

54. See SIDAK & SPULBER, *supra* note 8, at 200.

WorldCom, that an ILEC cannot be said to be an “incumbent” with respect to any new technology or service.<sup>55</sup>

41. The Commission itself has recognized how important incentives are to the innovation process and has already proposed a regulatory environment in which an ILEC may invest in advanced services without the threat of constant regulation, including mandatory unbundling at TELRIC prices:

We now explore the circumstances under which an advanced services affiliate would not qualify as an “incumbent LEC” under the definition set forth by Congress in section 251(h), and thus would not be subject to section 251(c) obligations. We also tentatively conclude that an advanced services affiliate, to the extent it provides interstate exchange access services, should, under existing Commission precedent, be presumed to be nondominant. Therefore, such affiliate would not be subject to price cap regulation or rate of return regulation for its provision of such services. We tentatively conclude that such an affiliate, as a non-incumbent, also should not be required to file tariffs for its provision of any interstate services that are exchange access.<sup>56</sup>

Conditional on satisfying a number of criteria, an ILEC may create a separate affiliate that would be exempt from the requirements of section 251(c). The Commission recognized that by allowing ILECs to create separate subsidiaries that are exempt from the unbundling requirements in the Telecommunications Act, the agency could increase the likelihood that ILECs would continue to have an incentive to invest, develop products, and innovate.

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55. *Id.* at 80-81.

56. See *Advanced Capability Memorandum Opinion and Order*, *supra* note 15, 13 F.C.C. Rcd. at 24,055-59 ¶¶ 95-100 (footnotes omitted).

42. Finally, we note that mandatory unbundling of a new technology is a disguised form of industrial policy.<sup>57</sup> Ironically, the Commission has attempted to distance itself from such blatant regulatory intervention. It stated two months before its issuance of the *Second Further Notice of Proposed Rulemaking*: “The role of the Commission is not to pick winners or losers, or select the ‘best’ technology to meet consumer demand, but rather to ensure that the marketplace is conducive to investment, innovation, and meeting the needs of consumers.”<sup>58</sup> Rather than fund its program of developing broadband networks through a broad financing scheme, the Commission, assuming that it is acting with the authority the U.S. government, has chosen to finance its version of industrial policy solely by taxing ILECs through TELRIC price regulation and compulsory access. If the government wants to subsidize the development of a new technology, then there should be nondiscriminatory funding *ex ante* and nondiscriminatory access *ex post*. But if the funding is *not* competitively neutral, then access should not be either. The Commission cannot have it both ways. It is well established, under cases such as *Monsanto* and *Kaiser Aetna*,<sup>59</sup> that the compelled sharing of the fruits of private investment can be a taking of property entitled to just compensation under the Fifth Amendment.

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57. Industrial policy largely has been discredited in the economics profession. For examples of industrial policy failures, see SIDAK & SPULBER, *supra* note 8, at 495-97; PAUL R. KRUGMAN & MAURICE OBSTFELD, *INTERNATIONAL ECONOMICS: THEORY AND POLICY* 285-92 (Addison-Wesley 4th ed. 1997); J. Gregory Sidak & Daniel F. Spulber, *Deregulation and Managed Competition in Network Industries*, 15 YALE J. ON REG. 117 (1998).

58. See Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, Report, CC Dkt. No. 98-146, at ¶ 5 (released Feb. 2, 1999) [hereinafter *Advanced Services Report*].

59. *Kaiser Aetna v. United States*, 444 U.S. 164 (1979); *Ruckelshaus v. Monsanto Co.*, 467 U.S. 986 (1984).

## **B. How Mandatory Unbundling Affects the Weighted-Average Cost of Capital**

43. In the examples presented above, we have assumed that the ILEC's cost of capital, which serves as the benchmark of comparison for all expected-return calculations, has remained constant.<sup>60</sup> Unfortunately, that assumption ignores the impact that mandatory unbundling has on the riskiness and cyclical nature of the ILEC's economic performance and hence on the ILECs' weighted-average cost of capital. Mandatory unbundling raises both components of the weighted-average cost of capital for ILECs—equity and debt.

### **1. Mandatory Unbundling Raises the Cost of Equity Capital**

44. The cost of equity capital depends on the systematic or "beta" risk of the firm. Beta risk is any risk whose source is related to economy-wide effects. An immediate implication of systematic risk is that it cannot be eliminated through diversification.<sup>61</sup> Beta risk is measured by examining the sensitivity of a firm's stock price to the movements of a broad portfolio that contains the stocks of all firms in the economy. For example, one would expect to see higher betas for companies in industries that are highly cyclical.<sup>62</sup> Investors demand a larger risk premium for stocks with large betas because such stocks contribute more to the volatility of an investor's overall portfolio.<sup>63</sup>

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60. For a clear exposition of cost-of-capital analysis, see EUGENE F. BRIGHAM & LOUIS C. GAPENSKI, *INTERMEDIATE FINANCIAL MANAGEMENT* 167-210 (Dryden Press 5th ed. 1996).

61. See BREALEY & MYERS, *supra* note 18, at 137-38.

62. For a description of how cyclical nature affects beta, see ROSS, WESTERFIELD & JAFFE, *supra* note 18, at 300. Other factors that influence beta include operating leverage and financial leverage.

63. Of course, other factors such as dividend yield, affect the cost of equity capital as well. See, e.g., Mukesh Bajaj & Anand M. Vijh, *Dividend Clientele and the Information Content of Dividend Changes*, 26 J. FIN. ECON. 193 (1990).

45. How does mandatory unbundling affect an ILEC's beta and thus its cost of equity?

The answer depends on how unbundling affects the cyclical nature of an ILEC's returns. The effect of unbundling is to make an ILEC more sensitive to swings in the overall economy. In particular, a CLEC is more likely to lease the unbundled elements of the ILEC's network in times of weak demand for telecommunications services. Weak demand for a telecommunications service lowers its price and thus makes it harder for a CLEC to justify facilities-based entry, which not only may be more expensive in the short-term, but also may require investment that has a greater degree of sunk (as opposed to merely fixed) cost than does the leasing of UNEs at TELRIC prices over rather short lease terms. Alternatively, in times of high demand, a CLEC is more inclined to enter as a facilities-based competitor. Thus, the *timing* of the CLEC's request for unbundled network elements exaggerates the ILEC's risk of loss during times of weak demand. An ILEC's profits will fall in the face of CLEC entry through mandatory unbundling because the CLEC will capture some customers from the ILEC. The ILEC's profit will fall even more if the access price for the unbundled network element is calculated by regulators in a manner that is not compensatory. The combination of lower returns during "weak demand" and unaffected returns during "high demand" intensifies the cyclical nature of an ILEC's returns.

46. Because there has not been a recession since the passage of the Telecommunications Act of 1996, that conjecture about increased systematic risk is not falsifiable. There exist no data with which to test our conjecture empirically. What matters, however, is whether the capital markets understand the possibility of increased cyclical nature and thus penalize ILECs by requiring them to produce a higher (risk-adjusted) return on equity investment.

47. In summary, one would expect mandatory unbundling at TELRIC prices to increase beta for an ILEC by increasing the cyclical nature of the company's financial performance. As a result, an ILEC's investors would demand a larger risk premium to hold the ILEC's stock because that stock would contribute more to the volatility of the investor's overall portfolio. The larger risk premium would imply a higher cost of equity capital for an ILEC.

## **2. Mandatory Unbundling Raises the Cost of Debt Capital**

48. Mandatory unbundling also raises the ILEC's cost of debt. It is well established in corporate finance that debt financing is a less expensive source of capital than equity financing.<sup>64</sup> For any given level of financial risk, debt financing is preferable to other forms of capitalization because the interest that the firm pays is a tax-deductible expense.<sup>65</sup> A firm will continue to invest through debt offerings until the additional tax paid by lenders on an extra dollar of interest equals the corporate tax shield on an extra dollar of interest. As Professors Brealey and Myers observe, uncertainty is the enemy of debt financing: "If companies cannot be sure of taxable profits in the future, the expected corporate tax saving will be less, and less debt will be issued."<sup>66</sup> Increased uncertainty limits a firm's ability to debt finance because the threat of financial distress trumps the corporate tax savings at an earlier stage of the capital allocation process.

49. Mandatory unbundling increases the cost of debt capital for an ILEC because it increases uncertainty for the firm. Under the FCC's current regime of mandatory unbundling, an ILEC is required to make the sunk investment to provide a particular UNE on the basis of ex-

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64. See BREALEY & MYERS, *supra* note 18, at 432.

65. *Id.* at 422.

66. *Id.* at 433.

pected orders submitted by requesting CLECs. The requesters, however, are not required to make firm commitments to take specified volumes of the UNE for a minimum contract duration. If the ILEC makes the UNE available but there are no CLEC orders that actually materialize for the UNE, as has occurred with unbundled switching, the ILEC is forced to bear that entire cost. This allocation of risk distorts competition: The ILEC is compelled to impute *to itself* this additional transition cost of mandatory unbundling when providing the network element in question to one of its affiliates. On the other hand, the CLECs do not need to incur that unbundling cost or impute it to themselves, to their affiliates, or to any other party with whom they choose to do business. Because an ILEC must bear all the risk of mandatory unbundling, the uncertainty of the ILEC's profits naturally rises. Moreover, because an ILEC will be limited in the *share* of total financing that it may structure as debt (a cheaper source than equity), the firm will experience an increase in its overall cost of capital. That effect, in addition to the increase in the cost of equity described above, will serve to undermine further an ILEC's investment prospects by "raising the bar" by which all expected returns are measured.

## **II. THE EFFECT OF MANDATORY UNBUNDLING ON THE CLEC'S INVESTMENT DECISION**

### **A. Optimal Entry Delay**

50. The uncertain success of any technology gives imitators an advantage over innovators when regulators mandate unbundling at TELRIC prices. By requesting unbundled elements, the CLEC can always "keep its powder dry" and unbundle the ILEC's successful technology choice. In that manner, mandatory unbundling confers a "second-mover" advantage and sub-

stantially decreases a CLEC's incentives to make a sunk investment, an effect that has been investigated in the recent academic literature on innovation and real-option theory.<sup>67</sup> Indeed, one CLEC, Intermedia, has recognized that fact in its 1999 SEC filings:

Utilizing leased facilities enables Intermedia to (i) meet customers' needs more rapidly; (ii) improve the utilization of Intermedia's existing network; (iii) add revenue producing customers before building out its network, thereby *reducing the risks associated with speculative network construction or emerging technologies*; and (iv) subsequently focus its capital expenditures in geographic areas where network construction or acquisition will provide a competitive advantage and clear economic benefit.<sup>68</sup>

Simply put, CLECs have the freedom to choose between investing today in sunk equipment embodying uncertain technology or delaying that investment until more information becomes available and reduces that uncertainty.

51. In telecommunications—with leapfrogging innovations and fundamentally different competing technologies—the decision to invest today (rather than to delay investment) is particularly risky, as it often commits the CLEC to a particular technology that may reveal itself later to be an inferior one. Investments in telecommunications technology also face uncertainties about market demand, competition, and the associated costs. The history of telecommunications offers many examples of firms that squandered substantial market opportunities by investing either too early or too late.<sup>69</sup>

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67. See Aron, Dunmore & Pampush, *supra* note 8; DIXIT & PINDYCK, *supra* note 11. For an application of option theory to investment in telecommunications, see Hausman, *Valuing the Effect of Regulation on New Services in Telecommunications*, *supra* note 8.

68. See INTERMEDIA COMMUNICATIONS INC., 1999 SEC FORM 10-K, at 8 (1999) (emphasis added).

69. For example, AT&T introduced Picturephone too soon. See, e.g., [www.djvu.att.com/djvu/att/archives](http://www.djvu.att.com/djvu/att/archives).

52. Without mandatory unbundling, a CLEC would have to balance delay against the potential loss of a first-mover advantage. Through early investment, a CLEC could serve markets before other CLECs or ILECs in complementary markets could deploy networks. With mandatory unbundling, however, the payoff to swift action diminishes, as such outlays can only confer transitory rewards. A compulsory-sharing regime tips the balance of the CLEC's calculus in favor of waiting. The value of the first-mover advantage erodes, and the value to the CLEC of keeping its options open increases. If hindsight confirms that the ILEC chose to invest in the correct technology, then the CLEC can simply demand to unbundle the ILEC's facilities at TELRIC prices.

53. The option value of mandatory unbundling at TELRIC prices can lead the CLEC to prefer unbundling to building facilities, even if building facilities has a higher net present value. One CLEC, Focal Communications, admits in its SEC filings that it can shift risk onto the ILEC by exploiting the option to unbundle:

The Company's strategy of leasing rather than building its own fiber transport facilities results in the Company's cost of service being a significant component of total costs. The Company has to date been successful in negotiating lease agreements which match the duration of its customer contracts, thereby allowing the Company to avoid the risk of continuing expenses associated with transmission facilities that are not being used by revenue generating customers.<sup>70</sup>

Moreover, if each CLEC expects other CLECs to reason in the same manner, the incentive to delay investment is amplified. Stated another way, as soon as a particular CLEC commits to an investment in a particular technology, that CLEC is no longer protected by its second-mover status. Other CLECs may benefit by waiting for a superior technology to emerge.

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70. See FOCAL COMMUNICATIONS CORP., 1999 SEC FORM 10-K, at 11 (1999).

## **B. The Possibility of Regulatory Gaming**

54. Mandatory unbundling of network elements at TELRIC prices creates incentives for a CLEC to game the regulatory system. One plausible strategy that CLECs (and their IXC parents or strategic partners) could employ is to demand a perfect, “bug-free” version of the ILEC’s back-office systems and operations support systems (OSS) before considering entry. Because most CLECs and IXCs have new OSS and back-office computer systems, requests for UNEs by those firms can place heavy burdens on the ILEC’s older computer systems and databases. An ILEC has invested large amounts in upgrading its legacy systems and training employees.<sup>71</sup> Nonetheless, some IXCs claim that the current system is still plagued by errors.<sup>72</sup> Three years after the enactment of the Telecommunications Act, not a single RBOC has received permission to begin offering consumers in-region interLATA service. It would be naïve to ignore that such delay can be increased through regulatory gaming by CLECs—whose owners and strategic partners, the IXCs, have a strong incentive under the competitive checklist process of section 271 to characterize any problem in the ILEC’s network as evidence that its local exchange markets are closed to competition.

55. Before an RBOC undergoes scrutiny under the checklist, it first must enter into an interconnection agreement, approved by the state public utilities commission in the state where

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71. See, e.g., Raymond W. Smith, *Smoke Detection: Clearing the Air on Local Competition*, in *IS THE TELECOMMUNICATIONS ACT OF 1996 BROKEN? IF SO, HOW CAN WE FIX IT?* 25 (J. Gregory Sidak ed. AEI Press 1999) (describing OSS compliance at Bell Atlantic).

72. See, e.g., John Zeglis, *Out of the Courts and Into the Market: Wouldn’t It Be Great?*, in *id.* at 100 (describing AT&T’s complaints about RBOC provision of OSS).

the RBOC seeks to originate interLATA calls, with a facilities-based provider of local exchange service.<sup>73</sup> Then the FCC, in consultation with the relevant state public utilities commission (PUC), will determine whether the RBOC's interconnection agreement satisfies the fourteen requirements of the checklist.<sup>74</sup> If the interconnection agreement passes the checklist, and if the RBOC has established a structurally separate entity for the provision of in-region interLATA service,<sup>75</sup> then the FCC, after consulting with and giving substantial weight to the views of the Department of Justice,<sup>76</sup> must rule, under the general public interest standard of the Communications Act, on the RBOC's request to provide in-region interLATA service.<sup>77</sup>

56. Although the FCC must approve or reject the RBOC's application within ninety days, the complexity of the checklist and the related approval process will inevitably produce disputes on matters of fact, law, economics, and engineering. That complexity—along with the provision authorizing the FCC to suspend or revoke its approval of the RBOC's provision of in-region interLATA service and the related provision creating a process for the filing of complaints by private parties upon which the FCC must act within ninety days<sup>78</sup>—creates a rich opportunity for strategic gaming by IXCs and CLECs seeking to block RBOC entry into long-distance markets. The experience with the MFJ is suggestive. The MFJ allowed for modification of its line-of-

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73. 47 U.S.C. § 271(c)(1)(A). Alternatively, if the state PUC approved a generic interconnection plan offered by the RBOC but the RBOC received no request for interconnection within the first seven months after enactment of the Telecommunications Act of 1996, then the RBOC may proceed to be evaluated under the checklist. *Id.* § 271(c)(1)(B).

74. *Id.* § 271(c)(2)(B).

75. *Id.* § 272(b).

76. *Id.* § 271(d)(2)(A).

77. *Id.* § 271(d)(3).

78. *Id.* § 271(d)(6).

business restrictions through a waiver process. That process proved to be a quagmire that was costly in terms of delaying benefits to consumers in the form of greater price competition and new service introductions. By 1993 the average age of pending waiver requests before the Department of Justice was thirty-six months, despite the fact that the DOJ had opposed relief in only six of the 266 waiver requests filed by the RBOCs.<sup>79</sup> By the end of 1993 the average age of pending waiver motions before the district court had grown to 54.7 months, despite the fact that the court had approved in full 96 percent of all waiver requests filed.<sup>80</sup>

57. Viewed in these terms, it is not surprising that the Commission has not approved a single section 271 application since the passage of Telecommunications Act of 1996. The process of construing and applying the checklist fuels esoteric regulatory proceedings and litigation. Because the outcome of such proceedings and litigation will determine when an RBOC will be allowed to compete in lucrative interLATA markets, one would therefore expect the IXC's, and the CLECs controlled by them, to contest those proceedings and litigation fiercely. The competitive checklist has become "regulation's rendition of *Waiting for Godot*."<sup>81</sup> The likely result of the FCC's ordering of mandatory unbundling of OSS and other information-based assets at TELRIC prices would be to slow the section 271 approval process even more.

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79. Paul H. Rubin & Hashem Dezhbakhsh, *Costs of Delay and Rent-Seeking Under the Modification of Final Judgment*, 16 MANAGERIAL & DECISION ECON. 385, 385-86 (1995).

80. *Id.* at 389, 392.

81. See PAUL W. MACAVOY, *THE FAILURE OF ANTITRUST AND REGULATION TO ESTABLISH COMPETITION IN LONG-DISTANCE TELEPHONE SERVICES* 176 (MIT Press & AEI Press 1996).

**C. Diminished Provision of “Traditional” Services Using Innovative Means**

58. In the face of mandatory unbundling at TELRIC prices, CLECs will be less inclined to develop innovative ways to provide service. For example, innovations are being developed to permit the provision of POTS over DSL lines without the use of any circuit-switching apparatus.<sup>82</sup> CLECs will have less incentive to pursue those technologies if they can require the ILEC, through “spectrum unbundling,” to provide the POTS service, especially if the ILEC is compelled to provide that service below cost because of rate regulation and social-pricing concerns.

59. Without spectrum unbundling, CLECs have an incentive to add voice service to DSL—either by investing in voice switching or by developing voice-over-DSL protocols. Innovation and investment would therefore be higher in the absence of spectrum unbundling. In early 1999, Commissioner Powell warned that mandatory unbundling may diminish the CLEC’s incentive to offer “traditional” service using new means: “While mandating access can bring about short-term improvements in retail competition, it also may undermine incentives for developing new methods to circumvent the influence of incumbents over distribution.”<sup>83</sup>

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82. See *Jetstream Offers CLECs Affordable Entry into Small Business*, COMMUNICATIONS TODAY, Dec. 8, 1998; 3COM PRESS RELEASE, “End-to-end ADSL: Solutions for Deployable ADSL Services” ([www.teledotcom.com/strategies/xdsl3com.html](http://www.teledotcom.com/strategies/xdsl3com.html)); PARADYNE CORPORATION, THE DSL SOURCE BOOK, *supra* note 39.

83. See *Advanced Services Report*, *supra* note 58 (statement of Commissioner Powell).

60. Also, as noted by Commissioner Powell in the *Second Further Notice of Proposed Rulemaking*<sup>84</sup> and by Justice Breyer in *Iowa Utilities Board*,<sup>85</sup> the incentives for a CLEC in such a regulatory framework encourage its overdependence on unbundling and its underinvestment in facilities-based competition. Commissioner Powell observed that “unconstrained access would eviscerate incentives for entrants to install their own facilities and thereby inhibit the type of competition most likely to spur innovation, provide price discipline and otherwise benefit consumers.”<sup>86</sup> The FCC should scrutinize the CLECs’ strategic incentives when designing the optimal policy of mandatory unbundling pursuant to section 251(d)(2).

### **III. FURTHER DISTORTIONS OF THE INVESTMENT DECISION CAUSED BY THE COMMISSION’S MANDATORY UNBUNDLING RULES**

61. In the following sections, we show how the possibility of mispriced UNEs aggravates the disincentives to invest in innovation efforts. We also demonstrate how mandatory unbundling will eliminate or greatly reduce procompetitive bundling opportunities for ILECs that would redound to the direct benefit of consumers. Finally, we argue that the Commission should endeavor to solve the commitment problem associated with its discretion to mandate the unbundling of additional network elements at TELRIC prices in the future.

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84. See *SFNPRM*, *supra* note 4 (statement of Commissioner Powell).

85. See *Iowa Utilities Board*, 119 S. Ct. at 754 (Breyer, J., concurring in part and dissenting in part).

86. See *SFNPRM*, *supra* note 4 (statement of Commissioner Powell).

**A. The Relation between Retail Rates and Costs Affects the CLEC's Entry Decision**

62. The possibility of mispriced UNEs further reduces the incentives to invest in innovation efforts. A conflict arises if UNEs are available at TELRIC prices while resale rates are calculated on the basis of avoided-cost discounts applied to retail rates.<sup>87</sup> In cases where retail rates are below costs, especially in rural and low-density service areas, CLECs will rationally choose to use resale rather than lease unbundled network elements at TELRIC prices, thus obtaining wholesale service considerably below cost. That effect drastically reduces the ILEC's incentive to engage in innovation and the CLEC's incentive to enter a particular geographic market as a facilities-based competitor. By contrast, the CLEC's ability to bypass wholesale rates in areas where retail prices exceed costs reduces the CLEC's incentives to invest in facilities.<sup>88</sup> That is particularly important in locales where particular rates (often, for business service) are maintained artificially high by regulatory fiat.

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87. See SIDAK & SPULBER, *supra* note 8, at 308, 335–37.

88. As Justice Scalia, writing for the Court in *Iowa Utilities Board*, noted: “Because this universal-service subsidy is built into retail rates, it is passed on to carriers who enter the market through the resale provision. Carriers who purchase network elements at cost, however, avoid the subsidy altogether and can lure business customers away from ILECs by offering rates closer to cost. This, of course, would leave the ILECs holding the bag for universal service.” 119 S. Ct. at 737.

**B. Input Unbundling Eliminates Procompetitive Output-Bundling Opportunities that Would Benefit Consumers**

63. Mandatory unbundling will eliminate or greatly reduce procompetitive bundling opportunities for ILECs that would redound to the direct benefit of consumers.<sup>89</sup> Bundling of outputs is attractive if a new service is most cost-effectively marketed and most convenient to the end-user when combined with an existing service. For example, many ILECs currently offer POTS bundled with DSL service at an attractive price and include an Internet service provider (ISP) for a nominal charge. Thus, some customers are able to purchase all three of those services from an ILEC for a single price. This bundling advantage is being threatened by AT&T, which announced plans in 1998 to bundle POTS, long-distance service, cable television service, cable modem, and ISP offerings all for one price:

AT&T intends to pursue local entry by transforming the cable footprint of one-way cable plant into a two-way, broadband network capable of meeting the full spectrum of communication needs of the residential customer. AT&T intends to deploy a variety of services over the upgraded cable plant, including a richly featured “all-distance” (i.e., local, long distance, international) voice telephony offering. AT&T plans to use existing circuit-switched technology to pilot telephony service offers over the cable plant beginning in 1999. However, AT&T expects to begin to transition to an integrated Internet protocol (IP) packet data architecture by the end of 2000 that affords cost and feature benefits over the older circuit-switched technology.<sup>90</sup>

Mandatory spectrum unbundling would eliminate the ILEC’s opportunity to offer bundled one flat-rate residential service and DSL service. Such regulatory intervention would make it harder for ILECs to match the bundled services that sophisticated rivals like AT&T intend to will likely

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89. It has long been noted that bundling can have procompetitive or efficiency-enhancing effects in markets subject to rapid technological innovation. *See, e.g.,* J. Gregory Sidak, *Debunking Predatory Innovation*, 83 COLUM. L. REV. 1121 (1983).

offer in the marketplace. Despite this perverse consequence for competition and consumer welfare, the FCC is pursuing mandatory spectrum unbundling in the *Advanced Services Further Notice of Proposed Rulemaking*.<sup>91</sup>

64. Mandatory spectrum unbundling would decrease the ILEC's incentive to develop innovative technical solutions that facilitate bundling, such as splitterless DSL. It would also decrease incentives for CLECs to compete in residential telephony. Instead of unbundling the entire loop, CLECs would simply pursue the most profitable advanced-services portion of the customer's demand. That digital cream-skimming would not necessarily increase competition in residential voice telephony; rather, it would more likely siphon off to CLECs the most lucrative opportunities among the most attractive customers of the residential market. Moreover, in the process the CLECs would not be developing the customer service and other intangible assets that are required to be successful local exchange carriers. In short, mandatory spectrum unbundling would preclude (at least in the short-term) the possibility of ILECs competing for the advanced-services market.

**C. The Commission Should Solve the Commitment Problem Associated with Its Discretion to Unbundle Additional Network Elements in the Future**

65. Economic theory recognizes that commitments made in bargaining situations influence the behavior of other actors only to the extent that the person making such commitments is

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90. See AT&T CORP., 1998 SEC FORM 10-K, at 15 (1999).

91. See *Advanced Services FNPRM*, *supra* note 41. The California legislature is similarly considering such a policy in A.B. 991. See *supra* note 41.

credibly bound (by himself or others) to honoring them.<sup>92</sup> The notion of enforceable agreements plays a similar role in regulated industries as it does in competitive markets. As Pablo T. Spiller and others have shown, both theoretically and empirically, that the level of investment in long-lived infrastructure undertaken by a regulated (or recently privatized) public utility depends critically on regulatory institutions' having been designed to ensure the credibility of the regulator's commitments that it will not act opportunistically once the utility has placed those nonsalvageable assets into service.<sup>93</sup>

66. The FCC's interpretation of the "necessary" and "impair" standards ultimately leads to a choice of which network elements shall be unbundled. For any well-defined geographic market, the Commission's framework will result in one of four classifications for each network element:

- (1) the element will be unequivocally within the set of elements to be unbundled;
- (2) the element will be unequivocally outside the set of elements to be unbundled;
- (3) the element will be just within the set of elements to be unbundled; or
- (4) the element will be just outside the set of elements to be unbundled.

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92. See, e.g., OLIVER E. WILLIAMSON, *THE MECHANISMS OF GOVERNANCE* 120–44 (Oxford University Press 1996); PAUL MILGROM & JOHN ROBERTS, *ECONOMICS, ORGANIZATION AND MANAGEMENT* 131 (Prentice Hall 1992); OLIVER E. WILLIAMSON, *THE ECONOMIC INSTITUTIONS OF CAPITALISM: FIRMS, MARKETS, RELATIONAL CONTRACTING* 167 (Free Press 1985); THOMAS C. SCHELLING, *THE STRATEGY OF CONFLICT* (Oxford University Press 1960).

93. Pablo T. Spiller, *Institutions and Regulatory Commitment in Utilities' Privatizations*, 2 *INDUS. & CORP. CHANGE* 387 (1993); Brian Levy & Pablo T. Spiller, *The Institutional Foundations of Regulatory Commitment: A Comparative Analysis of Five Country Studies of Telecommunications Regulation*, 10 *J.L. ECON. & ORG.* 201 (1994); Shane Greenstein, Susan McMaster & Pablo T. Spiller, *The Effect of Incentive Regulation on Infrastructure Modernization: Local Exchange Companies' Deployment of Digital Technology*, 4 *J. ECON. & MGMT. STRATEGY* 187 (1995).

The first two classifications may be regarded as *inframarginal* cases, and the latter two classifications may be regarded as *marginal* cases. Economics teaches, of course, that consumers and firms make decisions at the margin. An ILEC considering whether to invest in a technology that relies on a network element in the fourth category would rationally forgo that investment if there were a significant risk that regulators would later reclassify the element as one subject to mandatory unbundling at regulated, cost-based rates. To the extent that the risk of regulatory reclassification is significant, the incentive problem extends not only to network elements that the FCC currently subjects to mandatory unbundling, but also to any network element for which it might be technically feasible for the FCC *in the future* to order mandatory unbundling at a TELRIC price.

67. There are several ways in which a network element that “just passed the test” might eventually be reclassified as being subject to mandatory unbundling at a TELRIC price. First, any standard adopted by the Commission will incorporate several exogenous characteristics that will likely change over time. For example, suppose the FCC embraced an efficient-competitor standard for mandatory unbundling that incorporated the extent of competition in the supply of the requested element. Suppose further that the number of distinct suppliers of the requested element in a well-defined geographic market decreased as the result of a consolidation or a decision to exit the industry. When applied at a later date, the efficient-competitor standard might reclassify the requested element such that the ILEC would then be ordered to unbundle that element at a TELRIC price.

68. Second, the application of any regulatory standard that relies on empirical data is subject to measurement error. To continue the earlier example, suppose that the Commission’s

standard required the level of competition for the supply of the network element to meet some threshold,  $t^*$ . Suppose that the Commission (or the state PUC) must measure the actual level of competition for the supply of that element,  $t$ , which is randomly distributed from 0 to 100.<sup>94</sup> Suppose further that the Commission (or the state PUC) measures the actual level of competition with error, such that the Commission's estimate of competition is  $t + e$ , where  $e$  is a random error term that ranges from -10 to 10. Assume that the Commission declares that the network element should *not* be unbundled at the present time (that is, the actual level of competition surpasses the target level,  $t^*$ .) The ILEC can only infer from such a decision that the actual level of competition,  $t$ , ranges from  $t^*-10$  (if the error term was -10) to 100. Assuming the Commission's subsequent measurement of competition is just as accurate as its first attempt, the probability that the Commission will reclassify the network element in the subsequent round of examination is substantial.<sup>95</sup>

69. Given the significant likelihood that a network element that the FCC originally considered off-limits may eventually be unbundled, either through measurement error or through a change in exogenous variables underlying the test, the Commission should adopt an appropriate commitment mechanism to encourage investments in network elements subject to this risk of regulatory reclassification. The Commission should outline its position regarding network elements *conditional on the first application of its impairment test* in the present remand proceed-

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94. For example, the Commission may attempt to measure the Herfindahl-Hirschman Index (HHI) of concentration in the switching market by calculating shares as a function of switches sold. In that case, the range of the competitive index would be from 0 to 10,000.

ing. To all elements that are originally unbundled at TELRIC prices, the Commission should apply a sunset provision that would (1) remove the element from the set of network elements subject to mandatory unbundling and (2) place the burden on the CLEC to prove that an absence of competitive conditions for end-user telecommunications services requires regulators to continue to mandate unbundling of the element at a TELRIC price. The mandatory unbundling of obligations for the ILEC's elements should sunset after the passage of two years or upon the entry of a facilities-based competitor of the stature of AT&T, MCI WorldCom, or Sprint, whichever occurs first.

70. For those elements for which the Commission (or the relevant state public utilities commission) does *not* initially mandate unbundling at TELRIC prices, the Commission should announce a "rising competitive benchmark" by which those elements would be tested in the future. Suppose, for example, that the Commission adopted a consumer-welfare standard that asked whether the ILEC could exercise market power in the end-user services market by restricting access to a given network element. Upon the first application of the test, the Commission (or state PUC) would assess whether, in a particular geographic market, the ILEC's restriction of CLEC access to the element at a TELRIC price would allow the ILEC to raise prices in the end-user services market by *five* percent. Conditional upon the element not being unbundled at a TELRIC price in the first regulatory iteration, the Commission (or state PUC) would assess, in its second iteration, whether denying CLECs unbundled access to that network element at a TELRIC price would allow the ILEC to raise prices in the end-user services market by *ten* percent. Because it is

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95. The probability that the UNE would be reclassified can be calculated by summing the probabilities that  $t + e$  is less than  $t^*$  given that  $t$  ranges from  $t^*-10$  to 100. Assuming (1) both variables are uniformly distributed, (2)

less likely that an ILEC could sustain a ten-percent price increase (relative to a five-percent increase), the probability would greatly diminish that regulators would reclassify the element as being subject to mandatory unbundling at a TELRIC price.

71. Suppose, alternatively, that the Commission embraced a competitor-welfare standard that asked whether a CLEC could profitably produce the service given the ILEC's restriction of unbundled access to the network element in question.<sup>96</sup> In its first application of the test, the Commission (or state PUC) could assess whether a CLEC could earn a *fifteen* percent rate of return without having access to the requested element at TELRIC prices.<sup>97</sup> Again, conditional upon the regulator's not ordering the ILEC to unbundle the element at a TELRIC price, in its second application, the Commission (or state PUC) would assess whether a CLEC could earn a *ten* percent rate of return without having access to the requested element at a TELRIC price. An increasing competitive benchmark would credibly commit the regulator to a policy of not reclassifying one of the ILEC's network elements after the regulator has initially determined that the element in question should not be subject to mandatory unbundling at a TELRIC price. Such a credible commitment by the Commission would maintain the proper incentives for the ILEC to continue making investments in the development and improvement of that element.

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*e* is independent of *t*, and (3)  $t^*=75$ , the probability would be 28 percent.

96. We emphasize that the Commission should adopt a consumer-welfare standard rather than a competitor-welfare standard for interpreting section 251(d)(2).

97. One such profitable business plan might entail leasing the element from the ILEC at a voluntary rate in excess of TELRIC.

#### IV. THE EFFECT OF MANDATORY UNBUNDLING ON INNOVATION IN PARTICULAR NETWORK ELEMENTS

72. In the following sections, we describe recent innovations in switching, loops, DSLAMs, and transmission facilities. Mandatory unbundling at TELRIC prices would jeopardize continued innovation with respect to each of those recent developments.

##### A. Switching

73. A number of voice-switching innovations, including more efficient routing tables and vertical features, should not be unbundled. Whether or not those innovations ultimately are deemed to be “proprietary,” they represent a substantial investment by the ILEC in embedded intellectual property for the creation of service enhancements. Similar concerns and negative implications arise with respect to the mandatory unbundling of data switching (such as ATM and DSLAMs).

74. First, these advanced switching services have not been as extensively deployed as competing technologies. For example, cable modems outnumber DSL modems. After AT&T’s acquisition of TCI, the CLEC that will provide the majority of cable modem service throughout the United States will be AT&T.<sup>98</sup> AT&T’s proposed acquisition of MediaOne would increase that dominance.<sup>99</sup>

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98. See PAUL KAGAN ASSOCIATES, INC., CABLE TV TECHNOLOGY, *U.S. High-Speed Access Cable & ADSL Projection Model*, 1997-2006 (Feb. 28, 1998) (predicting that by 2003 over 12 million households (or over 10 percent of U.S. households) will subscribe to high-speed data service, and that three quarters of those households will obtain service through digital cable modems).

99. See Kathy Chen, Bryan Gruley & John R. Wilke, *AT&T-MediaOne Deal Is Likely: Complaints Involve Control Over Cable-TV Business And Pipelines to Internet*, WALL ST. J., May 6, 1999, at B11.

75. Second, the provision of business switched-data services is currently dominated by IXCs, and the ILECs have only a miniscule share of this market segment. Frost & Sullivan reports that in 1997, the three largest IXCs (AT&T, MCI, and Sprint) accounted for 73.5 percent of such traffic.<sup>100</sup> Frost & Sullivan also reports that IXCs control over 90 percent of the market in certain advanced segments, such as ATM and frame relay.<sup>101</sup> That evidence suggests that IXCs, not ILECs, are the dominant providers of services in this segment of the industry.

76. The FCC's suggestion that mandatory unbundling extend to packet switches raises troubling issues with respect to the Telecommunications Act's goals of fostering innovation and extending advanced telecommunications services: "It is the policy of the United States . . . to preserve the vibrant and competitive free market that presently exists for the Internet and other interactive computer services, unfettered by Federal or State regulation."<sup>102</sup> Packet switches are the legitimate object of these expressions of legislative concern, for they are expected to be the foundation for delivering advanced telecommunications services. By definition, advanced services currently are services not widely deployed, for which the critical technology is advancing rapidly. The supply of those services is therefore fraught with technological risk. In many cases, the supply is yet to be created, as the assets need yet to be deployed. Therefore, we conclude that mandatory unbundling of switches at TELRIC prices would likely impose large social costs in the form of

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100. See FROST & SULLIVAN, U.S. MARKETS FOR ATM, FRAME RELAY, SMDS AND X.25 PUBLIC DATA SERVICES 1-5 (1998) [hereinafter *SMDS Report*]. This category includes switched multimegabit data service (SMDS), ATM, and frame relay, as well as lower-speed services such as ISDN and X.25 service. *Id.* at 1-13.

101. See *id.* at 2-3.

102. See 47 U.S.C. §230(b)(2). The stated congressional purpose prefacing the Telecommunications Act is "to promote competition and reduce regulation in order to secure lower prices and higher quality services for

reduced investments. Such mandatory unbundling would not “reduce regulation,” nor would it “encourage the rapid deployment of new telecommunications technologies,”<sup>103</sup> as Congress intended through its enactment of the Telecommunications Act.

## **B. Loops**

77. There is also a high potential for innovation in the area of loops, especially in the development of advanced broadband technologies such as DSL. Those areas include loop plant upgrades and conditioning (for example, bridge tap, dry join, and load coil removal), the implementation of DSLAMs at digital loop carrier (DLC) huts,<sup>104</sup> and the development of new and faster DSL protocols. Although interfaces are not *per se* proprietary to ILECs, they do reflect substantial development in trade secrets, such as engineering, installation, and troubleshooting techniques and methodologies.

78. In the presence of mandatory unbundling of the traditional loop, mandatory spectrum unbundling exacerbates the disincentive for investment. It currently is both cost-effective and feasible for CLECs to provide their own DSLAMs and switching equipment to provide both DSL and POTS over an ILEC’s unbundled “traditional” loops. For example, Paradyne has developed a DSL “starter kit” for extending service to as few as twenty subscribers over loops exceeding

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American telecommunications consumers and encourage the rapid deployment of new telecommunications technologies.” See Telecommunications Act of 1996, Pub. L. No. 104–104, 110 Stat. 56, 56 (preamble).

103. *Id.*

104. DLC is “network transmission equipment used to provide pair gain on a local loop. The digital loop carrier system derives multiple channels, typically 64 Kbps voice-grade, from a single four-wire distribution cable running from the central office to a remote site.” See NEWTON, *supra* note 47, at 252.

20,000 feet.<sup>105</sup> Given the feasibility of unbundling the entire loop for use by the CLEC, and the given desirability of increasing competition in the local telephone market, the consumer benefits of mandatory spectrum unbundling are nonexistent. The only “benefit” of such a policy is captured by the CLEC and its shareholders, because the CLEC most likely would unbundle the entire loop if mandatory spectrum unbundling were not an option. In that sense, spectrum unbundling would be a classic case of asymmetric regulation: The CLEC would pursue the more profitable, unregulated service, while the ILEC would be left providing basic local service (in many cases, below cost). Innovation would be eroded by regulations that arbitrarily favored CLECs, without regard to the adverse effect of such asymmetric regulation on the welfare of consumers.

79. The Commission should reject mandatory spectrum unbundling outright because of its obviously deleterious effects on innovation. Such regulatory intervention would certainly reduce and possibly eliminate the current innovation occurring in loop technology, as well as reduce the market for small, entrepreneurial companies like Paradyne that are creating CLEC-tailored solutions to the provision of DSL and POTS over an unbundled loop. Indeed, once one accounts for the harmful effects that such an unbundling rule would have on the currently dynamic and competitive market for advanced services, the only reason to implement mandatory unbundling would be to enrich CLECs at the expense of ILECs and their ratepayers. Nothing in the Telecommunications Act authorizes the FCC to engage in such redistribution of income.

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105. Bob Metcalfe, *More from Maine's rural MVL DSL front: Pick your speed and pay your toll*, INFO WORLD, July 13, 1998, at 4 (available at <http://www.infoworld.com>).

### C. Digital Subscriber Lines Access Multiplexers

80. The *Second Further Notice of Proposed Rulemaking* raises the prospect of mandatory unbundling of DSLAMs.<sup>106</sup> Such a policy would harm the public interest. To understand why, it is instructive to review the recent developments in DSLAM technology. Some RBOCs are now experimenting with versions of DSL service that rely on high-frequency, high-power transmission over ordinary copper loops using asymmetrical data rates—such as asymmetric digital subscriber lines (ADSL), where the end-user’s download rate is much faster than the upload rate. In particular, some firms are experimenting with ADSL technology that does not require a splitter at the customer’s premises.<sup>107</sup> This technology is known as G.Lite, or “splitterless ADSL.”<sup>108</sup> Some analyst have criticized G.Lite as the “wrong” technology,<sup>109</sup> which appears to be inferior to alternative symmetric DSL solutions relying on other standards, such as Paradyne’s Hotwire multiple virtual lines (MVL) system.<sup>110</sup> Although G.Lite is a public, nonproprietary standard, the consortium members are devoting considerable effort to the implementation of G.Lite in their networks. Such efforts include the deployment of G.Lite-compatible DSLAMs in central offices, training of installation personnel, development of loop selection and testing procedures, and OSS support.

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106. See *SFNPRM*, *supra* note 4, at ¶ 35.

107. A splitter “resides at both the [central office] and service user locations, allowing the copper loop to be used for simultaneous high-speed DSL data transmission and single line telephone service. POTS splitters usually come in two configurations—a single splitter version designed for mounting at the residence and a multiple splitter version designed for mass termination at the [central office].” See PARADYNE CORPORATION, *THE DSL SOURCE BOOK*, *supra* note 43.

108. For a general description of G.Lite technology, see Tim Greene, *Key DSL flavor faces big compatibility test, but G.Lite modem makers hope to achieve interoperability by June*, NETWORK WORLD, Apr. 19, 1999, at 1.

109. Bob Metcalfe, *Universal ADSL Working Group Is Speeding G.Lite Down a Road to Nowhere*, INFO WORLD ELEC., Sept. 7, 1998 (available at <http://www.infoworld.com>).

81. If the Commission were to mandate the unbundling of DSLAMs, the attractiveness of G.Lite deployment would plummet. First, the ILEC would have to sell wholesale access to DSLAMs, which would dampen investment incentives in central office facilities. Second, the ILEC would be forced to share with other DSL operators the considerable investment in personnel training, installation procedures, and OSS support. Finally, the product differentiation that the ILEC is seeking through its ability to offer “splitterless” DSL service would be nullified. The provision of the splitter would entail an additional cost that the ILEC would have to charge to the customer. Consequently, the price-adjusted quality of the ILEC’s DSL service would diminish relative to the CLEC’s DSL service.

#### **D. Transmission Facilities**

##### **1. Fixed-Link Innovations**

82. Often CLECs provide competing loop services without using any regulated input from the traditional ILEC. For example, AT&T claims that half of its traffic from business customer terminates on its own network, a figure that is certainly higher after the company’s purchase of Teleport Communications Group in 1998.<sup>111</sup> Competing carriers encourage the use of their facilities through discounts or rebates for traffic either originating or terminating on proprietary networks, or through the use of special “on-net” tariffs. Any mandatory unbundling rule that facilitates a CLEC’s ability to share the ILEC’s innovations in fixed-link transmission would re-

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110. PARADYNE CORPORATION, THE DSL SOURCE BOOK, *supra* note 43, at 73.

111. Statement by Frank Ianna, AT&T Data Services, *cited in* Stephanie N. Mehta & John J. Keller, *Sprint Plans to Integrate Voice, Data*, WALL ST. J., June 3, 1998, at A3.

duce the CLEC's incentive to invest in those types of proprietary networks. Government-induced disincentives to investment do not enhance consumer welfare and should not be regarded as advancing the public interest.

## 2. Wireless Innovations

83. Wireless carriers are experimenting with a wide range of wireless data services.<sup>112</sup>

For example, Teligent has integrated point-to-point and point-to-multipoint wireless technologies with traditional broadband wireline technology. Teligent serves its customers by placing a small digital microwave antenna on the roof of a customer's building. It currently offers service in 24 markets that comprise more than 405 cities and towns with a combined population of more than 75 million.<sup>113</sup> The company views changing consumers preferences and a favorable regulatory climate as key ingredients to its success:

We believe we are well positioned to capture revenues in the estimated \$128 billion business communications market. Our focus is on the estimated \$51 billion local exchange market, which is currently one of the most profitable segments in the communications industry. Local exchange services have historically been provided by regional monopolies known as incumbent local exchange carriers or "ILECs." ILECs have typically used older, existing copper wire-based networks. The ILECs' networks, faced with increasing demand from businesses for new services, such as Internet access, at reasonable costs, have created a "last mile bottleneck" between the customer location and the ILEC network switch. Our market research indicates that the ILECs have been unable to satisfy customer demands for cost-effective, flexible and responsive service and that a significant portion of Teligent's target customer base—small and medium-sized businesses—is currently dissatisfied with

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112. Traditional commercial mobile radio operators (including cellular, PCS, and specialized mobile radio) are increasing their deployment of next-generation wireless data services. *See, e.g.,* Eoin Licken, *New Data Age: Now, Portable Phones Aren't Just For Talking*, INT'L HERALD TRIB., Jan. 21, 1999, at ¶ 1. Other wireless carriers are also entering the fray. For example, Metricom, Ardis, and Ram are all offering a mobile wireless low-speed data service. Other carriers, such as Winstar, Teligent, and Teledesic, are offering fixed high-speed (DS-1 and above) services using land-based or satellite-based technologies.

113. *See* TELIGENT INC., 1999 SEC FORM 10-K, at 3 (1999)

its ILEC service. The potential revenue opportunity in this market, coupled with changes in the regulatory environment designed to enhance competition, have created opportunities for competitive local exchange carriers, or “CLECs,” such as Teligent. We intend to reduce or eliminate this last mile local bottleneck and gain market share primarily through the use of our SmartWave(TM) local networks while providing quality customer service and competitive pricing.<sup>114</sup>

Teligent’s strategy is suggestive of what other CLECs can do. Again, such investments in alternative technologies for access to the local network, which are already taking place *without* mandatory unbundling of the ILEC’s advanced services, would surely diminish in the face of more expansive mandatory unbundling rules.

#### CONCLUSION

84. Mandatory unbundling at TELRIC prices distorts the investment decision of ILECs. With respect to investments that decrease the marginal cost of an existing service, an invasive policy of mandatory unbundling undermines the ILEC’s incentive to maintain and upgrade its existing facilities. Mandatory unbundling of new services supported by new technologies is even more harmful to consumer welfare because it confers a valuable option on CLECs that can be exercised against the ILEC whenever the service and technology prove successful. It is disturbing that the Commission’s *Second Further Notice of Proposed Rulemaking* refers to “investment” or “innovation” only *once*.<sup>115</sup> Investment, innovation, and product development are too central to

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114. *Id.* at 4.

115. *SFNPRM*, *supra* note 4, at ¶ 3.

consumer welfare in a high-technology industry such as telecommunications to be treated as an afterthought by the FCC.

85. Mandatory unbundling also raises the ILEC's cost of capital, which serves as a benchmark of comparison for all expected returns. First, mandatory unbundling at TELRIC prices increases the cyclical nature of an ILEC's profits and hence raises the ILEC's systematic risk or beta risk. As a result, an ILEC's investors would demand a larger risk premium because the firm's stock would contribute more to the volatility of an investor's overall portfolio. The larger risk premium would imply a higher cost of equity capital for an ILEC. Second, mandatory unbundling raises the uncertainty of an ILEC's profits, increases the probability of its financial distress, and hence diminishes the ILEC's ability to use debt financing. Because debt is a cheaper source of finance, the ILEC's weighted-average cost of capital will rise.

86. Mandatory unbundling at TELRIC prices also adversely affects the CLEC's investment decision. First, a compulsory-sharing regime tips the balance of the CLEC's calculus in favor of waiting. The value of the first-mover advantage erodes, and the value to the CLEC of keeping its options open increases. Second, mandatory unbundling of network elements at TELRIC prices also creates incentives for a CLEC to game the regulatory system. Third, in the face of mandatory unbundling at TELRIC prices, CLECs will be less inclined to develop innovative ways to provide service.

87. Other Commission policies exacerbate the perverse incentives that stem from mandatory unbundling at TELRIC prices. In cases where retail rates are below costs, especially in rural and low-density service areas, CLECs will rationally choose to use resale rather than lease un-

bundled network elements at TELRIC prices, thus obtaining wholesale service considerably below cost. Mandatory unbundling will also eliminate or greatly reduce procompetitive bundling opportunities for ILECs that would redound to the direct benefit of consumers. Finally, the Commission should credibly commit itself to maintaining the proper incentives for the ILEC to continue making investments in elements that would be at risk of being unbundled at TELRIC prices in the future.

88. In assessing whether a particular interpretation of section 251(d)(2) would enhance consumer welfare and thus serve the public interest, the Commission should recognize that any regulation that mandates the unbundling of network elements at regulated prices can severely distort investment, product development, and innovation in the telecommunications marketplace. If some mandatory unbundling is good, it does not at all follow that more is better for purposes of serving the public interest. Mandatory unbundling has costs as well as benefits, and the *Second Further Notice of Proposed Rulemaking*, by ignoring that tradeoff, fails to give investment and innovation the solicitude that the public interest standard requires. Congress directed the FCC in section 251(d)(2) to consider, “at a minimum,” the “necessary” and “impair” standards when deciding whether to mandate unbundling of particular network elements at regulated prices. The “something more” that the Commission should consider, beyond the statute’s minimum concerns, is the harm that mandatory unbundling at TELRIC prices would impose on consumer welfare by discouraging investment, innovation, and product development.