

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)
)
Restoring Internet Freedom) WC Docket No. 17-108

COMMENTS OF DR. TIMOTHY J. TARDIFF

The Federal Communications Commission’s (FCC) Notice of Proposed Rulemaking (NPRM) in this proceeding¹ signals a return to the “light-touch regulation” that prevailed before the 2015 Open Internet Order imposed certain common carrier regulations on providers of broadband Internet access services.² The NPRM is seeking comments on how to evaluate the FCC’s previous predictive judgements, including identifying “what *actual harms*, if any, resulted from light-touch regulation.”³ I addressed this issue in two recently published articles that analyzed trends in the availability of competitive broadband alternatives.⁴ Attachment A updates the analysis in the published articles to include the FCC’s most recent (June 2016) fixed broadband deployment. The updated analysis corroborates the conclusion in my previous articles that the apparent insufficiencies in competitive alternatives the FCC had used to justify increased regulation have been ameliorated in fairly short order by new offerings by multiple Internet service providers, thus rendering *ex ante* rules based on common carrier regulation superfluous, at best, and counterproductive to competition and innovation, at worst. My qualifications are described in Attachment B: my resume.

Timothy J. Tardiff
July 17, 2017

¹ Federal Communications Commission, *Restoring Internet Freedom*, WC Docket No. 17-108, Notice of Proposed Rulemaking, May 23, 2015, (“NPRM”), available at http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0523/FCC-17-60A1.pdf.

² Federal Communications Commission, *Protecting and Promoting the Open Internet*, GN Docket No. 14-28, Report and Order on Remand, Declaratory Ruling, and Order, March 12, 2015, (“2015 Open Internet Order”), available at https://apps.fcc.gov/edocs_public/attachmatch/FCC-15-24A1.pdf.

³ NPRM, ¶ 39, emphasis added.

⁴ Timothy J. Tardiff, “Economic Evaluation of the Factual Basis for the FCC’s Open Internet Order,” *Criterion Journal on Innovation*, Vol. 1, 2016, pp. 479-495, available at <https://www.criterioninnovation.com/articles/tardiff-fcc-open-internet-order.pdf> and Timothy J. Tardiff, “Net Neutrality: Economic Evaluation of Market Developments,” *Journal of Competition Law & Economics*, Vol. 11, No. 3, 2015, pp. 701-725, available at <http://aacg.com/empirical-evidence-on-justification-for-net-neutrality/>.

Consistent Measurement of Broadband Availability: Implications for the Federal Communications Commission's Restoring Internet Freedom Notice of Proposed Rulemaking

Timothy J. Tardiff
Advanced Analytical Consulting Group
timtardiff@aacg.com
(617) 827-4043

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The Federal Communications Commission (FCC) issued its Open Internet Order on March 12, 2015.¹ The Order's major features were (1) reclassifying mass-market broadband internet access services from an information service (subject to "light-touch regulation") to a telecommunications service (subject to more stringent regulation), (2) imposition of several bright-line rules on providers of these services, including prohibiting charging content providers such as Netflix for higher quality transmission, and (3) imposition of a "general conduct rule" intended to provide the Commission with the authority to prevent yet-to-be-defined anticompetitive conduct. The FCC's order was upheld by a three-judge panel of the Court of Appeals for the District of Columbia Circuit in June 2016² and the full court corroborated that decision on May 1, 2017.³ An important feature of the D.C. Circuit's Opinion was its determination that the FCC's predictive judgement that absent more stringent rules, broadband service providers would have strong incentives to harm content providers⁴ was a proper exercise by an expert agency.

Shortly after the D.C. Circuit's 2017 Order, the FCC issued a new Notice of Proposed Rulemaking that signals a return to the "light-touch regulation" that prevailed before the 2015 Order.⁵ The NPRM is seeking comments on how to evaluate the FCC's previous predictive judgements, including identifying "what *actual harms*, if any, resulted from light-touch regulation."⁶ The evaluation of the FCC's previous predictive judgements that competition was

¹ Federal Communications Commission, *Protecting and Promoting the Open Internet*, GN Docket No. 14-28, Report and Order on Remand, Declaratory Ruling, and Order, March 12, 2015, ("2015 Open Internet Order"), available at https://apps.fcc.gov/edocs_public/attachmatch/FCC-15-24A1.pdf.

² United States Telecom Ass'n v. FCC, 825 F.3d 674 (D.C. Cir. 2016).

³ United States Court of Appeals for the District of Columbia Circuit, *United States Telecom Association, et al. v. Federal Communications Commission*, Case No. 15-1063, On Petitions for Rehearing En Banc, Order, May 1, 2017, available at [https://www.cadc.uscourts.gov/internet/opinions.nsf/06F8BFD079A89E13852581130053C3F8/\\$file/15-1063-1673357.pdf](https://www.cadc.uscourts.gov/internet/opinions.nsf/06F8BFD079A89E13852581130053C3F8/$file/15-1063-1673357.pdf).

⁴ "Without rules in place to protect the open Internet, the overwhelming incentives broadband providers have to act in ways that are harmful to investment and innovation threaten both broadband networks and edge content." 2015 Open Internet Order ¶ 103.

⁵ Federal Communications Commission, *Restoring Internet Freedom*, WC Docket No. 17-108, Notice of Proposed Rulemaking, May 23, 2015, ("NPRM"), available at http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0523/FCC-17-60A1.pdf.

⁶ NPRM, ¶ 39, emphasis added. The FCC's 2015 Open Internet Order rendered its predictive judgement despite the facts that (1) it cited only two enforcement actions and a handful of allegations over a period of more than a decade

insufficient to prevent such anticompetitive outcomes (and the dissenting DC Circuit opinion that those predictive judgements were arbitrary and capricious) was addressed in two previous articles. In this short paper, I update that evaluation based on more recent data that shows continued growth in the availability of competitive broadband providers.

As described in previous articles,⁷ the significant growth in broadband availability calls into question the FCC's earlier and nearly-identical predictive judgement (based on 2009 data) that competition was insufficient because one-fifth of households had no choice among broadband providers at the highest reported speed level (10 megabits per second (Mbps) downstream/1.5 Mbps upstream) and only 2 percent of household had three or more alternatives.⁸ Within four years, the industry responded so that only two percent of households have no choice and over 90 percent of household have three or more alternatives.⁹ Further, the growth in the availability of broadband alternatives for the 25 Mbps downstream/3 Mbps upstream standard used by the FCC in support of the 2015 Open Internet Order has been very similar to the pattern measured four years earlier for the highest speed level (10 Mbps downstream/1.5 Mbps) measured twice per year in the FCC's Internet Access Services reports from December 2009 through December 2013. This outcome, in conjunction with the historical growth in competitive alternatives that ameliorated deficiencies the FCC previously had noted in its generally pessimistic assessments of competition, raise the question of whether broadband availability measured at the current 25 Mbps downstream/3 Mbps standard continues to match historical availability at the lower speed level. Table 1 provides the answer.

that in any way manifest the “overwhelming incentive” providers have to disrupt the functioning of the Internet and (2) there was no evidence to date that investment and innovation had been harmed.

⁷ Timothy J. Tardiff, “Economic Evaluation of the Factual Basis for the FCC’s Open Internet Order,” *Criterion Journal on Innovation*, Vol. 1, 2016, pp. 479-495 (“Tardiff 2016”), available at <https://www.criterioninnovation.com/articles/tardiff-fcc-open-internet-order.pdf> and Timothy J. Tardiff, “Net Neutrality: Economic Evaluation of Market Developments,” *Journal of Competition Law & Economics*, Vol. 11, No. 3, 2015, pp. 701-725 (“Tardiff 2015”), available at <http://aacg.com/empirical-evidence-on-justification-for-net-neutrality/>.

⁸ Federal Communications Commission, *Preserving the Open Internet*, GN Docket No. 09-191, *Broadband Industry Practices*, WC Docket No. 07-52, Report and Order, December 23, 2010, ¶ 32 (“2010 Open Internet Order”), available at https://apps.fcc.gov/edocs_public/attachmatch/FCC-10-201A1_Rcd.pdf.

⁹ Tardiff 2015, pp. 715-716. Mobile wireless providers were included in this comparison. The corresponding growth for fixed broadband providers was from 2 percent to 65 percent. Because the FCC changed how mobile wireless broadband speeds are measured in its recently released data, the remainder of this paper does not include mobile broadband alternatives. Federal Communications Commission, *Inquiry Concerning the 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, as Amended by the Broadband Data Improvement Act*, GN Docket No. 15-191, 2016 Broadband Progress Report, January 29, 2016, ¶ 82, available at https://apps.fcc.gov/edocs_public/attachmatch/FCC-16-6A1_Rcd.pdf.

Table 1: 25 Mbps downstream/3 Mbps upstream excludes fixed wireless and satellite/availability measured at census block level

Alternatives	10 Mbps downstream/1.5 Mbps upstream					25 Mbps downstream/3 Mbps upstream				
	Dec-09	Dec-10	Jun-11	Dec-11	Jun-12	Dec-13	Dec-14	Jun-15	Dec-15	Jun-16
3 or more	2%	3%	3%	3%	9%	2.4%	2.2%	2.5%	2.6%	5.3%
2	20%	25%	28%	29%	42%	22.9%	28.6%	28.5%	28.6%	42.6%
1	58%	57%	55%	55%	42%	55.3%	57.3%	57.0%	57.0%	41.4%
0	21%	15%	14%	13%	7%	19.4%	11.9%	12.0%	11.8%	10.7%

Sources: December 2009 through June 2012: Federal Communications Commission, "Internet Access Services: Status as of December 31, 2009," https://apps.fcc.gov/edocs_public/attachmatch/DOC-303405A1.pdf; Federal Communications Commission, "Internet Access Services: Status as of December 31, 2010," https://apps.fcc.gov/edocs_public/attachmatch/DOC-310261A1.pdf; Federal Communications Commission, "Internet Access Services: Status as of June 30, 2011," https://apps.fcc.gov/edocs_public/attachmatch/DOC-314630A1.pdf; "Internet Access Services: Status as of December 31, 2011," https://apps.fcc.gov/edocs_public/attachmatch/DOC-318810A1.pdf; "Internet Access Services: Status as of June 30, 2012," https://apps.fcc.gov/edocs_public/attachmatch/DOC-344499A1.pdf; December 2013: "Prepared Remarks of Chairman Tom Wheeler: The Facts and Future of Broadband Competition," September 4, 2014, https://apps.fcc.gov/edocs_public/attachmatch/DOC-329161A1.pdf; December 2014, June 2015, December 2015, and June 2016: calculated from data available at <https://www.fcc.gov/general/broadband-deployment-data-fcc-form-477>.

Indeed, the trajectory of broadband availability at the new 25 Mbps downstream/3 Mbps upstream standard over its first two and one-half years generally continues to track broadband development at the 10 Mbps downstream/1.5 Mbps upstream speed level four years earlier. In particular, over the first two years of these trajectories, the proportions of households with no alternatives decreased by about eight percentage points, with a similar increase in the percentage of households with two alternative providers. Similarly, both the historical and current series exhibit a noticeable uptick in availability between two and two and one-half years, with the increase being somewhat larger for the historical series. For example, the proportion of households with two or more alternatives at the 10 Mbps downstream/1.5 Mbps upstream speed level increased from 32 percent to 51 percent between December 2011 and June 2012, while four years later the proportion of households with two or more alternatives at the 25 Mbps downstream/3 Mbps upstream speed level increased from 31 percent to 48 percent. This outcome is consistent with my earlier observation that the history of broadband availability and customer demand suggests that in the absence of unnecessary regulation that may dampen investment incentives, transitory shortfalls in competitive alternatives may be ameliorated in fairly short order as ISPs invest to make broadband services increasingly available and at greater speeds. Narrowly focusing on how many alternatives might now be available at the highest speeds would ignore the lesson that sufficient competitive alternatives at speeds that previously had been deemed adequate for broadband has heretofore been forthcoming.

While Table 1 allows a comparison of the *growth pattern* of the historical and current broadband availability series, their *levels* are not comparable. As I explained in my earlier articles, two differences in how the historical and current series are measured result in the latter measurement producing lower availability levels, everything else being equal.¹⁰ First, the current series, which is displayed on the right-hand side of Table 1 (and which is consistent with the way the FCC had previously presented these data) does not include the fixed wireless and satellite broadband

¹⁰ See, for example, Tardiff, 2016, p. 489. Since the FCC changed how it measures broadband availability, Advanced Analytical Consulting Group produces a series of consistent availability measures, including a series consistent with the FCC's December 2009 through December 2013 measures. A description of this analysis can be found at <http://aacg.com/litigation/telecommunications/net-neutrality/>.

alternatives that are measured in the historical series. Second, the current series counts an alternative being available to a household if it is offered somewhere in the household's census block, while the historical series, as the FCC had calculated availability in the past, considered alternatives offered anywhere with the household's census tract as being available. The next two tables explore the effects of these measurement differences.

In Table 2, fixed wireless and satellite alternatives are included in the 25 Mbps downstream/3 Mbps upstream speed level results. The left side of the table is the same as in Table 1. Because the data that would be needed to produce the 25 Mbps downstream/3 Mbps upstream speed level results for December 2013 are not available, this discussion focuses on the eighteen-month changes between December 2010 and June 2012 for the historical series and the corresponding changes four years later for the current series.

Table 2: 25 Mbps downstream/3 Mbps Upstream includes fixed wireless and satellite/availability measured at census block level

Alternatives	10 Mbps downstream/1.5 Mbps upstream					25 Mbps downstream/3 Mbps upstream				
	Dec-09	Dec-10	Jun-11	Dec-11	Jun-12	Dec-13	Dec-14	Jun-15	Dec-15	Jun-16
3 or more	2%	3%	3%	3%	9%	NA	6.5%	6.0%	7.1%	21.9%
2	20%	25%	28%	29%	42%	NA	30.4%	29.9%	30.8%	40.3%
1	58%	57%	55%	55%	42%	NA	51.9%	52.8%	51.2%	30.4%
0	21%	15%	14%	13%	7%	NA	11.1%	11.2%	10.8%	7.4%

Sources: December 2009 through June 2012: Federal Communications Commission, "Internet Access Services: Status as of December 31, 2009," https://apps.fcc.gov/edocs_public/attachmatch/DOC-303405A1.pdf; Federal Communications Commission, "Internet Access Services: Status as of December 31, 2010," https://apps.fcc.gov/edocs_public/attachmatch/DOC-310261A1.pdf; Federal Communications Commission, "Internet Access Services: Status as of June 30, 2011," https://apps.fcc.gov/edocs_public/attachmatch/DOC-314630A1.pdf. "Internet Access Services: Status as of December 31, 2011," https://apps.fcc.gov/edocs_public/attachmatch/DOC-318810A1.pdf. "Internet Access Services: Status as of June 30, 2012," https://apps.fcc.gov/edocs_public/attachmatch/DOC-344499A1.pdf. December 2013: "Prepared Remarks of Chairman Tom Wheeler: The Facts and Future of Broadband Competition," September 4, 2014, https://apps.fcc.gov/edocs_public/attachmatch/DOC-329161A1.pdf. December 2014, June 2015, December 2015, and June 2016: calculated from data available at <https://www.fcc.gov/general/broadband-deployment-data-fcc-form-477>.

In particular, the respective series were relatively flat for the first year, e.g., the left side of the table shows that about 30 percent of households had two or more alternatives at the 10 Mbps downstream/1.5 Mbps upstream speed level between December 2010 and December 2011, while about 36-38 percent of households had two or more alternatives at the 25 Mbps downstream/3 Mbps upstream speed level four years later. And while both series show a rapid increase in availability in the last period, the current series shows a more rapid increase. For example, while the percentage of households with two or more alternatives increased from 32 percent to 51 percent for the 10 Mbps downstream/1.5 Mbps upstream speed level between December 2011 and June 2012, the percentage of households with two or more alternatives increased from 38 percent to 62 percent for the 25 Mbps downstream/3 Mbps upstream speed level four years later.

Finally, Table 3 presents results for the 25 Mbps downstream/3 Mbps upstream speed level, with availability measured as the FCC formerly did: the alternatives include fixed wireless and satellite and availability denotes that alternatives are available somewhere in a household's census tract, thus providing an "apples to apples" comparison of broadband growth at the 10 Mbps downstream/1.5 Mbps upstream speed level four years earlier. The table reveals the

following: (1) as expected, the less stringent census tract availability criterion produces higher availability percentages than those shown in Table 2, (2) the results display the same pattern shown in the previous tables that the availability levels were fairly flat from December 2014 to December 2015, e.g., on the order of three quarters of households lived in census blocks with two or more alternatives, and (3) from December 2015 to June 2016, the proportion of households living in census tracts with two or more alternatives increased from 77.4 percent to 86.5 percent.¹¹

Table 3: 25 Mbps downstream/3 Mbps Upstream includes fixed wireless and satellite/availability measured at census tract level

Alternatives	10 Mbps downstream/1.5 Mbps upstream					25 Mbps downstream/3 Mbps upstream				
	Dec-09	Dec-10	Jun-11	Dec-11	Jun-12	Dec-13	Dec-14	Jun-15	Dec-15	Jun-16
3 or more	2%	3%	3%	3%	9%	NA	26.8%	27.0%	29.7%	46.6%
2	20%	25%	28%	29%	42%	NA	48.8%	49.5%	47.7%	39.9%
1	58%	57%	55%	55%	42%	NA	22.4%	21.4%	20.8%	12.6%
0	21%	15%	14%	13%	7%	NA	2.0%	2.1%	1.7%	0.9%

Sources: December 2009 through June 2012: Federal Communications Commission, "Internet Access Services: Status as of December 31, 2009," https://apps.fcc.gov/edocs_public/attachmatch/DOC-303405A1.pdf; Federal Communications Commission, "Internet Access Services: Status as of December 31, 2010," https://apps.fcc.gov/edocs_public/attachmatch/DOC-310261A1.pdf; Federal Communications Commission, "Internet Access Services: Status as of June 30, 2011," https://apps.fcc.gov/edocs_public/attachmatch/DOC-314630A1.pdf. "Internet Access Services: Status as of December 31, 2011," https://apps.fcc.gov/edocs_public/attachmatch/DOC-318810A1.pdf. "Internet Access Services: Status as of June 30, 2012," https://apps.fcc.gov/edocs_public/attachmatch/DOC-344499A1.pdf. December 2013: "Prepared Remarks of Chairman Tom Wheeler: The Facts and Future of Broadband Competition," September 4, 2014, https://apps.fcc.gov/edocs_public/attachmatch/DOC-329161A1.pdf. December 2014, June 2015, December 2015, and June 2016: calculated from data available at <https://www.fcc.gov/general/broadband-deployment-data-fcc-form-477>.

Conclusion

Proper measurement of the growth in broadband Internet availability is critical to valid policy analysis. Here and in my previous papers, I have sought to provide such consistent measures so that the rate of growth of Internet availability can be accurately assessed. While broadband policy may be address a number of objectives, this consistent measurement shows that broadband availability has grown rapidly in the number of providers offering the service, even as the broadband standard increases in speed.

¹¹ The availability percentages in the last column of Table 3 are roughly comparable to the levels obtained for 10 Mbps downstream/1.5 Mbps upstream speed level as of June 2013: 54 percent for 3 or more alternatives, 38 percent for 2 alternatives, 7 percent for 1 alternative, and 1 percent for 0 alternatives. "Internet Access Services: Status as of June 30, 2013," June 2014, available at https://apps.fcc.gov/edocs_public/attachmatch/DOC-327829A1.pdf.

Timothy J. Tardiff, Ph.D.

Principal

Advanced Analytical Consulting Group, Inc.

Office: (617) 338-2224

Direct: (617) 340-7872

Email: TimTardiff@AACG.com

Professional Summary

Dr. Timothy J. Tardiff has more than 30 years of academic and consulting experience. He has participated in numerous legal and regulatory proceedings regarding telecommunications, economics, intellectual property antitrust, and regulation issues. His research consulting, and expert witness experience in telecommunications has addressed pricing and costing issues involving increasingly competitive services, such as wireless and traditional wireline services. This experience has also included extensive examination and economic evaluation of all facets of the costing methodologies used to establish prices in rate-regulated industries—including expert reports and testimonies in a U.S. Department of Transportation proceeding on the reasonableness from an economic perspective of the rates international carriers at Los Angeles International Airport pay for use of terminal space. His work has included the telecommunications, software, transportation, energy, and public utility industries, and he has published extensively in economics, telecommunications, and transportation journals.

Dr. Tardiff is an economic consultant with clients in the telecommunications and regulated utilities industries. From 2006 to 2009, he was a Managing Director at Huron Consulting Group. Prior to joining Huron, Dr. Tardiff served as a vice president in the telecommunication practice at NERA Economic Consulting. During his career, he has served as the director of Marketing Research and senior member of the transportation practice at Charles River Associates, Inc. and assistant professor in the Department of Civil Engineering and Division of Environmental Studies at the University of California, Davis.

Dr. Tardiff's research has addressed the demand, cost, and competitive aspects of converging technologies, including wireless and broadband. He has evaluated pricing policies for increasingly competitive telecommunications markets, including appropriate mechanisms for pricing access services to competitors and studied actual and potential competition for services provided by incumbent telephone operating companies. Most recently, he has analyzed the effects of convergence and growing intermodal competition on whether incumbent firms should be considered dominant in the provision of certain services and the regulatory and antitrust implication of such determinations.

Since the passage of the United States Telecommunications Act, Dr. Tardiff has participated in interconnection arbitrations, unbundled element proceedings, universal service investigation, applications by incumbent local exchange carriers for authorization to provide interLATA long-distance, and implementation of the Triennial Review Order rules for unbundling network elements in over 25 states and before the United States Federal Communications Commission. His international research and consulting experience includes studies and expert reports on telecommunication competition issues in Canada, Japan, New Zealand, Peru, Australia, and Trinidad and Tobago, where he was an economic expert in an interconnection arbitration between two wireless carriers.

Education

- Ph.D., Social Sciences, University of California, Irvine, CA
- B.S., Mathematics, California Institute of Technology, Pasadena, CA

Testimony experience

- Deposition Testimony, Susan Mojica and Thomas Mojica, Individually and on behalf of others similarly situated v. Securus Technologies, Inc., Civil Action No. 5:14-cv-5258-TLB, U.S. District Court for the Western District of Arkansas, May 31, 2017.
- Expert Report, Susan Mojica and Thomas Mojica, Individually and on behalf of others similarly situated v. Securus Technologies, Inc., Civil Action No. 5:14-cv-5258-TLB, U.S. District Court for the Western District of Arkansas, April 26 and May 16, 2017.
- Deposition Testimony, Virginia Electric and Power Company d/b/a Dominion Virginia Power v. Verizon Virginia LLC and Verizon South Inc., Case No. CL15-3029-00, Virginia: In the Circuit Court of the County of Henrico, March 10, 2017.
- Expert Report, Walter Chruby, et al. v. Global Tel*Link Corporation, Civil Action No. 5:15-cv-05136-TLB, U.S. District Court for the Western District of Arkansas, February 16, 2016.
- Expert Rebuttal Report, Global Tel*Link Corporation ICS Litigation, Civil Action No. 5:14-cv-5275-TLB, U.S. District Court for the Western District of Arkansas, October 20, 2016.
- Expert Rebuttal Report, Susan Mojica, Individually and on behalf of others similarly situated v. Securus Technologies, Inc., Civil Action No. 5:14-cv-5258-TLB, U.S. District Court for the Western District of Arkansas, October 7, 2016.
- Deposition Testimony, Global Tel*Link Corporation ICS Litigation, Civil Action No. 5:14-cv-5275-TLB, U.S. District Court for the Western District of Arkansas, August 9, 2016.
- Deposition Testimony, Susan Mojica, Individually and on behalf of others similarly situated v. Securus Technologies, Inc., Civil Action No. 5:14-cv-5258-TLB, U.S. District Court for the Western District of Arkansas, July 12, 2016 and August 30, 2016.

- Expert Report, Susan Mojica, Individually and on behalf of others similarly situated v. Securus Technologies, Inc., Civil Action No. 5:14-cv-5258-TLB, U.S. District Court for the Western District of Arkansas, June 10, 2016.
- Expert Report, Global Tel*Link Corporation ICS Litigation, Civil Action No. 5:14-cv-5275-TLB, U.S. District Court for the Western District of Arkansas, June 9, 2016.
- Reply Affidavit of Timothy J. Tardiff on the economic evaluation of the monetary value of possible joint use agreement advantages, prepared for filing with the Federal Communications Commission on behalf of Verizon Virginia and Verizon South, Verizon Virginia LLC and Verizon South, Inc., Complainant v. Virginia Electric and Power and Light Company dba Virginia Dominion Power, Respondent, Docket No. 15-190, File No. EB-15-MD-006, February 9, 2016.
- Reply Affidavit of Timothy J. Tardiff on the economic evaluation of the monetary value of possible joint use agreement advantages, prepared for filing with the Federal Communications Commission on behalf of Verizon Florida, Verizon Florida LLC, Complainant v. Florida Power and Light Company, Respondent, Docket No. 15-73, File No. EB-15-MD-002, November 24, 2015.
- Affidavit of Timothy J. Tardiff on the economic evaluation of the monetary value of possible joint use agreement advantages, prepared for filing with the Federal Communications Commission on behalf of Verizon Virginia and Verizon South, Verizon Virginia LLC and Verizon South, Inc., Complainant v. Virginia Electric and Power and Light Company dba Virginia Dominion Power, Respondent, Docket No. 15-190, File No. EB-15-MD-006, August 3, 2015.
- Affidavit of Timothy J. Tardiff on the economic evaluation of the monetary value of possible joint use agreement advantages, prepared for filing with the Federal Communications Commission on behalf of Verizon Florida, Verizon Florida LLC, Complainant v. Florida Power and Light Company, Respondent, Docket No. 15-73, File No. EB-15-MD-002, March 13, 2015.
- Reply Affidavit of Timothy J. Tardiff on presumptive just and reasonable rates for pole attachments, prepared for filing with the Federal Communications Commission on behalf of Frontier Communications, Commonwealth Telephone Company d/b/a Frontier Communications Commonwealth Telephone Company and CTSI, LLC d/b/a Frontier Communications CTSI Company, LLC, Complainants v. UGI Utilities – Electric Division, Respondent, File No. EB-14-MD-007, September 15, 2014.
- Reply Affidavit of Timothy J. Tardiff on presumptive just and reasonable rates for pole attachments, prepared for filing with the Federal Communications Commission on behalf of Frontier Communications, Commonwealth Telephone Company LLC d/b/a Frontier Communications Commonwealth Telephone Company, Frontier Communications of Breezewood, LLC, Citizens Telecommunications Company of West Virginia d/b/a Frontier Communications Company of West Virginia, and Frontier West Virginia Inc., Complainants, v. Metropolitan Edison Company, Pennsylvania Electric Company, West Penn Power

Company d/b/a Allegheny Power , Monongahela Power Company, and the Potomac Edison Company, Respondents, File No. EB-14-MD-008, July 31, 2014.

- Supplemental Expert Report, Duke Energy Carolinas, LLC, Plaintiff v. Frontier Communications of the Carolinas LLC, Defendant, 2:13-cv-00040-MR-DLH, U.S. District Court for the Western District of North Carolina, June 27, 2014.
- Deposition Testimony, Florida Power & Light Company, Plaintiff v. Verizon Florida LLC, Defendant, Case No. 13-014808-CA-01, Circuit Court of the Eleventh Judicial District in and for Miami-Dade County, Florida, June 24, 2014.
- Affidavit of Timothy J. Tardiff on presumptive just and reasonable rates for pole attachments, prepared for filing with the Federal Communications Commission on behalf of Frontier Communications, Commonwealth Telephone Company LLC d/b/a Frontier Communications Commonwealth Telephone Company, Frontier Communications of Breezewood, LLC, Citizens Telecommunications Company of West Virginia d/b/a Frontier Communications Company of West Virginia, and Frontier West Virginia Inc., Complainants, v. Metropolitan Edison Company, Pennsylvania Electric Company, West Penn Power Company d/b/a Allegheny Power , Monongahela Power Company, and the Potomac Edison Company, Respondents, File No. EB-14-MD-008, June 11, 2014.
- Expert Report, Florida Power & Light Company, Plaintiff v. Verizon Florida LLC, Defendant, Case No. 13-014808-CA-01, Circuit Court of the Eleventh Judicial District in and for Miami-Dade County, Florida, May 15, 2014.
- Affidavit of Timothy J. Tardiff on presumptive just and reasonable rates for pole attachments, prepared for filing with the Federal Communications Commission on behalf of Frontier Communications, Commonwealth Telephone Company d/b/a Frontier Communications Commonwealth Telephone Company and CTSI, LLC d/b/a Frontier Communications CTSI Company, LLC, Complainants v. UGI Utilities – Electric Division, Respondent, File No. EB-14-MD-007, May 14, 2014.
- Expert Report, Duke Energy Carolinas, LLC, Plaintiff v. Frontier Communications of the Carolinas LLC, Defendant, 2:13-cv-00040-MR-DLH, U.S. District Court for the Western District of North Carolina, April 1, 2014.
- Reply Affidavit of Timothy J. Tardiff on presumptive just and reasonable rates for pole attachments, prepared for filing with the Federal Communications Commission on behalf of Frontier Communications of the Carolinas, Frontier Communications of the Carolinas, LLC, Complainant v. Duke Energy Carolinas, LLC, Defendant, File No. File No. EB-14-MD-002, March 20, 2014.
- Reply Affidavit of Timothy J. Tardiff on presumptive just and reasonable rates for pole attachments, prepared for filing with the Federal Communications Commission on behalf of Frontier Communications of the Carolinas, Frontier Communications of the Carolinas, LLC, Complainant v. Duke Energy Carolinas, LLC, Defendant, File No. File No. EB-14-MD-001, March 18, 2014.

- Expert Report, Tampa Electric Company, Plaintiff v. Verizon Florida LLC, Defendant, Civil Action No. 12-016349, Circuit Court, Hillsborough County, Florida, Civil Division, February 24, 2014.
- Reply Affidavit of Timothy J. Tardiff on presumptive just and reasonable rates for pole attachments, prepared for filing with the Federal Communications Commission on behalf of Frontier Communications of the Carolinas, Frontier Communications of the Carolinas, LLC, Complainant v. Duke Energy Progress, Inc., Defendant, File No. EB-13-MD-007, February 11, 2014.
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Professional associations

- Member, American Economic Association
- Associate Member, American Bar Association
- Member, Federal Communications Bar Association

Fellowships, grants and awards

- First Place, Dissertation Contest of the Transportation Science Section of the Operations Research Society of America.
- National Science Foundation (NSF) Research Initiation Grant (Engineering Division), 1976-1978.
- NSF Grant for Improving Doctoral Dissertation Research in the Social Sciences, 1973-1974.
- NSF Predoctoral Fellowship, 1972-1974.
- Public Health Service Traineeship, 1971-1972.