

Matthew T. Murchison
Direct Dial: +1.202.637.2136
matthew.murchison@lw.com

555 Eleventh Street, N.W., Suite 1000
Washington, D.C. 20004-1304
Tel: +1.202.637.2200 Fax: +1.202.637.2201
www.lw.com

LATHAM & WATKINS LLP

June 28, 2016

VIA ECFS

Marlene H. Dortch
Secretary
Federal Communications Commission
445 Twelfth Street, SW
Washington, DC 20554

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Re: *Business Data Services in an Internet Protocol Environment, WC Docket No. 16-143; Investigation of Certain Price Cap Local Exchange Carrier Business Data Services Tariff Pricing Plans, WC Docket No. 15-247; Special Access Rates for Price Cap Local Exchange Carriers, WC Docket No. 05-25*

REDACTED – FOR PUBLIC INSPECTION

Dear Ms. Dortch:

Pursuant to the Protective Orders in the above-captioned proceedings,¹ Comcast Corporation (“Comcast”) submits the redacted public version of the attached comments via electronic delivery. Comcast will separately submit a Highly Confidential version of this filing via hand delivery. The {{ }} symbols denote Highly Confidential Information.

¹ *In the Matter of Investigation of Certain Price Cap Local Exchange Carrier Business Data Services Tariff Pricing Plans*, Order and Protective Orders, WC Docket No. 15-247, DA 15-1387 (rel. Dec. 4, 2015); *In the Matter of Special Access Rates for Price Cap Local Exchange Carriers*, Modified Protective Order, WC Docket No. 05-25, DA 10-2075 (rel. Oct. 28, 2010); *In the Matter of Special Access Rates for Price Cap Local Exchange Carriers*, Second Protective Order, WC Docket No. 05-25, DA 10-2419 (rel. Dec. 27, 2010); *In the Matter of Special Access Rates for Price Cap Local Exchange Carriers*, Order and Data Collection Protective Order, WC Docket No. 05-25, DA 14-1424 (rel. Oct. 1, 2014).

Please contact the undersigned should you have any questions regarding this matter.

Respectfully submitted,

/s/ Matthew T. Murchison

Matthew T. Murchison
of LATHAM & WATKINS LLP
Counsel for Comcast Corporation

Attachments

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

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)	
AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services)	RM-10593
)	

COMMENTS OF COMCAST CORPORATION

Matthew A. Brill
James H. Barker
Matthew T. Murchison
Alexander L. Stout
Nicholas L. Schlossman
LATHAM & WATKINS LLP
555 Eleventh Street, NW
Suite 1000
Washington, DC 20004

Kathryn A. Zachem
David M. Don
Mary P. McManus
COMCAST CORPORATION
300 New Jersey Avenue, NW
Suite 700
Washington, DC 20001

Lynn R. Charytan
Brian A. Rankin
Beth A. Choroser
COMCAST CORPORATION
One Comcast Center
55th Floor
Philadelphia, PA 19103

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COMMENTS OF COMCAST CORPORATION

Comcast Corporation (“Comcast”) submits these comments in response to the Further Notice of Proposed Rulemaking (“FNPRM”) adopted on April 28, 2016 in the above-captioned proceedings.¹

INTRODUCTION AND SUMMARY

The FNPRM, in exploring the appropriate treatment of business data services (“BDS”), begins with the bedrock proposition that “competition is best” and represents the “single best

¹ *See Business Data Services in an Internet Protocol Environment; Investigation of Certain Price Cap Local Exchange Carrier Business Data Services Tariff Pricing Plans; Special Access for Price Cap Local Exchange Carriers; AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services, WC Docket Nos. 16-143, 15-247, 05-25, RM-10593, Tariff Investigation Order and Further Notice of Proposed Rulemaking, FCC 16-54 (rel. May 2, 2016) (“FNPRM” or “Tariff Investigation Order”).*

way of ensuring that consumers benefit.”² And in light of this “deeply rooted preference for preserving and enhancing competition,”³ the Commission appropriately seeks “to facilitate the continued evolution of the type of robust competition that will result in ever-improving services for American businesses and consumers.”⁴

Yet one aspect of the FNPRM presents a stark and alarming threat of *thwarting* this paramount objective. While the Commission seeks to revise the price cap regime that applies to dominant incumbent local exchange carriers (“LECs” or “ILECs”), the FNPRM inexplicably introduces the prospect of subjecting *new entrants* in the BDS marketplace to rate regulation and other heavy-handed mandates. The FNPRM is far from clear on exactly how the Commission would translate this ill-founded idea into a set of rules; the item raises the specter of regulating new entrants casually and almost in passing, amidst a flurry of questions more befitting a Notice of Inquiry than a Notice of Proposed Rulemaking.⁵ But it is crystal clear that such an approach would represent a radical and deeply counterproductive departure from well-settled Commission precedent and economic and antitrust principles that have undergirded telecommunications regulation for decades. The inevitable result would be a severe disincentive to entry and investment that would powerfully undercut the Commission’s avowed interest in promoting increased competition and the downstream benefits it entails. Indeed, it is hard to conceive of a worse prescription for encouraging the massive investments that will be required to build new

² *Id.* ¶ 5.

³ *Id.* ¶ 186.

⁴ *Id.* ¶ 159.

⁵ *See, e.g., id.* ¶¶ 308-09 (asking whether new rules should apply to “the provider with the largest market share,” “to any firm in the non-competitive market that has a near ubiquitous network,” or “to all BDS providers in the non-competitive area”).

backhaul facilities for 5G wireless networks and to spur increased entry and rivalry among providers of retail BDS services.

The relevant data make clear that the BDS marketplace is more competitive today than ever before. If the Commission intends to stand by the proposition that “competition is best,” then it should eschew rate regulation of all providers in this marketplace and instead “maintain the traditional oversight” role that will further the important interests of promoting competition and encouraging investment.⁶

Over the past decade, as the FNPRM recognizes, “[t]he great entry success story has been that of cable.”⁷ Contributing to that success story, Comcast has made substantial investments as a very recent entrant in the provision of various types of Ethernet services, bringing increased competition, choice, and innovation to commercial customers ranging from small businesses to larger enterprises, and to wireless carriers that require high-capacity backhaul connectivity.

The light regulatory touch that the Commission historically has applied to competitive BDS providers has been critical in facilitating such entry and investment. In particular, for more than three decades, applying fundamental tenets of economics and antitrust law, the Commission has distinguished between incumbent BDS providers that historically possessed market power (“dominant” providers) and newer competitors that do not (“non-dominant” providers). The Commission has steadfastly avoided imposing onerous rate regulation and other mandates on the latter group, while appropriately seeking to deregulate the former group where competition has emerged. This historical approach appropriately reflects a recognition that, in the words of former FCC Chief Economist Dr. Joseph Farrell, regulators should “tread lightly in markets where market power is uncertain, modest or fragile,” particularly in light of the “difficulties and

⁶ *Id.* ¶ 3.

⁷ *Id.* ¶ 236.

consequences of price regulation in markets that are not secure monopolies.”⁸ And as Professor John Mayo of Georgetown University affirms, “[m]arket-wide application of price cap regulation on *all* competitors, including new entrants like Comcast that do not have monopoly power under any interpretation, would, in direct opposition to the Commission’s stated objectives of increased competition, thwart competitive entry, innovation, and investment in the marketplace.”⁹

As the Commission grapples with how to ensure that competition among providers of BDS continues to grow and prosper and that businesses and consumers reap the benefits of such competition, the Commission should focus on eliminating barriers to entry for all providers, not reducing incentives for investment. While Comcast takes no position on the specific contractual prohibitions adopted in the *Tariff Investigation Order*, the Commission is right to examine whether certain contractual terms are impeding competition by locking customers into inefficient service arrangements. By the same token, the Commission should consider whether other types of entry barriers—including obstacles to building access or municipal restrictions on access to rights of way—are frustrating competition.

By contrast, subjecting new BDS entrants to rate regulation and other regulatory mandates would perversely *create* new entry barriers. Capping competitive providers’ rates—*notwithstanding* the market-driven imperative for such providers to price their services at rates that will win business away from incumbent providers whose rates may already be regulated—would artificially constrain investment incentives and translate directly into diminished competition. As described in detail below and the attached declarations, Comcast’s financial modeling leaves no doubt that rate regulation would have substantially reduced the network build-out it undertook in recent years and would materially curtail such build-out in the future.

⁸ Declaration of Dr. Joseph V. Farrell ¶ 53, attached hereto as Exhibit A (“Farrell Decl.”).

⁹ Declaration of Dr. John W. Mayo ¶ 13, attached hereto as Exhibit B (“Mayo Decl.”).

In the long run, such unnecessary regulation would foster the very market concentration the FNPRM seeks to avoid.

To the extent the Commission believes that the widespread deployment of cable providers’ hybrid fiber-coaxial (“HFC”) networks justifies regulating cable providers’ BDS offerings, such a theory is entirely misplaced. It may be true that, in areas where a cable provider is able to provide Ethernet services over its HFC facilities, the presence of those HFC facilities in a given market could indicate that the ILEC in that market faces some degree of potential competition from the cable provider—and such potential competition may be relevant when considering whether to continue regulating the ILEC as a dominant provider in that market. But the mere existence of those HFC facilities does not remotely establish that the *cable provider* has market power in the provision of BDS and should be subject to rate regulation in that market.

The vast majority of services provided over HFC facilities are best efforts services, which the FNPRM correctly and expressly excludes from the market definition of BDS. Moreover, many HFC facilities are not even capable of supporting BDS; approximately {{ }} of Comcast’s HFC headends are not Ethernet-capable today. And even where “Ethernet-over-HFC” (“EoHFC”) is available, the demand for such services has been and likely will continue to be very limited. EoHFC offers substantially lower speeds and less robust assurances than fiber-based services, and indeed, only {{ }} of the approximately {{ }} business locations currently connected to Comcast’s dedicated services consist of EoHFC connections. EoHFC also would encounter significant capacity constraints if cable operators sought to carry high volumes of dedicated traffic via HFC facilities, given the predominant use of the HFC network to support MSOs’ mass-market offerings of video, broadband Internet access, and voice

services. In short, any effort to rely on cable operators' extensive HFC networks as a supposed justification for regulation of cable-provided BDS services would be at odds with marketplace realities.

HFC-based services have even less competitive significance in the wireless backhaul market, and are not expected to play any meaningful role with respect to future 5G services. Wireless providers today overwhelmingly rely on fiber-based services, which are significantly faster and more reliable than HFC-based services, for their backhaul needs. And as the nation moves to 5G, those speed, performance, and reliability benchmarks for backhaul will only grow more exacting and more critical to the success of the technology. There is simply no realistic prospect that cable HFC-based services—and EoHFC services in particular—will catch up to the demands of 5G services. Any notion that the impending arrival of 5G wireless services justifies regulating cable operators' HFC-based offerings thus is deeply misguided.

To be sure, as demand for backhaul capacity has grown in recent years and will continue to grow as the nation moves to 5G, Comcast and other cable providers have endeavored to deploy new *fiber* connections to support faster speeds and more robust reliability guarantees, and have begun expanding the BDS offerings they make available over those fiber connections in competition with ILEC services. But cable providers' fiber facilities are not as ubiquitous as ILECs' BDS networks. Moreover, wireless carriers' increasing interest in leasing *dark fiber*—which would not even be subject to the FNPRM's rate regulation proposals—confirms that the demands for 5G backhaul capacity provide no basis for upending the enduring tenet that new entrants' rates should be free from government price controls.

Apart from being profoundly unwise, subjecting non-dominant providers to rate regulation and related obligations would be unlawful. The Commission's contemplated reliance

on Sections 201 and 202 of the Communications Act would impermissibly compel non-dominant BDS providers that offer services on a *private carrier* basis to operate instead as common carriers, solely so that they could be regulated under Title II. Imposing price caps and other common carrier mandates on new entrants also would represent the opposite of reasoned decision-making—by abandoning decades of well-settled precedent that has fostered competition and undermining the very goals the Commission seeks to advance—and thus would be arbitrary and capricious in violation of the Administrative Procedure Act (“APA”).

Finally, the Commission should examine whether the existing pricing flexibility triggers used to relieve incumbent LECs from price caps are flawed, as they often significantly understate (and occasionally can overstate) the degree of competition in a metropolitan statistical area (“MSA”). Comcast looks forward to participating in a constructive dialogue regarding how to create an improved mechanism to determine where legacy regulation should be eliminated. In all events, however, any new framework must avoid subjecting new entrants to government price controls and other burdensome mandates, as regulating competitive BDS providers would be profoundly counterproductive and contrary to law.

BACKGROUND

A. Comcast Has Invested Heavily Over the Last Decade in Support of Its Entry into the BDS Marketplace

Over the past ten years, Comcast and other cable providers have invested billions of dollars in network infrastructure to provide competitive business data services and have pioneered multiple innovations in the BDS marketplace. Although Comcast and other cable providers remain new entrants and must compete against established incumbent providers in markets across the country, cable providers have begun to bring increased competition, choice, and innovation to commercial customers ranging from very small businesses to larger

enterprises, and to wireless carriers that require high-capacity backhaul connectivity. Comcast made the strategic decision to devote considerable resources to expanding and improving its service offerings for business customers. In particular, while Comcast’s HFC network has long enabled the company to offer “best efforts” Internet access (along with video and voice services) to smaller business customers, Comcast has invested hundreds of millions of dollars in new fiber transmission facilities (and associated network equipment) to support the robust and reliable data services that larger businesses and carrier-customers demand.

Comcast’s first substantial foray into the marketplace for dedicated business data services entailed selling regional Metro Ethernet services, which were launched in 2009.¹⁰ By 2011, Comcast had rolled out Metro Ethernet services to 20 of the top 25 metropolitan areas entirely over fiber, with plans ranging from 1 Mbps to 10 Gbps.¹¹ By 2013, Comcast’s network had evolved to allow for region-to-region Ethernet offerings,¹² and the percentage of Comcast’s headends that have been upgraded to support Ethernet services continues to grow.¹³ As the Commission has noted,¹⁴ as Comcast has upgraded its network to offer BDS services, it has entered into new market segments, such as providing cell backhaul services and offering enterprise-class BDS services to the country’s largest businesses.¹⁵ Demand for some of

¹⁰ Declaration of John Guillaume ¶ 3, attached hereto as Exhibit C (“Guillaume Decl.”).

¹¹ See FNPRM ¶ 62; Stephen Lawson, *Comcast Rolls Out Metro Ethernet*, Telarus (May 16, 2011), <http://www.telarus.com/blog/comcast-rolls-out-metro-ethernet.php>.

¹² Guillaume Decl. ¶ 3.

¹³ *Id.*

¹⁴ See FNPRM ¶ 59.

¹⁵ See Declaration of William R. Stemper ¶ 4, attached hereto as Exhibit D (“Stemper Decl.”); Declaration of David Allen ¶ 4, attached hereto as Exhibit E (“Allen Decl.”); Guillaume Decl. ¶ 4; see also Malathi Nayak, *Comcast Creates Enterprise Services Unit to Target Big Businesses*, Reuters (Sept. 15, 2015), <http://www.reuters.com/article/us-comcast-enterprise-idUSKCN0RG0D520150916> (“Comcast has set up a new business

Comcast’s business class data services has increased substantially in recent years in tandem with its increasing investments. In particular, Comcast experienced revenue growth from 2014 to 2015 of approximately {{ }} for Business Internet and {{ }} for Ethernet (fiber and HFC) services.¹⁶ And Comcast’s overall BDS revenues increased from {{ }} in 2013 to {{ }} in 2015.¹⁷ Still, as new entrants, Comcast and other cable providers account for “less than eight percent of [total] BDS revenues,”¹⁸ reflecting far less penetration than ILECs even today.

Until recently, Comcast chose to build out its fiber network to business locations only reactively, in response to a customer’s request for service. Comcast now has begun to undertake proactive fiber buildouts in select downtown markets. These newly developed “hyperbuilds” {{ }}, representing a substantial capital risk.¹⁹ The continued allocation of capital to such prospective construction is of course dependent on forecasting sufficient new business to justify the cost, and on a regulatory environment that remains conducive to such investments.²⁰

Comcast has also recruited an expanded sales force and built the required service delivery and service assurance expertise and systems to support its BDS offerings. Having a proactive sales force is critical for a new entrant such as Comcast to overcome business customers’

services division to sell broadband, Wi-Fi, ethernet and other services to large companies in the Fortune 1000 list, hoping to attract new revenue Over the last six to nine months, Comcast has signed up 25 to 30 customers with \$45 million in contracts”).

¹⁶ Letter of Matthew A. Brill, Counsel for Comcast, to Marlene H. Dortch, Secretary, FCC, WC Docket No. 05-25, at 5 (Mar. 25, 2016) (“Comcast Mar. 25 Ex Parte”).

¹⁷ Stemper Decl. ¶ 3.

¹⁸ FNPRM ¶ 218.

¹⁹ Allen Decl. ¶ 12.

²⁰ Declaration of Devesh Raj ¶ 9, attached hereto as Exhibit F (“Raj Decl.”).

predisposition to use incumbent providers' BDS services. As a consequence of these investments in network infrastructure and human capital, Comcast (along with other cable providers) has begun to have a positive competitive impact in the BDS arena, driving legacy providers to reduce prices and to upgrade their services and add value for customers.²¹ Over the last several years, cable providers have brought to thousands of small, medium, and large businesses a value proposition far better than what was previously available to them—the quintessential example of a market-driven virtuous cycle.²²

B. Comcast Offers a Variety of Business Data Services

Comcast offers data services to business customers of all sizes. Among other services, Comcast offers retail and wholesale Ethernet transport services, which provide point-to-point connectivity between or among multiple business locations and secure access to cloud and data center resources over dedicated fiber connections (or, for a relatively small pool of customers, over Comcast's HFC network). Comcast's Ethernet transport services include providing high-bandwidth connections to networks operated by other service providers (including cable operators and LECs) pursuant to individually negotiated External Network to Network Interface ("ENNI") arrangements. Comcast also has begun to offer fiber-based transport (backhaul) services to mobile wireless providers, connecting those providers' cell towers to mobile switching centers, and ultimately to the public switched telephone network and to data networks.

In addition, Comcast offers dedicated Internet access to businesses over fiber connections pursuant to availability SLAs (as with Ethernet transport services, a relatively small number of customers purchase dedicated Internet access over HFC facilities). Many small and mid-sized

²¹ See Mayo Decl. ¶¶ 44-45.

²² See J.T. Ramsey, *Q&A with Bill Stemper, President of Comcast Business Services*, Comcast Voices (Feb. 12, 2013) (describing evolution of Comcast's Business Services); see also Stemper Decl. ¶ 4.

businesses purchase Comcast’s best-efforts Internet access service, but that service, unlike the business data services noted above, is offered with asymmetrical download and upload speeds on a best-efforts basis—*i.e.*, without SLAs providing availability or performance guarantees. As a result, Comcast’s best-efforts services are priced very differently than dedicated services with SLAs and are not considered competitive substitutes by customers.²³

1. Comcast Provides an Array of Retail BDS Services to Business Customers

Comcast offers retail business customers two primary services: dedicated Internet access and Ethernet transport.²⁴ Comcast is able to offer retail BDS across much of its facilities-based footprint, as well as in out-of-footprint areas through the purchase of wholesale access services.²⁵ While Comcast’s retail BDS offerings are broadly available, they are typically targeted towards businesses with at least 50 employees, multiple locations, and a budget of approximately \$750 a month for telecommunications services.²⁶

Comcast’s dedicated Internet access service is called “Ethernet Dedicated Internet” or “EDI.” Unlike the TDM-based services with which EDI often competes, EDI is easily scalable and can grow alongside a business without requiring the addition of new lines, and EDI service typically costs less per Mbps than DS-1 or DS-3 services.²⁷ Comcast’s usually provides EDI service via fiber to the premises and offers speed increments from 1 Mbps to 10 Gbps. In a very small number of instances, Comcast provides EDI service using EoHFC technology, but such speeds are limited to 10 Mbps, upload and download. Moreover, whereas fiber-based EDI

²³ FNPRM ¶¶ 13-14.

²⁴ Guillaume Decl. ¶ 4.

²⁵ *Id.*

²⁶ *Id.*

²⁷ *Id.* ¶ 5.

service includes an SLA committing to 99.99% availability (often called “four nines” in the industry), the EoHFC version offers lesser 99.9% availability. In light of these differences and other limitations, EDI offered via HFC appeals to a very limited subset of customers.²⁸

Comcast’s Ethernet transport services likewise are primarily delivered via dedicated fiber connections, though Comcast also offers the latter two variants of Ethernet transport services described below over its HFC network up to 10x10 Mbps:

- Comcast’s “Ethernet Network Service” or “ENS” is the company’s multipoint-to-multipoint Ethernet service. This service is typically a replacement for legacy TDM-based Wide Area Networks (“WANs”). Customers can create and manage their own virtual local area network (“VLAN”) without coordinating with Comcast. This service is available via fiber in speed increments from 1 Mbps to 10 Gbps and in three service tiers (Basic, Priority, and Premium) offering a range of performance assurances for latency, jitter, and packet loss. All three tiers offer the same 99.99% SLA for availability via fiber.²⁹
- Comcast’s “Ethernet Private Line” or “EPL” service provides dedicated connectivity between two customer locations using any VLANs or Ethernet control protocols without coordination with Comcast. This service is available via fiber in speed increments from 1 Mbps to 10 Gbps and in three service tiers (Basic, Priority, and Premium) offering a range of performance assurances for latency, jitter, and packet loss. All three tiers offer

²⁸ *Id.* ¶ 6. As of December 2015, Comcast provided Ethernet over HFC EDI service to only about {{ }} business locations, out of approximately {{ }} business locations to which it provided EDI service. Thus, only about {{ }} percent of all EDI sites were serviced via Ethernet over HFC. *Id.*

²⁹ *Id.* ¶ 9.

the same 99.99% SLA for availability via fiber, and a 99.9% SLA for availability via HFC.³⁰

- Comcast’s “Ethernet Virtual Private Line” or “EVPL” service is similar to its EPL service, but with the additional capability of supporting several remote sites that need to connect to a regional or central hub. Fiber-based EVPL offers the same speed and service tiers and SLAs as EPL.³¹

2. *Comcast Also Offers a Variety of Wholesale BDS Services*

Comcast sells connectivity on a wholesale basis to carrier customers seeking service to or from points within Comcast’s footprint. By far the largest source of this business for Comcast is the demand for cellular backhaul.³² Comcast provides cellular backhaul service to large wireless carriers that require dedicated, fiber-based connectivity. Sales to these carriers represent approximately {{ }} of Comcast’s revenue from its carrier services business.³³ Cellular backhaul sales are generally reliant on the presence of available fiber or Comcast’s ability to deploy new fiber facilities at a cost that will yield an acceptable return. To the extent this demand persists, Comcast will need to continue to build new, dedicated fiber capacity into its network in order to win cell backhaul business from mobile carriers.³⁴

While Comcast has planned for the development of 5G wireless services, the prospect of increased demand for backhaul services, and the need for fiber connections to support this

³⁰ *Id.* ¶ 10.

³¹ *Id.* ¶ 11.

³² Allen Decl. ¶ 4.

³³ *Id.*

³⁴ *Id.* Looking ahead, wireless providers are increasingly demanding long-term leases of dark fiber facilities, rather than seeking to purchase lit Ethernet services. Comcast’s sales experience has demonstrated that its lit fiber service is increasingly subject to diminished demand. *Id.* ¶ 5.

transition, Comcast does not expect that its HFC-based services will be a meaningful competitive backhaul alternative in the long run.³⁵ Among other things, EoHFC offers dedicated symmetrical speeds only up to 10 Mbps, and does not include an SLA for availability at the 99.99% level typically demanded by wireless carriers.³⁶ Accordingly, to the extent that wireless carriers are willing to purchase lit backhaul services at all (either today or for future 5G networks), Comcast’s business experience has led the company to conclude that wireless carriers ultimately will insist on fiber-based services, given fiber’s superior performance attributes, reliability, and capacity.³⁷

Comcast also provides an E-Access/NNI service that allows other service providers to purchase wholesale fiber-based Ethernet connectivity to businesses within Comcast’s footprint. Nationwide, Comcast sells its E-Access service to nearly {{ }} carriers.³⁸ Comcast works with other providers to establish a network-to-network interface (“NNI”) through which its E-Access services can be delivered to the other provider’s customer. E-Access customers generally require participating wholesale providers, including Comcast, to identify all on-network buildings within their respective footprints, and to provide fixed price lists and one-time costs and timing for reaching each building.³⁹ When a carrier customer is seeking connectivity to a building outside of its facilities-based footprint, it simply enters the address and receives instant price quotes from Comcast and other participating wholesale providers. The typical E-Access customer may have 30 to 40 providers within its pricing tool, with individual bidders varying

³⁵ See Section II.A.1, *infra*.

³⁶ Allen Decl. ¶ 7.

³⁷ *Id.*

³⁸ *Id.* ¶ 9.

³⁹ *Id.* ¶ 10.

depending on the geographic locations requested.⁴⁰ Given the level of competition, Comcast has been forced to reduce prices over time in order to maintain a foothold in this business.⁴¹ While larger service providers negotiate highly customized NNI arrangements and rely on the aforementioned pricing tools, smaller carrier customers without NNI agreements may purchase Comcast’s retail Ethernet offerings for resale to business customers.⁴²

3. *Many of Comcast’s BDS Offerings Are Private Carrier Services*

Comcast offers many of its BDS offerings—including its cellular backhaul service and E-Access service, as well as certain of its retail services—on a “private carriage” basis, pursuant to individually negotiated agreements with terms that can vary significantly according to the business customer’s specific needs, and without any “indifferent” holding out to the public.⁴³

For example, Comcast’s cell backhaul service bears all the hallmarks of private carriage.

Comcast does not hold itself out indifferently to the public or any class of customers to provide cell backhaul service upon request.⁴⁴ Rather, Comcast makes individualized determinations as to the circumstances in which and the customers to whom it will offer wholesale service.⁴⁵ Cell backhaul agreements are individually negotiated with each of Comcast’s customers, and

{{

}} which is then heavily negotiated by the parties.⁴⁶ As a result, these agreements

contain highly individualized terms and prices that differ significantly from customer to

⁴⁰ *Id.*

⁴¹ *Id.*

⁴² *Id.* ¶ 11.

⁴³ *Id.* ¶ 13.

⁴⁴ *Id.*

⁴⁵ *Id.*

⁴⁶ *Id.*

customer and from agreement to agreement.⁴⁷ Furthermore, Comcast increasingly sells dark fiber connectivity to cell sites, in which case it is providing facilities rather than a service (let alone a common carrier service).

Comcast’s E-Access/NNI service likewise is a classic private carrier service. Comcast does not hold itself out indifferently to the public or any class of customers to provide E-Access services upon request.⁴⁸ Rather, Comcast makes individualized determinations as to the circumstances in which and the customers to whom it will offer E-Access service.⁴⁹ Comcast’s E-Access service is available only to a limited number of carriers with which Comcast chooses to create a network-to-network interface.⁵⁰ Where Comcast does offer E-Access service, its contract pricing and terms are highly individualized for each NNI counterparty.⁵¹

Some of Comcast’s interstate retail products also are private carriage services. For example, Comcast does not hold itself out indifferently to the public or any class of customers to provide EDI or Ethernet transport to all interested buyers. In many cases, Comcast must make an initial determination whether investing to extend facilities to a potential customer meets Comcast’s investment and business objectives.⁵² And although Comcast has standard “rack” rates for all of its retail services, contracts generally are individually negotiated, with rates and

⁴⁷ *Id.*

⁴⁸ *Id.*

⁴⁹ *Id.*

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² Declaration of Robert Victor ¶ 3, attached hereto as Exhibit G (“Victor Decl.”).

other terms dependent on term, volume, and total commitment—which are themselves frequently subject to negotiation and adjustment from customer to customer.⁵³

C. Comcast Offers BDS in an Increasingly Competitive Marketplace

By any measure, the BDS marketplace, long dominated by incumbent LECs, is more competitive than ever before. Invariably, Comcast offers service in competition with a well-entrenched incumbent LEC that has many advantages, including far more extensive network connectivity to business locations, much larger sales and marketing operations, and long-term customer relationships. In addition, Comcast typically competes in both the retail and wholesale marketplace against a variety of CLECs and lit and dark fiber providers (such as Level 3, XO, Zayo, DQE, and Windstream), cable overbuilders (such as WOW and RCN), and, in some instances, fixed wireless providers.⁵⁴

The lion's share of Comcast's retail sales are proactive, with Comcast sales representatives reaching out to potential customers.⁵⁵ While Comcast does receive and bid on requests for proposals for its retail services, such opportunities are less common and are typically associated with larger projects for healthcare, education, and government customers. When Comcast does compete for RFPs, it is often bidding to replace legacy TDM (often DS-1) lines that provide lower bandwidth at a higher cost than Comcast's Ethernet-based services. Whereas adding capacity to a TDM-based network may take weeks and require pulling new cable, Comcast's services (once installed) can grow elastically along with a business's needs.

⁵³ Guillaume Decl. ¶ 14.

⁵⁴ *Id.* ¶ 15; Allen Decl. ¶ 14.

⁵⁵ Guillaume Decl. ¶ 12.

Nevertheless, Comcast’s success rate with RFPs has been {{ }} in light of the robust competition Comcast faces from other bidders.⁵⁶

Likewise, Comcast must compete vigorously to capture business in the wholesale marketplace to provide resold (Type II) connectivity to retail business locations. Such wholesale competition is most vigorous in larger, more densely populated areas, where Comcast typically must compete with 10 to 15 providers (primarily based on price, but sometimes based on service quality metrics and vendor/network diversity requirements as well).⁵⁷ But even in less dense areas, the invariable presence of the ILEC, and often various CLECs, means that Comcast must offer a competitive price.⁵⁸ Indeed, in areas where it may be more difficult to capture business from multiple customers using a single build—either because of the presence of several competitors in the area or because of the low density of business locations in the area—new entrants like Comcast often must gamble and accept a less-than-optimal return on investment in order to enter the market. Incumbent LECs, which typically already offer widespread BDS-capable connections to businesses, do not face the same constraints.⁵⁹

The high and increasing level of competition in the wholesale and retail BDS marketplaces has had a predictable effect on prices, which have been declining substantially for several years. In 2013, when Comcast delivered 100 Mbps fiber service in the wholesale market, it could expect a market rate of between {{ }} per month. Today, Comcast

⁵⁶ *Id.*

⁵⁷ Allen Decl. ¶ 15.

⁵⁸ *Id.*

⁵⁹ Unlike ILEC facilities, cable facilities tend to be less prevalent in business-dense urban areas than in suburban locations (due to the fact that many cable facilities were first constructed to support residential video services).

typically charges less than {{ }} a month for the same service.⁶⁰ Comcast’s retail customers also have observed a steady year-over-year decline in pricing for dedicated Internet access and Ethernet transport services.⁶¹ For example, Comcast’s EDI service has seen a {{ }} decline in prices over just 12 months.⁶² Buyers are keenly aware that service offerings are rapidly improving and that prices are measurably declining, providing limited incentive for {{ }}.⁶³ For most of Comcast’s retail BDS products, the key differentiator among competitors is price.⁶⁴ Pricing competition also has required Comcast generally to forgo certain fees and service charges, such as {{ }}
 }}.⁶⁵

Even as Comcast has made inroads in various product and geographic markets in the face of incumbents’ advantages and declining marketplace prices, it continues to face challenges besides just its well-entrenched competitors. As the FNPRM recognizes, Comcast and other competing providers also frequently face “a lack of a timely potential for a positive return on investment,” particularly in “[a]reas of low BDS demand, which would include most suburban and rural areas.”⁶⁶ In addition, competitive providers like Comcast “frequently need[] to obtain building access and/or rights of way” to deploy service to a particular business.⁶⁷ And “when [a]

⁶⁰ Allen Decl. ¶ 16.

⁶¹ Guillaume Decl. ¶ 13.

⁶² *Id.*

⁶³ *Id.*

⁶⁴ *Id.*

⁶⁵ *Id.*

⁶⁶ FNPRM ¶ 227; *see also supra* at 18.

⁶⁷ FNPRM ¶ 225.

building owner refuses to grant . . . access or charges a high access fee, or when it is difficult or costly to obtain rights of way to a specific building,” these entry barriers “cannot be easily overcome.”⁶⁸

D. Despite Substantial Investments, Comcast and Other Cable Providers Remain New Entrants with Limited Market Share and Geographic Reach

Despite substantial infrastructure investments by Comcast and other cable providers, and growth in cable BDS revenues of approximately 20 percent annually,⁶⁹ cable providers remain new entrants with limited market share and geographic reach for their BDS services. As the Commission has recognized, by the end of 2016, cable providers are still expected to generate less than eight percent of total BDS revenues.⁷⁰ While cable competitors continue to invest substantially and are rapidly bringing competition to this marketplace, their limited geographic footprint and barriers to providing services that are true competitive substitutes with incumbent LECs’ (and some CLECs’) nationwide service offerings present challenges for certain customer segments. Comcast’s fiber network, which, unlike its HFC plant, is capable of providing the carrier-grade and enterprise-level performance and SLAs that legacy BDS services and Ethernet over fiber can provide, is far from “ubiquitous.” Nor does Comcast today “ubiquitously deploy connections” capable of supporting BDS to business locations in remotely the same manner as incumbent LECs.⁷¹ Moreover, as noted above, Comcast’s Ethernet services provided over its HFC network are not competitive substitutes for the vast majority of BDS customers; even where HFC facilities are present, demand for HFC-based services has been limited. This is particularly

⁶⁸ *Id.* ¶ 227.

⁶⁹ *Id.* ¶ 236.

⁷⁰ *Id.* ¶ 218.

⁷¹ *Id.* ¶ 54.

true with respect to cellular backhaul, a segment in which HFC has attracted negligible interest and in which HFC is unlikely to play a significant competitive role in the future.

Furthermore, cable providers’ penetration of geographic markets and buildings through their own facilities remains limited, both in the retail and wholesale markets. Dr. Rysman notes that competitive providers “report that they can reach approximately 277,000 locations or less than a quarter of all buildings [studied] via their own facilities,” with only about half of this reach attributed to cable providers.⁷² Comcast’s large and continuing investments to expand its fiber network are a testament to its desire to *become competitive* with incumbent LECs and more established CLECs on a broader geographic basis for the types of high-performance services that enterprise customers demand.⁷³ But as of this year, Comcast has achieved a revenue share of less than {{ }} in the mid-market segment (firms with over 20 employees), and less than {{ }} in the markets for cell backhaul and network carrier operations.⁷⁴ Comcast

⁷² Marc Rysman, “Empirics of Business Data Services,” White Paper, attached as Appx. B to FNPRM, at 209 (“Rysman White Paper”). In recent submissions to the Commission, Comcast provided supplemental data at the request of Commission staff indicating that a much larger number of business locations are connected to Metro-Ethernet-capable headends today (and were connected in 2013) via HFC plant. See Letter of Matthew A. Brill, Counsel for Comcast, to Marlene H. Dortch, Secretary, FCC, WC Docket No. 05-25 (filed June 1, 2016) (“Comcast June 1 Ex Parte”); Letter of Matthew A. Brill, counsel for Comcast, to Marlene H. Dortch, Secretary, FCC, WC Docket No. 05-25 (filed May 16, 2016). But because such HFC location data consists overwhelmingly of best-efforts Internet access connections, it has little, if any, relevance to the Commission’s analysis of dedicated business data services. See Comcast June 1 Ex Parte at 2; *Business Data Services in an Internet Protocol Environment; Investigation of Certain Price Cap Local Exchange Carrier Business Data Services Tariff Pricing Plans; Special Access for Price Cap Local Exchange Carriers; AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, WC Docket Nos. 16-143, 15-247, 05-25, RM-10593, Order, DA 16-641, ¶ 10 & n.38 (WCB rel. Jun. 8, 2016) (distinguishing HFC-based best-efforts services from the BDS offerings at issue in this rulemaking).

⁷³ FNPRM ¶¶ 77-78.

⁷⁴ Stemper Decl. ¶ 6.

also has achieved a revenue share of less than {{ }} among Fortune 1000 firms, a nationwide market with a total size of between \$13 and \$15 billion.⁷⁵ In short, while Comcast is making large investments in the BDS marketplace and is having a positive impact on the marketplace through this emerging competition, it remains very much a new entrant and a relatively minor player compared to ILECs and a number of large CLECs.

DISCUSSION

I. THE COMMISSION SHOULD FOCUS ON PROMOTING BDS COMPETITION BY REMOVING BARRIERS TO ENTRY AND INVESTMENT

Comcast strongly supports the Commission’s stated goal in this proceeding of “facilitat[ing] the continued evolution of the type of robust competition [in the BDS marketplace] that will result in ever-improving services for American businesses and consumers.”⁷⁶ In recent years, building on the success of earlier cable entrants, Comcast has helped lead the charge in bringing competitive alternatives to a BDS marketplace long dominated by incumbent LECs. The FNPRM expressly acknowledges the pivotal role that Comcast and other cable BDS providers have played in this marketplace, noting that “[t]he great entry success story has been that of cable” in recent years.⁷⁷ Comcast’s strong interest in stoking increased BDS competition and expanding the availability of services for BDS customers of all stripes thus is closely aligned with the Commission’s stated policy objectives in this proceeding.

⁷⁵ *Id.*

⁷⁶ FNPRM ¶ 159

⁷⁷ *Id.* ¶ 236; see also *Petition for Declaratory Ruling to Clarify 47 U.S.C. § 572 in the Context of Transactions Between Competitive Local Exchange Carriers and Cable Operators, Conditional Petition for Forbearance from Section 652 of the Communications Act for Transactions Between Competitive Local Exchange Carriers and Cable Operators*, Order, 27 FCC Rcd 11532 ¶ 27 (2012) (finding that eliminating regulatory restrictions on cable-CLEC mergers “will likely speed entry of cable operators into the market for telecommunications services provided to business customers and will foster increased facilities-based competition for these services”).

Comcast and other new entrants have been important drivers of the “competition, competition, competition” that Chairman Wheeler espouses, and Comcast agrees that even greater competition would bring enhanced benefits to BDS customers and ultimately to consumers.

While the FNPRM asks various questions about what role the Commission should play in promoting that goal, Congress already has provided an answer in the broadband context. Section 706 of the Telecommunications Act of 1996 instructs the Commission to “encourage the deployment on a reasonable and timely basis of advanced telecommunications capability” by using “regulating methods that remove barriers to infrastructure investment.”⁷⁸ The Commission’s principal focus in this proceeding thus should be on eliminating barriers to competition and investment in the BDS marketplace by all providers. At the same time, the Commission should not entertain any proposal that creates or exacerbates barriers by reducing incentives to engage in infrastructure investment, and thus contravenes the pro-competitive mandate long reflected in Commission policy.

With these principles in mind, Comcast supports the Commission’s efforts—both in the *Tariff Investigation Order* and now in the FNPRM—to identify and address conditions in the BDS marketplace that threaten to impede entry and investment by competitive providers. In the *Tariff Investigation Order*, the Commission examined “a wide range of terms and conditions in 18 business data (or special access) services tariff pricing plans” offered by incumbent LECs in response to concerns by competitive providers that those terms “constrained their ability to compete in the business data services marketplace.”⁷⁹ The Commission accordingly adopted a “targeted” and “measured” approach in that *Order* to eliminate a handful of provisions in tariffs filed by incumbent LECs—including all-or-nothing requirements and shortfall penalties—that,

⁷⁸ 47 U.S.C. § 1302(a).

⁷⁹ *Tariff Investigation Order* ¶ 86.

according to the Commission, “preclude[] customers from managing their business data services purchases in an economically efficient manner, restricting how they purchase services from the incumbent LEC plans and restricting their ability to consider competitive alternatives.”⁸⁰

While Comcast takes no position on whether particular contractual terms imposed by incumbent LECs in fact are anticompetitive, the Commission’s examination of those terms reflects a reasonable and appropriate regulatory effort to address barriers to competitive entry and investment in the BDS marketplace.⁸¹ The investigation that led to the *Tariff Investigation Order* focused narrowly on specific provisions in incumbent LECs’ tariffs that, in the Commission’s view, represented clear and readily ascertainable impediments to competition. Moreover, the Commission took action only where it determined that there was a strong evidentiary basis for doing so, and expressly declined to take immediate action with respect to certain other tariffed terms for which it lacked sufficient evidence to make such a determination.⁸² This action represents the kind of data-driven and narrowly tailored approach that the Commission should be pursuing in seeking to promote increased competition in the BDS marketplace. Going forward, Comcast would not oppose further efforts to analyze the competitive effects of other contractual provisions employed by dominant BDS providers, including certain provisions that the Commission identified as requiring further examination in the *Tariff Investigation Order* and in the FNPRM.⁸³

⁸⁰ *Id.* ¶¶ 87, 96.

⁸¹ Dr. Farrell concurs, noting that “the Commission has identified practices that it believes have weakened or may have weakened competition, has taken steps to address some of them, and has sought comment on others,” and that “[t]o the extent that the Commission can identify and address substantial barriers, competitive conditions would improve.” Farrell Decl. ¶ 20.

⁸² *See Tariff Investigation Order* ¶ 88.

⁸³ *See* FNPRM ¶¶ 447-91.

The Commission likewise should explore regulatory measures that would address non-contractual barriers to entry. The FNPRM identifies potential non-contractual barriers that “cannot easily be overcome” by new entrants, “such as when the building owner refuses to grant the [competitive provider] access or charges a high access fee, or when it is difficult or costly to obtain rights of way to a specific building (e.g., pole access or costs of burying lines).”⁸⁴ Moreover, the FNPRM notes that incumbent LECs often do not face these impediments when considering whether to pursue a business opportunity at a particular location, as they typically can “use the same rights of way, trenches, conduit, wires, poles, building access, riser, truck rolls, employees, outside plant, central office equipment, administrative expenses, and other legacy inputs that they use when they provision TDM-based special access services.”⁸⁵ Accordingly, the Commission should consider ways in which it can facilitate competitive providers’ ability to use public rights of way, gain access to buildings, and obtain the necessary construction permits to deliver BDS to potential customers.

In all events, the Commission should let any measures to remove barriers to competitive entry and investment play out before pursuing more drastic regulatory intervention in the BDS marketplace. The ink has barely dried on the *Tariff Investigation Order*, and the Commission has yet to complete its review of other barriers to entry (including other lock-up provisions imposed by dominant BDS providers in non-competitive markets). The FNPRM touts these examinations of dominant providers’ contractual provisions as groundbreaking efforts to address practices in the BDS marketplace that “have the effects of decreasing facilities-based

⁸⁴ *Id.* ¶ 227 (internal citations and quotation marks omitted).

⁸⁵ *Id.* ¶ 226 (internal citations and quotation marks omitted).

competition and the transition to newer technologies.”⁸⁶ Yet in the next breath, the FNPRM remarkably asks whether the Commission should regulate the rates of (and thereby potentially handicap) *new entrants*, who stand to offer the robust facilities-based competition the *Tariff Investigation Order* hoped to enable.

Rather than pursuing such a radical approach—which as shown below would be deeply counterproductive—the Commission at least should give the marketplace time to respond to the barrier-reducing measures it has adopted as facilities-based competitors roll out new initiatives and service offerings with greater freedom than was possible before. As discussed in the attached declarations of Dr. Joseph Farrell, former FCC Chief Economist, and Professor John Mayo, former Dean of the McDonough School of Business at Georgetown University, basic principles of sound economic policy teach that it is far better for an agency to focus on removing barriers to entry for all providers and allowing competition to grow organically than to attempt to manufacture the effects of competition through invasive regulation. “[T]he Commission has multiple plausible opportunities to strengthen competition rather than replacing it (and likely undermining it) through pervasive price regulation,” explains Dr. Farrell, and “[w]here competition is already workable or entry is plausible, those opportunities should be the priority.”⁸⁷ Similarly, Professor Mayo concludes that “[m]arket-wide application of price cap regulation on *all* competitors, including new entrants like Comcast that do not have monopoly power under any interpretation, would, in direct opposition to the Commission’s stated

⁸⁶ *Id.* ¶ 11.

⁸⁷ Farrell Decl. ¶ 19.

objectives of increased competition, thwart competitive entry, innovation, and investment in the marketplace.”⁸⁸

II. THE COMMISSION SHOULD AVOID TAKING ANY STEPS THAT WOULD CREATE NEW BARRIERS TO ENTRY AND INVESTMENT

While Commission action may be justified to eliminate barriers to entry and investment, the Commission should ensure that any rules it adopts do not *create* such barriers. Any such rules—including in particular extending price cap regulation and other investment-inhibiting mandates to new entrants—would directly undermine the paramount goal of promoting increased investment and competition in the BDS marketplace, and would create administrability problems and other costs that far outweigh any purported benefits. While the Commission should take steps that foster, not thwart, investment by all providers, the FNPRM notes that there may be reasons to treat different providers differently.⁸⁹ Given the imperative for more BDS investment in this country, the Commission should narrowly tailor any new price control measures it ultimately adopts. Accordingly, it should stay true to its long history of adopting policies that promote new entry by removing, not adding, new regulatory burdens to those creating competition.

A. The Commission Should Not Subject Competitive BDS Providers to Rate Regulation

There is no sound basis for adopting what is undoubtedly the most radical and controversial proposal floated in the FNPRM: subjecting non-dominant BDS providers to *ex ante* rate regulation in markets deemed to be “non-competitive.”⁹⁰ While there are several reasons to be skeptical of the net benefits of imposing rate regulation to *any* extent in today’s BDS

⁸⁸ Mayo Decl. ¶ 13.

⁸⁹ FNPRM ¶ 429.

⁹⁰ *See id.* ¶ 420.

marketplace,⁹¹ it would be completely capricious to subject recent entrants like Comcast and other cable operators to government price controls. The FNPRM recognizes that, in 2013, cable operators had “less than 5% of all [BDS] sales,” and, despite their significant growth rate, cable operators BDS revenues by the end of 2016 are expected to be “still less than eight percent of [total] BDS revenues.”⁹² Despite this nascent presence and the acknowledgement that cable providers encounter various entry barriers and competitive challenges,⁹³ and notwithstanding that cable providers already face uncertain returns on investment in entering new markets with little guarantee of securing customers, the FNPRM appears to give serious contemplation to the remarkable prospect that a cable competitor with, say, a 10 percent market share should be treated no differently from a dominant incumbent provider with a 90 percent share. Such an approach would represent an extraordinary departure from bedrock competition policy principles rooted in antitrust law, longstanding Commission precedent, and common sense.

1. Proposals To Impose Rate Regulation on Cable BDS Providers Stem from Deeply Flawed Assumptions

As an initial matter, the Commission has not articulated any rational policy justification for subjecting cable providers and other new entrants in the BDS marketplace to rate regulation. The FNPRM’s fixation on cable BDS providers—which have never been subject to the special access regulatory regime designed for ILECs and still represent a relatively small portion of the BDS marketplace—is particularly mystifying. As discussed below, the implicit hypothesis underlying any notion of subjecting cable BDS offerings to what has heretofore been considered “dominant carrier” regulation appears to be that cable providers’ widespread deployment of HFC

⁹¹ See Farrell Decl. ¶ 53; Mayo Decl. ¶¶ 80-85.

⁹² *Id.* ¶ 218.

⁹³ *Id.* ¶¶ 231-32.

networks might justify imposing prescriptive rules—including rate regulation—on cable providers. More specifically, the theory appears to be that the “ubiquity” of HFC plant indicates some level of market power warranting heightened regulation or that HFC-based services will be important backhaul inputs for 5G networks.⁹⁴ But in the words of Mark Twain, “How empty is theory in the presence of fact!”⁹⁵ And in the presence of the realities of the BDS marketplace, the theoretical argument for regulating cable BDS providers is quite empty indeed.

There is simply no evidentiary basis or rational justification for imposing rate regulation or other prescriptive mandates on cable BDS providers simply because they have widespread HFC facilities—or for subjecting a cable provider in a particular market to rate regulation based solely on the “ubiquity of [HFC] infrastructure capable of delivering BDS service” in that market.⁹⁶ The FNPRM suggests at various points that cable providers enjoy some special status in the BDS marketplace by virtue of their “ubiquitously deployed HFC infrastructure,”⁹⁷ and contemplates “apply[ing] specific rules to any firm in the non-competitive market that has a near ubiquitous network in the local territory and rights of way.”⁹⁸ But the fact that a provider has widely deployed HFC facilities in a geographic market hardly indicates that the provider has market power in the provision of *BDS* services in that area—and certainly does not warrant

⁹⁴ See *id.* ¶ 429 (asking whether rate regulation should apply to non-incumbent BDS providers in non-competitive markets based on “the ubiquity of infrastructure capable of delivering BDS service in a relevant geographic market, or the effective ability of a provider to reach some percentage of potential BDS customers”).

⁹⁵ MARK TWAIN, *A CONNECTICUT YANKEE IN KING ARTHUR’S COURT* 420 (1889).

⁹⁶ FNPRM ¶ 429.

⁹⁷ *Id.* ¶ 249.

⁹⁸ *Id.* ¶ 309; see also *id.* ¶ 429 (asking whether providers in non-competitive markets should be subject to rate regulation based on “the ubiquity of infrastructure capable of delivering BDS service in a relevant geographic market, or the effective ability of a provider to reach some percentage of potential BDS customers”).

subjecting that provider to rate regulation or other heightened restrictions. Indeed, if the mere presence of facilities were sufficient to justify such regulation, the ubiquitous broadband networks operated by wireless providers also would warrant regulation of any BDS services offered by wireless providers.

The overwhelming majority of business services provided over HFC facilities are business Internet access services offered on a best efforts basis (*i.e.*, without any type of SLAs or contractual performance objectives),⁹⁹ and the FNPRM unambiguously recognizes that such best efforts services are outside the product market for BDS.¹⁰⁰ As the FNPRM explains, while “BDS services typically provide dedicated symmetrical transmission speeds with performance guarantees,” a best efforts service “is typically an asymmetrical service with greater download than upload speeds, is shared among multiple users absent service guarantees, and is subject to failure during high congestion periods.”¹⁰¹ Thus, “[a]lthough fit for many customer purposes, best efforts services do not meet the requirements of all BDS purchasers, nor is it offered by sellers as a product intended for all customers.”¹⁰²

These critical distinctions—and the accompanying price differences between BDS and best-efforts services¹⁰³—demonstrate that best efforts services are “not . . . in the same product market or markets as BDS.”¹⁰⁴ Earlier this month, the Wireline Competition Bureau reiterated that HFC-based best efforts services are “distinguishable from the types of dedicated services

⁹⁹ See Comcast Mar. 25 Ex Parte at 3-4.

¹⁰⁰ See FNPRM ¶¶ 13-14, 190-96.

¹⁰¹ *Id.* ¶¶ 13, 14.

¹⁰² *Id.* ¶ 191.

¹⁰³ See *id.* (“The prices of best efforts services are considerably lower than the prices of roughly comparable BDS.”)

¹⁰⁴ *Id.*

considered in the [FNPRM],” and cited approvingly to submissions from Comcast and others indicating that location data for HFC facilities, “consisting overwhelmingly of best-efforts Internet access connections,” have no “relevance to the Commission’s analysis of dedicated business data services.”¹⁰⁵

The only services offered over HFC that have any limited relevance to the BDS marketplace are cable providers’ EoHFC offerings—and, even there, EoHFC represents a very small segment of the market with little potential for significant growth. Indeed, many HFC facilities are not even capable of supporting BDS; approximately {{ }} of Comcast’s HFC headends are not Ethernet-capable today.¹⁰⁶ And even in areas where Comcast EoHFC services are available, those products typically serve as gap-fillers for customers with hard-to-reach, off-network locations.¹⁰⁷ The vast majority of businesses seeking Ethernet services demand full carrier-grade performance and SLAs that EoHFC cannot provide.¹⁰⁸ Accordingly, EoHFC services have been and continue to be a small fraction of Comcast’s Ethernet business. Of the roughly {{ }} business locations Comcast identified in its 2013 special access submission, only approximately {{ }} consisted of EoHFC connections.¹⁰⁹ That percentage has seen minimal growth over time; of the approximately {{ }} business

¹⁰⁵ See *Business Data Services in an Internet Protocol Environment; Investigation of Certain Price Cap Local Exchange Carrier Business Data Services Tariff Pricing Plans; Special Access for Price Cap Local Exchange Carriers; AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, WC Docket Nos. 16-143, 15-247, 05-25, RM-10593, Order, DA 16-641, ¶ 10 & n.38 (WCB rel. Jun. 8, 2016) (internal citations and quotation marks omitted).

¹⁰⁶ See Comcast Mar. 25 Ex Parte at 1.

¹⁰⁷ See Guillaume Decl. ¶ 6.

¹⁰⁸ See *id.*

¹⁰⁹ See Letter of Matthew A. Brill, Counsel for Comcast Corp., to Marlene Dortch, Secretary, FCC, WC Docket No. 05-25, at 2 (filed Apr. 26, 2016).

locations connected to dedicated services that Comcast noted in its March 25 *ex parte* submission, approximately {{ }} consist of EoHFC connections.¹¹⁰

Even if customer demand for Comcast’s EoHFC products were to increase suddenly (and unexpectedly), Comcast’s ability to grow this product to scale is capacity-constrained. In order to add significant wholesale BDS traffic to its shared HFC network, Comcast would need to undertake significant expansions of capacity to avoid adverse impacts on the broadband Internet access, video, and voice traffic supported by that network, including impacts on residential subscribers.¹¹¹ In any event, it would be far more efficient to build new fiber connections than to undertake significant expansions of shared HFC capacity to support dedicated connectivity to business customers, provided the regulatory framework does not alter the investment incentives.¹¹²

To the extent the Commission believes the impending arrival of 5G wireless services justifies imposing heightened regulatory requirements on cable operators’ HFC-based offerings, such a theory simply cannot be supported. Chairman Wheeler has suggested that the primary objective motivating the effort to expand prescriptive regulation in the BDS marketplace is a desire to pave the way for future 5G services. In his April 8 blog post announcing the circulation of the FNPRM, Chairman Wheeler wrote that “[b]usiness data services . . . [are] hugely important in our connected economy and society,” because “mobile networks are heavily dependent on the use of BDS for the backhaul of mobile traffic,” and “[t]his dependence will

¹¹⁰ *Id.*

¹¹¹ *See* Guillaume Decl. ¶ 7; Allen Decl. ¶ 8.

¹¹² *See* Guillaume Decl. ¶ 7.

only grow as wireless carriers expand their networks and move into 5G wireless.”¹¹³ Chairman Wheeler then expounded at length on the connection between BDS regulation and 5G at his speech to INCOMPAS on April 11, stating that “American leadership in 5G is a national priority,” which “means the Business Data Service connectivity among 5G cell sites must be fast and fair – something addressed in this month’s rulemaking.”¹¹⁴ And in his statement issued concurrently with the release of the FNPRM, Chairman Wheeler cited the need for 5G backhaul as the leading reason for reexamining the regulatory framework for BDS, asserting that “access to competitive backhaul is important to the buildout of wireless networks, to investment in wireless networks and to the creation of 5G.”¹¹⁵ Just last week, Chairman Wheeler reiterated that BDS reform is necessary to “ensur[e] that lack of competition in some places cannot be used to hold 5G hostage.”¹¹⁶

While 5G is certainly important, what is particularly troubling is the FNPRM’s unwarranted suggestion that cable providers’ HFC-based services somehow justify the imposition of rate regulation. The FNPRM contains several references to the widespread deployment of cable HFC facilities and assertions that “the capacity of the HFC network is

¹¹³ FCC Chairman Tom Wheeler, Blog Post, “Out with the Old, In with the New,” Apr. 8, 2016, *available at* <https://www.fcc.gov/news-events/blog/2016/04/08/out-old-new>.

¹¹⁴ Remarks of FCC Chairman Tom Wheeler, INCOMPAS Policy Summit, Apr. 11, 2016, at 1, 5, *available at* https://apps.fcc.gov/edocs_public/attachmatch/DOC-338806A1.pdf.

¹¹⁵ Statement of Chairman Tom Wheeler, *Business Data Services in an Internet Protocol Environment; Investigation of Certain Price Cap Local Exchange Carrier Business Data Services Tariff Pricing Plans; Special Access for Price Cap Local Exchange Carriers; AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, WC Docket Nos. 16-143, 15-247, 05-25, RM-10593, Tariff Investigation Order and Further Notice of Proposed Rulemaking, FCC 16-54, at 194 (rel. May 2, 2016) (internal quotation marks omitted).

¹¹⁶ Remarks of FCC Chairman Tom Wheeler, “The Future of Wireless: A Vision for U.S. Leadership in a 5G World,” National Press Club, Jun. 20, 2016, *available at* https://apps.fcc.gov/edocs_public/attachmatch/DOC-339920A1.pdf.

greater than the incumbent LECs’ legacy copper-based infrastructure”¹¹⁷—implicitly suggesting that cable providers have some advantageous market position in certain areas with respect to a backhaul-capable service. The FNPRM even suggests at one point that it may be appropriate to subject a provider to “heightened regulation” in geographic markets where that provider has “a near-ubiquitous network,” regardless of whether that network relies on HFC, fiber, or other technologies—and, in turn, regardless of the capabilities of the facilities in question.¹¹⁸

But the purported logic of supporting 5G by regulating HFC-based services breaks down entirely when confronted with technical and marketplace realities. First and foremost, wireless carriers—whose demands will shape the backhaul marketplace irrespective of what regulations the Commission adopts—do not view EoHFC services as viable alternatives for cellular backhaul, especially for 5G applications. As explained in the attached White Paper by Bob Azzi (former Chief Network Officer at Sprint) and Von McConnell (longtime Executive Director at Sprint’s Innovation and Advanced Analytics Labs), HFC-based services are not serious backhaul options for 5G networks—or even for today’s 4G networks.¹¹⁹

While today’s bandwidth-intensive wireless marketplace requires high-speed and highly reliable backhaul services, HFC-based services simply do not offer the speeds or reliability that wireless carriers seek.¹²⁰ Comcast’s EoHFC service, like other dedicated HFC-based services in the industry, is limited to 10x10 Mbps¹²¹—far below the minimum symmetrical speeds of 50x50 Mbps that carriers require for backhaul applications today, let alone the much higher capacity

¹¹⁷ See, e.g., FNPRM ¶¶ 61, 249.

¹¹⁸ *Id.* ¶ 309 n.723.

¹¹⁹ See Bob Azzi and Von McConnell, “Business Data Services and the Future of Wireless 5G,” at 12-14, attached hereto as Exhibit G (“Azzi/McConnell White Paper”).

¹²⁰ *See id.*

¹²¹ Comcast Mar. 25 Ex Parte at 3; Allen Decl. ¶ 7.

that likely will be required to support 5G networks.¹²² Moreover, to the extent that EoHFC services are provided pursuant to service level agreements (“SLAs”), those SLAs offer less robust guarantees (*e.g.*, on availability) than fiber SLAs.¹²³ Nor do HFC networks have the capacity to scale to carry large quantities of wireless broadband traffic, given their predominant use in transmitting traditional video and best-efforts Internet access traffic.¹²⁴ In light of these limitations, wireless carriers generally do not view cable-provided HFC-based services as a realistic substitute for fiber-based backhaul connections.¹²⁵ Instead, wireless carriers predominately seek out fiber-based backhaul solutions, which provide dedicated, high-bandwidth connections pursuant to SLAs committing to increased availability and performance requirements.¹²⁶

The record in this proceeding bears out Comcast’s experiences in the marketplace and the expert judgment of Messrs. Azzi and McConnell. The FNPRM itself notes that “Sprint, a purchaser of wireless backhaul transit services, . . . describes Ethernet over HFC as a poor substitute for fiber-based services.”¹²⁷ The Sprint filing cited in the FNPRM goes on to explain that EoHFC services “are not available to every business location, including many in proximity

¹²² See Allen Decl. ¶ 7; *see also* Azzi/McConnell White Paper at 1-2, 13-14.

¹²³ See Allen Decl. ¶ 7; *see also* Azzi/McConnell White Paper at 13.

¹²⁴ See Allen Decl. ¶ 8.

¹²⁵ See Azzi/McConnell White Paper at 12-14. Notably, while Comcast’s EoHFC products have achieved relatively minimal sales overall, those sales have generally been limited to the retail BDS marketplace. See Guillaume Decl. ¶ 6.

¹²⁶ See Azzi/McConnell White Paper at 13; *see also* Allen Decl. ¶ 6. Indeed, as noted above, wireless carriers increasingly are interested in securing backhaul capacity by leasing *dark fiber*, which is not even a “service” (let alone a “telecommunications service”) and thus would not be subject to any of the FNPRM’s regulatory proposals.

¹²⁷ FNPRM ¶ 202.

to cable companies’ traditionally residential footprint, nor to most wireless towers.”¹²⁸

Moreover, “even where access is available,” EoHFC services cannot substitute for ILEC special access services “{ {

}}.”¹²⁹ According to Sprint, “{ {

}}.”¹³⁰ The May 24 Sprint filing includes a lengthy declaration by network planner Ed Carey, corroborating the letter’s characterization of HFC-based services as { { } }.¹³¹

Other industry players, including leading purchasers of wholesale services, have reached the same conclusions about HFC-based services. Level 3, for instance, filed a letter on April 14, 2016 explaining that it “does not consider Ethernet-over-HFC service to be competitive with the dedicated services that Level 3 sells,” including fiber-based backhaul services.¹³² Level 3 noted in particular that, in its experience, “Ethernet-over-HFC is not typically offered subject to SLAs with performance commitments for jitter,” and that “[e]ven the jitter objectives for Ethernet-over-HFC are set at levels that are significantly higher (*i.e.*, at lower performance levels) than the commitments typically made by Ethernet providers under SLAs and at levels that are too high to reliably support real-time applications” such as wireless voice and high-speed data

¹²⁸ Letter of Jennifer Bagg, Counsel to Sprint Corp., WC Docket Nos. 05-25 and 15-247, at 2 (filed Mar. 24, 2016) (“Sprint Mar. 24 Ex Parte”).

¹²⁹ *Id.*

¹³⁰ *Id.*

¹³¹ *See id.*, Attachment B, Second Declaration of Ed Carey.

¹³² Letter of Thomas Jones, Counsel for Level 3 Communications, LLC and EarthLink, Inc., WC Docket No. 05-25, at 1 (filed Apr. 14, 2016).

transmission.¹³³ Other competitive LECs, including Birch, BT Americas, XO, and Windstream, likewise have noted that cable providers’ “HFC-based services are not substitutes” for fiber-based backhaul.¹³⁴ Even INCOMPAS—the trade group leading the charge for expanded regulation of BDS services—noted as recently as February 2016 that cable HFC-based services “are not regarded by most purchasers as substitutes for special access dedicated circuits at guaranteed levels,” citing earlier filings by wireless carriers indicating that such services are “unsuitable” for “wireless macrocell-site backhaul needs or as wholesale inputs to . . . core retail services.”¹³⁵

While most of the relevant filings in this proceeding to date have focused on the unsuitability of HFC-based services for *current* wireless backhaul needs, it also is clear that such services are even less suited to supporting *future* 5G services. Based on its customer interactions and sales experience, Comcast does not expect that its HFC network will offer any significant advantages vis-à-vis other potential providers of 5G backhaul services.¹³⁶ Even though 5G is likely to be a more distributed wireless service with smaller cell sites, there is no expectation among purchasers of backhaul services that cable providers’ HFC-based services, even assuming

¹³³ *Id.* at 2 (citing Comcast’s EoHFC offerings).

¹³⁴ Comments of Birch, BT Americas, EarthLink, and Level 3, WC Docket No. 05-25, at 27 (filed Jan. 22, 2016); *see also* Comments of XO Communications, WC Docket No. 05-25, at 39 (filed Jan. 27, 2016) (“[W]hile cable companies may in the long run have the potential to be robust competitors in the Dedicated Services market, they should not be considered rapid entrants.”); Comments of Windstream Services, WC Docket No. 05-25, at 23 (filed Jan. 28, 2016) (“Windstream Comments”) (“CLECs will continue to represent the main source of competition to ILECs in dedicated services markets, even if cable providers make further inroads in best efforts services markets.”).

¹³⁵ Reply Comments of INCOMPAS, WC Docket No. 05-25, at 15-16 & n.58 (filed Feb. 19, 2016) (internal citations omitted).

¹³⁶ *See* Allen Decl. ¶¶ 6-7.

they continue to improve, will keep pace with the massive bandwidth and performance needs of 5G networks.¹³⁷

Instead, the migration to 5G will require wireless carriers to rely all the more heavily on fiber-based backhaul connections.¹³⁸ Standard-setting bodies call for speed and performance levels for 5G backhaul that can only be met by fiber and other more robust technologies.¹³⁹ Wireless providers likewise have told the Commission in the *Spectrum Frontiers* proceeding that fiber—as opposed to HFC plant—will be the key ingredient to ensuring sufficient backhaul for 5G deployments. For example, CITA – The Wireless Association has explained that “[t]he 5G standards will require increased capacity and data throughput to allow new services to be delivered to consumers,” and emphasized “the need for *fiber* backhaul to enable these deployments.”¹⁴⁰

And even for these fiber-based connections, cable providers’ *lit* fiber services are not essential to—and may not even end up relevant to—the future of 5G. As noted in the White Paper of Messrs. Azzi and McConnell, wireless carriers increasingly are turning to leasing *dark* fiber as their preferred backhaul solution—a trend that will only accelerate as the nation transitions to 5G.¹⁴¹ Comcast has witnessed this shift firsthand; wireless providers that have approached Comcast for backhaul in recent months are increasingly demanding long-term leases

¹³⁷ See generally Azzi/McConnell White Paper.

¹³⁸ See Azzi/McConnell White Paper at 6-7.

¹³⁹ See *id.*

¹⁴⁰ See Letter of Scott K. Bergmann, CTIA – The Wireless Association, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 14-177, at 1 (filed Oct. 14, 2015) (emphasis added).

¹⁴¹ See Azzi/McConnell White Paper at 12, 14.

of dark fiber facilities.¹⁴² Verizon in particular has been avidly pursuing dark fiber backhaul solutions; just two months ago, press reports indicated that dark fiber is at the centerpiece of Verizon’s 5G backhaul plans.¹⁴³ Sprint likewise has said that its “backhaul strategy” for 5G and small cell projects consists of “dark fiber and microwave radio” solutions, with no mention of cable providers’ HFC-based or lit fiber Ethernet services.¹⁴⁴ And, as small cell locations increase in number, Comcast expects that there, too, demand principally will be for dark fiber.¹⁴⁵ Thus, not only are cable providers’ HFC-based services unlikely to play a key role in the Commission’s 5G goals, but their lit fiber services also may not be significant inputs for 5G providers in the long run.

These facts conclusively demonstrate that cable providers’ HFC networks, far from conferring market power or warranting strict regulatory oversight, play a bit part in the BDS marketplace overall, and are irrelevant to the Commission’s key goal of promoting the development of next-generation services like 5G. Nor does the FNPRM identify any basis to conclude that cable providers have market power with respect to fiber-based BDS (which itself is playing a diminishing role in wireless backhaul). Indeed, even accounting for all forms of BDS offered by cable providers (fiber- and HFC-based), the FNPRM finds that cable providers accounted for “less than 5% of all sales” in the BDS marketplace in 2013, and projects that by

¹⁴² See Allen Decl. ¶ 6.

¹⁴³ See Sean Buckley, *Verizon’s 5G Plans Could Spell Dark Fiber Opportunities for Zayo, Level 3, Others*, FierceTelecom, Apr. 26, 2016, available at http://www.fiercetelecom.com/story/verizons-5g-plans-could-spell-dark-fiber-opportunities-zayo-level-3-others/2016-04-26?utm_medium=rss&utm_source=rss&utm_campaign=rss.

¹⁴⁴ See Sue Marek, *Sprint Will Use 2.5 GHz Spectrum, Dark Fiber for Backhaul to Small Cells*, FierceWireless, Jan. 26, 2016, available at <http://www.fiercewireless.com/story/sprint-will-use-25-ghz-spectrum-dark-fiber-backhaul-small-cells/2016-01-26>.

¹⁴⁵ See Allen Decl. ¶ 5.

the end of 2016 cable BDS revenues will “still [be] less than eight percent of [total] BDS revenues.”¹⁴⁶ Comcast itself has achieved less than {{ }} revenue share for sales to Fortune 1000 firms.¹⁴⁷ There is simply no conceivable rationale for subjecting Comcast and other cable BDS providers to rate regulation on these undisputed facts.

2. *Subjecting Competitive BDS Providers to Rate Regulation Would Cause Significant Harms and Depart Dramatically from Precedent*

Imposing rate regulation on cable BDS providers and other new entrants would only thwart competitive entry and investment in the BDS marketplace just when it may be most needed to support 5G. While the Commission points to the “goals of promoting competition and investment” in the FNPRM,¹⁴⁸ it should be obvious that imposing rate regulation on nascent competitors would directly undercut those core objectives. Chairman Wheeler has acknowledged the basic principle that regulating rates for broadband services inevitably leads to lower investment and less competition. When the Commission adopted the *2015 Open Internet Order*, he pledged that there would be “no rate regulation, no tariffs, no last-mile unbundling” for broadband services and facilities, precisely because eschewing such measures would “preserve incentives for broadband operators to invest in their networks,” and “provide returns necessary to construct competitive networks.”¹⁴⁹ Imposing rate regulation on competitive providers of business broadband services would irrationally disregard the time-tested logic underlying that pledge. Indeed, subjecting new entrants to rate regulation not only would be incoherent as a policy matter; as discussed below, it would run counter to the Commission’s

¹⁴⁶ FNPRM ¶ 218.

¹⁴⁷ See Stemper Decl. ¶ 6.

¹⁴⁸ FNPRM ¶ 271.

¹⁴⁹ Tom Wheeler, *This Is How We Will Ensure Net Neutrality*, Wired.com (Feb. 4, 2015), available at <http://www.wired.com/2015/02/fcc-chairman-wheeler-net-neutrality/> (“Wheeler Feb. 4, 2015 Op-Ed”).

repeatedly expressed view that such an approach would undermine competitive entry and investment.

Perhaps the most direct illustration of the harms posed by the proposal to rate-regulate new BDS entrants is the impact that such an approach would have on Comcast's allocation of capital among its many business units and on its pursuit of specific BDS opportunities. Comcast regularly reassesses the allocation of its investments between and among its different business units and makes decisions on how to apportion its capital based on multiple factors, including among other things the expected rate of return for specific investments.¹⁵⁰ Comcast generally is more willing to invest (both in the form of capital and operations expenditures, and in terms of executive attention) in business units that deliver an attractive return on investment (relative to other opportunities) or that offer the potential for future growth, than in business units where the future is more clouded.¹⁵¹ A critical factor in predicting a business opportunity's expected return on investment is whether the opportunity faces restraints on its potential growth, including governmental regulatory restraints.¹⁵² Where such restraints are present, Comcast is substantially more likely to devote its capital to opportunities elsewhere in the company.¹⁵³

Accordingly, when evaluating opportunities in the BDS marketplace, Comcast considers whether and to what extent increased regulatory risks and burdens—including the potential imposition of rate regulation on competitive BDS providers—might render continued investments less attractive than other business opportunities that compete for capital.¹⁵⁴ Just as

¹⁵⁰ See Raj Decl. ¶ 6.

¹⁵¹ See *id.* ¶ 7.

¹⁵² See *id.* ¶ 8.

¹⁵³ See *id.* ¶ 9.

¹⁵⁴ See *id.*

Comcast’s cable subsidiary must take into account the regulatory landscape in assessing how much capital to devote to BDS vis-à-vis its other lines of business (including residential offerings of video, broadband Internet access, and voice services), the company as a whole must make similar judgments in allocating capital among the cable business, NBCUniversal, and their attendant business segments.¹⁵⁵ Increased regulatory risks affecting one line of business tend to make other lines of business more attractive and thereby influence the flow of capital away from any business units facing increased regulatory risks.¹⁵⁶

The prospect of rate regulation would have a direct and material effect on Comcast’s decision-making process with respect to specific BDS opportunities. When Comcast receives a request to provide business data services to a new location or considers proactive line extensions, the company applies a financial rate-of-return model to determine whether extending facilities would be economically justified.¹⁵⁷ This model—{{

}}—is designed to allow the company to make prudent allocations of the capital that has been allotted each year to building connections to new customers.¹⁵⁸ {{

}}¹⁵⁹ Also, as noted above, Comcast faces particular challenges in meeting its targeted return on investment in low-density areas where it may be more difficult to capture business from multiple customers using a single build. {{

¹⁵⁵ See *id.*

¹⁵⁶ See *id.*

¹⁵⁷ See Victor Decl. ¶ 3.

¹⁵⁸ See *id.* ¶¶ 3-5.

¹⁵⁹ See *id.* ¶ 5.

}}.¹⁶⁰

A government-imposed price cap would reduce the projected revenues for opportunities in areas where the price cap applies, thereby reducing the rate-of-return and thus the likelihood that Comcast would pursue opportunities in those areas. As the attached declaration of Professor Mayo explains, economic models strongly indicate that the imposition of rate caps would have substantially reduced the network build-out Comcast undertook in recent years and would materially curtail such build-out in the future.¹⁶¹ In particular, Dr. Mayo finds that, for a representative set of recent cell backhaul opportunities, if a price cap of just 10 percent below the actual price had been imposed on Comcast for those opportunities, {{ fiber build-outs likely would not have occurred.¹⁶² Dr. Mayo likewise concludes that such price caps would stifle future build-outs to at least the same degree.¹⁶³

Of course, the purportedly “non-competitive” areas in which the Commission proposes to apply price caps are precisely the markets in which, under the FNPRM’s logic, competitive entry for BDS is most needed. Thus, rather than providing a mechanism for promoting economic efficiency in the provision of BDS, applying price cap regulation to competitive BDS providers would perversely harm supply in the market, preclude consumer choice, diminish investment, and harm service quality.¹⁶⁴ As Dr. Mayo explains, such an approach “would almost certainly

¹⁶⁰ See *id.* ¶ 8.

¹⁶¹ See Mayo Decl. ¶¶ 86-94.

¹⁶² See *id.* ¶ 90.

¹⁶³ See *id.*

¹⁶⁴ See *id.* ¶ 12.

fail to produce economic benefits and, in fact, would perversely prolong any monopoly power the Commission seeks to eliminate.”¹⁶⁵

The Commission itself has long recognized not only the fundamental irrationality of imposing rate regulation on non-dominant BDS providers, but also the profound competitive harms that regulating new entrants invariably causes. For decades—dating back to the First Report and Order in the *Competitive Common Carrier* proceeding in 1980—the Commission has distinguished between carriers that have market power (dominant carriers) and those that do not (non-dominant carriers), and imposed most price regulation only on dominant carriers with the power to impose supracompetitive prices, while minimizing such obligations on non-dominant providers. As the Commission explained in that Order, price regulation of non-dominant firms was neither necessary nor appropriate because “the well-established teachings of modern welfare economics” hold that “a firm without market power does not have the ability or incentive to price its services unreasonably, to discriminate among customers unjustly, to terminate or reduce service unreasonably or to overbuild its facilities.”¹⁶⁶ The Commission accordingly ruled that “it would defy logic and contradict the evidence available to regulate in an identical manner carriers who differ greatly in terms of their economic resources and market strength,” further observing that “[t]he Commission has often taken this fundamental incongruity into account in fashioning its regulations and reaching its decisions.”¹⁶⁷

The Commission went on to explain in that Order that exempting non-dominant carriers from *ex ante* rate regulation not only made sense, but affirmatively served the public interest.

¹⁶⁵ *See id.*

¹⁶⁶ *Policy and Rules Concerning Rates for Competitive Common Carrier Services and Facilities Authorizations Therefor*, First Report and Order, 85 FCC 2d 1 ¶ 55 (1980) (“*First Competitive Common Carrier Report and Order*”).

¹⁶⁷ *Id.* ¶ 34.

The reason, according to the Commission, was that leaving non-dominant providers free of constraints directly “enhance[s] competition.”¹⁶⁸ According to the Commission, this approach gives non-dominant carriers the “flexibility” to “experiment with price/service offerings,” “enter new markets quickly where they perceive competitive opportunities exist,” or “leave others on relatively short notice if their projections are not realized.”¹⁶⁹ By contrast, the Commission acknowledged, imposing prescriptive rate regulation on non-dominant carriers would hinder such carriers’ efforts “to establish [themselves] in the market.”¹⁷⁰

Over the years and in other contexts, the Commission has recognized the same need to promote competitive entry and investment in rejecting calls to impose *ex ante* rate regulation on nascent providers. For example, in determining that it should forbear from applying *ex ante* rate regulation to Commercial Mobile Radio Service (“CMRS”) providers, the Commission stressed that a light regulatory touch would promote robust competition among CMRS providers by shielding them from the economically harmful effects of unnecessary common carrier regulation.¹⁷¹ The Commission noted in particular that imposing *ex ante* rate regulation on CMRS providers likely would have substantial anticompetitive effects, by (1) interfering with “rapid, efficient responses to changes in demand and cost, and remove incentives for carriers to introduce new offerings”; (2) “imped[ing] and remov[ing] incentives for competitive price discounting”; and (3) “increas[ing] rates for consumers.”¹⁷² The Commission accordingly

¹⁶⁸ *Id.* ¶ 33.

¹⁶⁹ *Id.* ¶ 85.

¹⁷⁰ *Id.* ¶ 36.

¹⁷¹ *See generally Implementation of Sections 3(n) and 332 of the Communications Act, Regulatory Treatment of Mobile Services, Second Report and Order, 9 FCC Rcd 1411 (1994) (“CMRS Forbearance Order”).*

¹⁷² *Id.* ¶ 177.

concluded that refraining from *ex ante* rate regulation would strongly *advance* the expansion of competition and related consumer benefits, whereas imposing such regulation would threaten to impede investment and innovation and thereby undermine the public interest when applied to competitive industries.

Policymakers have refrained from regulating the rates of competitive providers even in contexts where incumbent providers are subject to rate regulation, and the result has been a steady expansion of competition in those markets. In the video arena, for example, while Congress and the Commission subjected cable operators to rate regulation in the 1980s and 1990s under the theory that cable operators had “substantial market power at the local distribution level,”¹⁷³ other video providers—including direct broadcast satellite (“DBS”) providers and, more recently, online video distributors (“OVDs”)—have never been subject to *ex ante* rate regulation.¹⁷⁴ Today, these competitive video providers are thriving; as the cable industry overall has seen steady declines in video subscribers, the two DBS providers, DIRECTV and DISH, have had a “ubiquitous nationwide presence” for years and together had “captured approximately 25.6 percent of U.S. households” as of 2013,¹⁷⁵ while OVDs count among their number the largest video distributor in the country, Netflix, with more than double

¹⁷³ *Implementation of Section 19 of the Cable Television Consumer Protection & Competition Act of 1992*, First Report, 9 FCC Rcd 7442 ¶ 13 (1994).

¹⁷⁴ If the test for whether to impose rate regulation in the video context had been “widespread presence” in the marketplace, as the FNPRM suggests for the BDS context, that standard perversely would have led to imposing rate regulation on DBS providers and OVDs as well.

¹⁷⁵ *Amendment to the Commission’s Rules Concerning Effective Competition; Implementation of Section 111 of the STELA Reauthorization Act*, Report and Order, 30 FCC Rcd 6574 ¶¶ 8, 9 n.48 (2015) (“*2015 Effective Competition Order*”).

the subscribership of any cable company.¹⁷⁶ Similarly, the Commission has studiously avoided subjecting providers of voice over Internet Protocol (“VoIP”) services to the same *ex ante* rate regulation that applies to incumbent LECs.¹⁷⁷ Here, too, this policy has proven extremely successful in enabling lightly regulated entrants to make significant inroads against incumbents; indeed, according to a recent Commission report, the number of residential non-ILEC interconnected VoIP lines is now roughly equal to the number of residential ILEC switched access lines in the country.¹⁷⁸

Just as Commission precedent confirms the clear benefits of shielding new entrants from rate regulation, the Commission’s historical experience in *applying* rate regulation—even with respect to dominant firms—demonstrates the substantial risk of counterproductively chilling investment and impeding entry. For instance, the Commission’s TELRIC scheme for regulating the rates charged by ILECs for leasing unbundled network elements to competitive providers has long been criticized for hindering the development of facilities-based competition in the telecommunications marketplace. Leading academics and economists observed in the early 2000s that TELRIC pricing dramatically reduced ILECs’ ability to raise capital for infrastructure

¹⁷⁶ See Netflix Letter to Shareholders, *available at* http://files.shareholder.com/downloads/NFLX/2240143589x0x886428/5FB5A3DF-F23A-4BB1-AC37-583BAEF2A1EE/Q116LettertoShareholders_W_TABLES_.pdf (reporting that Netflix had 47 million U.S. video subscribers as of Q1 2016); compare Comcast Corp., “Comcast Reports 1st Quarter 2016 Results,” Apr. 27, 2016, *available at* <http://www.cmcsa.com/releasedetail.cfm?ReleaseID=967022> (reporting that Comcast had 22.4 million U.S. video subscribers as of Q1 2016).

¹⁷⁷ See, e.g., *Vonage Holdings Corp. Petition for Declaratory Ruling Concerning an Order of the Minnesota Public Utilities Commission*, Memorandum Opinion and Order, 19 FCC Rcd 22404 ¶ 21 (2004) (preempting state tariffing obligations for VoIP service).

¹⁷⁸ See FCC, *Voice Telephone Services: Status as of December 31, 2014*, at 3 (rel. Mar. 2016), *available at* https://apps.fcc.gov/edocs_public/attachmatch/DOC-338629A1.pdf (reporting that, as of December 2014, there were 28,738,000 residential non-ILEC interconnected VoIP lines in the United States, compared with 29,937,000 residential ILEC switched access lines).

improvements, and invited potential competitors to engage in regulatory gamesmanship rather than build out their own facilities.¹⁷⁹ The TELRIC example is particularly instructive because there, as here, the Commission was seeking to regulate *inputs* to competitive services.

Similarly, in the video context, the renewed application of rate regulation to cable operators in the early 1990s led to stagnant revenues and impaired access to capital, with “many cable companies” at the time “finding it difficult to obtain the billions of dollars needed . . . to upgrade their headends, finish installing fiber, and expand their use of digital compression technology.”¹⁸⁰ Cable stock prices dropped by six percent between September 1993 and February 1995, compared to the six to seven percent increase in the S&P 500 index and the NASDAQ composite during that period.¹⁸¹ This downturn had a direct and negative impact on cable operators’ capital expenditure programs and the ability to invest in programming.¹⁸² Notably, when the Commission recently took steps to reduce the burdens associated with cable rate regulation, including by establishing a presumption that rate regulation does not apply absent

¹⁷⁹ See, e.g., Thomas M. Jorde, J. Gregory Sidak, and David J. Teece, *Innovation, Investment, and Unbundling*, 17 YALE J. ON REG. 1, 8-9 (2000). Notably, in a 2003 letter to the Commission, a bipartisan group of House lawmakers explained that TELRIC pricing for unbundled network elements “only served to undermine investment and delay the emergence of true facilities-based competition” and accordingly harmed the public interest. Letter from Reps. John Dingell, Fred Upton, and Billy Tauzin to Michael Powell, Chairman, Federal Communications Commission (Jul. 29, 2003), *available at* <http://apps.fcc.gov/ecfs/document/view?id=6515282066>. As the Members of Congress noted in their letter, testimony before the House indicated that “investment by telecommunications carriers ha[d] declined by some \$60 billion” between 2000 and 2003, “which correspond[ed] with the period when prices set initially under TELRLC were slashed again. *Id.*”

¹⁸⁰ See Hearing on the Telecommunications Policy Reform, Hearing of the Committee on Commerce, Science, and Transportation, United States Senate, 104th Congress, 1st Session, S. Hrg. 104-216, at 12-15, 25 (Mar. 21, 1995).

¹⁸¹ *Id.* at 13.

¹⁸² See Telecommunication Competition and Deregulation Act of 1995, Senate Committee Report, 104th Congress, 1st Sess., S. Rep. 104-23 (Mar. 27, 1995).

an affirmative showing that the cable operator is not subject to effective competition,¹⁸³ Chairman Wheeler acknowledged the harms posed by the application of rate regulation to cable operators. He noted, among other things, that “the average rate for basic service is *lower* in communities with a finding of Effective Competition than in those without such a finding,” and observed that “[t]his is not surprising since competitive choice is the most efficient market regulator.”¹⁸⁴ The Commission likewise should not be surprised if any expansion of rate regulation in the BDS marketplace undermines rather than supports competition.¹⁸⁵

Economics literature likewise teaches that price regulation is poor substitute for competition, and in fact discourages the development of competition.¹⁸⁶ As Dr. Mayo explains, “[t]here is simply no support within the body of economic research for imposing price cap regulation on an entire market of competitors, including new entrants that, under any conceivable interpretation, do not enjoy monopoly power.”¹⁸⁷ Even outside the communications context, “history is replete with the economic harm caused by market-wide price controls.”¹⁸⁸ For example, “the imposition of price controls on retail gasoline markets in the 1970s” drastically

¹⁸³ 2015 *Effective Competition Order* ¶ 6.

¹⁸⁴ See *id.* at 6607 (Statement of Chairman Tom Wheeler) (emphasis added).

¹⁸⁵ As current FCC General Counsel Jonathan Sallet observed in a 2011 paper on Internet regulation, “[i]n today’s dynamic and complex Internet market, regulators . . . run the risk of inadvertently stifling innovation and competition by incorrectly predicting sources of competition or economic incentives that favor new value propositions.” Jonathan Sallet, *The Internet Ecosystem and Legal Regimes: Economic Regulation Supporting Innovation Dynamism*, at 3 (Nov. 11, 2011), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1957715. Accordingly, “where the source and nature of innovation and competition are unpredictable, such prescriptive rules have a high cost to consumer welfare because regulatory processes cannot effectively predict the future.” *Id.* at 25-26.

¹⁸⁶ See Mayo Decl. ¶ 81.

¹⁸⁷ *Id.*

¹⁸⁸ *Id.* ¶ 82.

“reduced the quantity of gasoline supplied,” and is widely regarded today as having been a “very poor economic policy.”¹⁸⁹ Experiments in market-wide rate regulation in the natural gas and freight rail shipment industries similarly led to “massive under-investment” and caused Congress to move aggressively to deregulate those industries.¹⁹⁰

Moreover, as Dr. Farrell explains, these risks are especially pronounced in the BDS marketplace. He points to substantial evidence that “informed industry players expect entry to respond significantly to incentives” in the BDS marketplace, and that “there are likely to be many locations where incentives for entry are on the cusp.”¹⁹¹ Imposing rate regulation on potential new entrants would negatively “affect [providers’] entry decisions” by greatly disrupting these incentives and pulling new entrants back from the “cusp” of entering many markets.¹⁹² Indeed, “[b]ecause BDS costs vary by locations, and because customers demand customized BDS products,” price regulation would be particularly inappropriate in this fragile and still nascent marketplace.¹⁹³ And “putting a thumb on the scales in the direction of lower price and less innovation/competition for any one carrier-customer relationship, as price regulation is likely to do, will tend to reduce innovation and competition available to other customers.”¹⁹⁴

189 *Id.*

190 *Id.* ¶ 84.

191 Farrell Decl. ¶ 94.

192 *Id.* ¶ 99.

193 *Id.* ¶ 62.

194 *Id.* ¶ 110.

In the face of its own extensive and successful precedent, the Commission now simply declares, “It is time for a new start.”¹⁹⁵ But the passage of time cannot be a reasoned basis for abandoning such well-settled and highly effective public policy and economic principles. In sum, there is simply no basis for the Commission to conclude that imposing rate regulation on cable BDS providers would promote competitive entry or investment in any way. To the contrary, every indication—from basic economics to the history of communications regulation—confirms that subjecting cable BDS providers to rate regulation would significantly harm competition in this marketplace. In a world where cable BDS providers are newly subject to prescriptive rate regulation for those services, fewer cable BDS providers would choose to expand their efforts to compete with incumbent providers, leaving BDS customers with less choice than they have today (not to mention substantially reducing competition-driven incentives for incumbent providers to improve their networks and pricing). While Sprint complains in a recent filing that it “did not receive *any* bids from any provider at {{ }} of its cell site locations,”¹⁹⁶ the percentage of no-bid or one-bid cell sites undoubtedly would *increase* if rate regulation were extended to all new entrants in markets deemed to be insufficiently competitive. That outcome would be particularly harmful to the Commission’s efforts to pave the way for bandwidth-intensive 5G services.

3. *The FNPRM’s Rate Regulation Proposal Relies on a Flawed Approach to Assessing Competition*

Even apart from the unprecedented proposal to regulate non-dominant providers’ rates, the specific proposed criteria for doing so under the contemplated “Competitive Market Test” would only compound the problems. To begin with, the FNPRM’s proposal for identifying

¹⁹⁵ FNPRM ¶ 4.

¹⁹⁶ Letter of Paul Margie, Counsel to Sprint Corp., to Marlene Dortch, Secretary, FCC, WC Docket No. 05-25, at 2 (filed Jun. 3, 2016).

markets where a provider has “market power” not only is woefully short on specifics, but also appears to ignore established antitrust principles and Commission precedent. Prior to this FNPRM, the Commission consistently has employed the traditional and time-tested definition of market power as “the ability to raise and maintain prices above the competitive level without driving away so many customers as to make the increase unprofitable.”¹⁹⁷ The Commission even acknowledges in the FNPRM that this traditional conception of market power is consistent with the definition “generally adopted” by “antitrust enforcement agencies and courts.”¹⁹⁸ Yet the FNPRM proposes to dispense with traditional antitrust analysis of market power—and with the Commission’s historical approach to evaluating market power—and to replace it with new form of “regression analysis” that the Commission asserts is “more direct.”¹⁹⁹ And as discussed in the attached report by Dr. Mayo,²⁰⁰ the Commission’s proposed approach is “more direct” only in the sense that it takes impermissible shortcuts in the competitive analysis.²⁰¹

The factors the Commission proposes to consider in its regression analysis are deeply misguided.²⁰² If, for example, the Commission were to look to *business density* to predict the

¹⁹⁷ *Policy and Rules Concerning Rates for Competitive Common Carrier Services and Facilities Authorizations Therefor*, Fourth Report and Order, 95 FCC 2d 554 ¶ 7 (1983), vacated on other grounds, *AT&T v. FCC*, 978 F.2d 727 (D.C. Cir. 1992); see also *First Competitive Common Carrier Report and Order* ¶ 56 (“Market power refers to the control a firm can exercise in setting the price of its output,” often by “setting price above competitive costs in order to earn supranormal profits.”).

¹⁹⁸ FNPRM ¶ 187 n.479.

¹⁹⁹ *Id.* ¶ 188.

²⁰⁰ See Mayo Decl. ¶¶ 68-78.

²⁰¹ See, e.g., FNPRM ¶ 210 n.543 (“We are less concerned to use market definitions as a first step in estimating market power (for example, that could be necessary if concentration measures were to be used) because we believe regression analysis such as that presented in the Rysman White Paper and the Baker Declaration, can directly show the presence or absence of market power.”).

²⁰² See Mayo Decl. ¶ 48.

“presence, or likelihood, of competition,”²⁰³ that assessment of *demand* would do nothing to justify regulating new entrants. Indeed, looking only at demand in a market would entirely ignore the level of competitiveness on the *supply* side. And by severely chilling such providers’ incentive to invest in additional or upgraded facilities, the Commission would all but ensure that demand would exceed supply on a long-term basis.²⁰⁴ That outcome would prevent the Commission from harnessing market forces to deliver benefits to BDS purchasers,²⁰⁵ which the FNPRM identifies as a key objective.²⁰⁶

It would be equally problematic simply to count the number of competitors currently serving a particular geographic area.²⁰⁷ Given that competitive providers typically deploy fiber to businesses only in response to specific requests for service, any test that simply looks to the number of existing carriers’ serving customers—whether in a building, census block, or broader geographic area—risks systematically understating the extent of competition by improperly excluding potential competitors with a *present* ability to enter.²⁰⁸ Notably, while the FNPRM nominally acknowledges the importance of “potential competition” in the BDS marketplace,²⁰⁹ the contemplated “number of competitors” test as framed in the FNPRM would improperly discount such competition. Indeed, competitive facilities-based providers with the ability to

²⁰³ FNPRM ¶ 293.

²⁰⁴ *See* Mayo Decl. ¶¶ 86-94.

²⁰⁵ *See* Farrell Decl. ¶ 5 (noting that “competitive incentives work toward efficient product quality as well as cost savings,” whereas “concerns about price cap regulation arise with respect to entry decisions and supply of product innovation”).

²⁰⁶ *See* FNPRM ¶ 186 (expressing a “deeply rooted preference for preserving and enhancing competition”); *see also id.* ¶¶ 5, 159.

²⁰⁷ *See id.* ¶ 294.

²⁰⁸ *See* Mayo Decl. ¶¶ 50-58.

²⁰⁹ FNPRM ¶ 292.

extend connections to business locations in the relevant geographic market are more properly described as *actual* competitors than potential competitors, regardless of the extent of their success in attracting customers.²¹⁰

On top on these methodological issues with the Commission’s proposed analysis, the Commission relies on stale data from 2013 that fails to account for the significant growth in competition over the past three years. As Dr. Mayo explains, the marketplace has seen substantial “growth in demand” for BDS particularly for “high bandwidth services”²¹¹—which, in turn, has accelerated “entry and growth by cable companies, CLECs, and other providers.”²¹² This competitive response to increased BDS demand has included substantial capacity expansions and investments by BDS providers to build out fiber networks.²¹³ The last three years also have witnessed a demonstrable intensification of “competitive rivalry” among BDS providers in bidding for opportunities across the country.²¹⁴ Accordingly, “both the assessment of competition and the regulatory design anticipated by the Commission suffer immensely from the Commission’s reliance on 2013 data,” particularly given the Commission’s goal of “design[ing] a regulatory oversight mechanism for 2017 and beyond.”²¹⁵

4. *The FNPRM’s Rate Regulation Proposal Would Cause Serious Administrability Problems*

Finally, the FNPRM’s rate regulation proposal would create intractable problems for providers’ contracting with business customers—particularly for new entrants seeking to win a

²¹⁰ See Mayo Decl. ¶¶ 52-58; see also *id.* ¶¶ 103-16 (explaining appropriate measures of competition and market power in the BDS marketplace).

²¹¹ *Id.* ¶ 31; see also *id.* ¶¶ 32-35.

²¹² *Id.* ¶ 31; see also *id.* ¶¶ 36-38.

²¹³ See *id.* ¶¶ 39-45.

²¹⁴ *Id.* ¶ 45.

²¹⁵ *Id.* ¶ 8; see also *id.* ¶ 45.

customer for the first time. Under the approach espoused in the FNPRM, the Commission would turn the map into a checker-board of “competitive” markets and “non-competitive” markets, with prescriptive rate regulation applied to providers in the latter, while market-based rates would prevail in the former.²¹⁶ The administrative difficulties of such an approach are apparent when considering the fact that a significant portion of the BDS marketplace consists of “[m]ulti-location customers”—that is, “customers requir[ing] connections to . . . many sites in diverse locations, often in areas with limited business density,” that prefer to purchase service from a single BDS provider with “a broad regional footprint.”²¹⁷ A provider seeking to serve such a multi-location customer would be faced with the daunting prospect of devising an arrangement that accounts for a hodgepodge of disparate regulatory obligations in geographic markets (whether individual buildings, census blocks, census tracts, or other designated areas) across a region or nationwide. To the extent the Commission ultimately adopts a competition framework dependent on significantly smaller geographic markets than those traditionally used in the special access context (*e.g.*, building-level markets), this problem would be substantially worse for new entrants than it has been for decades for the incumbents. Customers also would find it far more difficult to understand and reconcile the various regulated rates that a BDS provider would be forced to charge in different geographic areas.

The proposal to adopt a three-year cycle for reviewing the competitiveness of markets would further complicate any effort to enter into long-term service contracts with enterprise customers.²¹⁸ The FNPRM notes that, every three years, the proposed “re-application of the

²¹⁶ See FNPRM ¶ 260 (“The proposed technology-neutral framework will apply depending on the classification of a specific market as either competitive or non-competitive.”).

²¹⁷ *Id.* ¶ 201.

²¹⁸ See *id.* ¶ 298.

Competitive Market Test matrix using updated data would likely result in changes to the market delineation established by its prior application,” so that a market previously found to be competitive could be deemed non-competitive during the periodic reassessment, and vice versa.²¹⁹ The resulting prospect that markets would periodically gain or lose their rate-regulated status would cause significant difficulties in attempting to negotiate long-term deals; such arrangements would need to account not only for a patchwork of regulated and market-based rates across the area to be served, but also for the possibility that that patchwork would change over time. Indeed, this approach would create far more uncertainty than the Commission’s prior pricing flexibility regime, in which a market’s status could move in only one direction—from non-competitive to competitive.²²⁰ Overall, the significantly increased transaction costs associated with such an approach would far outweigh the intended benefits, at least as applied to new entrants.

B. The Commission Also Should Refrain from Imposing Wholesale Obligations on Competitive BDS Providers

While the FNPRM focuses overwhelmingly on proposals to apply rate regulation to providers in assertedly “non-competitive” BDS markets, the Commission briefly—and offhandedly—raises the specter of another investment-destroying regulatory measure: imposing Section 251-style wholesale obligations on all “provider(s) in non-competitive markets” in a “technology-neutral manner.”²²¹ As a threshold matter, the FNPRM implicitly acknowledges the fact that Section 251’s resale and wholesale unbundling provisions apply only to “local exchange

²¹⁹ *Id.*

²²⁰ See *Access Charge Reform; Price Cap Performance Review for Local Exchange Carriers*, Fifth Report and Order and Further Notice of Proposed Rulemaking, 14 FCC Rcd 14221 ¶ 68 (1999).

²²¹ FNPRM ¶ 443-44.

carriers”²²²—a category that includes cable providers only to the limited extent they offer local exchange services on a common carrier basis. Moreover, as discussed in Section III *infra*, the other statutory provisions cited in the FNPRM as potential sources of authority for imposing wholesale pricing obligations—Sections 201 and 202 of the Act—apply only to common carriers, and thus are inapplicable to cable BDS providers when they act as private carriers. Still, even if the Commission *were* able to identify some grant of statutory authority that would enable it to mandate resale and unbundling obligations for non-LEC, private carrier services in the BDS marketplace, such a measure would be disastrous as a policy matter for many of the reasons addressed above in connection with the FNPRM’s rate regulation proposals.

For starters, forcing cable BDS providers to provide competitors with access to their unbundled facilities or to allow other providers to resell their service would do little if anything to advance the Commission’s goals of promoting 5G or to foster the “facilities-based competition” that the Commission appears to prefer.²²³ As noted above, the most extensively deployed cable facilities are those that employ HFC technology, which generally is unsuitable for 5G backhaul service and various other bandwidth-intensive applications that business customers demand.²²⁴ Mandating unbundled access to cable providers’ fiber facilities likewise

²²² See *id.* ¶ 443; see also 47 U.S.C. § 251(b)(1) (imposing on “local exchange carriers” a “duty not to prohibit, and not to impose unreasonable or discriminatory conditions or limitations on, the resale of its telecommunications services”); *id.* § 251(c)(3) (imposing on “incumbent local exchange carriers” a “duty to provide, to any requesting telecommunications carrier for the provision of a telecommunications service, nondiscriminatory access to network elements on an unbundled basis”); *id.* § 251(c)(4) (imposing on “incumbent local exchange carriers” a duty to “offer for resale at wholesale rates any telecommunications service that the carrier provides at retail to subscribers who are not telecommunications carriers”).

²²³ See, e.g., FNPRM ¶ 294 (asking whether the Competitive Market Test should “require more than two facilities-based competitors in any area for a competitive trigger”).

²²⁴ See Section II.A.1, *supra*.

would present very little upside; cable providers' fiber lines are deployed far less extensively than ILECs' dedicated lines, and in any event, allowing potential entrants to piggyback on cable BDS facilities would not increase the number of facilities-based competitors capable of providing 5G backhaul or other services.

At the same time, such an approach would have significant adverse consequences that would vastly outweigh any perceived benefits. Chairman Wheeler expressly acknowledged the perils of unbundling mandates in the Open Internet context, asserting that, along with forbearing from *ex ante* rate regulation, there would be “no last-mile unbundling” for broadband services and facilities in order to “preserve incentives for broadband operators to invest in their networks” and “provide returns necessary to construct competitive networks.”²²⁵ The same policy conclusion is even more clearly warranted in the BDS context. Comcast's capital allocation and return-on-investment models leave no doubt that the company would be far less likely to invest in new fiber facilities if it were unable to take full advantage of those facilities to provide BDS services. The prospect of sharing capacity over such facilities with other providers would force Comcast to reduce its revenue projections in connection with those facilities, resulting in a lower expected return on investment and accordingly a diminished incentive to invest in such facilities in the first place. Indeed, if the Commission were to impose *both* rate regulation and mandatory unbundling on cable BDS providers in non-competitive markets, Comcast might well refrain altogether from new fiber deployments in those areas, as the projected return on investment likely would fall well below the company's targets and may even be *negative* in many circumstances. Needless to say, an outcome in which cable BDS providers have severely

²²⁵ Tom Wheeler, *This Is How We Will Ensure Net Neutrality*, Wired.com (Feb. 4, 2015), available at <http://www.wired.com/2015/02/fcc-chairman-wheeler-net-neutrality/> (“Wheeler Feb. 4, 2015 Op-Ed”).

diminished incentives to enter less competitive markets would directly undermine the Commission’s asserted goals in this proceeding.

The harms associated with imposing wholesale obligations on new entrants should be particularly apparent to the Commission in light of past precedent involving the unbundling of incumbent LECs’ broadband-capable facilities. In 2002, the D.C. Circuit struck down a Commission order requiring ILECs to unbundle the high-frequency portion of their copper loops to requesting CLECs for use in providing broadband DSL service.²²⁶ The court explained that “mandatory unbundling comes at a cost, including disincentives to research and development by both ILECs and CLECs and the tangled management inherent in shared use of a common resource,” and that the Commission must “balance” those costs against the asserted need to impose unbundling mandates.²²⁷ According to the court, the Commission could not justify the “cost” of unbundling these ILEC broadband facilities because it could not demonstrate that ILECs were in fact dominant in the residential broadband marketplace. The court pointed in particular to the fact that, as of 2001, “cable companies had 54% of extant high-speed lines in the mass market, almost double the 28% share of asymmetric DSL” offered by ILECs; the court also cited the Commission’s acknowledgment that “[c]ompetitive LECs and cable companies appear[ed] to be leading the incumbent LECs in their deployment of advanced services” at that time.²²⁸ Any effort to impose wholesale unbundling obligations on cable BDS providers and other non-dominant new entrants would reflect the same “naked disregard of the competitive context” that doomed the Commission’s unbundling requirement in that case.²²⁹

²²⁶ *United States Telecom Ass’n v. FCC*, 290 F.3d 415, 428-29 (D.C. Cir. 2002).

²²⁷ *Id.* at 429.

²²⁸ *Id.* (internal citations omitted).

²²⁹ *Id.*

Notably, the Commission recognized the error of its ways in its 2003 order on remand from that D.C. Circuit decision. There, in response to calls from CLECs to extend “unbundling requirements to the packet-based and fiber optic portions of incumbent LEC hybrid loops,” the Commission expressly “decline[d] to require incumbent LECs to unbundle the next-generation network, packetized capabilities of their hybrid loops to enable requesting carriers to provide broadband services.”²³⁰ Critically, the Commission concluded that “applying [S]ection 251(c) unbundling obligations to these next-generation network elements would blunt the deployment of advanced telecommunications infrastructure by incumbent LECs and the incentive for competitive LECs to invest in their own facilities, in direct opposition to the express statutory goals authorized in [S]ection 706.”²³¹ The same logic applies to any proposal to force unbundling of cable BDS facilities. Such a mandate would be unjustifiable based on cable providers’ non-dominant position, would destroy incentives for cable BDS providers to invest in facilities subject to unbundling requirements, and would diminish incentives for other new entrants to build their own facilities.

III. THE COMMISSION LACKS AUTHORITY TO SUBJECT NON-DOMINANT BDS PROVIDERS TO RATE REGULATION AND OTHER RULES

Leaving aside that subjecting non-dominant BDS providers to *ex ante* rate regulation is not justifiable as a matter of policy, it would be unlawful under the Communications Act of 1934, as amended (the “Act”), and the Administrative Procedure Act (“APA”).

²³⁰ See *Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, Report and Order and Order On Remand & Further Notice of Proposed Rulemaking, 18 FCC Rcd 16978 ¶ 288 (2003).

²³¹ *Id.*; see also *id.* ¶ 272 (finding that “relieving incumbent LECs from unbundling requirements for [next-generation] networks will promote investment in, and deployment of, next-generation networks”).

A. The Commission Cannot Compel Comcast To Offer BDS on a Common Carrier Basis

In proposing to assert authority to impose rate regulation on all BDS providers under Title II of the Act, the FNPRM asserts with no basis that *all* “business data services are telecommunications services, regardless of the provider supplying the service,” and that “BDS providers are therefore common carriers” subject to Sections 201 and 202 of the Act.²³² That cavalier assumption is wholly unfounded and unsupportable.

As courts and the Commission have previously explained, an entity may be treated as a common carrier in either of two circumstances: (1) where the provider voluntarily has elected an “indifferent holding out to the eligible user public,” or (2) where there is a “legal compulsion . . . to serve [the public] indifferently” because the entity has market power.²³³ By contrast, where “the carrier chooses its clients on an individual basis and determines in each particular case ‘whether and on what terms to serve’ and there is no specific regulatory compulsion to serve all indifferently, the entity is a private carrier for that particular service and *the Commission is not at liberty to subject the entity to regulation as a common carrier.*”²³⁴ This formulation is echoed in the Act’s definition of “telecommunications service” as “the offering of telecommunications for

²³² FNPRM ¶ 257.

²³³ *Nat. Ass’n of Reg. Util. Comm’rs v. FCC*, 525 F.2d 630, 642 (D.C. Cir. 1976) (“*NARUC I*”); see also *AT&T Submarine Systems, Inc.*, Memorandum Opinion and Order, 13 FCC Rcd 21585 ¶¶ 9, 11 (1998), *aff’d sub nom.*, *Virgin Islands Tel. Corp. v. FCC*, 198 F.3d 921 (D.C. Cir. 1999) (“*Vitelco*”).

²³⁴ *Southwestern Bell Tel. Co. v. FCC*, 19 F.3d 1475, 1481 (D.C. Cir. 1994) (internal citations omitted, emphasis added); see also *Nat. Ass’n of Reg. Util. Comm’rs v. FCC*, 533 F.2d 601, 608-09 (D.C. Cir. 1976) (“*NARUC II*”) (holding that the “primary *sine qua non* of common carrier status is a quasi-public character, which arises out of the undertaking to carry for all people indifferently”).

a fee directly to the public,”²³⁵ and the Act’s general prohibition on subjecting non-common carrier services to common carrier treatment.²³⁶

As discussed below, the Commission cannot demonstrate that all BDS variants it intends to regulate are offered on a common carrier basis, as many such services, including Comcast’s cell backhaul and E-Access transport services, in fact are offered on a private carrier basis. The Commission accordingly would need to make a finding of market power as a prerequisite to compelling a private carrier to operate on a common-carrier basis.²³⁷ The FNPRM is devoid of any notice on the issue of *whether* cable BDS providers *ought* to be compelled to offer BDS on a common carrier basis—thus precluding the Commission from pursuing such an approach in this proceeding absent a further NPRM that properly raises the prospect of such compulsion and the many complex issues it would entail. And in any event, the Commission could not come close to demonstrating that all BDS providers have market power—and certainly not with respect to new entrants like Comcast.

1. Comcast Offers Many of Its BDS Services on a Private Carriage Basis

Courts have long held that, “if one is to draw a coherent line between common and private carriers,” the “essential element” of common carriage is “the characteristic of holding

²³⁵ 47 U.S.C. § 153(53).

²³⁶ *Id.* § 153(51) (“A telecommunications carrier shall be treated as a common carrier under this [Act] only to the extent that it is engaged in providing telecommunications services.”).

²³⁷ Notably, in the D.C. Circuit’s recent decision upholding the Commission’s *2015 Open Internet Order*, the court concluded that the Commission was not obligated to undertake a market power analysis because it properly (in the court’s view) determined that retail broadband Internet access service was offered on a common carrier basis. *See United States Telecom Association v. FCC*, No. 15-1063, slip op. at 45-46 (D.C. Cir. Jun. 14, 2016). Here, there is plainly no basis to conclude that *all* BDS services are offered on a common carrier basis—thus requiring the Commission to make an express finding of market power under established precedent.

oneself out to serve [the public] indiscriminately.”²³⁸ Absent such a “holding out,” the central rationale for common carrier treatment—the notion that the carrier “ha[s] implicitly accepted a sort of public trust by availing themselves of the business of the public at large”—vanishes.²³⁹

As explained above, and as the attached declarations of John Guillaume and David Allen demonstrate, Comcast offers key services at issue—including in particular its cell backhaul and E-Access transport services—on a private carrier basis.²⁴⁰ Comcast chooses its customers for these services “on an individual basis” and provides service subject to individualized arrangements that meet the particular needs of each customer.²⁴¹ These services do not entail an indiscriminate “holding out” of any kind and thus are classic private carrier services.²⁴²

With respect to its cell backhaul services, far from indiscriminately offering transport services to all cellular providers, Comcast makes case-by-case determinations as to whether to offer such services.²⁴³ In addition, Comcast’s cell backhaul agreements are individually negotiated with each of Comcast’s customers, and {{

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²³⁸ *NARUC I*, 525 F.2d at 642.

²³⁹ *Id.* at 641-42.

²⁴⁰ Allen Decl. ¶ 13.

²⁴¹ *Id.*

²⁴² *See NorLight Request for Declaratory Ruling*, Declaratory Ruling, 2 FCC Rcd 132 ¶ 6 (1987) (“*Norlight*”) (according private carrier treatment to a proposed “backbone” service entailing the transmission of “long-haul, intercity and regional communications,” including the carriage of “interexchange traffic” over a “hybrid communications system that will be composed of both radio and fiber optic links”).

²⁴³ Allen Decl. ¶ 13.

²⁴⁴ *Id.*

agreements contain individualized terms and conditions that differ widely from customer to customer and from agreement to agreement.²⁴⁵

Comcast’s E-Access service likewise is a classic private carrier service. Comcast has made an intentional decision not to hold itself out indifferently to the public or any class of customers to provide E-Access services upon request.²⁴⁶ Rather, Comcast makes individualized determinations as to the circumstances in which and the customers to whom it will offer wholesale service.²⁴⁷ Comcast’s E-Access service is available only to a limited number of carriers with which Comcast chooses to create a network-to-network interface.²⁴⁸ And where Comcast does offer E-Access service, its contract pricing and terms are highly individualized for each NNI counterparty.²⁴⁹

Moreover, to the extent the provision of certain BDS offerings—like Ethernet services designed for retail business customers—entails more standardized terms, that fact, on its own, does not mean that the service is offered on a common carrier basis. Notably, the Commission in *Vitelco* classified an undersea fiber-optic transmission service offered by AT&T Submarine Systems, Inc. (“AT&T-SSI”) as a private carrier service, despite the fact that many of the baseline terms of that service were relatively standardized.²⁵⁰ The Commission specifically found that “AT&T-SSI’s offer of access, nondiscriminatory terms and conditions and market

²⁴⁵ *Id.*

²⁴⁶ *Id.*

²⁴⁷ *Id.*

²⁴⁸ *Id.*

²⁴⁹ *Id.*

²⁵⁰ *AT&T Submarine Systems, Inc.*, Cable Landing License, 11 FCC Rcd 14885 ¶ 64 (IB 1996) (“*Vitelco Order*”), *aff’d*, *AT&T Submarine Systems, Inc.*, Memorandum Opinion and Order, 13 FCC Rcd 21585 (1998), *aff’d sub nom.*, *Virgin Islands Tel. Corp. v. FCC*, 198 F.3d 921 (D.C. Cir. 1999).

pricing of [indefeasible rights of use (‘IRUs’)] does not rise to the level of an ‘indiscriminate’ offering.”²⁵¹ As the Commission explained, “notwithstanding its offer of IRU capacity at market prices, AT&T-SSI must engage in individual negotiations with customers to reach agreement regarding the market price of the particular amount of capacity needed for the certain time period of usage sought,” and also must “negotiate for the cost of maintenance and repairs.”²⁵² The end result of this process, under which individualized negotiations proceed from an initial set of standard terms, “is an offering that is tailored to meet the needs of the particular customer.”²⁵³ And the Commission classified the service as private carriage even though AT&T had indicated that it would be making “capacity available to all interested carriers” in order to “ensure that sunk costs are recovered.”²⁵⁴ As the Commission explained, “the Commission has never found, and we do not believe, that these practices constitute indiscriminate offerings.”²⁵⁵

Comcast’s retail services, including EDI and Ethernet transport, likewise are not sold to all interested buyers. In many cases, Comcast must make an initial determination of whether providing service to a potential customer meets Comcast’s target IRR or otherwise makes business sense.²⁵⁶ Even where Comcast is willing to extend its services to a customer, the parties may be unable to agree on price and walk away from any transaction as a result. Although Comcast generally has standard “rack” rates for its retail services, contracts typically are individually negotiated, with rates and other terms dependent on term, volume, and total commitment—which are themselves frequently subject to negotiation and adjustment from

²⁵¹ *Id.*

²⁵² *Id.*

²⁵³ *Id.*

²⁵⁴ *Id.* ¶ 65.

²⁵⁵ *Id.*

²⁵⁶ Victor Decl. ¶ 3.

customer to customer.²⁵⁷ Moreover, Comcast’s customers and potential customers often have limited incentive to {{
 }} or are unwilling to {{
 }},
 resulting in attendant negotiations over term and price.²⁵⁸ In short, there is simply no basis in the record from which to conclude that all of Comcast’s retail Ethernet BDS services—much less its wholesale BDS services—are offered on a common-carrier basis.

While the FNPRM oddly states that “[t]he only assertions in the record that these dedicated access services are not offered on a common carrier basis are related to Verizon’s request for forbearance from all Title II requirements for non-TDM services,”²⁵⁹ Comcast never had any reason to submit record evidence detailing its private carrier offerings before now. It was not until the FNPRM introduced the radical prospect of subjecting cable operators’ non-dominant BDS offerings to rate regulation and other dominant carrier mandates that the regulatory classification of those services was put in issue in any Commission proceeding. The evidence that Comcast has submitted makes clear that it offers many of the key BDS services at issue only on a private carrier basis.

2. *The Commission Cannot Demonstrate That All BDS Providers Have Market Power Sufficient To Compel Common Carriage*

Nor is there any legitimate ground for “legal compulsion” for Comcast or any other non-dominant BDS provider to offer such services on a common carrier basis, as the Commission’s own discussion of the BDS marketplace demonstrates that cable BDS providers *lack* market

²⁵⁷ Guillaume Decl. ¶ 14.

²⁵⁸ *Id.* ¶ 13.

²⁵⁹ FNPRM ¶ 257 n.671.

power.²⁶⁰ Accordingly, it would be unlawful for the Commission to impose common carrier rate regulation on these private carrier services.

In determining whether to impose common carrier duties on a provider that is not voluntarily holding itself out to serve the public indifferently, the Commission must consider “whether the service provider faces competition” or “will possess market power.”²⁶¹ Put differently, when determining whether “the public interest . . . require[s]” operation “on a common carrier basis,” the Commission’s “focus” is on whether the provider “has sufficient market power” to be able “to charge monopoly rents” for the service.²⁶² A provider that does “not have market power” “should not be regulated as a common carrier.”²⁶³

Applying this test, the Commission has compelled the provision of services on a common carrier basis where it has found that the service is a “monopoly service.”²⁶⁴ In contrast, the Commission has rejected claims that it should compel common carriage where the record evidence showed that the provider’s service is not a “bottleneck facility or the sole available means for a . . . user to obtain” service,²⁶⁵ or the provider does “not possess *sufficient* market power to justify such treatment” because of the presence of existing and potential other

²⁶⁰ See, e.g., FNPRM ¶¶ 91, 218.

²⁶¹ *Policies and Rules Concerning Local Exchange Carrier Validation & Billing Information for Joint Use Calling Cards*, Report and Order and Request for Supplemental Comment, 7 FCC Rcd 3528 ¶ 25 (1992).

²⁶² *Vitelco Order* ¶ 9.

²⁶³ *Id.* ¶¶ 9-11.

²⁶⁴ See *Provision of Access for 800 Service*, Order, 8 FCC Rcd 1423 ¶¶ 28-29 (1993); see also *Expanded Interconnection with Local Telephone Company Facilities*, Report and Order and Notice of Proposed Rulemaking, 7 FCC Rcd 7369 ¶ 163 (1992) (requiring LECs to offer physical collocation in their central offices on the ground that “[n]o competing space provider” could offer an alternative service).

²⁶⁵ *Cable & Wireless plc Application for a License To Land and Operate in the United States a Private Submarine Fiber Optic Cable Extending Between the United States and the United Kingdom*, Cable Landing License, 12 FCC Rcd 8516 ¶ 16 (1997).

providers.²⁶⁶ The Commission has required a heightened “bottleneck” or “monopoly” showing for market power in this context because, absent such a showing, “any public interest benefits of imposing additional burdensome regulation” will be outweighed by deterrent effects to new and anticipated entry.²⁶⁷

A number of prior proceedings make clear that the Commission has refused to compel common carriage of services even upon a far higher showing of market power than could conceivably be made with respect to Comcast or any other cable BDS providers—which affirmatively *lack* market power. For example, in considering whether to compel common carriage for a submarine fiber optic cable system, the Commission previously found that common carriage would not serve the public interest so long as “competing facilities will at least *partially* constrain the operations” of the system “so that it will not become a bottleneck facility.”²⁶⁸ In that proceeding, the Commission recognized that allowing private carriage was appropriate, absent a clear showing of monopoly power over prices, because “the public interest is best served by promoting the rapid expansion of capacity in order to promote facilities-based competition that will result in innovation and lower prices to consumers” in the provision of data transport services.²⁶⁹ The Commission emphasized that a sufficient level of market power to compel common carriage will generally be present only where a monopolist has sufficient market power to impose artificial capacity constraints on the supply of a given service.²⁷⁰ Here, by contrast, the record is bereft of evidence that cable providers possess bottleneck facilities or

²⁶⁶ *NorLight* ¶ 19 (emphasis added).

²⁶⁷ *AT&T Corp.*, Order, 14 FCC Rcd 13066 ¶ 39 (1999).

²⁶⁸ *Id.* (emphasis added).

²⁶⁹ *Id.* ¶ 25.

²⁷⁰ *Id.* ¶ 39 (emphasizing that private carriage would not provide “the ability and incentives [to] the major carriers on the route to constrain capacity”).

the incentive and ability to constrain the supply of BDS services artificially; to the contrary, the FNPRM emphasizes the current *rapid expansion* of supply and new entry from cable and other providers and *substantial declines in prices*, negating any inference of market power.²⁷¹

Likewise, in considering the treatment of domestic fixed-satellite transponder services, the Commission declined to compel common carriage where the record did not show that “small users will be deprived access to transponder facilities,” notwithstanding an acknowledged *shortage* of immediate-term transponder capacity.²⁷² The Commission recognized—as it should with respect to BDS services provided by cable providers and other new entrants—that maintaining private carrier treatment of providers that lack market power will “encourage additional entry, additional facility investment, . . . and allow for technical and marketing innovation in the provision of [data] services.”²⁷³ Both then and now, the “entry of new firms and the rapid expansion of capacity of both old and new firms . . . is evidence of the competitiveness” of the marketplace which ensures that “excessive prices cannot be maintained,” rendering compelled common carriage both unwise as a matter of policy and legally untenable.²⁷⁴

Despite longstanding precedent indicating that robust evidence of monopoly-level market power is necessary for the Commission to compel common carriage, the Commission candidly admits in the FNPRM that it cannot currently assess (i) how much competitive pressure different

²⁷¹ See, e.g., FNPRM ¶¶ 218, 231, 236.

²⁷² *Domestic Fixed-Satellite Transponder Sales*, Memorandum Opinion, Order and Authorization, 90 F.C.C.2d 1238 ¶ 39 (1982).

²⁷³ *Id.* ¶ 41; see also *id.* ¶ 29 (noting that customers’ expressed interest in noncommon carriage arrangements was evidenced by the number of such agreements and thus “a decision against these arrangements would thwart the expressed needs of many consumers and satellite operators alike”).

²⁷⁴ *Id.* ¶ 39.

forms of supply place on suppliers; (ii) how many suppliers, accounting for their differences, are sufficient to make prices effectively competitive; or, (iii) what the right geographic unit or units for measuring concentration may be, among the various other questions it would need to answer before imposing a common carriage mandate.²⁷⁵ In fact, all available evidence indicates that, under any reasonable measure of competition and market power, the Commission would lack any rational, evidenced-based justification for imposing common carriage on new entrants in this increasingly competitive marketplace. The FNPRM notes that cable BDS providers have experienced rapid growth rates over the course of the last five years, with a compound annual revenue growth rate of about 20 percent.²⁷⁶ And, over the course of 2013, competitive LECs' bandwidth grew at approximately six times the growth of the ILECs' bandwidth.²⁷⁷ According to the Commission's own study from Dr. Rysman, entry from cable providers and other fiber-based providers "could bode well for future competition in this industry."²⁷⁸ As reflected in their rapid entry and increased competitive pressures on incumbents, cable BDS providers are the polar opposite of monopolists. Indeed, cable providers do not remotely approach any measure of market power in the BDS marketplace. The FNPRM notes that cable sales made up less than 5% of the overall BDS marketplace in 2013, and that today cable revenues still remain below 8% of BDS revenues.²⁷⁹ It would be implausible to conclude that new entrants with such low penetration could exercise market power anywhere.

²⁷⁵ FNPRM ¶ 219.

²⁷⁶ *Id.* ¶ 236.

²⁷⁷ *Id.*

²⁷⁸ Rysman White Paper at 232.

²⁷⁹ FNPRM ¶ 218.

However the Commission ultimately seeks to define the relevant markets, cable operators' slight market shares are likely to *foreclose* any conclusion of market power.²⁸⁰ According to the Commission's data, leaving aside the continuing prevalence of TDM services in many areas, Comcast ranks sixth in the provision of Ethernet service; former Time Warner Cable, the largest cable Ethernet provider, ranked fifth, behind AT&T, Level 3, Verizon, and CenturyLink.²⁸¹ Moreover, Comcast took in revenues in 2015 that were less than *one sixth* of AT&T's BDS revenues.²⁸² And Dr. Rysman reports that among census blocks he examined, over 80 percent lack *any* cable provider competing within them.²⁸³ Thus, to the extent market power exists at all, "*ILECs dominate the market for facilities-based service in their regions.*"²⁸⁴ Notably, while the economic analyses and white papers submitted by the parties in this proceeding and by the Commission differ as to appropriate product and geographic market definitions, as well as the degree of competition in the BDS marketplace, *none* of these submissions suggests that Comcast—or any other cable provider—comes close to possessing market power in the BDS marketplace.²⁸⁵ Instead, they also focus appropriately on the extent to which ILECs remain dominant.

²⁸⁰ See, e.g., *Neumann v. Reinforced Earth Co.*, 786 F.2d 424, 428 (D.C. Cir. 1986) (suggesting that “a share of 30% or less presumptively disproves requisite power”).

²⁸¹ FNPRM ¶ 83.

²⁸² Rysman White Paper at 217.

²⁸³ *Id.* at 224. Although Dr. Rysman suggests that cable providers may have grown by 50% since the collection of the relevant data, “even if we optimistically assume that cable is now in 50% more census blocks, the qualitative results do not change.” *Id.*

²⁸⁴ *Id.* at 232 (emphasis added).

²⁸⁵ See, e.g., Rysman White Paper, *passim*; Drs. Mark Israel, Daniel Rubinfeld and Glenn Woroch, Competitive Analysis of the FCC's Special Access Data Collection, *passim* (Jan. 27, 2016); Level 3 *et al.* Comments, Attach., Declaration of Jonathan B. Baker on Market Power in the Provision of Dedicated (Special Access) Services, *passim* (Jan. 27, 2016); Declaration of Susan M. Gately, On Behalf of the Ad Hoc Telecommunications

B. Abandoning the Well-Established Dominant/Non-dominant Framework for BDS Would Be Arbitrary and Capricious

It also would be arbitrary and capricious under the APA for the Commission to replace the foundational and well-established distinction between dominant and non-dominant BDS providers with an approach that subjects dominant and non-dominant providers alike to prescriptive rate regulation and other regulatory burdens long reserved for dominant providers. The APA requires that an agency “examine the relevant data,” and articulate a decision that “reveal[s] a rational connection between the facts found and the choice made.”²⁸⁶ But as explained above, price cap regulation has always been employed as a response to particular providers’ market power.²⁸⁷ The entire basis for subjecting a particular class of carriers to rate regulation rests on the need to restrain carriers with market power from exercising such power to the detriment of consumers and the greater public interest.²⁸⁸ Yet no one contends that new entrants in the BDS marketplace possess any such market power. To the contrary, the Commission’s own economic analysis, as well as the substantial weight of record evidence in this proceeding, tell a “consistent story” of continued ILEC dominance in certain areas, but with

Users Committee, *passim* (Jan. 27, 2016); Sprint Comments, Attach. 1, Declaration of Stanley M. Besen and Bridger M. Mitchell, *passim* (Jan. 27, 2016); Sprint Comments, Attach. 2, Declaration of William P. Zarakas and Susan M. Gately, *passim* (Jan. 27, 2016).

²⁸⁶ *Motor Vehicle Mfrs. Ass’n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983)).

²⁸⁷ See FNPRM ¶ 347 (describing the history and purpose of price cap regulation and stating that “[p]rice cap regulation seeks to replicate *in a market where providers have market power* the beneficial incentives of competition in the provision of interstate access services, while balancing ratepayer and stockholder interests” (emphasis added)).

²⁸⁸ See, e.g., *id.* ¶ 344 (“Providers with market power are able to exercise such market power to the detriment of their customers.” (emphasis added)); *id.* ¶ 187 (explaining the Commission’s public interest evaluation in this proceeding as one that, in part, seeks “to identify where market power exists in BDS markets” and to consider “whether market power, where it exists, has enabled unreasonable pricing or other practices or an ability to unlawfully exclude competition”).

competition present or taking root in many others, along with the attendant consumer benefits of reduced prices and increased choice, particularly in areas where cable BDS providers like Comcast have made the substantial investments necessary to enter the marketplace.²⁸⁹

The Commission acknowledges, as it must, that the BDS marketplace has grown significantly more competitive in recent years.²⁹⁰ Yet the FNPRM fails to recognize that increased regulation in the face of such market expansion, particularly regulation of non-dominant providers, would only thwart the Commission’s policy goals. Decades of Commission precedent, built upon bedrock principles of economics and antitrust law, confirm this conclusion. Dating back to the Competitive Carrier proceeding, the Commission’s longstanding policy has been to impose regulatory burdens such as *ex ante* rate regulation only where competitive forces were lacking and, critically, only on those providers that possessed market power. A “major purpose” of that proceeding, which established the dominant/non-dominant framework pursuant to which BDS providers today operate, “was to reduce or eliminate the application of economic regulation to new competitive entrants,” recognizing that, by introducing competition in previously insular markets, “such entrants would improve market performance” by replacing the artificial, regulation-based incentives of incumbents with competitive, market-based incentives,

²⁸⁹ Rysman White Paper at 221 (concluding that “the various sources of data,” including revenue data, location data, and price regression analysis, all “tell a consistent story” of the continued “outsized presence” of ILECs in the BDS marketplace); *see also* FNPRM ¶ 239 (concluding that “the fact that the price capped incumbent LECs have kept their prices at the top of the cap is additional evidence of market power”); *id.* ¶ 238 (“A central finding in the Rysman White Paper is that ... competitive supply in a unique location is correlated in both statistically and economically significant ways with lower ILEC prices for DS1s and DS3s at that location.”); *id.* ¶ 236 (“The great entry success story has been that of cable,” which “has forced even the largest incumbent LECs to focus on maintaining market share.”).

²⁹⁰ *See, e.g.*, FNPRM ¶¶ 235-36 (describing the recent emergence of CLEC and cable BDS providers); *id.* ¶¶ 58-59 (describing emergence of non-cable CLECs and cable CLECs as BDS providers); *id.* at Chart 1 (Vertical Systems Group U.S. Carrier Ethernet Services Year-End 2015 Leaderboard).

to the overall benefit of consumer welfare.²⁹¹ Similarly, the Commission recognized that new entrants required “flexibility” to “experiment with price/service offerings,” “enter new markets quickly where they perceive competitive opportunities exist,” or “leave others on relatively short notice if their projections aren’t realized,” and thus established the light regulatory touch for non-dominant BDS providers that heralded the tremendous growth in the marketplace that is evident today.²⁹²

As competition emerged in particular markets, particularly in the years following enactment of the 1996 Act, the Commission’s consistent response has been to *remove* regulatory impediments from historically dominant ILECs when such carriers could demonstrate that they no longer possessed market power in a particular market.²⁹³ In fact, a major provision of the

²⁹¹ *Motion of AT&T Corp. to be Reclassified as a Non-Dominant Carrier*, Order, 11 FCC Rcd 3271 ¶ 3 (1995) (“*AT&T Reclassification Order*”).

²⁹² *First Competitive Common Carrier Report and Order* ¶¶ 85, 36; *see also* Section II.A, *supra*.

²⁹³ *AT&T Reclassification Order* ¶¶ 139-42, 12 (concluding that “AT&T lacks market power in the ... overall market for interstate, domestic, interexchange telecommunications services” and therefore removing price cap regulation for AT&T’s residential, operator, 800 directory assistance, and analog private-line services, subject to certain voluntary commitments made by AT&T); *Implementation of Further Streamlining Measures for Domestic 214 Authorization*, Report and Order, 17 FCC Rcd 5517 ¶ 31 (2002) (“*2002 Streamlining Order*”) (permitting streamlined treatment of certain transactions involving dominant carriers); *Petition of AT&T Inc. for Forbearance Under 47 U.S.C. § 160(c) from Title II and Computer Inquiry Rules with Respect to Its Broadband Services et al.*, Memorandum Opinion and Order, 22 FCC Rcd 18705 ¶ 49 (2007) (forbearing from dominant carrier regulation as to AT&T’s broadband services upon demonstration that such regulation would impede its ability to compete, and concluding that forbearance would “increase competition by freeing AT&T from unnecessary regulation” that “constrains incentives to invest in and deploy the infrastructure needed to deliver broadband services”); *cf. Petition of Qwest Corporation for Forbearance Pursuant to 47 U.S.C. § 160(c) in the Phoenix, Arizona Metropolitan Statistical Area*, Memorandum Opinion and Order, 25 FCC Rcd 8622 (2010) (denying forbearance relief based on findings that Qwest “fail[ed] to demonstrate that there is sufficient competition,” including for services necessary to provide BDS, “to ensure that ... Qwest will be unable to raise prices, discriminate unreasonably, or harm consumers”, and that questions

1996 Act was the addition of Section 10 to the Communications Act, which expressly required the Commission to remove regulations in competitive markets, pursuant to the public interest.²⁹⁴ Critically, the Commission remained steadfast in its commitment to avoid regulation of new entrants, recognizing that such providers' entry and expansion is key to achieving the Commission's ultimate goal of a competitive marketplace and that regulatory parity should be achieved by relaxing traditional requirements where competition has emerged.²⁹⁵

The FNPRM provides no hint of any rationale that could justify upending such settled principles and precedent. The BDS marketplace is more competitive today than ever before *precisely because* the Commission's deregulatory policy toward non-dominant providers has provided incentives for new entrants to invest, innovate, and challenge long-entrenched incumbents. A contrary regulatory approach would be fundamentally at odds with the Commission's own blueprint for driving expanded output and increased consumer welfare, and therefore arbitrary and capricious.

remained as to how Qwest's requested regulatory relief "could be tailored" to areas where competition exists "when other services remain insufficiently competitive").

²⁹⁴ See 47 U.S.C. § 160.

²⁹⁵ See, e.g., *AT&T Reclassification Order* ¶ 3 (stating that new entrants "should not be viewed as potential monopolists requiring the same degree of economic regulation" as dominant carriers); *Policy and Rules Concerning the Interstate, Interexchange Marketplace; Implementation of Section 254(g) of the Communications Act of 1934, as amended*, Second Report and Order, 11 FCC Rcd 20730 ¶ 9 (1996) (explaining that "market forces, together with the Section 208 complaint process and the Commission's ability to reimpose [regulatory] requirements, were sufficient to protect the public interest with respect to nondominant interexchange carriers" because "firms lacking market power could not charge unlawful rates because customers could always turn to competitors"); *2002 Streamlining Order* ¶ 30 (presumptive streamlining treatment of transfer applications involving non-dominant domestic, interstate carriers because, "[w]here facilities-based carriers proposing to combine are not dominant with respect to any service, ... it is extremely unlikely that the proposed transaction could result in a public interest harm, particularly where their combined market shares are relatively low").

Far from justifying the regulation of new entrants, the FNPRM acknowledges the inherent conflict between the “desire to promote new competitive entry” and the suggestion that the Commission might “apply additional regulation to new entrants with little or no market share.”²⁹⁶ Indeed, such a policy choice would be impermissible, as no “rational connection” could exist between the policy goal of promoting competition, innovation, and investment in the BDS marketplace, on the one hand, and the decision to subject new competitors to rate regulation and other onerous regulatory mandates, on the other.²⁹⁷ As explained above, Comcast and other new entrants with the ability to allocate capital resources across multiple lines of business inevitably will focus investments in areas with greater revenue potential and, all else being equal, fewer regulatory risks and burdens.²⁹⁸ Any decision to subject non-dominant BDS providers to the same regulatory treatment as dominant incumbents thus would deter the very entry and investment the FNPRM seeks to promote.²⁹⁹

For many of the same reasons, the Commission could not rationally base any decision to subject cable BDS providers to rate regulation and other new regulatory burdens on the desire to promote the deployment of 5G wireless services. To the extent the Commission believes that a

²⁹⁶ FNPRM ¶¶ 308-09.

²⁹⁷ *Ctr. For Auto Safety v. Fed. Highway Admin.*, 956 F.2d 309, 313 (D.C. Cir. 1992) (The APA requires that an agency “articulate[] a rational connection between its factual judgments and its ultimate policy choice.”) (citing *State Farm*, 463 U.S. at 43).

²⁹⁸ *See* Raj Decl. ¶ 9 (explaining that Commission’s adoption of new rules that threaten to lower the anticipated revenues and return on investment in the BDS marketplace, while simultaneously increasing the cost of regulatory compliance, likely would affect the allocation of capital not only within Comcast Cable, but among Comcast Cable, NBCUniversal, and other Comcast businesses, ultimately culminating in less aggressive investment by Comcast in BDS).

²⁹⁹ *State Farm*, 463 U.S. at 43 (“[A]n agency rule would be arbitrary and capricious if the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise.”).

“new start” is needed to facilitate infrastructure investment for backhaul of 5G wireless services, the imposition of unnecessary regulatory burdens on new entrants would be an entirely irrational approach (and thus would fail under the APA) for all of the reasons just discussed.³⁰⁰ Moreover, as shown above, cable operators’ widely deployed HFC networks confer no competitive advantage in the provision of wireless backhaul services (or, for that matter, most other BDS services), thus rendering such facilities virtually irrelevant for purposes of the backhaul marketplace.³⁰¹ Accordingly, were the Commission to attempt to justify rate regulation of cable BDS providers based on the anticipated needs of wireless providers, the obvious disconnect between the asserted ends of, and the means chosen for, such regulation would likely lead a reviewing court to deem it arbitrary and capricious.

The Commission would face an even steeper climb in seeking to justify the elimination of the dominant/non-dominant framework given industry reliance on its longstanding policy of exempting non-dominant BDS providers from rate regulation and the absence of factual changes that could justify turning that framework on its head. As the Supreme Court recently underscored, where an agency reverses course, it must offer a “more substantial justification” when the “new policy rests upon factual findings that contradict those which underlay its prior policy” and when the prior policy “has engendered serious reliance interests that must be taken into account.”³⁰²

³⁰⁰ *See id.*

³⁰¹ Allen Decl. ¶¶ 6-7.

³⁰² *Perez v. Mortgage Bankers Ass’n*, 135 S. Ct. 1199, 1209 (2015); *FCC v. Fox Television Stations*, 556 U.S. 502, 515 (2009) (same); *cf. INS v. Cardozo-Fonseca*, 480 U.S. 421, 446 n.30 (1987) (“An agency interpretation of a relevant provision which conflicts with the agency’s earlier interpretation is entitled to considerably less deference than a consistently held agency view.”); *Thomas Jefferson Univ. v. Shalala*, 512 U.S. 504, 515 (1994) (same).

Here, any factual changes in the BDS marketplace (including in particular cable operators’ lead role in bringing new investment and increased competition) only *confirm* that the decades-old policy of exempting new entrants from rate regulation remains sound. Moreover, it is indisputable that the Commission’s longstanding regulatory distinction between dominant and non-dominant BDS providers has engendered substantial reliance interests on the part of cable BDS providers and other new entrants. Until the FNPRM, there was no hint that cable BDS providers would be subject to rate regulation or related regulatory burdens. Under the existing regime, where new entrants have counted on the absence of regulation, Comcast and other competitive providers have invested many billions of dollars in network expansions and upgrades. Such a level of investment would not have occurred if Comcast, as a new entrant, had been subject to (or was at risk of being subject to) rate regulation and other types of burdens for dominant providers.³⁰³

The FNPRM also fails to acknowledge the significant costs that the proposed framework would impose on non-dominant BDS providers,³⁰⁴ which unquestionably are an “important aspect of the problem” that the Commission is required to consider under the APA.³⁰⁵ The Commission may not abandon its prior policy without identifying countervailing benefits that would justify the imposition of such significant costs.³⁰⁶ Given the dearth of evidence that regulating new entrants would produce *any* benefits, it is highly doubtful that the Commission

³⁰³ See Raj Decl. ¶ 11.

³⁰⁴ See, e.g., Mayo Decl. ¶¶ 86-94.

³⁰⁵ *State Farm*, 463 U.S. at 43.

³⁰⁶ *Michigan v. EPA*, 135 S. Ct. 2699, 2707 (2015) (“No regulation is ‘appropriate’ if it does significantly more harm than good.”); *Business Roundtable v. SEC*, 647 F.3d 1144, 1151-52 (D.C. Cir. 2011) (“By ducking serious evaluation of the costs that could be imposed ..., we think the Commission acted arbitrarily.”).

could justify the significant costs entailed by imposing rate regulation and other heavy-handed regulatory mandates on new entrants in the BDS marketplace.

IV. A RATIONAL REPLACEMENT OF THE PRICING FLEXIBILITY TRIGGERS TO GUIDE THE TRANSITION FROM LEGACY REGULATION OF INCUMBENT LECS MAY BE WARRANTED

Finally, Comcast agrees with the Commission that the existing pricing flexibility triggers used to relieve incumbent LECs from price caps are an imprecise and poorly targeted means of identifying areas with effective competition. Such triggers have had “little success [in] predict[ing] where competition would exist and where it would not.”³⁰⁷ In particular, measuring the extent of collocation in an incumbent LEC’s wire centers has proved to be an inappropriate proxy for effective competition and often significantly understates the existence of facilities-based competition from cable providers and others, thereby impeding efficient deregulation.³⁰⁸

Comcast accordingly looks forward to participating in a constructive dialogue regarding how to create an improved mechanism to determine where legacy ILEC regulation should be eliminated.³⁰⁹ As the Commission has recognized, BDS providers face rapidly increasing demand for BDS services and pressure on underlying BDS network infrastructure, requiring concomitant investments to keep pace.³¹⁰ To meet these demands, as reflected in the foregoing sections of these opening comments, Comcast submits that reforms to price cap regulation for ILECs should be guided by the following principles³¹¹:

³⁰⁷ FNPRM ¶ 1.

³⁰⁸ *Id.* ¶¶ 275-277.

³⁰⁹ *See id.* ¶ 209.

³¹⁰ *See id.* ¶¶ 77-78.

³¹¹ Many of these principles are captured in the attached economist declarations. *See, e.g.*, Farrell Decl. ¶¶ 1-7; Mayo Decl. ¶¶ 21, 116.

- First, the Commission should focus on developing regulations that eliminate barriers to entry into the BDS market and inhibit investment and technological transitions.³¹² Accordingly, Comcast supports the FNPRM’s additional inquiries regarding potential barriers that prevent wholesale customers from switching providers or migrating to their own facilities. By the same token, the Commission should consider whether other types of entry barriers—including obstacles to building access or municipal restrictions on access to rights of way—are frustrating competition.
- Second, the Commission should give the prophylactic measures adopted in its *Tariff Investigation Order* a chance to succeed and should carefully assess the impact of those measures before considering more expansive or intrusive regulatory interventions.
- Third, any new regulatory framework should avoid subjecting new entrants to price controls and other burdensome mandates that should be reserved for dominant carriers (if employed at all). Imposing such mandates on new entrants would be profoundly counterproductive, as doing so would deter entry and continued investment in the BDS marketplace. Over the long term, such over-regulation would foster the very market concentration and underinvestment that the FNPRM seeks to avoid.
- Fourth, the Commission should maintain restrictions on ILEC pricing only where market failure can be demonstrated. In particular, any new rules should apply only to dominant providers in product and geographic markets with no reasonable prospect of new entry, and should focus on addressing non-price terms, conditions, and legal restrictions that impede investment. Price regulation where competition *does* exist would only compromise and distort such competition, compressing margins and making it even

³¹² See FNPRM ¶ 7.

harder for competitive providers to enter and succeed. Market power should be assessed through a granular assessment of whether the incumbent provider exercises substantial power over price and supply.³¹³

- Fifth, any such regulatory interventions that would supplant and distort market forces should be drawn as narrowly as possible so as to preserve investment incentives necessary to foster competition in the long term.

³¹³ *Id.* ¶ 6.

CONCLUSION

For the foregoing reasons, Comcast urges the Commission to develop a procompetitive, pro-investment regulatory framework for BDS services—one that rewards entry and investment by all providers and limits rate regulation, unbundling, or other such restrictions to dominant providers (if employed at all) in areas where market failure has been demonstrated.

Respectfully submitted,

Matthew A. Brill
James H. Barker
Matthew T. Murchison
Alexander L. Stout
Nicholas L. Schlossman
LATHAM & WATKINS LLP
555 Eleventh Street, NW
Suite 1000
Washington, DC 20004

/s/ Kathryn A. Zachem
Kathryn A. Zachem
David M. Don
Mary P. McManus
COMCAST CORPORATION
300 New Jersey Avenue, NW
Suite 700
Washington, DC 20001

Lynn R. Charytan
Brian A. Rankin
Beth A. Choroser
COMCAST CORPORATION
One Comcast Center
55th Floor
Philadelphia, PA 19103

Exhibit A

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)	
)	
Business Data Services in an Internet Protocol Environment)	WC Docket No. 16–143
)	
Investigation of Certain Price Cap Local Exchange Carrier Business Data Services Tariff Pricing Plans)	WC Docket No. 15–247
)	
Special Access for Price Cap Local Exchange Carriers)	WC Docket No. 05–25
)	
AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services)	RM–10593
)	

DECLARATION OF JOSEPH FARRELL, DPHIL

June 28, 2016

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I. Executive summary

- (1) In this proceeding the Commission stresses that in the BDS industry “[c]ompetition...is uneven,” which is unsurprising.¹ There may be areas of more or less secure ILEC monopoly, perhaps, for example, in low-bandwidth TDM, but clearly there are substantial areas and sets of customers for which there is real, and increasing, albeit not perfect, competition.
- (2) The Commission identifies several ILEC contracting practices as retarding entry and competition and some others that it indicates may do so. In the increasingly but not yet ubiquitously competitive industry that the FNPRM describes, incumbents may have strong incentives to seek to retard entry and growth of competition, although I am not opining in this Declaration on the specific practices identified. An expert agency such as the Commission is to be applauded for seeking to address unnecessary or artificial barriers to competition, as it has sought to do through new regulation of ILEC contracting practices; this generally laudable approach may succeed in improving market performance by facilitating and strengthening competition. This is particularly true where, as here, it appears that entry and competition to serve some customers strengthens the entrant as a competitor to serve other customers.
- (3) At the same time, however, in parts of the FNPRM the Commission proposes to act as if there were a sharp dichotomy between what it simplistically calls “competitive” and “non-competitive” markets;² to include moderately competitive markets in the latter bin; and to impose binding price regulation on them. But, as I describe in this Declaration, broad extension of price regulation would almost inevitably do the opposite of strengthening competition. In its discussion, the Commission largely ignores the adverse effects of price regulation on entry, competition, and the adoption of new technology.
- (4) Those concerns are particularly strong in an industry—such as BDS—with increasingly vigorous but not ubiquitous competitive entry, in which quality and technological innovation are important, and in which different customers have very different needs and cost widely varying amounts to serve.
- (5) I do not comment on all of the many regulatory options that the Commission mentions, but a few points do stand out.

¹ *Business Data Services in an Internet Protocol Environment; Investigation of Certain Price Cap Local Exchange Carrier Business Data Services Tariff Pricing Plans; Special Access for Price Cap Local Exchange Carriers; AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, Tariff Investigation Order and Further Notice of Proposed Rulemaking, FCC 16-54 (WC 16-143, 15-247, 05-25, RM-10593) (2016) [hereinafter “FNPRM”] ¶ 3.

² FNPRM ¶ 11.

- First, the Commission appears to adopt an unrealistically optimistic view of price cap regulation. In particular, one well-recognized challenge with price caps (or benchmark pricing restrictions that effectively cap prices) is that they often undermine incentives to deliver quality.³ Intuitively, price caps provide incentives to reduce costs—and that includes reducing costs by reducing quality. Indeed, elsewhere the Commission has recognized “the theoretical concern that LECs under price cap regulation might seek to increase their profits not by becoming more productive, but by lowering the quality of the service they provide.”⁴ In contrast, competitive incentives work toward efficient product quality as well as cost savings. Similar concerns about price cap regulation arise with respect to entry decisions and supply of product innovation.
 - The Commission’s proposals to export pricing from the regulated TDM products offered by ILECs into the packet-based BDS market do not appear to be carefully justified either by similar costs or by demand substitutability. Moreover, given that BDS customers appear at least in some respects more sensitive to product design and quality than to price, any attempt to constrain pricing of one product by giving customers a right to buy a different product at a regulated price is likely either to be ineffectual or to draw the Commission into wider and more intrusive regulation.
- (6) In BDS, it seems to be recognized that ILECs are ubiquitous, and therefore monopoly markets are inherently ILEC monopoly markets. Hence, as a practical matter, monopoly-focused price regulation would only apply to ILECs.
- (7) Consistent with these observations, I urge that, outside zones of secure monopoly, the Commission should focus its attention on reducing entry barriers and barriers to customer switching and refrain from forms of price regulation that would discourage otherwise plausible beneficial competitive entry.

³ See Section V.D and n. 91.

⁴ *In the Matter of Policy and Rules Concerning Rates for Dominant Carriers*, Second Report and Order, 5 FCC Rcd. 6786 (1990) ¶ 334.

II. Introduction

II.A. Scope of this Declaration

- (8) I have been asked by Comcast Corporation to offer my opinions on certain aspects of the FNPRM, which orders certain changes to regulation of business data services (BDS) and proposes extensive additional changes in the regulatory scheme for this market. In this Declaration I begin by noting that there may well be considerable scope for policies to support and strengthen competition in BDS, as the Commission seeks to do. I then comment on issues related to the challenges of implementing efficient price regulation in BDS, and the potential harms to competition and to customers from price regulation in BDS markets other than secure incumbent local exchange carrier (ILEC) monopolies. My primary focus is on the retail BDS segment rather than on wholesale BDS or cell backhaul markets. Nevertheless, many of my remarks apply broadly to most, if not all, BDS markets.
- (9) I expect to submit additional analysis prior to the Reply deadline of the FNPRM.

II.B. Relevant qualifications

- (10) I am Professor of Economics at the University of California, Berkeley. I am also a Partner with Bates White, LLC. I received my DPhil, MSc, and BA degrees from Oxford University.
- (11) From 1996 to 1997, I served as Chief Economist for the FCC, where I reported directly to the Chairman and Commissioners.
- (12) From 2000 to 2001, I served as Deputy Assistant Attorney General for Economic Analysis for the Antitrust Division of the US Department of Justice (DOJ). In this position, which is the chief economist position at the Division, I supervised approximately 50 PhD-level economists and reported directly to the Assistant Attorney General for Antitrust.
- (13) From 2009 to 2012, I served as Director of the Bureau of Economics at the Federal Trade Commission (FTC), where I supervised approximately 70 PhD-level economists and reported directly to the Chairman and Commissioners. I was responsible for economic analysis relating to the Commission's broad antitrust and consumer protection portfolios.
- (14) I have taught undergraduate and PhD-level courses at the University of California at Berkeley and earlier at the Massachusetts Institute of Technology (MIT), and the University of Michigan, on microeconomic theory, industrial organization, and game theory. My teaching experience includes both theoretical and empirical analysis.

- (15) I have published extensively in peer-reviewed academic journals and elsewhere on topics centering on the economics of competition, industrial organization, and innovation.
- (16) I have served on the editorial boards of professional journals, including serving as Editor of the *Journal of Industrial Economics* from 1995 to 2000 and on the Board of Editors of *Information Economics and Policy* from 2004 to 2007. I am a Fellow of the Econometric Society, past President of the Industrial Organization Society, and former Board Member for the National Academies' Computer Science and Telecommunications Board.
- (17) I have been retained as a consultant or expert witness in a variety of matters involving telecommunications, intellectual property, competition, antitrust and merger analysis. I have served as a consultant to the DOJ, FTC, Canadian Bureau of Competition, Reserve Bank of Australia, and many private parties. I have testified on matters related to economic policy in hearings before the Senate Judiciary Committee, the FCC, the FTC, the DOJ, and the International Trade Commission (ITC).

III. Reducing entry barriers to promote competition

- (18) The Commission appears to be contemplating regulating BDS prices broadly. In later sections of this Declaration I discuss why efficient price regulation is challenging and why, even when done well, it tends to replace or weaken competition rather than enhance it.
- (19) The Commission has at its disposal ways to strengthen competition. Therefore, in this section I focus on the multiple plausible opportunities that the Commission could use to strengthen competition rather than replacing it (and likely undermining it) through pervasive price regulation. Where competition is already workable or entry is plausible, those opportunities should be the priority. Specifically, where competition is weakened by incumbents’ contracting processes or by other artificial or unnecessary barriers, careful action to remove those restraints and strengthen competition should be a priority.
- (20) Modern economic scholarship generally concurs with the Commission’s guiding principle that “competition is best.”⁵ where even moderately effective competition is possible, it appears that it normally outperforms real-world regulation;⁶ this seems particularly likely to be the case in dynamic, innovative industries with sophisticated customers. Whether or not the current “uneven” state of competition in BDS amounts to moderately effective competition has been the focus of other economists in this series of proceedings; it is not my point here.⁷ Rather, I observe that the Commission has identified practices that it believes have weakened or may have weakened competition, has taken steps to address some of them, and has sought comment on others. To the extent that the Commission can identify and address substantial barriers, competitive conditions would improve. I applaud the Commission’s willingness to address such barriers.

⁵ FNPRM ¶ 5.

⁶ Nancy L. Rose, “Learning from the Past: Insights for the Regulation of Economic Activity,” in *Economic Regulation and Its Reform: What Have We Learned?* ed. Nancy L. Rose, 1–23 at 1–2 (Cambridge, MA, and Chicago: NBER and The University of Chicago Press Books, 2014). (“The past thirty-five years have witnessed an extraordinary transformation of government economic intervention across broad sectors of the economy throughout the world. State-owned enterprises were privatized. Price and entry controls were largely or entirely dismantled in many industries . . . The political economy of the reform movement has been heavily debated . . . But a rich economics literature also had much to contribute. Studies demonstrated that regulation increased costs both directly and by reducing firm incentives to pursue more efficient operations, impeded the efficient allocation of goods and services to their highest value use, and often retarded innovation.”)

⁷ For example, Jonathan Baker’s declaration discusses “the extent to which incumbent local exchange carriers (ILECs) exercise market power in markets for the provision of dedicated service.” See Federal Communications Commission, “Declaration of Jonathan B. Baker on Market Power in the Provision of Dedicated (Special Access) Services,” WC Docket No. 05-25, FM-10593, Jan. 27, 2016, ¶ 4.

See also Federal Communications Commission, “Declaration of Stanley M. Besen and Bridger M. Mitchell,” WC Docket No. 05-25, FM-10593, Jan. 27, 2016, ¶ 8; Federal Communications Commission, “Declaration of Susan M. Gately On Behalf of Ad Hoc Telecommunications Users Committee,” WC Docket No. 05-25, FM-10593, Jan. 27, 2016, ¶ 2; Federal Communications Commission, “Mark Israel, Daniel Rubinfeld and Glenn Worocho, Competitive Analysis of the FCC’s Special Access Data Collection,” WC Docket No. 05-25, FM-10593, 3.

- (21) Because competition is best, generally and perhaps notably in BDS, and because competition in BDS has been growing rapidly and the Commission is already taking steps toward resolving what it has identified as barriers to entry and competition, moving ahead with such a pro-competition agenda makes more sense than shifting gears toward a regime of extensive price regulation.
- (22) In BDS, evidence that a substantial amount of potential entry is close to the margin of profitability may be found in the alleged presence of anticompetitive practices themselves. If imposing or negotiating any anticompetitive contract terms is otherwise costly for incumbents, their choice to do so could suggest an informed perception, consistent with the evidence on widespread and rapidly growing entry, that there is a substantial competitive threat worth thwarting.⁸ Indeed, the Commission’s Tariff Investigation Order responds to concerns along these lines raised by competitive LECs.⁹
- (23) In the FNPRM (discussing ILEC time-division multiplexing (TDM) services), the Commission concluded:

“[A]ll-or-nothing” provisions that are included in certain of the pricing plans under investigation are unjust and unreasonable practices. We direct the incumbent LECs to remove those provisions from the relevant pricing plans and submit tariff revisions consistent with this Order. We further conclude that certain of the shortfall and early termination penalties contained in the pricing plans are unjust and unreasonable practices to the extent that the penalties exceed expectation damages and direct their removal from the relevant pricing plans under investigation and the submission of tariff revisions consistent with this Order.¹⁰

- (24) In the FNPRM, the Commission also stated:

[W]e seek comment on the scope of application of the three requirements we adopt in the accompanying Tariff Investigation Order to other tariff pricing plans not subject to the tariff investigation and to commercial agreements for IP based business data

⁸ The Commission acknowledged this fact in *Access Charge Reform*, CC Docket No. 96-262; *Price Cap Performance Review for Local Exchange Carriers*, CC Docket No. 94-1 et al., Fifth Report and Order and Further Notice of Proposed Rulemaking, 14 FCC Rcd 14221 (1999) [hereinafter “*Pricing Flexibility Order*”], ¶ 80. (“An incumbent monopolist will engage in exclusionary pricing behavior only if it believes that it will succeed in driving rivals from the market or deterring their entry altogether. Otherwise, the reduced profits caused by exclusionary pricing behavior will not be recouped by other sales under the resulting conditions of reduced competition, and the incumbent will be worse off than if it had not engaged in exclusionary pricing behavior.”)

⁹ “The investigation was initiated in response to allegations by competitive LECs that these terms and conditions represented a complicated web of tariff provisions that constrained their ability to compete in the business data services marketplace and inhibited their transition to IP technologies.” FNPRM ¶ 86.

¹⁰ FNPRM ¶ 88.

services such as Ethernet. We also seek comment on whether such requirements should be applied in non-competitive markets or more generally in all markets.¹¹

- (25) In addition, for “non-competitive” markets, the Commission seeks comment on applying rules that would restrict the use of tying arrangements, percentage commitments, term commitments, upper percentage thresholds, overage penalties, and automatic renewal and evergreen provisions.¹²
- (26) The Commission’s discussion of three types of contractual terms in the FNPRM suggests that each tends to impose a kind of departure tax or mix-and-match tax that increases a customer’s cost of switching to an alternative provider or deploying its own facilities for part of its needs or for part of the contract term. Such concerns have been a focus in the modern economic literature on anticompetitive vertical restraints:
- Aghion and Bolton (1987) showed that when a buyer and a seller sign a contract with break-up fees, the buyer will be less willing to switch to another provider.¹³ “These contracts introduce a social cost, for they sometimes block the entry of firms that may be more efficient than the incumbent seller.”¹⁴ As noted in Section VI.A, this is of additional concern if entry involves positive spillovers for other buyers.
 - The spillover point is central to the exclusive-dealing work of Rasmusen, Ramseyer, and Wiley (1991) and Segal and Whinston (2000).¹⁵ They showed that when there are multiple buyers, an incumbent can block an entrant who needs scale economies by signing exclusionary contracts with some buyers. For example, Segal and Whinston (2000) found that “by exploiting the externalities present among buyers, an incumbent firm can often profitably exclude potential rivals.”¹⁶
 - The FTC and the DOJ Antitrust Division held a 2014 workshop on “conditional pricing practices” that focused in large part on some of the ways that disloyalty-penalty pricing can be anticompetitive.¹⁷

¹¹ FNPRM ¶ 321.

¹² FNPRM § V.F.4.

¹³ Philippe Aghion and Patrick Bolton, “Contracts as a Barrier to Entry,” *American Economic Review* 77 (1987): 388–401.

¹⁴ *Id.* at 389. Ex post renegotiation may address the actual ex post blocking but extracts efficiency rents from more efficient entrants; to the extent that such efficiency rents reflect prior investment, efficient entrants may not even be created.

¹⁵ Eric B. Rasmusen, J. Mark Ramseyer, and John S. Wiley Jr., “Naked Exclusion,” *American Economic Review* 81 (1991): 1137–45; Ilya R. Segal and Michael D. Whinston, “Naked Exclusion: Comment,” *American Economic Review* 90 (2000): 296–309.

¹⁶ Ilya R. Segal and Michael D. Whinston, “Naked Exclusion: Comment,” *American Economic Review* 90 (2000), 296–309 at 307.

¹⁷ Federal Trade Commission and Department of Justice, “Conditional Pricing Practices: Economic Analysis & Policy Implications” (workshop, FTC, Washington, DC, June 23, 2014), *available at* https://www.ftc.gov/system/files/documents/public_events/302251/cpp_workshop_transcript.pdf.

(27) In my 2005 declaration(s), I discussed certain alleged ILEC contracting practices in what was then known as “special access” and some of their implications for competition and for geographic market definition. I concluded that certain alleged ILEC contracting practices at the time “put an additional wedge into the incentive for the customer to contract with a competitive carrier whose long-run cost is below the ILEC’s price.”¹⁸

(28) Other opportunities for the Commission to maintain or promote competition in BDS likely exist. For example, as I urged eleven years ago, BDS could be a focus in the Commission’s evaluation of whether a proposed telecom merger is in the public interest.¹⁹

(29) Other barriers may be present: for example, access to rights of way or to buildings. Comcast has
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(30) The FNPRM echoes this concern:

One recent study asserts that current barriers are sufficient to deter new construction in most business locations. Certain issues cannot be easily overcome, such as “when the building owner refuses to grant the CLEC access or charges a high access fee, or when it is difficult or costly to obtain rights of way to a specific building (e.g., pole access or costs of burying lines).”²¹

(31) Some commentators have argued that BDS may be provided over fixed wireless connections,²² and the Commission should be alert to the need to remove any needless barriers to such provision.

(32) The Commission also raises the possibility that elimination of tariffing and the introduction of public disclosure requirements for BDS providers would reduce barriers to market entry. As with the other specific actions and proposals mentioned in this section, I am not opining on the merits of those

¹⁸ Comments of COMPTTEL in *United States v. SBC Communications, Inc. and AT&T Corp.; United States v. Verizon Communications and MCI, Inc.*, WC Docket No. 05-25 (filed July 29, 2005) (Reply Declaration of Joseph Farrell at ¶ 4).

¹⁹ Comments of COMPTTEL in *United States v. SBC Communications, Inc. and AT&T Corp.; United States v. Verizon Communications and MCI, Inc.*, WC Docket No. 05-25 (April 25, 2005) (Statement of Joseph Farrell at ¶ 37).
See also Dennis W. Carlton and Randal C. Picker, “Antitrust and regulation,” in *Economic Regulation and Its Reform: What Have We Learned?* ed. Nancy L. Rose, 25–61 at 26 (Cambridge, MA, and Chicago: NBER and The University of Chicago Press Books, 2014). (“Where activities in an industry remain partially regulated, antitrust and regulation can be used together in a complementary way to control competition and, in some cases, it is possible to use antitrust as a constraint on regulators.”)

²⁰ Federal Communications Commission, “Data Requested in Special Access NPRM: Comcast Response to II.A.08,” WC Docket No. 05-25, FM-10593.

²¹ FNPRM ¶ 227 (*internal citations omitted*).

²² FNPRM ¶¶ 68–69.

actions. (The effect of price transparency is ambiguous because it improves price information available to customers but also can facilitate price-matching strategies and price coordination.²³) My point rather is that the Commission has multiple plausible opportunities to strengthen competition rather than replacing it, and likely undermining it, through pervasive price regulation, and that, where competition is already workable or entry is plausible, those opportunities should be the priority.

²³ See, e.g., Jeffrey R. Brown and Austan Goolsbee, “Does the Internet Make Markets More Competitive? Evidence from the Life Insurance Industry,” *Journal of Political Economy* 110 (2002): 481–507.
 Svend Albæk, Peter Møllgaard, and Per B. Overgaard, “Government-Assisted Oligopoly Coordination? A Concrete Case,” *The Journal of Industrial Economics* 45 (1997): 429–43.
 Joseph E. Harrington, Jr., “Posted Pricing as a Plus Factor,” *Journal of Competition Law & Economics* 7 (2011): 1–35.
 Fernando Luco, “Mandatory Price Disclosure and Competition,” (working paper, Texas A&M University, 2015).
 Youngjun Jang, “The Effects of the Internet and Mobile Search Technologies on Retail Markets: Evidence from the Korean Gasoline Market” (*PhD diss.*, MIT, 2015). Jang finds that, empirically, increased price information could harm consumers on average even without coordination.

IV. The Further Notice of Proposed Rulemaking

- (33) The Commission seeks comment on its proposed adjustments to how it regulates BDS. The Commission proposes to retain price cap regulation of some BDS services but to alter where, how, and to which providers price caps would apply. The FNPRM may also contemplate extending price regulation in some cases to services and providers that have never been subject to such regulation.

IV.A. Guiding principles for Commission review

- (34) The FNPRM sets out four fundamental principles to guide the Commission’s review of its BDS regulatory regime:
- “[C]ompetition is best.”
 - “[T]he new regulatory framework should be technology-neutral.”
 - “Commission actions should remove barriers that may be inhibiting the technology transitions.”
 - “[T]he Commission should construct regulation to meet not only today’s marketplace, but tomorrow’s as well.”²⁴
- (35) In its proposed regulatory framework, the Commission seeks to distinguish between BDS providers “based on market circumstances, rather than technology or the happenstance of prior Commission action and inaction.”²⁵
- (36) In this Declaration, I discuss economic implications of extending or imposing price regulation in the BDS space, including in particular to competitive (non-incumbent) providers. In doing so, I use the lens of the Commission’s guiding principles. If the Commission proposes to impose price regulation on all providers in markets that are determined to be imperfectly competitive, I explain how that proposal conflicts with those guiding principles.

IV.B. Summary of the Commission proposal for regulating BDS

- (37) In this section I provide a partial summary of the Commission’s proposal for modifying and extending regulation of BDS.

²⁴ FNPRM ¶¶ 4–8.

²⁵ FNPRM ¶ 259.

- (38) The revised regulatory scheme would start with a “Competitive Market Test” across all geographic areas served by price cap carriers.²⁶ Each area would be deemed competitive or noncompetitive.²⁷ The test would “define the relevant market for applying a test along customer classes and varying bandwidths in geographic areas consisting of census blocks, including groupings of census blocks.”²⁸ One of the Commission’s “key geographic market findings” was that “[p]otential competition is important, that is, nearby suppliers can constrain BDS prices.”²⁹
- (39) For purposes of defining relevant product markets, the Commission would define BDS as:
- A telecommunications service that transports data between two or more designated points at a rate of at least 1.5 Mbps in both directions (upstream downstream) with prescribed performance requirements that typically include bandwidth, reliability, latency, jitter and/or packet loss. BDS does not include “best effort” services, e.g. mass market BIAS such as DSL and cable modem broadband access.³⁰
- (40) The Commission’s definition of BDS encompasses both TDM and packet-based services, including over hybrid fiber coaxial cable (HFC), consistent with its guiding principle of technology neutral regulation.³¹ However, the Commission seeks comment on whether and how to further divide the relevant product market by customer type and bandwidth.³² In so doing, it notes that “the needs of the customer dictate the service offering” of a BDS provider and that “as the needs change by customer

²⁶ FNPRM ¶ 16. (“The focus of this proceeding is on those geographic areas where the incumbent LEC is subject to price cap regulation that sets ceilings on the rates incumbent LECs may charge for BDS services.”). *See also* FNPRM n. 9. (“Hereinafter we refer to incumbent LECs subject to price cap regulation as either price cap incumbent LECs or price cap LECs.”)

²⁷ FNPRM ¶ 272.

²⁸ FNPRM ¶ 280.

²⁹ FNPRM ¶ 161.

³⁰ FNPRM ¶¶ 189, 279. The Commission seeks comment on whether the definition should also include minimum performance guarantees, and whether the minimum symmetrical speed should be reduced to 1 Mbps to include Ethernet dedicated Internet over fiber and HFC offered at symmetrical speed as low as 1 Mbps by providers such as Comcast.

³¹ FNPRM ¶ 160. Yet the Commission also recognizes that there are differences between packet and TDM services, including the fact that Ethernet—a packet-based service—is more easily scaled, and that customers are faced by high switching to transition from TDM to packet BDS. *See* FNPRM ¶¶ 190–198.

³² FNPRM ¶¶ 283–286. The Commission proposes the following customer classes: wholesale, mobile backhaul, and retail, with the latter customer category possibly subdivided by size—small businesses, mid-sized businesses, national/enterprise businesses. The Commission seeks comments on whether enterprise customers, which mostly require many sites in diverse locations and often in areas with limited business density (“spread-out” multisite customers), constitute a separate market. *See* FNPRM ¶ 199. According to the Commission, providers with a broad regional footprint without significant gaps in coverage that can effectively serve spread-out multisite customers are relatively rare. *See*, FNPRM ¶ 201. In addition, the Commission seeks comments on whether competitive LECs that purchase BDS wholesale to sell retail services to end users where they do not have network or where it is unprofitable to do so “have countervailing power even when dealing with an entity that may otherwise have market power, and whether they need different protections than end users.” *See* FNPRM ¶ 203.

class so do the service substitutes, the economics of providing service, and the likelihood of facilities based-entry by competitors.”³³

- (41) The Commission found evidence that services with bandwidths above 50 Mbps are generally competitive, but the FNPRM is non-committal about whether the Commission would exempt such services from further regulation.³⁴ The Commission seeks comment on whether it should consider a cut-off of 50 Mbps or of 100 Mbps, or some other bandwidth level, and whether the relevant bandwidth level(s) should evolve over time.³⁵
- (42) The Commission proposes to create a “bright-line” test for whether a given relevant market is competitive, based on business density and/or the number of facilities-based providers in the area.³⁶ How these two criteria (and potentially others) would be combined into a single test is not specified.
- (43) In markets deemed noncompetitive, the Commission also contemplated extending price regulation to competitive providers (including, e.g., traditional competitive LECs and cable companies) offering BDS (TDM or packet-based) services.³⁷ Such providers and services have not previously been price regulated apart from the general requirement that rates for common carrier offerings be just and reasonable. The Commission thus is considering extending price regulation to providers and services that constitute the competition to incumbent providers of BDS.
- (44) In the case of packet-based BDS, the Commission proposes moving away from tariffing or price cap requirements that have been imposed on ILEC TDM services, to instead introduce an “anchor” or “benchmarking” framework for regulating prices.³⁸
- (45) The FNRPM proposes three possible approaches to “anchor” or “benchmark” prices for packet-based services.³⁹ The first option, applicable where TDM price caps could be expected to reasonably constrain packet-based BDS prices, would be to rely on TDM prices to “anchor” prices for packet-based services. In such cases the Commission might decline to otherwise regulate packet-based services. The second option, applicable in areas where the Commission is unable to determine

³³ FNPRM ¶ 283.

³⁴ FNPRM ¶ 162.

³⁵ FNPRM ¶ 285.

³⁶ FNPRM ¶¶ 292–96.

³⁷ FNPRM ¶¶ 308–09. (“[W]e ask which provider(s) should be subject to the specific rules that apply to markets determined non-competitive. Should such rules only apply to the largest BDS provider in the non-competitive market as measured by network coverage, locations served, revenues or some other metric or metric combinations? . . . Should we focus on the provider with the largest market share? . . . Alternatively, should we apply specific rules to any firm in the non-competitive market that has a near ubiquitous network in the local territory and rights of way? . . . Another approach is to apply this framework to all BDS providers in the non-competitive area . . . [S]hould new entrants or providers with market share below a certain threshold not be subject to all or some of the proposed rules applicable to non-competitive markets?”)

³⁸ FNPRM ¶ 435.

³⁹ FNPRM § V.F.2.

whether TDM price caps constrain packet-based BDS prices, would establish a regulated rate for a benchmark packet-based BDS that would then serve as an “anchor” for “nearby-bandwidth packet-based BDS,” constraining their pricing. Finally, a third option would “initially use reasonably comparable prices for regulated TDM services as a benchmark” to determine whether rates for various packet-based BDS are just and reasonable, but would transition over time to use as a benchmark the packet-based BDS prices “established under this approach.”⁴⁰

- (46) The Commission seeks comment on which option should be used and how it should be implemented⁴¹ but appears to believe that the third option would be the least burdensome and most effective in “promoting facilities-based competition and facilitating technology transitions.”⁴² The Commission also asks for comments on other proposals.⁴³
- (47) The Commission suggests that the proposed anchor or benchmarking approach for packet-based BDS will encourage parties to negotiate reasonable terms and conditions, effectively constrain prices, and increase innovation.⁴⁴ Furthermore, in the Commission’s view this new framework would be implemented by removing tariffing requirements and implementing public disclosure requirements for providers affected by the proposed approach.⁴⁵
- (48) As discussed above in Section III, in the same document as these proposals, the Commission issues an Order that bans certain contracting practices by ILECs.⁴⁶ The Commission seeks comment on whether to extend this ban to all providers of BDS services in all relevant markets.⁴⁷ The banned practices are (1) all-or-nothing requirements, (2) above-expectation shortfall penalties, and (3) above-expectation early termination penalties. In addition, the Commission asks for comment on other contractual terms and conditions that have been subject to public comment.⁴⁸

⁴⁰ FNPRM ¶ 422.

⁴¹ See FNPRM ¶ 430 for an example of how certain aspects of the anchoring would be operationalized.

⁴² FNPRM ¶ 423.

⁴³ In response to certain parties’ proposals, the Commission asks whether the use of a cost model to establish benchmarks for Ethernet rates would be preferable to the proposed benchmark approaches. The Commission also asks for comment on whether ex ante rate regulation as proposed by Verizon and INCOMPAS would be a workable alternative to the benchmarking approach. See FNPRM ¶¶ 424, 426.

⁴⁴ FNPRM ¶ 425.

⁴⁵ FNPRM ¶¶ 435–36.

⁴⁶ FNPRM § IV.

⁴⁷ FNPRM § V.E.2. The Commission also proposes to ban certain nondisclosure agreements that would restrict sharing certain information with the Commission. FNPRM § V.E.1.

⁴⁸ FNPRM ¶ 11, § V.F.4.

IV.C. Select comments on the Proposed Rules

- (49) The bulk of my analysis in the remainder of this Declaration focuses on the difficulties of efficient price regulation and the possible adverse effects of such regulation. These effects are not limited to the likelihood that regulated prices will not be set at the best feasible levels; many of the problems are as a practical matter inherent in price regulation as an overall approach. In this section I offer a few general comments about the Commission’s proposals and some specific comments about important aspects of the proposals not addressed elsewhere in this Declaration.

IV.C.1. Uncertain scope of regulation

- (50) The FNPRM together with its appendices is a long and complex document. My review of its 288 pages leaves me with many questions about what exactly the Commission is contemplating in terms of new price regulation, especially as pertains to regulating providers and services that have not previously been subject to explicit price regulation. The FNPRM in places appears to contemplate wide extensions of existing regulation, but then through its many requests for further comment (the document contains literally hundreds of question marks) implicitly appears to be contemplating substantial restrictions on the scope, or sometimes a broadening of the scope, of the proposed regulation. For example, after (very loosely) describing its Competitive Market Test, the Commission asks which providers should be subject to price regulation in “noncompetitive” markets⁴⁹ and subsequently asks whether (in the case of packet-based BDS) price regulation should even extend to providers in markets deemed “competitive.”⁵⁰ In view of this absence of specificity, my analysis stresses general principles where possible, and is perhaps most applicable to the broadest proposals for price regulation.

IV.C.2. Problems with a “bright-line” test for competition

- (51) While the Commission proposes a “bright-line” test for designating areas as competitive or noncompetitive, the FNPRM asks numerous questions about key details of implementation (including, e.g., which providers to count as competitors),⁵¹ essentially recognizing that the line is anything but bright. This is not surprising, given that there are degrees of competition across markets, so any binary zero-one designation is inherently imperfect.
- (52) Based on my understanding of the facts, every non-ILEC competitor always faces competition from at least an ILEC. Comcast states that:

⁴⁹ FNPRM ¶¶ 308–11, 429.

⁵⁰ FNPRM ¶ 428.

⁵¹ FNPRM ¶ 294.

Comcast competes against incumbent telephone companies and competitive providers. Invariably, Comcast offers service in competition with a well-entrenched incumbent LEC that has many advantages, including far more extensive network connectivity to business locations, much larger sales and marketing operations, and long-term customer relationships.⁵²

- (53) Since price regulation is likely to have many unfortunate unintended effects (some described in later sections of this Declaration), it might make sense to contemplate price regulation of incumbents in secure monopoly markets, but the Commission should tread lightly in markets where market power is uncertain, modest, or fragile. My comments in subsequent sections of this Declaration accordingly focus on the difficulties and consequences of price regulation in markets that are not secure monopolies.

IV.C.3. Foundations for the anchor/benchmark approach to packet-based BDS regulation are unclear, as is the specific implementation

- (54) The Commission’s proposal for price regulation of packet-based services is especially unclear. In particular, the Commission’s proposal to use a TDM benchmark for similar packet-based services is surprisingly short on economic reasoning. The Commission does not offer analysis justifying such an idea through evidence that packet-based services and TDM services are close substitutes or have similar costs; nor does it offer any other reasoning, and in fact it expresses skepticism that TDM services would constrain prices for higher speed packet-based services.⁵³
- (55) Statements from Comcast call into question both the substitutability of TDM for packet-based services and the cost similarities. For example, one Comcast document explains the limitations of TDM services:

T1 DIA [also known as DS1 dedicated Internet access] services are typically offered over 1 or 2 T1 circuits so the bandwidth options are limited, inflexible and costly as an organization’s bandwidth and application requirements grow. To be competitive, you need to quickly and cost-effectively adapt your Internet access bandwidth. T1 DIA services are challenged to meet these elastic bandwidth requirements. There is, however, an alternative cost effective and more flexible option to connect to the Internet using an Ethernet [packet-based] dedicated Internet access service.⁵⁴

⁵² Comments of Comcast Corporation, Declaration of John Guillaume, June 28, 2016, ¶ 15.

⁵³ FNPRM ¶ 423 (“We question whether...TDM services could effectively constrain the prices for higher speed packet-based services in the current environment of increasing demand for high-bandwidth services.” (internal citations omitted)).

⁵⁴ Comcast Business, “Ethernet vs. T1s for Internet Access: A More Cost Effective and Flexible Alternative,” https://foxmediacontainer.s3.amazonaws.com/uploaded_assets/Ethernet-versus-T1s-for-Internet-

- (56) The cost of scaling bandwidth to meet increasing customer demand differs significantly between these two products. In particular, upgrading to a higher TDM bandwidth may require the “purchase [of] a new T1 router to support bonding of the two T1 circuits” or switching its service “to a different technology that offers higher bandwidth choices for Internet access.”⁵⁵ In contrast, most packet-based services do not carry similar technology upgrade costs.⁵⁶ The FNPRM acknowledges these cost differences between TDM and packet-based services:

As the demand for high-bandwidth services rises, users need increasing amounts of bandwidth for BDS. Ethernet services, especially over fiber, scale bandwidth to meet these demands more cost effectively than legacy TDM services. Providers must bond multiple DS1 lines together just to reach symmetrical transmission speeds in excess of 10 Mbps. This may require the costly deployment of additional lines to the location, and if a provider is already incurring the expense of trenching streets to deploy lines, then it makes more sense to install a higher capacity fiber line using newer technology protocols than deploying a copper line or coaxial cable. Once fiber lines with packet-based technology are deployed, it is relatively easy to increase bandwidth without further physical network modifications.⁵⁷

- (57) Similarly the Commission is skeptical that prices for one bandwidth tier of packet-based BDS could anchor prices for other bandwidth tiers.⁵⁸ Furthermore, it is unclear how the Commission’s plan to transition over time to the use of some unspecified packet-based services to benchmark other packet-based services would work.
- (58) Thus, the FNPRM provides little clarity as to exactly what is being proposed for price regulation of packet-based services. Since the Commission apparently believes that the “anchoring” or “benchmark” approach provides customer price protections comparable to those of a price cap

Access_WHT57159_Rev._6.14.pdf; *see also* Comcast Business, “T-1 or Ethernet: A Side-by-Side Comparison,” July 8, 2014, <http://cbcommunity.comcast.com/browse-all/details/t-1-or-ethernet-a-side-by-side-comparison>; Comcast Business, “How Carrier Ethernet Helps Mid-sized Businesses Embrace the Cloud,” Dec. 3, 2014, <http://cbcommunity.comcast.com/browse-all/details/how-carrier-ethernet-helps-mid-sized-businesses-embrace-the-cloud>.

In addition, a MegaPath document notes the scalability, reliability, availability, speed, and cost of equipment differences between TDM and packet-based services. MegaPath, “T1 vs. Ethernet Comparison,” *available at* https://www.megapath.com/megapath2016/assets/File/PDF/ProductSheets/Ethernet_vs_T1_Comparison.pdf.

⁵⁵ Comcast Business, “Ethernet vs. T1s for Internet Access: A More Cost Effective and Flexible Alternative.”

⁵⁶ “Unlike a T1-based DIA service, Ethernet DIA service bandwidth can be added simply and quickly by your Ethernet DIA service provider who can remotely reconfigure the Ethernet service demarcation device to support the new Ethernet DIA bandwidth you require. . . Contrast this to a T1 DIA service where new equipment and new, higher speed circuits are required which may take days or even weeks to get implemented.” Comcast Business, “Ethernet vs. T1s for Internet Access: A More Cost Effective and Flexible Alternative.”

⁵⁷ FNPRM ¶ 80 (*internal citations omitted*).

⁵⁸ FNPRM ¶ 423 (“[I]t is doubtful that [establishing rates for one tier of packet-based BDS] could reasonably constrain a relatively wide range of bandwidths (for example it is unlikely that a 25 Mbps anchor price would effectively constrain prices for 2Mbps and 50 Mbps services).”).

approach,⁵⁹ I assume in my comments that the Commission intends to apply a standard that effectively caps prices for packet-based BDS in areas it deems “noncompetitive.”

⁵⁹ FNPRM ¶ 425. (“[W]e expect adoption of an anchor or benchmarking pricing mechanism would provide many of the advantages of price caps and other forms of pricing regulation without some of the disadvantages.”)

V. Efficient regulation of BDS pricing is difficult

- (59) In general terms, the economic literature concludes that because both markets and regulation are imperfect, ultimately there is a trade-off between the costs of imperfect markets and the costs and benefits of imperfect regulation. A recent survey of analysis of the effects of regulation on economic activity concluded:

[E]ven where regulation might be intended to restore imperfect markets to a competitive ideal, outcomes frequently are associated with higher production costs and, in some cases, higher prices, distorted product offerings, and significant rent redistribution... Regulators typically have far less information on the markets they regulate than do the firms whose activities they oversee, confront limited resources in executing their oversight roles, and may themselves have weak incentives to achieve the outcomes that generate the greatest social welfare... The more dynamic is the industry, the greater the potential cost of these frictions.⁶⁰

- (60) While in principle price cap regulation has different imperfections than traditional rate-base regulation, those differences are not uniformly in favor of price caps: in particular, as I describe in Section V.D, its effects on incentives for product quality may actually be worse. More broadly, price cap regulation does not escape the inherent imperfections of regulation.⁶¹
- (61) In addition to the practical experience summarized in the Commission’s guiding principle that competition is best, economic theory can help illuminate the comparison between regulation and

⁶⁰ Nancy L. Rose, “Learning from the Past: Insights for the Regulation of Economic Activity,” in *Economic Regulation and Its Reform: What Have We Learned?* ed. Nancy L. Rose, 1–23 at 18, 20–21 (Cambridge, MA, and Chicago, NBER and The University of Chicago Press Books, 2014).

See also Joseph Farrell, “Prospects for Deregulation in Telecommunications,” *Industrial and Corporate Change* 6 (1997): 719–40 at 720. (“Deregulation is likely justified even under quite imperfect competition... [One] should weigh any price or other market power inefficiencies that deregulation would allow against the likely benefits of deregulation, broadly considered. In this balancing, we should remember that deregulation may cause firms to improve efficiency in ways that are hard for anyone to imagine *ex ante*.”)

See also *Pricing Flexibility Order*, ¶ 144. (“The Commission has determined on several occasions that retaining regulations longer than necessary is contrary to the public interest. Almost 20 years ago, the Commission determined that regulation imposes costs on common carriers and the public, and that a regulation should be eliminated when its costs outweigh its benefits.”)

⁶¹ Paul L. Joskow, “Incentive Regulation in Theory and Practice: Electricity Distribution and Transmission Networks,” in *Economic Regulation and Its Reform: What Have We Learned?* ed. Nancy L. Rose, 291–344 at 336 (Cambridge, MA, and Chicago: NBER and The University of Chicago Press Books, 2014). (“Incentive regulation has been promoted as a straightforward and superior alternative to traditional cost-of-service or rate-of-return regulation. In practice, incentive regulation is more a complement to than a substitute for traditional approaches to regulating legal monopolies. In some ways it is more challenging. Whether the extra effort is worth it depends on whether the performance improvements justify the additional effort. Incentive regulation in practice requires a good accounting system for capital and operating costs, cost reporting protocols, data collection, and reporting requirements for dimensions of performance other than costs.”)

competition as ways of generating welfare-improving outcomes for customers. Bulow and Klemperer (1996) show that increasing the number of symmetric competitive bidders in a simple auction mechanism leads to higher expected gains than does improving the auctioneer’s bargaining or mechanism-design skills in dealing with a given number of suppliers.⁶² Because regulation can be thought of as a negotiation between a presumably sophisticated agency on behalf of customers, on the one hand, and suppliers (often a monopolist), on the other, Bulow and Klemperer’s work offers support from economic theory for the view that “optimal regulation of an industry may be less important than attracting additional entry”—a view consistent with modern consensus interpretations of our experiences with regulation and competition.⁶³

- (62) Because BDS costs vary by location, and because customers demand customized BDS products, in the remainder of this section I describe why efficient price regulation would be extremely difficult to implement.

V.A. The problem of regulating price when costs and customer requirements are heterogeneous

- (63) When costs and customer requirements are heterogeneous, finding a regulated price that improves on unregulated market outcomes is challenging, even under the misguided view that the only goal is price.⁶⁴ Normally, we think of the goal of price regulation as finding a price that is (1) remunerative, though not profit-maximizing, for the seller and (2) below (or, more broadly, closer to efficiency than) the unregulated price. In a market with active bidding competition, two very fundamental problems immediately arise.
- (64) First, the efficient product description, and hence its costs, will differ from case to case. But if different customers want, and all but insist on, different products, with different costs and using differing amounts of scarce capacity at (perhaps shifting and evolving) network capacity bottlenecks, it will be very difficult to identify efficient prices by benchmarking one customer’s case against another. It is telling that while the Commission disclaims any intent to force prices for significantly different product bundles to be the same or to bear simplistic relationships to one another, its

⁶² Jeremy Bulow and Paul Klemperer, “Auctions Versus Negotiations,” *American Economic Review* 86 (1996): 180–94. Bulow and Klemperer’s model is developed for a seller’s auction, but the model applies equally to a procurement context. Their model shows that, under standard assumptions, a simple ascending auction with symmetric, serious bidders and no reserve price is more profitable than any mechanism conducted with one fewer bidder.

⁶³ *Id.* at 180 n. 1.

⁶⁴ For example, in the *Pricing Flexibility Order*, the Commission acknowledged the limitations of using a market characteristic such as traffic density to determine regulatory prices, as those prices failed to reflect the underlying cost characteristics. The Commission concluded “that market forces are more likely to result in efficient pricing than is regulation, and, for this reason, the greater flexibility we grant here will benefit access customers through more efficient pricing of access services.” *Pricing Flexibility Order*, ¶¶ 61, 66.

proffered example of how it might export TDM price regulation to packet-based BDS is strikingly simplistic:

We propose above to evaluate the reasonableness of rates for packet-based BDS by benchmarking them against the incumbent LEC’s TDM price for the most comparable level of service available, and over time, as TDM services are discontinued, benchmarking them against packet-based BDS rates established as being just and reasonable under this approach.⁶⁵

- (65) Seemingly recognizing the issue, but not acknowledging its difficulty, the Commission seeks comment on whether, in addition to bandwidth and service-level offering, benchmark rates should also “differ based on the technology, service tier, geographic location, quality of service, or any other factors.”⁶⁶
- (66) While benchmarking, or anchoring prices from one customer’s experience to another’s, is thus likely to be ineffectual or dangerous, the alternative of picking a price based on a cost model or other information on costs is also very challenging. To illustrate the difficulty, suppose that we have a well-functioning bid market⁶⁷ and that suppliers vary in their costs to supply a customer.⁶⁸ Then the lowest cost supplier will tend to win, at a price reflecting second-lowest cost. Other things being equal, having more suppliers bidding or potentially bidding on a particular opportunity will tend to bring down the lowest and second-lowest cost and may narrow the difference between these, leading to prices that are closer to the cost of the winning bidder. To the extent that one interprets this difference between price and the cost of the winning bidder as a measure of market power, competition may reduce this measure.
- (67) For customers to benefit from regulation in such a market, even in narrow price terms, a regulated price should exceed the lowest cost (i.e., long-run cost, to ensure supply and compensate the supplier) but be well below the second-lowest cost. When an incumbent has a reasonably knowable cost and is also known to have a dramatic cost advantage over all other suppliers, finding such a beneficial price may be feasible. But while that may have been, or may be, the case for ILEC provision of TDM services over existing copper that does not face competition from nearby fiber-based services, the

⁶⁵ FNPRM ¶ 430.

⁶⁶ FNPRM ¶ 432.

⁶⁷ By “well-functioning” I mean a market in which suppliers do not face substantial entry barriers apart from the cost of providing services. In particular, I am not assuming perfect competition or costless entry. However, I do not include artificial entry barriers.

⁶⁸ In the actual market there are many costs of different forms associated with serving a customer. Here I use the term “cost” to include total cost of serving the customer over the duration of the proposed contract. This will include one-time costs of buildout or equipment for a customer not already served by the supplier but would exclude costs of buildout sunk prior to negotiating a contract. Thus, I allow for substantial cost differences between incumbent suppliers and other suppliers for whom providing services requires a substantial new investment. (Cost differences in an economically sophisticated sense might also include differences in anticipated follow-on revenues, an issue I discuss below.)

Commission offers no reason to believe it is the case more generally, including in locations that are also served by reasonably nearby fiber-based packet data services. Rather, the attempt to set a price for a given product in a given market that covers the lowest cost and undercuts the second-lowest cost seems doomed to amount to shooting at a narrow, moving, and occluded target in such locations.

- (68) In past actions, the Commission has recognized that in locations where incumbent LECs face some competition, price regulation encounters significant additional problems.⁶⁹ Indeed, the FNPRM notes some of the challenges of choosing a regulated price to emulate the competitive price, as well as the potential for harm if this is not done well:

[W]e must account for limitations on our ability to establish what a competitive price is, the harms of unintended consequences from regulatory action . . . as well as its administrative costs.⁷⁰

V.B. Customer needs and associated costs of providing service are diverse

- (69) Different providers may have different costs of servicing a customer depending on how the customer’s needs for distant connections match their own facilities.⁷¹ For example, if the carrier has a national backbone, variation in the cost of serving a customer is largely driven by variation in the cost of last-mile connections to a customer’s set of locations requiring BDS.⁷² These costs in turn will depend on how the carrier provides the last-mile connections—through existing data lines, through new buildout, or through contracting with other providers. A competitor without a national backbone

⁶⁹ *Pricing Flexibility Order*, ¶¶ 19–21 (“[W]e have observed competition develop in the marketplace; . . . Although our current price cap regime gives LECs some pricing flexibility and considerable incentives to operate efficiently, significant regulatory constraints remain. As the market becomes more competitive, such constraints become counter-productive. . . . We now conclude that market forces, as opposed to regulation, are more likely to compel LECs to establish efficient prices.”)

⁷⁰ FNPRM ¶ 428.

⁷¹ For example, {{

}} See Comments

of Comcast Corporation, Declaration of Robert Victor, June 28, 2016, ¶ 4.

⁷² FNPRM ¶ 55. (“The decision to build or lease last-mile facilities generally occurs on a case-by-case basis when there is an interested, potential customer. Whether to build a lateral connection can depend on a variety of factors, including the distance of a building to the competitive provider’s existing network facilities, the density of business locations near the targeted location—especially the number of nearby multiple tenant buildings, the potential return on investment given the customer’s service demand (e.g., revenues tend to increase with the customer’s bandwidth demands), the term of the agreement with the customer, access to rights-of-way, and the ability to access buildings, among other factors.” *Internal citations omitted.*)

may incur other costs should it need to also contract for regional or long-distance transmission outside its own network to reach one or more of the customer’s locations.⁷³

- (70) Obviously, differences in customer needs regarding bandwidth and quality of service may cause variation in the costs of serving them.
- (71) Furthermore, because they vary in the set of other, perhaps distant, locations to which they require BDS connections, multi-location BDS customers may have requirements and costs that differ very substantially from those of other multi-location customers and from those of single-location customers, even as among customers who share a location and have similar needs for bandwidth and service quality.

V.C. Customization of BDS

- (72) I understand that substantial numbers of businesses purchase best-efforts services from Comcast and other providers.⁷⁴ The Commission has defined BDS to exclude best-efforts services and in doing so, appropriately relies on evidence that, for BDS customers, they are not close substitutes. This lack of substitution between BDS and best-efforts, together with the fact that some businesses rely on best-efforts services and others on BDS, strongly illustrates that business needs are highly variable. For example, the Commission cites evidence that BDS customers pay as much as ten times more for BDS services compared to best-efforts services that may provide loosely similar service levels most of the time, but with contractual differences (notably, without guarantees).⁷⁵ Customers who purchase BDS

⁷³ FNPRM ¶¶ 225, 228–29. (“Like incumbent LECs, competitive LECs build facilities to meet consumer demand. Deploying facilities requires incurring costs that vary, ‘among other things, on the length of the laterals and fiber rings built, the nature of the electronics added, whether the lines are buried, and local regulations (e.g., a city may require replacement of cobblestones on scenic streets).’ In addition to deploying facilities, a provider frequently needs to obtain building access and/or rights of way to reach the building. . . . In addition to deploying their own facilities, competitive LECs extend their network reach by purchasing incumbent LEC facilities at a regulated price on an unbundled basis or at non-regulated wholesale prices. Obtaining UNEs often is the most economical way to reach a new customer for a competitive LEC, and it is important to account for the effects of UNE competition. . . . Competitive LECs also lease dedicated, non-regulated, wholesale services to connect to commercial buildings over non-UNE facilities from incumbent LECs or other competitive LECs. Even competitive LECs with well-developed regional fiber rings rely on an incumbent or competitive LEC wholesale inputs for last-mile connections. Leasing last-mile dedicated services from the ubiquitous incumbent LEC oftentimes is the only option due to a lack of competitive build-out.” *Internal citations omitted.*)

⁷⁴ Best-efforts services are typically asymmetrical services with greater download than upload speeds, shared among multiple users with no (or weak) performance or service guarantees, and subject to failure during high congestion periods. *See* FNPRM ¶¶ 13–14 (*internal citations omitted*). *See also* Comcast March 25, 2016 SpA *Ex Parte* at 4. (“Comcast’s best effort Business Internet service is sold without SLAs or contractual performance objectives.”)

⁷⁵ FNPRM ¶ 193. (“[C]ustomers do not switch to available best efforts services with at least as much bandwidth in both directions that are priced at approximately one tenth of that level (compare with the FiOS 50/50 price of \$49.99), implies some customers must value certain characteristics of BDS highly relative to best efforts service. This suggests such customers would be unlikely to be tempted to switch to a best efforts service even if its price were to fall by a significant amount. It also suggests a customer currently purchasing a best efforts service would not switch to a BDS with a price of several multiples of the best efforts service, even if the BDS price were to fall significantly.” *Internal citations omitted.*)

instead of best-efforts services apparently care a great deal about service quality and the other attributes that distinguish BDS from best-efforts services, and thus are willing to pay substantially more to get a product that is just what they want.⁷⁶ This illustrates that tailoring of the service to the customer’s needs may well be more important than price in a customer’s procurement decision and welfare. Thus, it would be a disservice to customers to squeeze them into a limited set of products. For the remainder of this section, I focus on the customization of BDS.

- (73) As the FNPRM observes, BDS customers “come in all shapes and sizes,” which impacts business needs and results in customized solutions:

Retail purchasers of business data services come in all shapes and sizes, and include retail businesses, governmental and educational institutions, and other enterprises that require dedicated enterprise services. Their needs vary depending on, among other factors, the number of employees and locations they have, the volume of their traffic, and the technological sophistication of the services they require. Many call for a competitive wholesale BDS access market. Large businesses are especially likely to require “high quality phone and Internet services” that “depend upon special access services as the building blocks of their corporate networks, from workhorse DS1s to the growing number of Ethernet connections to the highest capacity OCns.” Medium-sized and small businesses also require “advanced IP and fiber connections,” which are “mission critical.” Retail banks, for example, “rely heavily on broadband service” to enable “financial transactions and provide [customer] support in a timely fashion.” Reliable broadband connections also allow brick and mortar companies to meet customer needs “as efficiently and effectively as possible” and to “enhance the customer shopping and buying experience.”

Most larger, sometimes called enterprise, customers require connections to more than one site, and some, such as retail banks, and large retail sales outlets, may require many sites in diverse locations, often in areas with limited business density. Moreover, at many of these locations such large customers may only have low bandwidth requirements, even if each connection must have a high degree of reliability (for example, in the case of a retailing outlet, to ensure rapid credit card processing) and/or be highly secure (in the case of a retail bank). Larger customers are typical users of dedicated fiber-based, symmetric services; some have service demands for a limited geographic area while others require service for any number of locations within the country. Multi-location customers are often provisioned by

⁷⁶ FNPRM ¶ 194. (“In fact, the characteristics of best efforts service and BDS appear to be very different. BDS comes with substantial reliability guarantees and functionality that do not accompany best efforts services, leading us to the view that the two services do not play important roles in constraining the quality-adjusted prices of each other. Consistent with the observed price differences between the different types of services, some end users do not require ‘mission critical’ connectivity, and prefer best efforts services to BDS, prioritizing cost savings over reliability and specific functionality. Other end users are willing to pay considerably more for services that include greater (particularly upload) speeds, are more reliable, and come with more rigorous guarantees.” *Internal citations omitted.*)

BDS providers that “have a broad regional footprint without significant gaps in coverage to serve large enterprises with multiple sites across given geographic regions effectively.” Such providers may be relatively rare.⁷⁷

- (74) In particular, different Comcast customers have different BDS needs in terms of type of connections, number of connections, bandwidth speed, etc. and these customized premium-priced options are typically contractually backed by specific service-level agreements.⁷⁸ For example, Comcast provides three service tiers in BDS (Basic, Priority, and Premium) that offer a range of performance assurances for latency, jitter, and packet loss.⁷⁹
- (75) Even within the class of services defined as BDS by the Commission, customers will have needs for various different kinds of connections. For example, the Commission classifies Ethernet connections as follows:
- Ethernet Private Line Service (EPL): Point-to-point connectivity between two customer sites for bandwidth-intensive applications, i.e., accessing cloud services and data centers;
 - Ethernet Virtual Private Line Service (EVPL): A point-to-multipoint connection that allows customers to tailor bandwidth, performance characteristics and cost to meet the needs of their applications;
 - Ethernet LAN Service (ENS): Multipoint-to-multipoint connectivity to connect organizations with high-bandwidth requirements and multiple locations across a provider’s network; and
 - Ethernet Dedicated Internet Access Service (EDI): Continuous, high-bandwidth connectivity between customers’ LANs and the public Internet.⁸⁰
- (76) Comcast provides three of these Ethernet products (EPL, ENS and EVPL), which may differ in price and are sometimes further customized.⁸¹ For example, based on communications with Comcast

⁷⁷ FNPRM ¶¶ 200–01 (*internal citations omitted*). See also FNPRM ¶ 283. (“Moreover, the needs of the customer dictate the service offerings. As discussed in our competition analysis and as providers have told us, different types of customers have different needs. A small business with less than 20 employees at one location is unlikely to need the multi-office networking connectivity, or even the same level of bandwidth capacity, as would a large enterprise customer.” *Internal citations omitted*.)

⁷⁸ FNPRM ¶ 199. (“As Comcast explains, ‘although all of Comcast’s business class data services may be used by various types of customers, the unique needs of certain customers may make one service more appropriate than others.’” Citing to Comcast Mar. 25, 2016 *Ex Parte* at 2.)

⁷⁹ Comments of Comcast Corporation at 11–12.

⁸⁰ FNPRM ¶ 47. Other BDS technologies, including the advantages and/or limitations of each, are discussed in a Comcast document. The technologies discussed are “Traditional T1 and DS3 private line connections,” “Layer 3 VPN,” “Dark fiber” and “Carrier Ethernet.” This again indicates that different solutions are suited for different customer needs. See Comcast Business, “Data Center Networking and Cloud Connectivity Options,” July 31, 2015, <http://cbcommunity.comcast.com/browse-all/details/data-center-networking-and-cloud-connectivity-options>.

⁸¹ Comments of Comcast Corporation, Declaration of John Guillaume, June 28, 2016, ¶¶ 8–11. See also ¶ 4 (“Potential customers typically seek unique bundles of services that are tailored to meet the varying needs of each of their locations and business purposes.”); ¶ 14 (“Although Comcast has standard ‘rack’ rates for all of its retail services, contracts

personnel, I understand that Comcast’s proposal {{

}} As another example, I understand that {{

}}

(77) In addition, customers are able to customize by including Comcast-specific add-on services (e.g., VoIP and cloud) to their business packages. For example:

- San Francisco 49ers: Comcast installed a 10 Gbps Ethernet Dedicated Internet Access (DIA) connection to the stadium, “the most Ethernet capacity the company has installed at a stadium to date,” for stadium-wide WiFi and HD video screens. In addition, the 49ers landline service was placed in the cloud, along with implementing Business VoiceEdge, a “cloud-based landline voice and unified communications (UC) service.”⁸²
- WebiMax Digital Marketing: Comcast installed a 50 Mbps Ethernet DIA connection to the office along with “SIP Trunks,” a voice service that “provides a dependable voice communication over a private IP network so phone calls can be prioritized over other types of network traffic.”⁸³
- Lake Union Sea Ray: In addition to a 50 Mbps Ethernet DIA product with connections to the three Lake Union Sea Ray locations, Comcast also installed “PRI Trunks” at the company’s headquarters giving the company “a reliable voice system. . . [where] callers can reach parties directly through individual extensions.”⁸⁴
- Sound Oxygen Service: The respiratory provider selected Business VoiceEdge for four of its locations and four homes of telecommuting employees. Some features of Business VoiceEdge include the ability of employees to make calls from their mobile phones, a central auto attendant

generally are individually negotiated, with rates and other terms dependent on term, volume, and total commitment.”)

⁸² Comcast Business Built for Business, “San Francisco 49ers Strike Gold with Ethernet, Video, VoiceEdge Services from Comcast Business,” 2015, *available at* <https://business.comcast.com/resource-library/case-studies/general/san-francisco-49ers-strike-gold-with-ethernet-video-and-voicededge-services>.

⁸³ Comcast Business Built for Business, “WebiMax Taps Comcast Business to Ramp Up Client Services at a Growing Digital Marketing Agency.”

⁸⁴ Comcast Business Built for Business, “Lake Union Sea Ray Improves Customer Service and Operations with Comcast Business,” *available at* <https://business.comcast.com/resource-library/case-studies/retail/lake-union-sea-ray-cmpromves-customer-service-and-operations-with-comcast-business>.

to direct calls and a dedicated line for voice. In addition, Comcast deployed a 100 Mbps Ethernet DIA connections to the Business VoiceEdge offices.⁸⁵

- (78) While the Commission seeks comment on whether, in addition to bandwidth and service-level offering, benchmark rates should also “differ based on the technology, service tier, geographic location, quality of service, or any other factors,”⁸⁶ these examples illustrate the challenges in implementing price regulation suitably customized for a diverse set of business needs.
- (79) Leading economic scholars have drawn a parallel between regulation and a long-term contract.⁸⁷ Both forms of governance promote rules, procedures and authority and de-emphasize the competitive form of governance under which parties dissatisfied with a relationship can readily turn elsewhere. In evaluating whether a more regulatory, less competitive BDS environment would benefit or hurt customers, it may therefore be informative to ask how customers view long-term contracts. Do customers seek out the protection that long-term contracts may offer against price increases in a noncompetitive environment? Or do they seek to bring forward the time when they can renegotiate, leveraging a powerful option to go elsewhere?
- (80) One source of evidence on this is Comcast’s own experience negotiating contract terms with customers. Comcast has found that retail BDS customers (perhaps in contrast with backhaul customers) often prefer to {{
}}.⁸⁸ The Commission should evaluate whether, in light of the economic parallels described, it is in the public interest to push the BDS environment toward leaning more heavily on rule-like, rather than competition-based, limits on prices, and on rules rather than competition for non-price elements.
- (81) Analogous evidence may be gleaned from the Commission’s investigation of ILEC contract terms in BDS.⁸⁹ The Commission’s discussion suggests that certain ILECs have sought to impose longer

⁸⁵ Comcast Business Built for Business, “Sound Oxygen Service Improves Client Service with Comcast Business,” available at <https://business.comcast.com/resource-library/case-studies/healthcare/sound-oxygen-service-improves-client-service-with-comcast-business>.

⁸⁶ FNPRM ¶ 432.

⁸⁷ Paul L. Joskow and Richard Schmalensee, “Incentive Regulation for Electric Utilities,” *Yale Journal on Regulation* 4 (1986): 8–9. Joskow and Schmalensee suggest that regulation is analogous to a long-term contract. They describe that for the regulation of electric utilities, “[I]t is useful to think the regulatory process embodied in established regulatory procedures as a long-term ‘regulatory contract’ between electricity customers, represented by the public utility commission, and the utility. This contract places explicit and implicit obligations on both the utility and, through commission policies, its customers.” (*Internal citations omitted.*) Similarly, in the BDS context, regulation can be thought of as a long-term contract between BDS customers, represented by the Commission, and BDS providers. Under this contract, the Commission employs a price cap to set prices.

⁸⁸ Comments of Comcast Corporation, Declaration of John Guillaume, June 28, 2016, ¶ 13. (“Comcast’s EDI service has seen a {{
}} decline in prices over just 12 months.”)

⁸⁹ The Commission’s discussion in FNPRM § V.F.4.c and my brief discussion in Section III focus on the potential for such provisions to be anticompetitive. Here, I am suggesting that something different can be learned from the customers’ views on the provisions.

contracts or practices that increase the effective length of contracts, whereas customers resist those practices or complain about them.⁹⁰

V.D. Quality of BDS

- (82) A well-recognized challenge with price caps (or benchmark pricing restrictions that effectively cap prices) is that they might undermine incentives to deliver quality.⁹¹ Intuitively, price caps provide incentives to reduce costs—and that includes reducing costs by reducing quality, in contrast to the case of competitive incentives. The Commission has also recognized “the theoretical concern that LECs under price cap regulation might seek to increase their profits not by becoming more productive, but by lowering the quality of the service they provide.”⁹²
- (83) In the United Kingdom in 2004, the Office of Gas and Electricity Markets incorporated quality of service metrics into its incentive mechanisms for electric distribution firms—the equivalent of utilities in the United States—because it realized that firms had responded to incentives to cut cost by both becoming more efficient and reducing spending on quality.⁹³ However, that implementation has been far from simple and has required a continued and evolving adaptation of the incentive mechanisms and has brought up the need for extensive data collection and monitoring.⁹⁴ In addition,

⁹⁰ FNPRM § V.F.4.c.

⁹¹ Timothy J. Brennan, “Regulating by Capping Prices,” *Journal of Regulatory Economics* 1 (1989): 133–47 at 141. (“If the price caps are not tied to quality in some way, and if quality can be varied by the regulated firm, it may have an incentive to reduce quality inefficiently in the face of a price control. The argument is analogous to the familiar argument regarding the failure of a landlord to maintain a rent-controlled apartment.”)

See also David Besanko, Shabtai Donnenfeld, and Lawrence J. White, “The Multiproduct Firm, Quality Choice, and Regulation,” *Journal of Industrial Economics* 36 (1988): 411–29. This work shows that when consumers have heterogeneous preferences and quality cannot be directly observed, the imposition of a price cap lowers the quality for high-quality goods and raises the quality for low-quality goods compared to the level of quality offered by an unregulated monopolist.

See also Richard O. Beil and David L. Kaserman, “Entry and Product Quality under Price Regulation,” *Review of Industrial Organization* 10 (1995): 361–72.

See also Gregory S. Crawford, “Cable Regulation in the Internet Era,” in *Economic Regulation and Its Reform: What Have We Learned?* ed. Nancy L. Rose, 137–93 at 169 (Cambridge, MA and Chicago: NBER and The University of Chicago Press Books, 2014). Crawford documents empirical studies that have analyzed the effects of repeated regulation and deregulation in the cable industry. He concludes that “[t]he accumulated evidence is not encouraging for proponents of regulation in cable markets. Research based on time-series data suggest that while prices briefly declined after the 1992 Cable Act, so too may have product quality. Detailed econometric studies based on disaggregate cross-section data provide mixed evidence. Some find that regulation lowers cable prices from monopoly levels, while others find negligible effects. Evidence of the impact of regulation on quality is positive, although further research is necessary, and evidence on consumer welfare effects of changes in cable choice sets is, if anything, in favor of deregulation.”

⁹² *In the Matter of Policy and Rules Concerning Rates for Dominant Carriers*, Second Report and Order, 5 FCC Rcd. 6786 (1990) ¶ 334.

⁹³ Paul L. Joskow, “Incentive Regulation in Theory and Practice: Electricity Distribution and Transmission Networks,” in *Economic Regulation and Its Reform: What Have We Learned?* ed. Nancy L. Rose, 291–344 (Cambridge, MA and Chicago: NBER and The University of Chicago Press Books, 2014).

⁹⁴ *Id.* at 322–23 and 337. (“Adding quality-related incentives to cost-control incentives makes good sense in theory and in practice. However, integrating these incentive mechanisms into a package that gives the correct incentives on all relevant margins remains a considerable challenge for incentive regulation in practice... [the Office of Gas and

it is unclear whether the benefits of such regulatory mechanisms have been outweighed by the associated administrative burden.⁹⁵

- (84) In addition, as mentioned in paragraph (59), the trade-off between imperfect markets and imperfect regulation might at times lean towards higher prices in exchange for increased quality and quality choices.⁹⁶
- (85) The retail BDS market seems to raise these concerns strongly. As discussed in Section V.C, there are many dimensions to the product, with customer demand being both idiosyncratic and demanding, in that even seemingly modest differences in performance or in performance guarantees may make a big difference in customer value.⁹⁷ Any regulatory attempt to maintain quality metrics would seem unlikely to be able to track all the performance dimensions that are important to some customers.⁹⁸

Electricity Markets] uses statistical and engineering benchmarking studies and forecasts...[T]he targets incorporate performance improvements over time and reflect, in part, customer surveys of the value of improved service quality... Incentive regulation in practice is clearly an evolutionary process. One set of mechanisms is tried, their performance assessed, additional data and reporting needs to be identified, and refined mechanisms developed and applied.” *Internal citations omitted.*)

⁹⁵ *Id.* at 332–33. (“There has been relatively little systematic analysis of the effects of the application of incentive regulation mechanisms on the performance of electric distribution and transmission companies.”)

⁹⁶ *See, e.g.,* Severin Borenstein and Nancy L. Rose, “How Airline Markets Work...or Do They? Regulatory Reform in the Airline Industry,” in *Economic Regulation and Its Reform: What Have We Learned?* ed. Nancy L. Rose, 63–135 at 122 (Cambridge, MA and Chicago: NBER and The University of Chicago Press Books, 2014). (“It is important to recognize that these patterns do not imply that passengers at dominated airports are necessarily worse off. Large airports with one or two dominant carriers generally are hubs and, as such, schedule a disproportionate number of flights compared to the local demand for air service. Improved service quality may offset part or all of the loss from higher prices resulting from airport dominance. Nor do these concerns necessarily demand regulation. Even if prices are above competitive levels, they may be no less efficient than are regulated prices. Rather, the relevant question is whether appropriately executed competition policy could enable customers to receive the benefits of greater service without having to pay higher fares associated with trips to and from the hubs.”)

⁹⁷ Comments of Comcast Corporation, Declaration of John Guillaume, June 28, 2016, ¶ 4. (“Potential customers typically seek unique bundles of services that are tailored to meet the varying needs of each of their locations and business purposes.”). *See also* ¶ 14 (“Although Comcast has standard ‘rack’ rates for all of its retail services, contracts generally are individually negotiated, with rates and other terms dependent on term, volume, and total commitment.”)

⁹⁸ Even if apt product quality metrics can be devised, managed, and enforced, the ensuing administrative burden would be substantial, contrary to the Commission’s proposal of minimizing administrative burden for the Commission and the providers “to build upon lessons from the Connect American Fund challenge.” *See* FNPRM ¶¶ 305, 497.

VI. Price regulating BDS would retard entry and reduce competition

- (86) The recent history of the BDS industry strongly suggests that the competitive conditions facing many customers over the coming years will depend crucially on the presence or absence of willing competitive entry. The degree of willing competitive entry will, in turn, depend on entry incentives. The Commission should analyze its BDS policies with close attention to how regulation affects those incentives.
- (87) As long as (1) entry is highly beneficial for competition and customers and (2) the supply of entry is significantly responsive to incentives (and specifically to the changes in incentives that the contemplated policies would cause), regulation that affects entry incentives can have a substantial effect on competition.
- (88) This suggests that if the Commission intends to divide the markets into two buckets and impose price regulation in the “noncompetitive” bucket, it would be better to define the noncompetitive bucket to consist of secure ILEC monopolies, than to define the competitive bucket as consisting only of markets that based on (e.g.) studies such as Dr. Rysman’s appear to be fully saturated with competition.

VI.A. Entry in this industry is beneficial

- (89) The benefits of entry are clear from the Commission’s own discussion and from its guiding principles.

The best available data suggest that competitive entry and potential competition are bringing material competitive benefits to some places and to some products (most notably high bandwidth services), but competition remains stubbornly absent from other places and different products (most notably low bandwidth services).⁹⁹

First, competition is best. Where competition exists, there is little for government to do except to maintain the traditional oversight of telecommunications services, because competition is the single best way of ensuring that customers benefit.¹⁰⁰

⁹⁹ FNPRM ¶ 3.

¹⁰⁰ FNPRM ¶ 5.

- (90) Entry in the BDS marketplace may take the form of buildout to business locations in response to a customer’s request for service, and/or proactive buildout in select markets so as to be able to address multiple potential customers.¹⁰¹
- (91) Policy attention to incentives for entry is particularly important because, while it is obvious that competitive buildout to a customer’s location benefits the original customer, there may also be positive spillover effects for nearby customers and multi-location customers. The carrier will be able to serve nearby potential customers at a lower incremental cost, as well as customers with multiple locations using its own on-net services.¹⁰² In addition, as discussed in Section VII, new buildouts are likely to use the most modern technology, so that future users of this buildout will benefit from this modernization. For example, as an entrant in the BDS marketplace, Comcast competes by “offering highly innovative products that appeal to business customers of all sizes,” which involve “extension of fiber networks and other upgrades to serve each individual customer.”¹⁰³
- (92) To the extent that these future or follow-on opportunities lead to additional profit for the carrier, those incentives are in principle internalized by a forward-looking carrier. But to the extent that the benefit accrues to future customers, it is a competitive spillover, not internalized by the carrier and/or the original customers.
- (93) Regulation of pre- and post-entry prices is likely to slow such buildout, as discussed in more detail in Section VII. There is thus a trade-off: while consumers may encounter artificially lower prices in the short term, entry will also be discouraged, reducing the benefits enumerated above. Both sides of this trade-off need to be taken into account.

VI.B. Entry in this industry significantly responds to entry incentives

- (94) There are also grounds to expect that entry responds significantly to incentives. As multiple statistics in the Commission’s discussion illustrate, competitive entry into BDS has reached a very substantial, and rapidly growing, set of customers and locations. In cable, business revenues have experienced a compound annual growth rate of 20%, and it has been estimated that over the course of 2013, CLECs’

¹⁰¹ Comments of Comcast Corporation at 9 (“Until recently, Comcast chose to build out its fiber network to business locations only reactively, in response to a customer’s request for service. Comcast now has begun to undertake proactive buildouts in select downtown markets. These newly developed ‘hyperbuilds’ { } { } representing a substantial capital risk.”).

¹⁰² As an example, the growing needs of cell backhaul customers, who tend to purchase BDS for multiple locations, have given Comcast the incentive to make substantial infrastructure investments. *See* Comments of Comcast Corporation, Declaration of Devesh Raj, June 28, 2016, ¶ 11. (“Comcast Cable expects that the demand for further substantial infrastructure investment in BDS products and offerings will continue, particularly as customers demand more backhaul capacity. Since entering the BDS market, Comcast Cable has aggressively made these investments in an effort to win new business and expand the availability of BDS within its footprint.”)

¹⁰³ Comments of Comcast Corporation, Declaration of Devesh Raj, June 28, 2016, ¶¶ 10–11.

bandwidth grew at six times the rate of ILECs'.¹⁰⁴ At the same time, the set of locations is far from saturated with competitive provision.¹⁰⁵ These facts combined suggest (although, of course, they cannot prove) that there are likely to be many locations where incentives for entry are on the cusp. Buttrussing that indication, it appears that many of the competitively served locations became so served only recently, suggesting that, for example, last year's entry incentives had significantly different effects on entry than did those of a few years ago.¹⁰⁶

- (95) Additional evidence that informed industry players expect entry to respond significantly to incentives comes from the ILECs' challenged contracting practices and from the Commission's discussion of them. Some of the practices, notably early termination fees above expectation damages, seem most easily understood as attempts to slow an ILEC's loss of customers to competitive entry, and the Commission appears to take this position. Such an attempt would make little sense if incentives (in this instance for entrant and customer jointly) did not affect the frequency of such entry much.¹⁰⁷ By the same token, the Commission's intervention against such contracting practices suggests that it believes that eliminating the practices' disincentives to entry is likely to have a real effect.

VI.C. Price regulation would negatively affect entry incentives

- (96) It is worth focusing a little on the economic analytics of entry incentives. In many markets, customers play no active role in the entry process, and the entrant makes the entry decision unilaterally. In this case, entry incentives are governed by (anticipated) post-entry pricing, because that is the price that the entrant will be charging and/or competing against. The incumbent's pre-entry pricing affects the benefit that accrues to the customer but does not (directly) affect the entrant's payoff or decision. In BDS markets, however, it is reportedly common for customers to contract with an entrant before costs are sunk.¹⁰⁸ In such cases, it seems more natural to model the entry decision as a joint one by the

¹⁰⁴ FNPRM ¶ 236 (citing to Sean Buckley, *Cable Becomes Emerging Special Access Source for CLECs, But Trails AT&T and CenturyLink's Ubiquity*, FierceTelecom (Mar. 26, 2015), <http://www.fiercetelecom.com/story/cable-becomes-emerging-special-access-source-clecs-trails-att-and-centuryli/2015-03-26> and IRW White Paper at 23). This paragraph also notes that "[m]ore recently, cable began offering BDS services over HFC, as well as fiber, and has forced even the largest incumbent LECs to focus on maintaining market share."

¹⁰⁵ FNPRM ¶ 91. ("While non-incumbent LEC affiliated competitive LECs – including, importantly, cable providers – are making great strides in competing to sell Ethernet services, data from the Commission's business data services mandatory data collection show that these carriers serve no more than 25 percent of buildings with business data services demand over their own networks.")

¹⁰⁶ That is, a location where competitive BDS provision now exists but didn't before is apparently a location where recent incentives made entry attractive but earlier incentives did not. Clearly the market is evolving rapidly, but in qualitative terms the incentives do not appear dramatically different from those of a few years; this suggests that an apparently moderate shift in incentives has had a sharp effect on the set of locations that are attractive to enter.

¹⁰⁷ The Commission acknowledged this fact in the *Pricing Flexibility Order*, ¶ 80. ("An incumbent monopolist will engage in exclusionary pricing behavior only if it believes that it will succeed in driving rivals from the market or deterring their entry altogether. Otherwise, the reduced profits caused by exclusionary pricing behavior will not be recouped by other sales under the resulting conditions of reduced competition, and the incumbent will be worse off than if it had not engaged in exclusionary pricing behavior." *Internal citations omitted.*)

¹⁰⁸ "Comcast generally will not build a Connection to a location unless {{

entrant and customer, in which case it is the incumbent’s pre-entry pricing that affects entry. Specifically, suppose that prior to entry the customer pays a price p_0 and receives value (gross of price) v_0 ; if entry occurs, the customer will pay the entrant p_1 and receive value (gross of price) v_1 . Entry requires the entrant to incur cost c . Then with passive customers, entry is profitable if and only if $p_1 > c$, and if entry occurs, the customer gains $(v_1 - v_0) - (p_1 - p_0)$. Note that p_0 affects the latter expression but not the entrant’s profit except via p_1 . If the customer and the entrant can contract on entry, they jointly gain from entry if and only if $(v_1 - v_0) > (c - p_0)$. Note that now p_1 is not directly relevant for the entry decision, but p_0 is.¹⁰⁹

- (97) Of course this is too stark: for instance, it would make sense for entrants to take into account an incumbent’s price response, both in thinking about later negotiations for contract renewal with this customer and in thinking about competing for other customers in (say) the building. Rather than making a sharp distinction, I would encourage the Commission to draw the broad lesson that, depending on contracts and expectations, both pre- and post-entry prices matter for entry incentives in markets where customers actively sponsor entry.
- (98) Turning to specifics from Comcast in particular, Comcast reports that its entry decisions and capital expenditures are tied to a wide array of components. In its submission to the Commission, Comcast describes its decision on whether to build a connection to a particular customer location as follows:

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}}.” See Federal Communications Commission, “Data Requested in Special Access NPRM: Comcast Response to II.A.08,” WC Docket No. 05-25, FM-10593.

¹⁰⁹ Excessive termination fees can also be seen as undermining bilateral joint gains from entry, as discussed in Section III.

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- (99) In particular, in alignment with economic common sense, Comcast’s description of its own entry decisions indicates that price regulation will affect its entry decisions (via projected revenues). Comcast customers may be able to partially undo those effects by paying any shortfalls from building out when the financial threshold is not met (see remarks in paragraph (96) on the joint entry incentive), but even if successfully negotiated, this then undoes the customer’s financial gain from lower (regulated) post-entry pricing, while not necessarily undoing non-price distortions.
- (100) William Stemper, President of Comcast Business, while highlighting the importance of competitive entry, indicates that rate regulation on BDS will negatively impact Comcast’s future competitive entry decisions:

Comcast’s large and continuing investments to expand its fiber network are indicative of its ability and desire to compete with incumbent LECs and more established CLECs on a broader geographic basis for the types of high-performance BDS offerings that enterprise customers demand. . . I believe that, as a new entrant, Comcast already has made an important competitive impact in the BDS marketplace within a relatively short time span, driving legacy providers to reduce prices and to upgrade their services. Imposing rate regulation on BDS likely would dampen Comcast’s willingness to invest capital and resources in BDS, as it would reduce rates of return, thus impacting Comcast’s growth, its competitive influence, and customer choice.¹¹¹

¹¹⁰ Federal Communications Commission, “Data Requested in Special Access NPRM: Comcast Response to ILA.08,” WC Docket No. 05-25, FM-10593.

¹¹¹ Comments of Comcast Corporation, Declaration of Bill Stemper, June 28, 2016, ¶¶ 7–8. *See also* Comments of Comcast Corporation, Declaration of Devesh Raj, June 28, 2016, ¶¶ 11–12. (“The provision of enterprise-grade services typically requires extensive infrastructure investments, demanding the extension of fiber networks and other upgrades to serve each individual customer. Comcast Cable expects that the demand for further substantial infrastructure investment in BDS products and offerings will continue, particularly as customers demand more backhaul capacity. Since entering the BDS market, Comcast Cable has aggressively made these investments in an effort to win new business and expand the availability of BDS within its footprint. These substantial investments likely would not have occurred or would have been greatly curtailed, however, if Comcast Cable, as a new entrant, had been subject to (or was at risk of being subjected to) rate regulation and other burdens typically reserved for dominant providers. Indeed, Comcast Cable’s investment expectation has been based on an assumption that new entrants would not be subject to such regulatory schemes. The FCC’s adoption of new rules that threaten to lower the anticipated revenues and return on investment in

- (101) In the *Pricing Flexibility Order*, the Commission acknowledged that “prices that are below cost reduce the incentives for entry by firms that could provide the services as efficiently, or more efficiently, than the incumbent LEC. Similarly, discrepancies between price and cost may create incentives for carriers to enter low-cost areas even if their cost of providing service is actually higher than that of the incumbent LEC.”¹¹² As a general matter, this resonates with the common-sense economics discussed above.

the BDS marketplace, while simultaneously increasing the costs of regulatory compliance, would likely affect the allocation of capital not only within Comcast Cable, but among Comcast Cable, NBCUniversal, and other Comcast businesses. Ultimately, if the BDS marketplace proves to be less profitable, the result would be less aggressive investment by Comcast in BDS.”)

¹¹² *Pricing Flexibility Order*, ¶ 61 (internal citations omitted).

VII. Price regulating BDS would slow the transition to new technologies

- (102) The FNPRM states as a guiding principle that its actions “should remove barriers that may be inhibiting technology transitions.”¹¹³ Additionally, Section 706 of the 1996 Telecommunications Act instructs the Commission to “encourage the deployment on a reasonable and timely basis of advanced telecommunications capability” by adopting policies and measures to “remove barriers to infrastructure investment.”¹¹⁴ However, for much the same reasons that price regulation would also slow competitive entry, it would slow the introduction of new BDS technologies.¹¹⁵
- (103) One channel for this effect is simply that entrants are likely to use up-to-date technology when installing new facilities (it makes little sense to dig up the streets to install copper). Thus, facilities-based entry brings transition¹¹⁶ and delays in such entry bring delays in technology transition. The discussion in Section VI explained why price regulation is in turn likely to discourage and delay entry.
- (104) At the same time, incumbents’ incentives to introduce new technology are also likely to be weakened by price regulation. Specifically, the incentive is weakened unless the price is allowed to rise by an amount equal to the customer’s increase in value. In broad terms, that condition is readily satisfied in competition and even in unregulated monopoly, but it is difficult to implement under price regulation, including (but not limited to) price-cap regulation.¹¹⁷

¹¹³ FNPRM ¶ 7.

¹¹⁴ 47 U.S.C. § 1302(a).

¹¹⁵ The Commission claimed, “Through adoption of price cap regulation, the Commission attempted to encourage incumbent LECs to innovate and increase efficiency in providing service,” but the logic below is likely to be the reverse. See FNPRM ¶ 425.

¹¹⁶ FNPRM ¶ 80. (“[I]f a provider is already incurring the expense of trenching streets to deploy lines, then it makes more sense to install a higher capacity fiber line using newer technology protocols than deploying a copper line or coaxial cable.”); FNPRM ¶ 189. (“[M]ost new investment [in BDS] is in fiber optic and coaxial cable, and in next generation DOCSIS 3.1 electronics.”)

¹¹⁷ This is closely related to the point made in Section V.D about quality incentives in price caps. See Mark Armstrong and David E. M. Sappington, “Regulation, Competition, and Liberalization,” *Journal of Economic Literature*, 44 (2006): 325–66 at 341, who state that “[price cap regulation] may provide limited incentive for long-term infrastructure investment.” (*Internal citations omitted.*)

See also Joseph Farrell, “Prospects for Deregulation in Telecommunications,” *Industrial and Corporate Change* 6 (1997): 719–40 at 723. Discussing the relationship between the price signal and capacity investment, I observed that “[t]he pattern of high and low prices over time and as a function of capacity and demand may be just as important as the overall level of prices. . . [Regulated prices do] not give the sharp signals ‘invest all-out in capacity’ or ‘do not invest in capacity,’ with their high-powered incentives, that the unregulated market can give.” This may be particularly important in markets with large sunk costs and potentially episodic technological advances, in which the timing of sunk investments is important for overall economic performance.

- (105) Transitions to new technologies may occur through either upgrades of existing infrastructure or new construction that implements new technology, which often is more expensive to deploy than mature technologies. Either way, technology transition often requires investment by suppliers and/or their customers.
- (106) Regarding investments by suppliers, the BDS market continues to see rapid increases in demand for higher bandwidth services, greater reliability, and other advanced features such as cloud-based services;¹¹⁸ as the FNPRM notes, this broadly requires transitions to fiber and to packet-switched technologies, and specific improvements may require specific additional investments in new technology.¹¹⁹ Cable providers, in particular, have invested billions to upgrade their networks to support high-bandwidth technologies. As Commissioner Pai notes:

Over the last several years, the FCC has implored cable operators to upgrade their networks and compete for enterprise customers. Many cable operators obliged, investing billions in new fiber facilities and new technologies like Ethernet over hybrid fiber-coaxial cables and successfully competing for new contracts every year at a rapid clip.¹²⁰

- (107) Comcast’s Senior Vice President of Corporate Strategy confirms that Comcast has made substantial investments in BDS to upgrade its infrastructure to compete with incumbent ILECs:

Comcast Cable has invested more than \$5 billion since 2010 to compete in the business services market as a new competitor offering highly innovative products that appeal to business customers of all sizes. . . . Since entering the BDS market, Comcast Cable has aggressively made these investments in an effort to win new business and expand the availability of BDS within its footprint.¹²¹

- (108) Regarding investments by customers, the FNPRM discusses customer switching costs from circuit-based to packet-based technologies:

¹¹⁸ FNPRM ¶ 77. (“The increasing demand for bandwidth-rich applications, such as VoIP, video conferencing, cloud-based services, machine-to-machine communications, and the Internet of things, places an ever increasing demand on the data transmission capabilities of the underlying BDS network infrastructure.”)

¹¹⁹ FNPRM ¶ 80. (“As the demand for high-bandwidth services rises, users need increasing amounts of bandwidth for BDS. Ethernet services, especially over fiber, scale bandwidth to meet these demands more cost effectively than legacy TDM services. Providers must bond multiple DS1 lines together just to reach symmetrical transmission speeds in excess of 10 Mbps. This may require the costly deployment of additional lines to the location, and if a provider is already incurring the expense of trenching streets to deploy lines, then it makes more sense to install a higher capacity fiber line using newer technology protocols than deploying a copper line or coaxial cable. Once fiber lines with packet-based technology are deployed, it is relatively easy to increase bandwidth without further physical network modifications.” *Internal citations omitted.*)

¹²⁰ FNPRM Dissenting Statement of Commissioner Ajit Pai (*internal citations omitted*).

¹²¹ Comments of Comcast Corporation, Declaration of Devesh Raj, June 28, 2016, ¶ 10.

Record evidence suggests that once a customer has installed a business data service, it faces high costs in switching. . . In particular, high switching costs can both slow the transition from TDM to packet BDS and limit the potential market for packet BDS which could in turn limit investment . . . [T]he “costs for a customer to transition [from TDM] to Ethernet service are much greater than the costs to upgrade to higher Ethernet speeds once it has Ethernet” with “the primary cost is the need for the customer to change out its legacy equipment” that can be “enough for customers to postpone a transition.”¹²²

- (109) Beyond the immediate effect on the customer in question, which in ideal circumstances the customer and carrier might be able to negotiate around, many BDS technology upgrades, such as laying fiber to replace HFC or copper plant, have positive spillover effects on other customers not likely to be present in the carrier’s negotiation with one customer or a manageable subset of customers.
- (110) Consequently, putting a thumb on the scales in the direction of lower price and less innovation/competition for any one carrier-customer relationship, as price regulation is likely to do, will tend to reduce innovation and competition that is available to other customers. As I described in Section III, this distortion would affect competition and innovation in the same way as voluntarily negotiated (or profit maximizingly imposed) exclusionary vertical contracts. Modern economic theory identifies the negative impact on competition and innovation of such contracts as their core problem. Thus, to the extent that the Commission believes that such contracts are a problem in this market, it should be all the more reluctant to impose price regulation.
- (111) In short, competitive entry in the BDS market, although often focused on serving one particular customer, is likely to involve building facilities that bring the entrant closer to being able to serve *other* customers. In other words, there is a competitive externality from such entry;¹²³ in much the same way, deployment of advanced technology, perhaps to serve an identified set of customers, is apt to benefit other customers.
- (112) To the extent that the investment promises additional returns to the provider by facilitating future sales, either to new customers or increased services to existing customers, providers often will deploy new technology even when such investment is not justified by short-run return on investment. That is, the investment may produce longer-run benefits, and to the extent that the provider can expect to capture enough of the value so created, the investment may make sense even if not justified by immediately available cash flow. To the extent that the future benefits accrue not to the provider but to its future customers, the investment confers a positive externality on those customers.

¹²² FNPRM ¶ 198, n. 512 (citing XO Comments at 11).

¹²³ A forward-looking entrant might well take into account that buildout now might later enable it to profitably serve customers that, for example, may not exist yet. But it would take into account only the profits that it would make that way, not the customer surplus that those as-yet unidentified customers would presumably get.

- (113) In economic theory, this might be a rationale for positively promoting (perhaps subsidizing) entry, or for subsidizing or positively encouraging the deployment of new technology to serve some customers that then enables the firm more easily to offer the new technology to other customers. I am *not* suggesting this as a policy, and I think the Commission is right to eschew it and prefer a technology-neutral position, partly because I think we understand some of the dangers of subsidizing particular business models (no such policy is on the table here anyway). But recognizing the analytical point does indicate that it would be a *bad* idea to create a bias *against* the forms of customer benefit that have substantial positive spillovers, specifically entry and deployment of new technology. As I explain throughout this Declaration, where competitive entry is otherwise reasonably plausible (i.e., outside the context of any relatively secure ILEC monopoly portions of the market), price regulation is likely to do just that.
- (114) In general terms, dynamic markets typically are not conducive to efficient price regulation; it is challenging to set regulated prices and their responsiveness to technology choice consistent with rapid (or efficient) technical change. Working to keep monopoly prices generally lower than they would otherwise be is inimical to allowing prices to change and potentially to rise, together with value-increasing technological innovation that may benefit customers more.¹²⁴ In the BDS markets, the FCC’s own discussion, for example, of how best-efforts services and TDM services are unlikely to constrain the pricing of more guaranteed or more advanced services illustrates how customers often care more about product design and innovation than they do about price.

¹²⁴ Gregory S. Crawford, “Cable Regulation in the Internet Era,” in *Economic Regulation and Its Reform: What Have We Learned?* ed. Nancy L. Rose, 137–93 at 187 (Cambridge, MA and Chicago: NBER and The University of Chicago Press Books, 2014). This survey of the effects of cable regulation documents that “[s]atellite and telco competition has largely replaced price regulation as the constraining force on cable pricing and driving force for innovative services, a welcome outcome given the empirical record on regulation’s effects in cable markets. While prices continue to rise, so too does quality and it may be that (most) consumers are better off.”

See also W. Kip Viscusi, John M. Vernon, and Joseph E. Harrington, Jr., *Economics of Regulation and Antitrust* (Lexington, MA: D.C. Heath and Company, 1992), 491. The authors state that “[i]nnovation provides a prospective firm with the opportunity to profitably enter an industry. Regulation that prevents entry, or keeps price so low that entry is generally unprofitable, closes the door to these entrepreneurs.” They conjecture that the prevention of entry may be the most important effect of regulation on innovation.

See also *Petition of AT&T Inc. for Forbearance Under 47 U.S.C. § 160(c) from Title II and Computer Inquiry Rules with Respect to Its Broadband Services*, Memorandum Opinion and Order, 22 FCC Rcd. 18705 (2007), ¶ 29 and statement of Chairman Kevin J. Martin at 18742: “Today, we take another step in establishing a regulatory environment that encourages such investments and innovation by granting AT&T’s petition for regulatory relief of its broadband infrastructure and fiber capabilities. This relief will enable AT&T to have the flexibility to further deploy its broadband services and fiber facilities without overly burdensome regulations.”

See also *Pricing Flexibility Order*, ¶¶ 17–18.

VIII. Price regulating BDS would cause distortions in related markets

- (115) As is well known in the literature on regulation, price regulation could create an incentive for providers to shift the exercise of their market power onto related segments.¹²⁵ This concern applies to BDS sold (or potentially sold if incentives push that way) as a bundle of associated or complementary services. For example, BDS providers that are not currently subject to price cap regulation do not typically charge separately for access and transport; instead, they offer a package of termination and transport that meets the bandwidth and service reliability needs of the customer.¹²⁶ Furthermore, as discussed in Section V.C, BDS customers in the retail Ethernet segment may well look for a combination of services including voice, video, backup, expansion options, and security—over and above a reliable Ethernet connection. Finally, to the extent that a BDS customer requires service in

¹²⁵ Jonathan E. Nuechterlein and Philip J. Weiser, *Digital Crossroads: American Telecommunications Policy in the Internet Age* (Cambridge, MA: MIT Press, 2nd edition, 2013), 16. (“Another exception to the one-monopoly profit phenomenon arises where the platform service is subject to price regulation. If so, the provider may well have incentives to discriminate against firms in adjacent markets because it will be unable to recoup all otherwise available monopoly profits from the sale of the platform service itself and will need to extract them instead from those other markets. This exception is sometimes called *Baxter’s Law* in honor of William Baxter, the Justice Department official who cited it in the early 1980s as a reason for breaking up AT&T’s Bell System. As Baxter understood, AT&T had a strong incentive to leverage its (price-regulated) monopoly in local markets to suppress competition in the adjacent long-distance market (see chapter 2).”)

See also Joseph Farrell and Philip J. Weiser, “Modularity, Vertical Integration, and Open Access Policies: Towards a Convergence of Antitrust and Regulation in the Internet Age,” *Harvard Journal of Law and Technology* 17 (2003): 85–134 at 105.

See also Timothy J. Brennan, “Regulating by Capping Prices,” *Journal of Regulatory Economics* 1 (1989): 133–47 at 141. (“There remain two problems that even a perfect price cap cannot solve. The first is product quality... The second problem is that an incentive remains for anticompetitive discrimination. The regulated firm may be able to exploit any residual market power it may have by tying provision of its regulated services to unregulated products, e.g., by discriminating against its competitors in access to its regulated services.” *Internal citations omitted.*)

See also Kenneth S. Corts, “Regulation of a Multi-Product Monopolist: Effects on Pricing and Bundling,” *The Journal of Industrial Economics* 43 (1995): 377–397. The author shows that it is possible for a price cap on a basic or lower quality product to lead to a higher price for the higher quality version of that product. While the price cap on the basic product may make consumers of that product better off, the drop in quality that potentially accompanies that cap may mean that it is optimal to charge consumers that demand the higher quality product even more. The author also shows that where products are made up of many individual components bundled together—a regulated basic good together with, potentially, unregulated additional goods—then under certain conditions it is also possible for those who wish to buy the bundle of multiple goods to pay even more overall, and be worse off, than before price cap regulation. The paper gives the example of the 1992 Cable Act, which regulated basic cable service, and led to providers stripping down that basic offering and shifting many consumers onto alternate packages that cost more overall for similar levels of service.

See also Gregory S. Crawford, “The impact of the 1992 Cable Act on household demand and welfare,” *RAND Journal of Economics*, 422–49 at 422 (Cambridge, MA and Chicago: NBER and The University of Chicago Press Books, 2014). (“In April 1993 the Federal Communications Commission (FCC) capped the per-channel prices that systems could charge for most types of cable service. The agency estimated that cable prices would fall by 10% from September 1992 levels, yielding annual savings to U.S. households of over \$1 billion (FCC, 1993). The FCC soon found, however, that not only had these gains failed to materialize, for nearly one-third of cable subscribers the average cable bill had *increased*. Many systems had introduced new, unregulated services and moved popular programming networks to those services; others had reallocated their portfolio of programming across all services.” *Italics in the original.*)

¹²⁶ FNPRM ¶ 282.

both noncompetitive and competitive locations, the same concern arises, viewing the local markets with different competitive conditions as related markets in the discussion above.

- (116) In such circumstances, the provider can effectively evade price regulation on BDS, ostensibly by increasing the price of the unregulated product. This profitable regulatory evasion strategy puts regulators in a position from which there are no attractive actions:
- If they do nothing, the ostensibly regulated firm is now unregulated, but with what may be the added cost and distortion of bundling in a product that not all users may want.
 - They could “quarantine” the regulated firm and forbid it from supplying unregulated products, but some (perhaps many) customers may want to buy those products from that firm.
 - They could regulate the price of the bundle, but the bundle may be more idiosyncratic and rapidly evolving than is the core regulated product.
 - They could insist that the regulated firm must offer the regulated product on its own (at the regulated price), including for use with another provider’s VoIP, although it can also offer the bundle. But this creates incentives to sabotage, or at a minimum not promote, the efficient combination of the regulated product with the other firm’s VoIP.

IX. Conclusion

- (117) For the reasons outlined above, outside zones of secure monopoly, the Commission should prioritize removing obstacles to BDS competition, and should be very wary of price regulation in workably or incipiently competitive BDS markets.



[SIGNATURE]

Name

June 28, 2016

[DATE]

Date

Exhibit B

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

In the Matter of

Business Data Services in an Internet Protocol
Environment

WC Docket No. 16-143

Investigation of Certain Price Cap Local Exchange
Carrier Business Data Services Tariff Pricing Plans

WC Docket No. 15-247

Special Access for Price Cap Local Exchange
Carriers

WC Docket No. 05-25

AT&T Corporation Petition for Rulemaking to
Reform Regulation of Incumbent Local Exchange
Carrier Rates for Interstate Special Access Services

RM-10593

Declaration of John W. Mayo

June 28, 2016

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I. Introduction

A. Qualifications

1. I am a Professor of Economics, Business and Public Policy in the McDonough School of Business at Georgetown University. I am also the Executive Director of the Georgetown Center for Business and Public Policy. I previously served as Dean of the McDonough School at Georgetown University. My business address is Georgetown University, McDonough School of Business, 37th and O Streets, N.W., Washington, D.C., 20057.
2. I hold a Ph.D. in economics from Washington University in St. Louis (1982), with a principal field of concentration in industrial organization, which includes the analysis of antitrust and regulation. I also hold both an A.M. (Washington University in St. Louis, 1979) and a B.A. (Hendrix College, Conway, Arkansas, 1977) in economics. I have served as a Visiting Scholar at the University of California, Berkeley and Stanford University. I have taught both undergraduate and graduate economics, business and public policy courses at Georgetown University, Washington University, the University of Tennessee and Virginia Tech, and the University of Basel (Switzerland).
3. I have authored numerous peer-reviewed articles, research monographs and a number of specialized articles in industrial organization economics, both generally in antitrust and regulation and specifically in the area of the economics of telecommunications regulation. These have appeared in academic journals such as the *RAND Journal of Economics*, *Journal of Law and Economics*, *Journal of Industrial Economics*, *International Journal of Industrial Organization*, *Review of Network Economics*, *Review of Industrial Organization*, *Journal of Regulatory Economics* and the *Yale Journal on Regulation*. I have also written a comprehensive text entitled *Government and Business: The Economics of Antitrust and Regulation*. In addition, I have served as President of the Transportation and Public Utilities Group and am currently serving in editorial

capacities for the *Journal of Regulatory Economics*, *Economic Inquiry* and the *Review of Industrial Organization*.

4. Additionally, I have been an economic advisor for, and consultant to, both public agencies and private companies, including the Antitrust Division of the United States Department of Justice, the Federal Trade Commission, AT&T, Sprint, UPS and AmerenUE. A more detailed accounting of my education, publications, and employment history is contained in Exhibit 1.

B. Assignment

5. The Federal Communications Commission (hereafter, “the Commission”) has issued a Tariff Investigation Order and a Further Notice of Proposed Rulemaking (hereafter, the “FNPRM”) proposing a new regulatory framework in the marketplace for “special access” or business data services (hereafter, “BDS”).¹ I have been retained by Comcast to evaluate the state of competition in the BDS marketplace and to comment on the Commission’s proposed regulation. In the context of this assignment, I have also been asked to review and analyze the data collected by the Commission and made available to interested parties (hereafter, “the FCC Data Collection”).²

C. Summary of Findings

6. Based on my analysis to date, I have formed the opinions set forth below:
7. In its FNPRM the Commission seeks to establish a “new start” to regulatory oversight of the provision of BDS in the United States. The merits of this new start turn on: (1) consistency between the target of the Commission’s inquiry and the marketplace as it exists today; (2) accurate assessment of the presence or absence of competition among the providers of BDS; and (3) effective and

¹ “Tariff Investigation Order and Further Notice of Proposed Rulemaking,” Federal Communications Commission, Adopted April 28, 2016.

² See FCC Special Access Data Collection; Special Access Data; FNPRM, at ¶¶29-43.

efficient mitigation of any actual economic harm that would, but for the application of the particular regulation, beset the BDS marketplace.

8. Because the BDS marketplace is, by all accounts, evolving rapidly, both the assessment of competition and the regulatory design anticipated by the Commission suffer immensely from the Commission’s reliance on 2013 data. In a highly dynamic market as the one at issue, examining 2013 data to assess competition and design a regulatory oversight mechanism for 2017 and beyond is especially problematic. My assessment of more recent data emerging from the industry provides an encouraging picture of the growth of competitive rivalry in the provision of BDS.
9. The FNPRM proposes a new “formula” – the Competitive Market Test – for distinguishing between local BDS markets that are “competitive” or “non-competitive.” This test has little, if any, economic merit. It ignores established methods and metrics for assessing competition that have been employed by economists, and by the Commission itself, in the past.
10. The Commission seeks to shore up its Competitive Market Test based on a white paper by an economist retained by the Commission, Professor Marc Rysman, which describes several criteria for assessing competition, including the distribution of revenue market shares, location-based counts of competitors, and the relationship between price and the presence of competitors in a given geographic area. The paper concludes, as does the FNPRM, that significant monopoly power exists in the provision of lower-bandwidth BDS (i.e., DS1 and DS3), and that ILECs dominate the BDS market.³ Specifically, the FNPRM states that there is evidence of market power in the delivery of DS1 and DS3 and lack thereof for higher bandwidth services.⁴ Notwithstanding a finding of lack of

³ FNPRM, at 69-73, 108-10, 232-33.

⁴ FNPRM, at 108.

market power for higher-bandwidth BDS, the aforementioned share-, location-, and price-based criteria employed by Professor Rysman and relied upon by the Commission distort the analysis of competition in the marketplace and significantly understate the extent of competition that is present in the provision of BDS in the United States.

11. A close re-examination of the FCC’s Data Collection reveals that competition is significantly more robust than Professor Rysman’s white paper represents. Indeed, when considered at a deeper level, few – if any – of the criteria examined by Professor Rysman point to the conclusions of significant market power that the Commission tentatively reaches based on his analysis.
12. The FNPRM contemplates the application of price cap regulation on BDS providers in geographic areas deemed to be non-competitive. The FNPRM anticipates that the Commission will re-visit the determination every three years and re-classify areas accordingly. The potential extension of price cap regulation to *all* providers in the BDS marketplace has no basis in accepted economic theory. If implemented, this regulation would almost certainly fail to produce economic benefits and, in fact, by discouraging new entrants, would perversely prolong any market power the Commission seeks to eliminate. Indeed, rather than providing an efficient mechanism for promoting economic efficiency in the provision of BDS, the contemplated application of price cap regulation would significantly threaten supply in the marketplace, preclude consumer choice, decelerate investment, and lower the quality of products and services.
13. There is no support within the body of economic research for imposing price cap regulation on an entire market. Cable providers such as Comcast are relatively new entrants in the BDS market and, while growing rapidly, still have a limited market presence. Market-wide application of price cap regulation on *all* competitors, including new entrants, such as Comcast, that do not have monopoly power under any interpretation, would, in direct opposition to the Commission’s

stated objectives of increased competition, thwart competitive entry, innovation, and investment in the marketplace.

14. My review of Comcast’s financial models reveals that factors such as price, contract duration, and costs greatly impact Comcast’s decisions to invest in the marketplace and bid for projects. In particular, these factors heavily influence whether Comcast invests in building out its fiber network to serve a new customer or location. If the price Comcast is required to charge does not provide an adequate return on investment relative to Comcast’s next-best investment opportunities (which may not be in the communications sector or in the United States), the company – like any rational firm – will not choose to make investments to expand its fiber network, thereby severely affecting the availability and quality of BDS product offerings in the marketplace. As a result, if market prices are artificially reduced by regulation, many BDS customers will be left with fewer fiber-based options and may be forced to purchase inferior alternatives such as prior generation TDM-based BDS services (e.g., DS1 and DS3). Perversely, these are precisely the segments of the marketplace that the Commission claims suffer from insufficient competition today.
15. In direct contradiction to the Commission’s proposed goal of removing barriers that inhibit technology transitions, the proposed price cap regulation would jeopardize the ability of end-users to transition from low-speed, prior-generation technology to high-speed, current-generation technology. For example, Comcast’s financial models suggest that *more than half* of Comcast’s fiber build-out projects for cell backhaul would have been put at risk and likely not have occurred if prices were 25 percent lower than the prices negotiated by Comcast and its customers.
16. The application of the proposed regulatory structure becomes even more damning upon considering the high costs and distorted incentives that the contemplated regulatory scheme would impose on regulators, firms, and consumers. Applying price cap regulation broadly would incentivize BDS providers to focus primarily

on minimizing costs and would provide little incentive for providers to offer high-quality customer service or develop better products, thereby adversely affecting consumer welfare. Furthermore, the contemplated price cap regulation would impose additional costs on regulators (e.g., determining every three years at a finely disaggregated geographic level and for numerous services and customer types whether the offering is competitive) and firms (e.g., writing, negotiating, and enforcing contracts that account for price caps at the time of the contract and in the future). These costs would flow through to both consumers and taxpayers.

17. At points, the contemplated regulatory structure moves from being merely massively costly to economically bizarre. For instance, the FNPRM raises the potential that any firm in a geographic area judged to be non-competitive would be “rewarded” for developing a near-ubiquitous network in that area by having the Commission add it to the list of regulated entities, even if that network were being used to support the provision of BDS on a very small scale relative to more established providers. Such an approach could only thwart the growth in competition that the FNRPM seeks to promote.
18. To circumvent the problems associated with looking in the rearview mirror to assess competition, I have examined competition from the perspective of several more timely and relevant economic metrics such as price, output, investment, innovation, and the ability and willingness of competitive providers to expand. These metrics hold the promise to provide considerable insight into the current, forward-looking competitive landscape for BDS. The available data point toward a marketplace that is significantly more competitive than characterized in the FNPRM.
19. Rather than exhibiting price increases that could be an indicator of the exercise of monopoly power, prices for BDS have been consistently falling, and Ethernet-based services that are readily available in the marketplace provide powerful constraints on the ability of any provider to raise prices in an anticompetitive fashion.

20. The Commission should adopt a definition of “competition” and an empirical methodology to more accurately determine the presence of competition than what is embodied in the current FNPRM. The Commission’s definition and empirical test should reflect the degree to which competitive pressures are manifesting themselves to the benefit of BDS consumers.
21. In contrast to the distorted competitive analysis presaged by certain of the Commission’s regulatory proposals, the Commission should reset its goals for the BDS market around the following fundamental principles:
 - a) The Commission should take actions that reduce, not heighten barriers to entry.
 - b) The Commission should avoid the introduction of new barriers to entry.
 - c) The Commission should assiduously avoid price regulation of entrants, who, under any interpretation, have no monopoly power.
 - d) Any regulation of the BDS marketplace should be tailored to current and emerging market conditions rather than the market that existed in 2013 (or before).
 - e) Any regulation should minimize the imposition of new administrative, regulatory, and transaction costs imposed on the Commission, firms and consumers.
22. The remainder of this declaration describes my findings in greater detail.

II. Key Features of the Proposed Regulation

23. The provision of BDS has historically been price regulated for incumbent local exchange companies. The Commission, however, has recognized that the regulatory oversight of these services has been far from ideal and that it has struggled to evolve its historical approach to the new realities of the marketplace. The FNPRM seeks to overcome these struggles with a “new start.” It champions the effort as a “large scale de-regulation” that is accompanied by “tailored rules

where competition does not exist.”⁵ As part of this process, the Commission seeks comments that “would further [its] goal of promoting competition and investment for BDS services.”⁶

24. In essence, it appears that the Commission’s proposed regulation consists of two steps. In the first step, the Commission would determine whether a particular “market” (defined by product and geography) is “competitive” by employing a “bright-line” formula.⁷ As inputs to the formula, the Commission is contemplating the use of a “Competitive Market Test” that includes some business density metric (e.g., number of business establishments or employees within a defined geographic area) as a proxy for business demand and a metric designed to capture the number or type of competitors in that area. According to the Commission, it would “adopt a formula using available data” and the formula would “generate lists of census blocks or whatever geographic area the Commission adopts for each relevant market determined competitive and non-competitive.”⁸ In the second step, the Commission would apply the corresponding regulatory obligation, potentially price caps, to markets deemed “non-competitive” by the formula.⁹
25. The Commission also stated that it is contemplating “re-applying the Competitive Market Test across all areas served by price cap carriers every three years to account, for example, for changes in business density and the presence of facilities-based providers in geographic areas.”¹⁰

⁵ FNPRM, at ¶4.

⁶ FNPRM, at ¶286.

⁷ FNPRM, at ¶¶292, 296-97.

⁸ FNPRM, at ¶¶296-97.

⁹ FNPRM, at ¶297.

¹⁰ FNPRM, at ¶298.

III. Public Policy Considerations

26. The proposed new policy is set against a backdrop of regulation that, while evolving somewhat over time, has retained key elements of the regulatory structure established in 1999 for a significant portion of BDS sold in the United States. Since the initial implementation of the regulatory framework, the industry has evolved dramatically as readily and widely acknowledged by the Commission. Accordingly, the FNPRM speaks of a “new start” that will reform and modernize the oversight of the BDS marketplace. It speaks of jettisoning the existing regulation to implement “a large scale de-regulation” that would be accompanied by a set of “tailored rules” where necessary.¹¹
27. The Commission’s approach rests on three cornerstones. First, the merits of the Commission’s assessment rest on the accuracy of its characterization of the current and emerging BDS marketplace. Sound regulatory policy must be forward-looking rather than developed by looking in the rear-view mirror. Second, the Commission proposes to determine whether in particular areas, for particular services, BDS are offered in a “competitive” or a “non-competitive” market. The importance and complexity of this exercise cannot be overstated. If the methodology for this determination is unsound, the Commission will regulate markets that should be deregulated, or deregulate markets that should be regulated (or both). Third, the Commission seeks to establish a regulatory framework that is aligned with the competitive realities of the modern and emerging provision of BDS. This step, too, is crucial because if the regulatory framework is inconsistent with the dynamics of this market, then the likelihood of real and potentially very large economic distortions arises. An inappropriate governance framework creates the prospect of a host of economic maladies including delayed and distorted investment, increased and unnecessary use of public resources and increased

¹¹ FNPRM, at ¶4.

private and public transaction costs. Given the importance of these cornerstones, it is to them that I now turn.

A. The Evolution of the Business Data Services Market

28. According to the Commission, BDS is defined “as a telecommunication service that ... transports data between two or more designated points at a rate of at least 1.5 Mbps in both directions (upstream/downstream) with prescribed performance requirements that typically include bandwidth, reliability, latency, jitter, and/or packet loss” and excludes “‘best effort’ services, e.g., mass market BIAS such as DSL and cable modem broadband access.”¹²
29. The Commission has traditionally viewed BDS in two distinct segments: (1) “channel terminations” (last-mile, local loop, transmission links to end user locations); and (2) “dedicated transport” (higher-capacity connections moving traffic between network aggregation points).¹³ However, in recent years, the byzantine regulatory provision of “channel terminations” and “dedicated transport” from a traditional monopoly supplier has evolved into a consumer-centric, dynamic and robust marketplace for BDS. Indeed, Chairman Wheeler has observed that the BDS marketplace “is changing – fast. New technologies offer IP-based products alongside the traditional legacy circuit-based products. New entrants, such as cable companies [e.g., Comcast], play a growing role in the BDS market, supplementing the services offered by incumbent and competitive carriers alike, and in some markets changing the competitive dynamics.”¹⁴
30. Numerous changes have occurred, and are occurring, in the marketplace for BDS just since the Commission’s collection of the 2013 data. While acknowledging changes that have occurred since it last substantively altered the regulatory

¹² FNPRM, at ¶279.

¹³ FNPRM, at ¶15.

¹⁴ Remarks of FCC Chairman Tom Wheeler, INCOMPAS Policy Summit, Gaylord National Hotel & Convention Center, National Harbor, Md., April 11, 2016.

structure for this market in the 2005 Special Access NPRM, the Commission, fails to fully recognize the numerous and relevant market developments that have occurred, and are occurring, in the marketplace today. As described below, the market has changed significantly since 2013, the year covered by the FCC Data Collection.¹⁵ These changes point toward the immense frailty of a regulatory “fresh start” to regulation – for 2017 and beyond – that is largely predicated on data from 2013, and earlier.

31. The changes that have taken place in the BDS market since 2013 are evidenced by, among other things: (1) growth in demand for high-bandwidth BDS; (2) entry and growth by cable companies, CLECs, and other providers; and (3) capacity expansions and investments by BDS providers to build-out fiber networks. I discuss these factors in more detail below.

1. Growth in Demand for High-Bandwidth BDS

32. In recent years, there has been a surge in high-bandwidth applications such as video conferencing, cloud-based services, and the Internet of things, imposing significant demands on the data transmission capabilities of the underlying BDS network infrastructure. The Commission has observed, for example, that business IP traffic has grown from 3 exabytes¹⁶ in 2005 to 39 exabytes in 2015 and is expected to reach approximately 85 exabytes by 2019.¹⁷ Furthermore, the Commission and numerous third-party market research firms have reported that the BDS market has experienced significant growth over the past several years and the market is projected to grow even more in upcoming years.¹⁸

¹⁵ FNPRM, at 211.

¹⁶ 1 exabyte is equal to 1 billion gigabytes.

¹⁷ FNPRM, at ¶¶77 (referencing the Cisco Visual Networking Index).

¹⁸ See, e.g., FNPRM, at ¶¶77-85; “Business Carrier Ethernet Services Market Update 2015,” Frost & Sullivan, September 2015, at 7-8, 27, 29; and “2015 U.S. Incumbent Carrier Ethernet LEADERBOARD”,

33. The growth in demand for high-bandwidth business applications has driven the migration of end-users from prior-generation lower-speed technology (circuit-based TDM protocol) to current-generation higher-speed technology (packet-based IP protocol, such as Ethernet). In fact, the Commission has recognized that “[a]s the demand for high-bandwidth services rises, users need increasing amounts of bandwidth for BDS” and Ethernet BDS over fiber is particularly suited to fulfill this demand as it can “meet these demands more cost effectively than legacy TDM services” and “[o]nce fiber lines with packet-based technology are deployed, it is relatively easy to increase bandwidth without further physical network modifications.”¹⁹
34. According to a 2015 report by Frost & Sullivan, the U.S. business carrier dedicated Ethernet services market will have increased from \$2.1 billion in revenues in 2013 to an expected \$2.9 billion in 2016 and is projected to reach \$4.2 billion in 2020; and the number of ports for Ethernet BDS will have increased from 455,640 in 2013 to an expected 695,156 in 2016, and is projected to reach 1.3 million in 2020.²⁰ The report also noted that the migration from TDM to Ethernet is fueling double-digit revenue growth for Ethernet BDS and that the growth rate is expected to increase as providers expand their network footprints to reach more customer locations in the future.²¹ Frost & Sullivan explained that with its large number of benefits, and cost effective, flexible, and reliable bandwidth, Ethernet continues to gain acceptance among enterprise customers seeking cost-effective solutions to converge their voice, data, and video applications.²² Similarly, according to an article by Vertical Systems Group,

Vertical Systems Group, available at <http://www.verticalsystems.com/vsglb/2015-u-s-incumbent-carrier-ethernet-leaderboard/> (viewed June 14, 2016).

¹⁹ FNPRM, at ¶80.

²⁰ “Business Carrier Ethernet Services Market Update 2015,” Frost & Sullivan, September 2015, at 27, 29.

²¹ “Business Carrier Ethernet Services Market Update 2015,” Frost & Sullivan, September 2015, at 7.

²² “Business Carrier Ethernet Services Market Update 2015,” Frost & Sullivan, September 2015, at 7-8.

dated March 11, 2016, “Ethernet remain[ed] the fastest growing network service” for ILECs and the Ethernet market grew by more than 20 percent in 2015 (based on number of retail ports in service at businesses and enterprises).²³ This growth is important because it promotes pro-competitive entry, as well as the expansion of efficient firms in the marketplace.²⁴

35. Despite the growth in Ethernet-based BDS, end-users have continued to purchase TDM-based BDS. According to the Commission, almost 60 percent (or \$25.8 billion) of revenues reported for 2013 were for legacy, circuit-switched dedicated services.²⁵

2. Entry and Growth by Cable Companies, CLECs, and Other Providers

36. Over the past several years, BDS providers have been rapidly entering new product and geographic areas by increasing their product offerings and geographic reach.²⁶ Notably, cable companies and CLECs have greatly increased their presence in the BDS marketplace. In 2015, Comcast launched a new business, Comcast Enterprise Services, to complement its commitment “to expanding and enhancing our offerings for businesses of all sizes.”²⁷ With this undertaking, Comcast now provides BDS to large enterprises that have multiple locations across the nation. As noted by Comcast with its launch, “Comcast’s Enterprise

²³ “2015 U.S. Incumbent Carrier Ethernet LEADERBOARD”, Vertical Systems Group, available at <http://www.verticalsystems.com/vsglb/2015-u-s-incumbent-carrier-ethernet-leaderboard/> (viewed June 14, 2016). See also, “2015 U.S. Carrier Ethernet LEADERBOARD,” Vertical Systems Group, available at <http://www.verticalsystems.com/vsglb/2015-u-s-carrier-ethernet-leaderboard/> (viewed June 1, 2016).

²⁴ See, e.g., John C. Hause and Gunner Du Rietz “Entry, Industry Growth, and the Microdynamics of Industry Supply,” *Journal of Political Economy*, Vol. 92, August 1984, pp. 733-757, finding in part that “[t]here is strong statistical evidence that new firm entry is positively related to industry growth.”

²⁵ FNPRM, at ¶85.

²⁶ See, e.g., “Business Carrier Ethernet Services Market Update 2015,” Frost & Sullivan, 2015, at 32-45; <http://www.telecompetitor.com/amazon-web-services-and-comcast-deal-another-cableco-ethernet-opportunity/> (viewed June 25, 2016); “Comcast Business Overview,” Comcast Business, at 3, 7-9.

²⁷ <http://corporate.comcast.com/news-information/news-feed/comcast-business-announces-new-unit-targeting-fortune-1000-enterprises> (viewed June 3, 2016).

Services team will design, build, implement and manage customized communications networks for large enterprise customers who need managed Broadband, Ethernet, Voice, Router, Business Continuity and Wi-Fi services in locations across the country.”²⁸ The launch of Comcast Enterprise Solutions is significant because the firm now offers BDS to large businesses in and outside of its network area. In order to launch this new service, Comcast established “NNI” (network-to-network interconnection) wholesale agreements with other cable companies and CLECs to facilitate the ability of each party to such agreements to offer BDS outside its physical network.²⁹

37. The Commission’s research also shows that competitive providers have been increasing their presence in the BDS marketplace. The FCC staff collected publicly available information on the approximate total BDS and managed service revenue of telecommunications carriers (including cable companies) and found, among other things, that Level 3’s revenues increased by 66 percent from 2013 to 2015; Comcast’s revenues increased by 46 percent from 2013 to 2015; and Time Warner Cable’s revenues increased by 73 percent from 2013 to 2015.³⁰
38. Exhibit 2 reports Comcast’s BDS revenues for Carrier Ethernet, Cell Backhaul, and Retail Ethernet from 2012 through 2015. As shown in Exhibit 2, Comcast’s BDS revenues increased from {{ }} in 2013 to {{ }} million in 2015, an astounding {{ }} growth rate. The growth of competitors in the provision of BDS reveals that the marketplace of 2017, when the Commission’s “new” regulatory framework would begin, will be very different than the one projected by examining the market as it existed in 2013.

²⁸ <http://corporate.comcast.com/news-information/news-feed/comcast-business-announces-new-unit-targeting-fortune-1000-enterprises> (viewed June 3, 2016).

²⁹ <http://corporate.comcast.com/news-information/news-feed/comcast-business-announces-new-unit-targeting-fortune-1000-enterprises> (viewed June 3, 2016).

³⁰ See FNPRM, at 217 (Table 3). Calculated as $\$4,989 / \$3,011 = 166\%$; $\$4,742 / \$3,241 = 146\%$; and $\$3,284 / \$1,901 = 173\%$.

3. Capacity Expansions and Investments by BDS Providers

39. BDS providers can expand their competitive footprints by building out fiber or other networks or entering into an agreement to use other BDS providers’ (or, in some cases, a city’s) network. Over the past several years, BDS providers have ramped up their build-out of fiber networks. As a result, more businesses are connected to fiber than ever before. For example, according to Vertical Systems Group, the percent of U.S. buildings connected to fiber has increased from approximately 11 percent in 2004 to 39 percent in 2013 and reached 42 percent in 2014.³¹ Vertical Systems Group noted that fiber-based business services in the U.S. “nearly quadrupled between 2004 and 2014 as service providers like AT&T, cable operators, and a host of competitive carriers equipped thousands of business sites with 20 or more employees with fiber over the course of this period.”³²
40. According to a 2014 Vertical Systems report, a record number of retail Ethernet ports were added to the U.S. Ethernet base during the first half of 2014—more than in any previous corresponding period.³³ Vertical Systems Group reported that many larger ILECs have “completed upgrades of their Ethernet networks” in 2015 and ILECs “are now focused on selling higher bandwidth connectivity and feature enhancements to existing customers, as well as capturing new customers in underserved markets.”³⁴
41. ILECs and CLECs are not the only entities building fiber. Among other entrants, Google has started building its own fiber network. Since launching in Kansas

³¹ <http://www.fiercetelecom.com/story/vsg-fiber-penetration-gap-us-businesses-narrowed-under-60/2015-04-01> (viewed June 27, 2016).

³² <http://www.fiercetelecom.com/story/vsg-fiber-penetration-gap-us-businesses-narrowed-under-60/2015-04-01> (viewed June 27, 2016).

³³ Vertical Systems Group, Mid-Year 2014 U.S. Carrier Ethernet LEADERBOARD (available at <http://www.verticalsystems.com/vsglb/mid-year-2014-u-s-carrier-ethernet-leaderboard/>) (viewed June 27, 2016).

³⁴ <http://www.verticalsystems.com/vsglb/2015-u-s-incumbent-carrier-ethernet-leaderboard/> (viewed June 27, 2016).

City in 2012, Google Fiber has expanded to four additional metropolitan areas by laying thousands of miles of new fiber optic cables and has plans to offer its fiber services, including symmetric 1Gbps speeds to small businesses, to many more areas in the near future.³⁵ Google also recently announced its acquisition of Webpass, a provider of Ethernet and fixed wireless services.³⁶

42. Comcast has spent {{ }} on the development of its fiber network from 2013 through 2015.³⁷ The company also spent an additional {{ }} in installation costs for its fiber and coax networks during this 3-year period.³⁸ Notably, Comcast’s investment to build-out its fiber network has increased every year since 2012 – increasing from {{ }} in 2013 to {{ }} in 2015 {{ }}³⁹

43. Since the launch of Comcast Business {{

}}

44. As described more fully in Section IV below, the demonstrable willingness and propensity of competitive providers to expand in recent years and into the future

³⁵ See, e.g., <https://fiber.google.com/newcities/> (viewed June 25, 2016); <https://fiber.google.com/smallbusiness/> (viewed June 27, 2016); “Exploring Dallas for Google Fiber,” Google Fiber Blog, June 14, 2016 (available at <https://googlefiberblog.blogspot.com>) (accessed June 27, 2016).

³⁶ <https://www.webpass.net/blog/google-fiber-agrees-to-acquire-webpass> (viewed June 25, 2016).

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(assuming that the right policies are in place) provide a powerful competitive check on all providers of BDS.

45. In sum, the BDS marketplace has evolved rapidly since the collection of the 2013 data that the Commission relies upon to both make conclusions regarding the competitiveness of the marketplace and to design a corresponding regulatory structure. This rapid change has consistently and quickly moved the market toward greater competitive rivalry and should give considerable pause to any thought of adopting a regulatory structure largely based on these earlier data, which will surely systematically understate the extent of competition in the provision of BDS for 2017 and beyond.

B. The FNPRM’s Perspective on “Competition”

46. A central tenet in the Commission’s initiation of regulation is the principle that competition is best. The FNPRM states in its opening paragraphs: “Where competition exists, there is little for government to do except maintain the traditional oversight of telecommunications services, because competition is the single best way of ensuring customers benefits.”⁴² From an economic perspective, this “north star” of competition is completely sound. It does, however, immediately raise the more fundamental question of what the Commission means by “competition.” Without an appropriate definition of, and empirical test for, “competition,” the very real prospect arises that the Commission will judge a market to be “competitive” when it is not, or vice versa.
47. At various times, in various markets, the Commission has adopted different definitions and standards to identify competition. For example, in its oversight of MVPD services, the Commission has, at different times, considered “effective competition” to be indicated by the presence of some threshold number (say, 2 or

⁴² FNPRM at ¶5.

3) of alternative providers (and either with or without a market share filter).⁴³ Elsewhere, the Commission has defined “effective competition” to mean “competition among service providers in a market that benefits consumers by expanding service offerings, promoting the development of innovative technology and lowering prices.”⁴⁴ The Commission’s vacillation has not gone unnoticed. In its review of the FCC’s oversight of the provision of BDS, the General Accountability Office has urged the Commission to develop “a more accurate measure of effective competition.”⁴⁵

48. In the present FNPRM, the Commission continues its vacillation on the definition of, and empirical tests for, the presence of competition. The FNPRM proposes eliminating its dominant firm regulation of incumbent providers of BDS to focus on market-wide competition. It proposes a “Competitive Market Test” as the empirical filter for determining the presence or absence of competition. This Competitive Market test tentatively rests on two simple observations: (1) the presence of (or number of) competitors within in a geographic area; and, (2) the business density of that geographic area.⁴⁶ The Commission’s reliance on a simple indicator of the presence (or count) of competitors is curious, if not completely anomalous, in light of the Commission’s own admission elsewhere in the FNPRM that “a simple count” of [competitors’ presence] is “a poor proxy for the presence of competition.”⁴⁷

⁴³ Amanda B. Delp and John W. Mayo “The Evolution of “Competition”: Lessons for 21st Century Telecommunications Policy, Georgetown University Working Paper, April 29, 2016.

⁴⁴ Federal Communications Commission. (1995b). Market Entry and Regulation of Foreign-Affiliated Entities; Report and Order (11 FCC Rcd. 3873). Washington, DC: Federal Communications Commission.

⁴⁵ FNPRM, at ¶23.

⁴⁶ FNPRM, at ¶¶292-95.

⁴⁷ FNPRM, at ¶28.

49. The FNPRM’s proposal to create a “bright-line”⁴⁸ “formula”⁴⁹ and “trigger”⁵⁰ with these two criteria to determine the “competitiveness” of the provision of BDS is unsuitable from an economic perspective. It fails both as a definitional foundation with which to determine the competitiveness of this (or any) market and fails in practice as an economically accurate measure of the extent to which consumers are benefiting from competitive rivalry. From a definitional perspective, the “Competitive Market Test” fundamentally ignores the Commission’s own standard that a market is competitive when it “benefits consumers by expanding service offerings, promoting the development of innovative technology and lowering prices.”⁵¹ It also ignores the Commission’s own observation of its prior failed attempts with bright line rules to measure the presence of competition.⁵² In doing so, the Competitive Market Test eschews any reliance on readily available data on economic metrics that signal the presence or absence of healthy competition. In particular, the Competitive Market Test fails to give any weight to output, price, quality, innovation and investment; each of which contains valuable information regarding the state and sustainability of competition. Furthermore, because the BDS marketplace is, by all accounts, evolving rapidly, both the assessment of competition and the regulatory design anticipated by the Commission suffer immensely from their reliance on 2013 data. In a market that is evolving as rapidly as the one at issue, examining 2013 data to assess competition and design a regulatory oversight mechanism for 2017 and beyond is especially problematic. I return to an examination of these economic metrics in the BDS marketplace below. This examination provides a richer and

⁴⁸ FNPRM, at ¶292.

⁴⁹ FNPRM, at ¶296.

⁵⁰ FNPRM, at ¶294.

⁵¹ Federal Communications Commission. (1995b). Market Entry and Regulation of Foreign-Affiliated Entities; Report and Order (11 FCC Rcd. 3873). Washington, DC: Federal Communications Commission.

⁵² See FNPRM, ¶256 acknowledging that “bright line rules” adopted in the past turned out to provide “a poor measure of the presence of competition.”

- more accurate assessment of competition in the provision of BDS than that provided by the simple “formula” proffered in the Competitive Market Test.
50. Underpinning the FNPRM’s Competitive Market Test is the analysis conducted by Professor Rysman. Professor Rysman examines three features of the BDS marketplace: (1) revenue market shares;⁵³ (2) location-based counts of competitors in 2013;⁵⁴ and, (3) the relationship between price and the presence of competitors in the geographic area.⁵⁵ He claims that “evidence of ILEC market power is found in each.”⁵⁶ I have carefully reviewed these features. In contrast to Professor Rysman’s conclusion, I find that a closer look at these data reveals evidence of a more robustly competitive marketplace than he or the Commission suggest in the FNPRM.
51. Professor Rysman’s analysis of BDS revenue market shares suffers from at least two problems. First, at a conceptual level, it is well known that market share data in price-regulated markets will provide misleading information regarding the presence of monopoly power. As noted by Professors Landes and Posner, “Regulation may increase a firm’s market share in circumstances where only the appearance and not the reality of monopoly power is created thereby.”⁵⁷ In circumstances when regulation of price is sufficiently binding, “a 100% market share is a symptom of a lack, rather than the possession, of market power.”⁵⁸ This standard caveat is especially apt in the case at hand: instead of a lack of competition leading to high prices, artificially low prices from price regulation

⁵³ FNPRM, at 215-217.

⁵⁴ FNPRM, at 218-225.

⁵⁵ FNPRM, at 225-232.

⁵⁶ FNPRM, at 212.

⁵⁷ Landes, William M., and Richard A. Posner. “Market power in antitrust cases.” *Harvard Law Review* (1981): 937-996, at 975-76.

⁵⁸ Landes, William M., and Richard A. Posner. “Market power in antitrust cases.” *Harvard Law Review* (1981): 937-996, at 976.

can cause a lack of observed competitors. Thus, any shortage of observed competitors is likely to be “a symptom of a lack, rather than the possession, of market power.”⁵⁹

52. At a more practical level, a closer examination of the revenue data paints a more encouraging picture regarding the vibrancy of competition in the BDS marketplace than is inferred by either Professor Rysman or the Commission. First, note that in Professor Rysman’s Table 1, a substantive piece of information is that, by 2013, competitive providers (CPs) had captured more than 50 percent of the total revenue in the marketplace. This growth is dramatic. Moreover, as seen in Professor Rysman’s Table 3, CPs have recently shown the critical competitive ability to grow significantly and capture market share. Indeed, Table 3 reveals that in just the past two years (2013-2015) CPs have grown BDS revenues by over 46 percent. Importantly, this growth has occurred in the face of overall price declines in the marketplace. Presumably, were any BDS provider to attempt to raise prices to supra-competitive levels in this marketplace the observed growth rates would be even higher.
53. In conclusion, a careful examination of the dynamic pattern of revenues in the BDS marketplace (as examined in greater detail in Section IV below) reveals an ability and propensity of CPs to vigorously compete for business. Together, their current majority share of the BDS revenues and their demonstrable success in expanding rapidly even in the absence of a supra-competitive price increases by any market player provide comforting reassurance that competition in the provision of BDS generally provides important discipline on all BDS market participants.
54. Next, consider the analysis of “location” data. The FNPRM’s analysis of location data from 2013 paints a mixed picture. Under very strict assumptions (e.g., that

⁵⁹ Landes, William M., and Richard A. Posner. “Market power in antitrust cases.” *Harvard Law Review* (1981): 937-996, at 976.

UNEs are not a platform capable of delivering competitive BDS service), the measured presence of competitors in 2013 is significantly less than ubiquitous. This focus leads Professor Rysman to conclude that “there is relatively little competition present.”⁶⁰ Under broader assumptions adopted elsewhere in the FNPRM, however, fully 88 percent of all buildings have two or more competitors⁶¹ and 84 percent of all census blocks have two or more competitors present.⁶²

55. Regardless of these specific assumptions and measures, the use of location counts systematically understates the level of competition in the BDS marketplace. First, the reliance on 2013 data is especially misleading in an environment in which the “marketplace has been changing.”⁶³ Since 2013, significant investments in additional locations (both in response to RFPs and green-field investments) have expanded the footprint of competitive alternatives for BDS considerably. This buildout has important, pro-competitive effects that are not captured in the 2013 data. For instance, with greater buildout of Ethernet networks across the country, the distance between the backbone network and customers declines. The result is that the marginal cost of serving as yet unconnected customers declines. This, in turn, means that the willingness and propensity of these expanding networks to seek to serve marginal customers increases. Thus, the competitive discipline brought by the new investment that has happened since 2013 is especially encouraging. In addition, much of the investment that has occurred in the 2013-2016 period has been in the form of the development of physical, sunk cost, facilities. As described above, Comcast alone has spent {{ }} on the development of its fiber network from 2013 through 2015 and an additional

⁶⁰ FNPRM, at 223.

⁶¹ FNPRM, at ¶221 (Table 4). Calculated as 57.4% + 26.9% + 3.1% + 0.5% + 0.2% = 88.1%.

⁶² FNPRM, at ¶¶222-23 (Table 5). Calculated as 53.6% + 17.93% + 6.6% + 5.78% = 83.9%.

⁶³ FNPRM, at ¶2.

{{ }} in installation costs for its fiber and coax networks during this 3-year period.⁶⁴ Notably, Comcast’s annual investment to build-out its fiber network has increased every year since 2012 – increasing from {{ }} in 2013 to {{ }} in 2015 ({{ }}).⁶⁵ A fundamental economic characteristic of such high-sunk-cost investments is that, once deployed, firms will compete especially vigorously. Again, the competitive discipline of this additional sunk cost investment is under-stated in the FCC’s analysis of the marketplace as it existed in 2013.

56. Second, the presentation of “location” data implicitly, if not explicitly, is intended to provide an indication of the geographic constraints that firms have to provide service. This analysis, however, ignores the very common practice of firms in this marketplace to use inter-firm contracts as a viable alternative to physical investment in facilities. For instance, I understand that Comcast routinely arranges contracts with other firms outside of its investment footprint to provide it access to the physical investments necessary for Comcast to provide retail BDS services. Other firms too have readily found ways to extend their service footprints by contracting with other providers to obtain wholesale access to underlying facilities. For example, the FNPRM notes that Verizon has entered into some 3,300 contracts “with unaffiliated carriers for non-TDM based services, valued at more than \$3.7 billion over their lifetime.”⁶⁶ Similarly, firms providing BDS may, and indeed do, utilize UNEs as a way of configuring their BDS services. This ability of firms to provide their service with a combination of their own investments and contracts for other necessary inputs is routine. Against this backdrop, the location-based count of physical facilities understates the

⁶⁴ {{ }}

⁶⁵ {{ }}

⁶⁶ FNPRM, footnote 671.

demonstrated ability of firms to use the combination of physical facilities and contracts to successfully bring competitive pressure to the marketplace.

57. It is interesting to note that while economies of scale will reduce the average cost of serving additional BDS customers, the fact that nearly 500 firms compete for the patronage of BDS customers suggests a nimbleness of providers that may not otherwise be obvious.⁶⁷ The fact that smaller firms have entered and survived in this marketplace indicates that any economies of scale do not act as a ubiquitous barrier to entry in this marketplace.⁶⁸
58. Yet another feature of the BDS marketplace diminishes the value of a cross-sectional examination of a count of the locations in which competitors have been observed to provide facilities. In particular, because providing service to customers can involve the expenditure of highly specialized assets, suppliers of BDS often do not make these expenditures *ex ante*. That is, rather than build facilities in the hope of securing business, BDS suppliers will often either negotiate directly with customers or will engage in a requests-for-proposal (RFP) process. When that happens, BDS suppliers may find themselves actively competing for the patronage of customers, but this active rivalry will not manifest itself in an observed “location” absent the consummation of an agreement with the customer. Thus, examining location data masks the underlying competitive rivalry that exists in the marketplace.
59. Finally, consider Professor Rysman’s econometric finding that price and the presence of competitors is negatively correlated. Unfortunately, this analysis

⁶⁷ FNPRM, at 221 (Table 5). My understanding is that beyond these firms that provided data to the Commission, there are also smaller, regional firms that provide BDS that did not file data with the Commission.

⁶⁸ See, e.g., Stigler, George J. “The Economies of Scale.” *The Journal of Law & Economics* 1 (1958): 54-71. As correctly pointed out in the FNPRM (e.g., ¶225), other barriers to entry and expansion exist, including the ability of entrants to gain access to public rights-of-way, to secure building access, and local regulations. These barriers are appropriate targets for a policy focus of reducing such entry barriers, with commensurate gains in the ability of new entrants to enter and expand.

suffers from two overarching, and ultimately damning, problems. First, the analysis is conceptually ill-suited to the challenge before the Commission. Second, the econometric application is critically flawed.

1. Professor Rysman’s Model is Conceptually Ill-Suited to the Challenge before the Commission

60. Professor Rysman’s approach incorrectly frames the critical and appropriate question for the Commission: whether, absent the proposed regulatory structure, the provision of BDS suffers from significant monopoly power. That is, does any firm in the BDS marketplace have the ability and propensity to raise prices to supra-competitive levels? Absent such significant monopoly power, the case for regulation fades. I return to this central question in Section IV below.
61. Instead, Professor Rysman offers a framework in which a negative relationship between price and the presence of observed competitors in a geographic area is interpreted as evidence of monopoly power. But a negative relationship between price and number of competitors is normal even in markets that are behaving competitively. The fact is that as firms enter, the available supply to consumers in that market increases with the predictable consequence that price falls. This is true in *all* markets, both those with substantial monopoly power and those that are effectively competitive. Consequently, a test of the (negative) relationship between price and a measure of nearby competitors cannot readily distinguish the market as competitive or, alternatively, subject to monopoly power.⁶⁹
62. The confounding factors associated with a negative coefficient on the “A Facilities-based Competitor Can Serve a Building in the Census Block” (hereafter, *Competitive Presence*) variable are especially vexing in dynamic

⁶⁹ See, e.g., Peter Davis and Eliana Garcés, “Quantitative Techniques for Competition and Antitrust Analysis,” Princeton University Press, 2010 for a discussion of the relationship between market structure and prices when firms are competitive price-takers, stating in part “entry will shift the aggregate market supply curve rightward and, in so doing, reduce equilibrium prices.” (p. 234).

markets with heterogeneous costs across competitors. For instance, a firm contemplating offering Ethernet services may see itself as offering a more powerful, scalable (i.e., superior) service to customers of traditional TDM services. In this case, entry into the market is driven by the pro-competitive belief that the new entrant will offer a superior and attractive service to customers. The consequence of the entry may very well be that the incumbent provider counters with a price decline, thus triggering a negative correlation between price and the emergence of a competitor, yet the correlation is not properly interpreted as a manifestation of monopoly power in the marketplace. Given the entry of a superior product, we would expect a negative correlation between price and the presence of competitors even when price was at or near competitive levels prior to the entry. And, once entered, especially with sunk facilities, it is widely recognized that competition in sunk cost markets will be especially fierce.

63. Additionally, consider that the costs of providing BDS are, in part, determined by the length of the transport service provided. In this case, with customers located throughout an area, entry is likely to increase the proximity of at least some customers to a provider. This will logically have the effect of reducing the average loop length necessary to provide BDS to customers in that area, and therefore the cost of providing service. In this case, entry will cause downward pressure on price not because of a reduction in market power of incumbents but rather because entry has reduced the cost of providing service to customers.
64. Yet another serious conceptual slip between cup and lip occurs with the econometric approach adopted in the FNPRM. Specifically, the advertised goal of the approach is “to detect market power.”⁷⁰ It is well-established, however, that any inferences about the magnitude of market power depends crucially on an

⁷⁰ FNPRM, at 227.

understanding of the supply elasticity of competitors in the marketplace.⁷¹ The supply elasticity provides a measure of the supply responsiveness of competitors to a change in the market price. Formally, it is the percentage change in supply by firms in response to a one percent increase in market price. Where that supply elasticity is higher, the market power of any firm in the market is diminished. Yet, the proffered econometric model fails to identify or capture the critical role of the supply elasticity of competitors. Formally, the model simply takes the presence of competitors as exogenously given, and their ability and willingness to expand is not part of the model at all. Absent an estimation of the propensity of competitors to expand (i.e., their supply elasticity) in the face of incentives to do so (e.g., a supra-competitive price), the econometric model cannot, as advertised, “detect market power.”⁷²

65. A close look at the econometric approach reveals another incongruity that makes it unsuitable to the policy question and Commission tools at hand. In particular, the economic foundation of the FCC’s econometric analysis is appropriate for merger analysis but not for determining the appropriateness of price regulation. Professor Rysman claims that the approach he adopts is “common in antitrust setting” and cites the application in the well-known Office Depot-Staples merger of 1997.⁷³ In the Office Depot-Staples case, as in merger cases generally, the critical policy question at hand was whether to permit a change in the number of firms in a market. That is, the relevant policy lever/decision is “the number of firms.” In such merger cases, an appropriate consideration is an examination of how price changes with changes in the number of competitors. In that context, if

⁷¹ See, e.g., Landes, William M., and Richard A. Posner. “Market Power in Antitrust Cases.” *Harvard Law Review* (1981): 937-996, at p. 945. Moreover, the Commission itself has previously recognized the supply elasticity as an important determinant of market power. See, e.g., Motion of AT&T to be Reclassified as a Non-Dominant Carrier, Order, 11 FCC Rcd 3271, 3302.

⁷² See FNPRM, at 227, stating that the goal of the exercise is to “detect market power”.

⁷³ FNPRM, at 211.

(holding other factors equal) the market price were adversely affected by a reduction in the number of firms brought about by the merger, then this may justify blocking the merger.

66. This is, however, not the policy question facing the FCC as it considers the BDS market. Unlike the antitrust authorities' decision in merger cases, the Commission does not have the power to alter the number of firms (at least directly). As described above, a negative relationship between price and the number of competitors is consistent with many markets, including competitive markets. In that context, applying price regulation may *reduce* the number of firms by discouraging entry, investment and expansion.
67. Thus, for a variety of reasons, an observed negative correlation between the price and the presence of competitors cannot detect market power in the provision of BDS and is, in any event, inapt to the policy question before the Commission as it seeks to design an appropriate oversight mechanism for the provision of BDS.

2. Professor Rysman's Econometric Application is Fatally Flawed

68. While the econometric model the Commission has relied upon does not permit one to make inferences about the presence or absence of market power in the provision of BDS (for reasons provided above), I have for purposes of completeness examined the 2013 data submitted to the Commission by BDS providers. In particular, I first sought to assemble a dataset as close as possible to the one used by Professor Rysman in his regression analysis.⁷⁴

⁷⁴ To do so, I used the datasets and programs provided by the Commission. Importantly, my analysis of the code and log files (files that record implemented steps in data processing) indicated that the raw data and many crosswalk files (tables that map the elements in one table to the equivalent elements in another table) used by Professor Rysman in his analysis are, in many instances, not the same ones provided to me. Furthermore, certain datasets containing geographic and economic data from the Census Bureau, Tom-Tom, and ArcGIS, as well as data on the availability of broadband from the National Telecommunications and Information Administration were not provided in their original form. These datasets were used by Professor Rysman to map the 2013 billing data collected by the Commission to the appropriate geographic marketplaces and to control for important economic and demographic factors in the regression analyses. I

69. With the assembled data, I engaged in two exercises. First, I examined the suitability of the data that were used in the model. I found that the data used were not, in fact, suitable even within the conceptually ill-designed model (as discussed above). Second, I incorporated the most suitable data to the approach I understand Professor Rysman undertakes and examined the model afresh. Below I explain each of these points in greater detail.

a. The Model Uses Data that Cannot Possibly Support the Finding that Competition Drives Prices Down

70. Recall that the empirical analyses performed by Professor Rysman seek to explain observed variation in price based upon measures of competitive presence, fixed effects (at alternatively the census tract and county level) and a set of controls. The data are all drawn from the FCC Data Collection. As the dependent variable (i.e., the variable to be explained), Professor Rysman uses the observed price in 2013. As the key explanatory variable, Professor Rysman uses *Competitive Presence*, also measured in 2013.
71. The problem with this approach, however, is that a substantial fraction of the observations involve contracts whose terms (including price) were established *before 2013*.^{75, 76} It is impossible for *Competitive Presence* – observed in 2013 –

followed the Commission’s instructions on how to retrieve and compile the missing data files and was able to assemble a final estimation sample that is very close, but not identical, to the one used by Professor Rysman. As a result, I cannot replicate Professor Rysman’s regression results perfectly.

⁷⁵ The FCC billing dataset includes two relevant fields that enable me to identify the date when a sale occurred and price was determined: (1) Term Commitment, which records the length of total time in months of the term commitment associated with each circuit; and (2) End Date, which records the month and year in which a term commitment expires. These two variables together allow me to calculate the approximate date on which each circuit was sold and when price was determined. For example, if a circuit has Term Commitment of 60 months and End Date in January 2015, I estimate that it was sold five years before the end date, i.e., in January 2010. I understand that in instances in which Term Commitment has a value of 1 month and End Date is missing, the circuit is sold on a month-to-month basis, likely after the end of a term-based contract.

⁷⁶ My calculations indicate that a significant number of observations used by Professor Rysman in his analysis have prices that were set prior to 2013. In particular, {{ }} percent of DS1 circuits and {{ }} percent of DS3 circuits in the regression analysis data sample were sold with term commitments prior to

to cause prices that were set in earlier years! Of course, it is possible that the prices, which were established prior to 2013, may have affected *Competitive Presence* which is measured in 2013, but the converse is simply not possible. Thus, rather than a conclusion that *Competitive Presence* causes price changes, the correlation is at best spurious, and more likely the product of reverse causality. The negative relationship is not because *Competitive Presence* drives prices down, but quite likely because higher prices observed in earlier years have driven the observed presence of competitors in 2013. Thus, the empirical application of model finds a correlation that cannot be interpreted as evidence of “market power”.

b. A Fresh Look at the Model with More Suitable Data Provide Qualitatively Different Conclusions

72. Using the dataset I assembled to be as true to Professor Rysman’s as possible, I was able to largely reproduce the regression results he reports. I then made three alterations that I believe are both reasonable and informative. First, because the Commission should be interested in understanding the BDS marketplace as it exists (at least as of 2013) rather than as it used to exist, I limited the data in the regression analysis to contracts that were issued in 2013. The prices in these contracts will more reasonably reflect current market conditions (at least as of 2013) than earlier contracts. This focus on 2013 price data is also necessary because the measure of competition used by Professor Rysman, *Competitive Presence*, is only measured in 2013. As explained above this makes *Competitive Presence* unsuitable as an explanatory variable for prices that were established in contracts before 2013. Because the dataset is so large, restricting the data to contracts issued in 2013 still left an ample number of observations with which to

2013. Only about {{ }} percent of DS1 and {{ }} percent of DS3 circuits were sold in 2013. About {{ }} percent of DS1 circuits and {{ }} percent of DS3 circuits were sold on a month-to-month basis, likely after the end of a term-based contract. I was unable to identify the date on which circuits were sold for about {{ }} percent of DS1 circuits and {{ }} percent of DS3 circuits due to data limitations.

perform the regression analysis. Second, given that the goal of the regression model is to explain variation in BDS prices, I have emphasized the impact of regulation on prices. As noted by Professor Rysman, “[a]n important feature of the BDS market are price caps, administered by the FCC.”⁷⁷ Accordingly, I not only estimated the regressions Professor Rysman reports in his Table 20, but I also ran a specification that additionally includes independent (explanatory) variables to account for the presence of Phase 1 or Phase 2 regulation for each observation in the data. Finally, in addition to performing a logarithmic transformation of the dependent variable as done by Professor Rysman, I simply used the actual price as the variable to be explained in the model (i.e., the dependent variable).⁷⁸ In all other respects, the models I estimate are the same as the ones Professor Rysman reports in his Table 20.

73. I incorporate these simple changes with an eye toward understanding whether the negative relationship between *Competitive Presence* and price continues to hold with the slightly modified models. This is important because the negative relationship that Professor Rysman finds is proposed to (and is taken by the Commission as) support for the proposition that the provision of DS1 and DS3 services are subject to market power.
74. The results of these simple changes are revealing. In Exhibit 3, I provide the key results of my regressions for DS1 and DS3, with both census tract and county fixed effects. Each analysis is performed using the relevant 2013 data on prices and *Competitive Presence*. To see the similarities and differences, I highlight in green, instances in which the alternative regressions yield a negative impact of

⁷⁷ FNPRM, at 231.

⁷⁸ To keep the number of variations to a minimum, I followed Professor Rysman in using only ILEC observations. This, of course, limits any relevance of the regressions for drawing inferences regarding the pricing strategies of competitors (non-affiliated ILECs, CLECs and cable companies). Consequently, the regressions that focus exclusively on the pricing determinants of the ILECs shed essentially no light on the issue of market power across the broader set of competitors, but that approach is consistent with the absence of evidence suggesting that non-ILECs possess market power in the BDS market.

Competitive Presence on price. I highlight in red instances in which the alternative regressions yield either a positive relationship or no relationship between *Competitive Presence* and price. As can be readily seen from the largely red table, the new regressions reveal many situations in which the indicated relationship between price and *Competitive Presence* is not negative.

75. To understand the specific results, consider the impact of *Competitive Presence* on DS1 prices when the model is estimated with census tract fixed effects. These are shown in column (1). In each case, the regression’s estimated impact of *Competitive Presence* on price is reported.⁷⁹ Using the model that exactly mirrors the explanatory variables used in Professor Rysman’s Table 20, I find that whether the model seeks to explain the level or the log of prices, the impact of *Competitive Presence* on prices calculated from the regression parameters is positive. This is also true when the regression models are extended to include the potential for a stand-alone impact of regulation on prices. And the results from the DS3 regressions yield statistically insignificant coefficients, failing to reject the hypothesis that there is no relationship between *Competitive Presence* and prices for DS3 service. The results using county fixed effects reveal modestly more evidence of a negative relationship, but there is still significant evidence of either a positive relationship or no relationship between *Competitive Presence* and prices. For example, in the DS1 estimations 8 out of 12 parameter estimates indicate either no relationship or a positive relationship for DS1, while the DS3 results are equally split on the “no effect” versus a “negative effect”.
76. In the Commission’s FNPRM, the negative impact of the presence of a competitor on prices is critical to the conclusion that BDS provided at the DS1 and DS3 levels are imbued with market power. As the FNPRM points out in its “Evidence of Market Power” section: “[a] central finding in the Rysman White Paper is that, in regressions controlling for a range of other factors, competitive supply in a

⁷⁹ The full regression results are reported in the Appendix.

unique location is correlated in both statistically and economically significant ways with lower ILEC prices for DS1s and DS3s at that location.”⁸⁰ Unfortunately, notwithstanding the numerous other problems with the econometric model and application, the lack of robustness of the econometric results to even simple alternative specifications indicates that the Commission cannot confidently rely upon this finding.

77. To be clear, I do not interpret these alternative and in some cases opposite results as indicative that market power is absent in the provision of BDS. Indeed, as I explained above, this model is, under any circumstances, ill-suited for drawing or refuting that hypothesis. It is clear, however, that with very simple and plausible adjustments to a model of price determination, the negative correlations that seem so critical to the market power narrative dissipate, and in some cases, evaporate altogether. Thus, even if the conceptual framework were correct (it is not) and the empirical construction appropriate (it is not), the empirical results are themselves not stable to simple alternative specifications that use relevant (as opposed to irrelevant) data. The results are, in any event, not robust enough to support the conclusion that that the regression analysis “provides direct evidence of market power.” Absent both an appropriate conceptual framework and a distinct lack of robustness to alternative sensible specifications, the regressions fail to provide the claimed “evidence” of market power inferred by the Commission. Moreover, given that the economic argument for imposing price regulation on ILECs is undermined by the relevant data in many respects, it necessarily follows that the FNPRM’s contemplation of extending price regulation to *non*-ILEC BDS providers—which cannot be shown to possess market power under any recognized theory—is even more indefensible.
78. In sum, Professor Rysman’s proposed econometric framework is conceptually inappropriate for the determination of market power in the provision of BDS and

⁸⁰ FNPRM, at ¶238.

is empirically bereft of meaningful policy guidance. Indeed, a more complete examination of the data provides a very different set of results than those the Commission has relied upon. This lack of robustness undermines any ability for the Commission to draw upon the econometric model to confidently conclude that market power is a substantial problem in the provision of BDS.

C. The FNPRM’s Regulatory Framework

79. For most of the twentieth century, regulatory bodies most typically imposed rate-of-return regulation on monopoly providers of services that were thought to be public utilities such as electricity, natural gas and telecommunication. Because of a number of economic shortcomings of traditional rate-of-return regulation, economists developed and regulators began to implement price cap regulation in the 1990s. Under pure price cap regulation, the prices of the regulated firm's products or services are severed from its costs. By doing so, the price-capped firm is provided an incentive to reduce production costs because, under pure price cap regulation, any cost reductions undertaken by the firm can flow to its profits, thereby providing a high-powered incentive for the firm at issue to minimize its costs.

1. The Contemplated Application of Price Caps to all Market Competitors is Economically Indefensible

80. The FNPRM contemplates that once the Commission determines a set of geographic areas for which the supply of BDS is non-competitive, it will impose price cap regulation on all providers within these geographic areas.⁸¹ While theoretically providing an economically superior regulatory mechanism to rate-of-return regulation in a monopoly environment, the application of price cap regulation in the BDS marketplace as contemplated by the Commission suffers

⁸¹ FNPRM, at ¶¶292-99. The FNPRM (¶351) proposes to subject TDM services supplied in areas judged to be non-competitive to price cap regulation, and to use those prices to initially establish price caps for Ethernet services in non-competitive areas (¶¶422-23).

from several critical flaws. Crucially, price cap regulations were not designed for markets with more than one competitor, but rather for a monopoly.⁸² I am not aware that any economic research on price cap regulation has indicated that its theoretically beneficial effects in the context of being applied to a single monopoly provider extend to its market-wide application to all providers in that marketplace.

81. Indeed, there are very sound reasons to believe that any beneficial consequences of price cap regulation in an environment for which it was originally intended evaporate (or turn explicitly harmful) when such regulation is imposed on all competitors in a market with multiple competitors. For instance, note that where consumers face choices, the salutary incentives ascribed to pure price cap regulation are a natural byproduct of marketplace competition. As the Commission has aptly noted, “[w]here competition exists, there is little for government to do except maintain the traditional oversight of telecommunications services, because competition is the single best way of ensuring customers benefits.”⁸³ Thus, for firms that face competition, incentives for cost-reductions exist *without the imposition of costly regulatory controls*. There is simply no support within the body of economic research for imposing price cap regulation on an entire market of competitors, including new entrants that, under any conceivable interpretation, do not enjoy monopoly power. Indeed, as described in Section IV below, the principal benefit of price cap regulation – cost and price reductions – are a regular feature of this marketplace as a consequence of the marketplace competition that exists today.
82. The pitfalls of imposing market-wide price controls are not merely theoretical. Indeed, history is replete with the economic harm caused by market-wide price

⁸² See, e.g., David E.M. Sappington and Dennis Weisman “Price Cap Regulation: What Have We Learned from Twenty-Five Years of Experience in the Telecommunications Industry,” *Journal of Regulatory Economics*, Vol 38, September 2010, pp. 227-257.

⁸³ FNPRM, at ¶5.

- controls. Consider, for instance the effects of the imposition of price controls on retail gasoline markets in the 1970s. While introduced as a well-meaning attempt to protect consumers, the consequence of price regulation of gasoline actually harmed consumers both directly and indirectly in a variety of ways. Artificially low prices imposed on all providers of retail gasoline reduced the quantity of gasoline supplied and led to long lines and significantly wasted time for millions of consumers. This direct harm, in turn, led the government to design a costly scheme to ration gasoline to consumers. This costly regulatory scheme drove up the administrative burden for consumers, the government and for taxpayers. Economists are in widespread agreement that this market-wide application of price controls was very poor economic policy.⁸⁴
83. Price regulation of the natural gas industry provides another powerful lesson regarding the market distortions that can befall market-wide regulation. Between 1954 and 1978, the Federal Power Commission sought at different times to individually price-regulate each natural gas producer in the country, regulate producers within region, and set a national (but below market) price for natural gas at the wellhead. The results of this market-wide, but highly, disaggregated approach to regulating areas was not only administratively infeasible, but also the regulation of prices led to significant supply distortions in the market. Facing price regulation, suppliers simply reduced investments in exploration, and together with the demand surge caused by artificially low regulated natural gas prices, shortages ensued. The distortion caused by these shortages was compounded by the reaction of producers to shift their sales from the regulated interstate market to the largely de-regulated intrastate market. The consequence was severe. Producing states had virtually no natural gas shortages, while consuming states experienced extreme shortages. In recognition of these

⁸⁴ See, e.g., Kalt, Joseph P. "Economics and Politics of Oil-price Regulation: Federal Policy in the Post-Embargo Era," MIT Press, 1981.

- distortions, the Carter administration supported, and Congress passed, the Natural Gas Policy Act, which began the process of deregulating natural gas prices. This deregulation renewed efforts by suppliers to identify new sources of natural gas and to expand output, effectively ending the shortages and distortions caused by market-wide prices.⁸⁵
84. Lessons also emerge from market-wide regulation of the various transportation industries in the United States. For instance, prior to the passage of the Staggers Rail Act of 1980, freight rail shipments in the U.S. were comprehensively regulated. It is now widely agreed that the result of that market-wide regulation was massive under-investment and the significant deterioration of the physical infrastructure of the industry.⁸⁶ The Staggers Act eliminated market-wide price regulation with substantially beneficial consequences to prices, costs and productivity.⁸⁷
85. These examples from the market-wide application of regulation in other industries provide valuable lessons for the merits of the market-wide application of price controls in the BDS marketplace. Inducing lower prices through regulation creates less supply and innovation from competitive price-regulated firms. Contrary to the public policy goal of stimulating robust competition among competitors, the consequence of such price regulation will simply be to hold back supply and innovation from the very firms that are driving the competitive energies in this marketplace. Instead of benefiting consumers, the consequence of applying market-wide regulation of BDS services will harm them by reducing supply, innovation and consumer choice and competition.

⁸⁵ For a more detailed discussion of the evolution of natural gas price regulation and deregulation, see Paul W. MacAvoy *The Natural Gas Market: Sixty Years of Regulation and Deregulation*, Yale University Press, 2000.

⁸⁶ John R. Meyer and Robert E. Gallamore *American Railroads: Decline and Renaissance in the Twentieth Century*, Harvard University Press, 2014.

⁸⁷ *Id.*

2. Evidence Indicates that Price Cap Regulation Would Stifle Investment and Harm the Growth of Competition

86. To be clear, evidence of these distortionary effects is not limited to other industries. Indeed, it is possible to observe directly the anti-consumer, anti-competitive effects of the imposition of market-wide price caps by considering the market investment models of specific firms. For example, in making its BDS investment decisions, Comcast utilizes a {{

}}

Comcast applies that {{

}} In

essence, Comcast considers {{

}} In

general, {{

}} More generally, Comcast’s BDS business unit {{

}} This is intuitive as it would be

⁸⁸ See Declaration of Robert Victor, June 28, 2016, at ¶¶3-7; Comcast Cell Backhaul Activity Tracker (Sold); Comcast Cell Backhaul Financial Model (Boston); Comcast Cell Backhaul Financial Model (Chicago); and Comcast Cell Backhaul Financial Model (Michigan).

⁸⁹ Declaration of Robert Victor, June 28, 2016, at ¶¶3-7.

⁹⁰ Declaration of Robert Victor, June 28, 2016, at ¶¶3-7; Declaration of Devesh Raj, June 28, 2016, at ¶¶6-12.

⁹¹ Declaration of Devesh Raj, June 28, 2016, at ¶¶6-12.

more profitable for Comcast to invest in, for example, a theme park or developing a feature film, if the returns on investment from those projects are higher than building out its fiber network. As such, each business unit is incentivized to maximize the returns from its limited capital in order to secure continued funding.

87. The market-wide imposition of price cap regulation would jeopardize Comcast’s investments in building out its fiber network. To illustrate, I have analyzed how price cap-induced reductions in Comcast’s BDS prices would affect the IRR of Comcast’s cell backhaul contracts and compared these reduced IRRs to Comcast’s firm-wide annual return on invested capital (“ROIC”). Comcast’s pre-tax ROIC was approximately 14 percent in 2014 and 15 percent in 2015.⁹² The ROIC serves as a benchmark threshold on Comcast’s investment decisions as the company earns, on average, the ROIC from all of its investments (including Comcast Business, NBC Universal, and Comcast Cable). {{

}}⁹⁵

88. I have also compared the IRR of Comcast’s cell backhaul contracts with an “Ethernet Pricing Model” constructed by Sprint. According to Sprint, its model “estimates prices at which an incumbent provider could profitably supply fiber-

⁹² From Morningstar (available at <http://financials.morningstar.com/ratios/r.html?t=CMCSA>, viewed June 14, 2016) and Bloomberg. Pre-tax ROIC calculated as Post-Tax Return on Invested Capital / (1 – Tax Rate).

⁹³ Declaration of Robert Victor, June 28, 2016, at ¶¶3-8.

⁹⁴ Declaration of Devesh Raj, June 28, 2016, at ¶¶6-12.

⁹⁵ In fact, only {{ }} percent of Comcast’s cell backhaul contracts were associated with an IRR of less than {{ }} percent. See Comcast Cell Backhaul Activity Tracker (Sold). The sample is restricted to contacts for which financial information is reported in the data.

based BD” and is used to evaluate offers for fiber-based BDS, “primarily for use as backhaul to Sprint’s cellular sites.”⁹⁶ The Sprint model considers, {{

}}

89. To illustrate the potential impact of price caps on Comcast’s build-out decisions, I have analyzed the effect of potential price caps on Comcast’s IRRs on executed contracts between Comcast and wireless providers for cell backhaul. Specifically, I reviewed the financial model that Comcast relies on to derive the parameters of the contract. The model can be used to calculate, among other things, the prices and contract durations that would enable Comcast to achieve a target return on its investments (e.g., build-out costs) while accounting for recurring costs for operating and maintaining the service. Exhibits 4-6 show the hypothetical impact of a price cap on three executed contracts, entered into by Comcast and its customer, for which I had access to the output of the financial model and all underlying data.¹⁰⁰ The exhibits report the change in IRR that would result from

⁹⁶ Letter from J. Bagg and V. Goel, Counsel to Sprint Corporation, to Marlene Dortch, Secretary, FCC, dated May 26, 2016.

⁹⁷ Declaration of James Appleby in Support of the Sprint Ethernet Pricing Model, May 19, 2016, at ¶15.

⁹⁸ Declaration of James Appleby in Support of the Sprint Ethernet Pricing Model, May 19, 2016, at ¶15.

⁹⁹ {{

¹⁰⁰ The contracts are for the following three projects: {{

}} Complete data on relevant projects were only available for these three projects.

a price cap that would reduce total price (including monthly recurring charges and non-recurring charges) by 10 percent, 25 percent, 50 percent, or 75 percent.

90. As can be seen from Exhibits 4-6, while Comcast {{
}}, a 10 percent decrease
in price reduced the IRR on two of those contracts {{
}} and a 25 percent decrease in price {{
}}¹⁰¹ As such, had a price cap of 25
percent below the actual price been imposed on Comcast for these opportunities,
{{
}} Furthermore, as
shown in Exhibits 7-9, {{
}}¹⁰²

91. I extended my analysis of cell backhaul investment by drawing on a dataset of
{{
}} from 2012 through 2016 for which I had access
to most, but not all, economic inputs required to run Comcast's financial
model.¹⁰³ The dataset contains some of the most important inputs such as
{{
}}¹⁰⁴ Applying the data and methodology of the three
contracts described above to the available inputs for each of the {{

¹⁰¹ {{

}}

¹⁰² The analysis reported in Exhibits 7-9 assumes that the non-recurring charge remains unchanged.

¹⁰³ {{
}}

¹⁰⁴ For these {{
}}, the dataset contained key variables such as {{

}} As such, I estimated the values of missing variables based on the corresponding actual values for the three contracts for which I had complete information and other financial information reported by Comcast. To test the robustness of my estimation methodology, I conducted additional sensitivities such as comparing the upper bound of estimated IRRs to the IRRs reported in the Comcast data.

}} I estimated the effect of potential price caps on Comcast’s IRRs for these {{ }}.

92. Exhibit 10 shows that while Comcast {{

}}¹⁰⁵ The exhibit also shows that while Comcast achieves an IRR that is {{

}}¹⁰⁶ Exhibit 11 shows that very similar results hold if price caps affected only recurring charges.¹⁰⁷

93. While I did not have sufficient data to conduct a similar analysis for Comcast’s retail contracts, the available data on Comcast’s retail pro-builds¹⁰⁸ suggest that a price cap regulation would jeopardize these build-outs as well. The data indicate that {{

}}¹⁰⁹ Comcast’s benchmark IRR for pro-builds is approximately {{

¹⁰⁵ {{

}}

¹⁰⁶ {{

}}

¹⁰⁷ The analysis reported in Exhibit 11 assumes that the non-recurring charge remains unchanged.

¹⁰⁸ Pro-builds are projects where Comcast builds fiber proactively across one or multiple buildings in order to serve potential future retail demand, rather than in response to a retail consumer’s request.

¹⁰⁹ {{

}}¹¹⁰

94. As can readily be seen, the consequence of price regulation would be a significant reduction in the competitive investment, supply, and innovation in the market. This is directly in contrast to the FNPRM’s assertion that the imposition of price cap regulation “incentivizes carriers to become more productive and forces them to pass a portion of their cost savings to ratepayers.”¹¹¹ Rather, imposing price cap regulation on competitive firms would simply drive investment away from the price- capped regulated services to investments in other activities within the firm's portfolio. In the case of Comcast, for example, price caps on BDS would drive the company’s investments into other parts of the company such as NBCUniversal (e.g., TV programs and movies).¹¹²

3. Price Cap Regulation Can Harm Consumers by Incentivizing Quality Reductions

95. The economic literature points to yet another problem associated with the imposition of price cap regulation in the provision of BDS. In particular, it is well-known that price cap regulation can erode incentive for the regulated price cap firm to maintain quality.¹¹³ This may be especially problematic in the case the Commission envisions. In particular, it seems that the Commission is most directly concerned that lower bandwidth services such as DS1s and DS3 offered by ILECs face little competition and should therefore be subjected to price cap regulation. But as is widely recognized, these are “legacy” services that are

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¹¹¹ FNPRM, at ¶353.

¹¹² Declaration of Devesh Raj, June 28, 2016, at ¶¶6-12.

¹¹³ See, e.g., David E.M. Sappington “Price Regulation” in *Handbook of Telecommunications Economics*, Vol. 1, North-Holland, 2002.

based on a platform (TDM) that is being overtaken by modern Ethernet-based services offered by all providers. The legacy nature of these services will make it increasingly difficult for the providers of TDM-based services to continue to invest in and maintain these services. The imposition of price cap regulation in this environment opens an economically attractive, but socially unwelcome option for the providers of these services. In particular, these firms may simply seek to maintain profits by reducing the quality (and thereby costs) of TDM-based services.¹¹⁴ Furthermore, price caps can reduce incentives for firms to incur costs to improve quality because the cap prevents firms from offering higher cost, higher quality products that consumers would like to pay for. As such, price caps intended to incentivize cost and productivity improvements can actually lead to inefficient reductions or lack of improvements in quality.¹¹⁵

96. Additionally, as described in Professor Farrell's Declaration, the application of regulation to markets in which firms compete by offering differentiated quality further compounds the demerits of applying the proposed regulatory regime. For example, price caps often undermine incentives to deliver quality as it provides incentives to reduce costs by reducing quality. In contrast, competition incentivizes firms to work toward efficient product quality and cost savings.¹¹⁶

¹¹⁴ A mitigating consideration is that where competition is present, quality reductions by the price-capped firm may simply lead consumers to switch providers. This mitigating consideration is, however, not operative if price cap regulation is applied only in areas that truly lack competition. In this case, however, the economic criticism of price cap regulation as a mechanism which allows quality degradation holds in force.

¹¹⁵ See, e.g., Crew, Michael A., and Paul R. Kleindorfer. "Service Quality, Price caps and the USO under entry." *Progress in the Competitive Agenda in the Postal and Delivery Sector, Cheltenham, UK and Northampton, USA: Edward Elgar* (2009): 1-22, at 2; Sappington, David EM. "Regulating service quality: A survey." *Journal of regulatory economics* 27, no. 2 (2005): 123-154, at 130.

¹¹⁶ Declaration of Joseph Farrell, June 28, 2016, at 3.

4. The Commission’s Proposed Regulatory Approach Fails to Recognize the Risk of Extending Regulation Unnecessarily

97. The imposition of regulation in any market will always encounter the possibility of either under-extending or over-extending the reach of the regulatory mechanism. The application of regulation in the provision of BDS is no exception, and indeed the potential for error is especially heightened by the fact that this marketplace is evolving so rapidly. Unfortunately, the FNPRM offers a one-sided perspective on the costs of error in the design of the regulatory framework for BDS. It focuses, preponderantly if not exclusively, on the possibility of under-regulating the market. For example, the FNPRM sets out the goal to “not repeat the errors of the 1999 pricing flexibility regime by granting relief too broadly to cover areas where competition is not present or likely to occur.”¹¹⁷ But given the substantial changes in this market since 1999, certainly the prospect exists that using a regulatory lens that over-estimated competition *seventeen years ago* may appropriately estimate (or, more likely, under-estimate) the power of competition in the marketplace today. Indeed, the proposed regulatory regime directly contradicts the Commission’s own advice that “[o]ur framework should reflect how the market operates today.”¹¹⁸

5. The Commission’s Proposed Regulatory Mechanism Would Impose Substantial Administrative Costs That Will Be Borne By Consumers, Firms and Regulators

98. It is also crucial for the Commission to consider the costs associated with the proposed regulatory mechanism; costs that will be borne by the Commission, by regulated firms, and by consumers. The contemplated regulatory regime is destined to impose substantial costs – costs well beyond any demonstrated benefit of the contemplated regulation.

¹¹⁷ FNPRM, at ¶290.

¹¹⁸ FNPRM, at ¶282.

99. In fact, the proposed regulatory regime embodies what are likely to be nightmarish administrative features. For example, the FNPRM envisions the potential to parse its regulatory application by census block (of which there are over 11 million in the United States), customers' size (small, medium and large), whether the service is provided at wholesale or retail, and bandwidth (e.g., DS1, DS3 and high bandwidth).¹¹⁹ The sheer number of regulatory determinations and permutations in this potential environment would create a staggering morass for regulators, firms, and customers alike.¹²⁰
100. Moreover, upon closer examination the challenges get even more severe. The FNPRM anticipates updating the determination of whether an identified market is “competitive” or “non-competitive” every three years.¹²¹ This would be especially problematic in the case of BDS as it is routinely provided under negotiated contracts that last multiple years and often cover customer locations in different census block areas. Consider a four-year contract for BDS being negotiated in 2018 (the second year of the proposed new regulatory regime) between a supplier and a customer, who operates in multiple census blocks. A three-year review of the regulatory status of these census blocks may be set for 2020. How might the contracting parties account for the prospect that prices for particular locations may be altered due to regulation in the second year of the four-year contract? Under any conceivable interpretation, the anticipated regulatory re-review would cause a *substantial* increase in the transaction costs between the negotiating parties. These costs will inevitably be borne by consumers and the firms that are subject to the contemplated regulation.

¹¹⁹ FNPRM, at ¶284, ¶285, and ¶289.

¹²⁰ For a historical parallel, see the discussion above (paragraph 83) regarding the failed efforts by the Federal Power Commission to disaggregate the level of regulation down to individual of natural gas producers.

¹²¹ FNPRM, ¶298.

101. The FNPRM also raises the potential of separate regulatory treatment by customer size.¹²² Small customers would be potentially subject to different regulatory protections than medium or large firms. But this, of course, raises the question of what happens when a customer grows from a small customer to become a medium customer? And under the anticipated regulatory regime, who will be responsible for measuring and monitoring customer size? Will that too be evaluated on a three-year basis? Again, the administrative challenges associated with the various regulatory proposals anticipated in the FNPRM are massive.

6. The Commission’s Regulatory Proposal Contemplates a Design that Creates Economically Perverse Incentives

102. Finally, at points, the contemplated regulatory structure moves from massively costly to economically bizarre. For instance, the FNPRM raises the potential that any firm in a geographic area judged to be non-competitive would be “rewarded” for developing a near-ubiquitous network in that area by having the Commission add it to the list of regulated entities,¹²³ even if that network is being used to support the provision of BDS on a very small scale relative to more established providers. Additionally, the FNPRM contemplates that a market share test be applied in those areas as a threshold for regulation. In either of these cases, the economic consequences would be perverse. In the former case, making the onset of regulation contingent upon the investment build-out of the firm would simply retard economically desirable investment by competitive firms. In the latter case, a market share test for regulation would perversely dissuade any new entrant from capturing too large a market share in the identified area, which might subject it to regulation; and would also encourage the incumbent (who may stand to gain regulatory relief by losing market share) to not compete aggressively.

¹²² FNPRM, at ¶284.

¹²³ See FNPRM, ¶309, ¶429.

IV. Competition Reconsidered

103. As I have indicated, the Competitive Market Test is particularly ill-suited to shed clear light on the ability of firms in the BDS marketplace to provide competitive checks on one another. The Commission can, however, readily access information that is better suited to providing such insights. In particular, basic economics indicates that monopoly power manifests itself in reduced output and increased prices. Data on these key economic metrics are available. Examining these metrics is also aligned with the Commission’s own proclamation that effective competition exists when “competition among service providers in a market ... benefits consumers by expanding service offerings, promoting development of innovative technology, and lowering prices.”¹²⁴
104. An examination of these data, however, does not provide any indication of systematic monopoly behavior or the threat of monopoly behavior absent the contemplated regulation. For instance, rather than observing price increases that might be driven by the exercise of monopoly power, average prices in the provision of BDS have, in fact, been {{ }} in virtually every bandwidth category. Vertical Systems Group reports that U.S. retail Carrier Ethernet pricing fell by double digit rates for all services across all tracked speed segments between 2010 and 2015.¹²⁵ These data do not convey any indication that monopoly power is manifest in the provision of BDS.¹²⁶ Instead, these price declines are likely driven by pro-competitive innovation and rivalry among the various market participants.

¹²⁴ See, e.g., Wireless Telecommunications Bureau Seeks Comment on Commercial Mobile Radio Services Market Competition,” FCC, May 14, 2009, at 5619-20 (referencing Market Entry and Regulation of Foreign-Affiliated Entities, Report and Order, 11 FCC Rcd 3873, ¶1 (1995)).

¹²⁵ Ethernet U.S. Data Pricing Overview, Vertical Systems Group 2016.

¹²⁶ While one could invoke the counter-factual possibility that there is significant monopoly power in the provision of BDS and that prices should be falling even faster, I believe this explanation is especially strained, especially in light of the variety of other pro-competitive behaviors that marketplace participants are exhibiting.

105. Moreover, not only are prices {{ }}, but for the bandwidth that seems to be of most concern to the Commission, industry sources report that average bandwidth costs per megabit (\$/Mbps) for carrier Ethernet services are lower than Legacy services.¹²⁷ Firm-level data corroborate the industry-level analysis. Comcast’s strategy to compete and win business from users of legacy technology (e.g., DSL and T1) is to offer more favorable terms with respect to price and speed.¹²⁸ Similarly, Level 3 takes specific aim at legacy services provided in the market:

Level 3 has an Ethernet solution that fits your desired architecture. Our MEF award-winning Ethernet services simplify the process of upgrading outdated TDM equipment, connecting new locations, linking data centers, the cloud and much more. Migrate your legacy network to Ethernet or expand your existing Ethernet WAN. Add on Adaptive Network Control to get site-by-site performance alerts and to dynamically scale bandwidth up to 300 percent.¹²⁹

In summary, rather than exhibiting price increases that could be an indicator of the exercise of monopoly power, prices for BDS have been consistently falling, and Ethernet-based services that are readily available in the marketplace provide powerful constraints on the ability of any provider to raise prices in an anticompetitive fashion.

106. Finally, note that not only is there limited evidence that providers have exercised monopoly power in the pricing of BDS, but internal company models also demonstrate that competitors stand ready to expand significantly in the event of a

¹²⁷ See, e.g., <http://www.verticalsystems.com/vsgpr/global-ethernet-bandwidth-surges-as-legacy-networks-migrate-to-higher-speeds/> (viewed June 27, 2016); <http://www.ipctech.com/a-smart-alternative-to-legacy-circuits/> (viewed June 27, 2016).

¹²⁸ See {{ }}

¹²⁹ <http://www.level3.com/en/products/ethernet/> (viewed June 25, 2016).

supra-competitive price increase in the marketplace. The Comcast financial model provides evidence on the expansion that would be triggered in the event of a supra-competitive price increase.

107. This higher quality/lower price feature of low-bandwidth Ethernet offerings places a very real competitive check on the ability of firms to raise prices to anti-competitive levels. Indeed, as noted by Vertical Systems Group, “[A]ggressive pricing strategies [by cable BDS providers] have prompted stronger competitive responses from incumbents and competitive providers, which particularly benefits consumers in the SMB ([S]mall and Medium Business) segment.”¹³⁰

108. Even in the face of precipitous price declines, revenues from firms competing with incumbent carriers of BDS are growing substantially. This means that they are capturing customers and increasing their market presence at a pace that eclipses the pricing declines that the market is experiencing. For example, over the 2012-2015 period, Comcast’s BDS revenues attributable to Carrier Ethernet, Cell Backhaul and Retail Ethernet services have {{

}}¹³¹ So while the Commission seems at times especially concerned that new entrants may face high barriers to entry, BDS providers have demonstrated the ability to both enter and expand.¹³² For example, over the 2012-2015 period Comcast was able to {{

}}¹³³ Other entrants into the BDS space have also grown rapidly. Indeed, as the Commission’s own data indicate, in just the past two years (2013-2015)

¹³⁰ “Ethernet U.S. Data Pricing Trends & Observations”, Vertical Systems Group 2016.

¹³¹ {{ See Exhibit 2.

¹³² The Commission has observed that while barriers to entry must be addressed, “[e]fforts to enter and expand in markets are being made with success ... Comcast, for example, has recently established a new business unit to target Fortune 1000 businesses.” FNPRM, at ¶232. This, of course, does not mean that the Commission should avoid opportunities before it to further reduce barriers to entry and expansion that may inhibit the full competitive potential of the market.

¹³³ {{

competitive providers as a whole have significantly grown their revenues.¹³⁴ For example, as reported in the FNPRM, the combined revenues of Level 3, Time Warner, and Comcast have increased by 60 percent from 2013 through 2015.¹³⁵ This demonstrable willingness and propensity to capture customers and expand output provides a compelling indication that firms in the BDS marketplace are not in a position to systematically raise prices to anti-competitive levels.¹³⁶

109. While competition is manifesting itself in both price and output, yet another dimension of firm rivalry that is benefiting consumers in the BDS marketplace is the propensity of firms to provide superior service. As noted by Vertical Systems Group, “[f]aster service installation is a competitive pricing factor. Lengthy time frames can jeopardize Ethernet sales, so discount offers on installations or waivers of costs for fiber construction have been employed to close new deals.”¹³⁷ Other consumer-welfare enhancing innovations are also introduced regularly in the BDS marketplace. These innovations are not exogenous, but rather are the product of an intense rivalry among individual firms that each vie to out-perform their competitors. For instance, in 2015, Verizon upgraded its fiber network to next-generation PON (NG-PON2). The new technology enables Verizon to offer symmetrical 10 Gbps speed to business customers with the potential for further increases in speed.¹³⁸ Additionally, Comcast was the first service provider in the world to offer Metro Ethernet Forum (MEF) CE 2.0 certified Ethernet services

¹³⁴ See FNPRM, at 217 (Table 3).

¹³⁵ See FNPRM, at 217 (Table 3).

¹³⁶ While this statement holds for all firms in the BDS marketplace, it holds *a fortiori* for new entrants. Indeed, given the rapid, pro-competitive growth of new entrants in the provision of BDS, it is inconceivable that the Commission would impose a regulatory mechanism on these firms that is designed to address the problem of the lack of competition (i.e., significant monopoly power).

¹³⁷ “Ethernet U.S. Data Pricing Trends & Observations”, Vertical Systems Group 2016.

¹³⁸ <http://www.verizon.com/about/news/verizon-tests-superfast-10-gigabit-internet-service-using-newest-optical-technology> (viewed June 25, 2016); <http://www.lightreading.com/gigabit/fttx/verizon-preps-next-major-broadband-upgrade/d/d-id/722062> (viewed June 25, 2016).

and was the first service provider to achieve all three of the previous CE 1.0 certifications (MEF 9, 14 and 18).¹³⁹

110. Investment is the lifeblood of market vitality. With investment, competitors become poised to compete vigorously for customer patronage. In the case of BDS, an examination of investments by firms is especially encouraging. For example, as described above, Comcast has invested more than {{ }} in developing its fiber network from 2013 through 2015.¹⁴⁰
111. At the firm level, new competitors such as Comcast have demonstrated a ready propensity to expand facilities to serve tomorrow’s customers.¹⁴¹ For example, Comcast has dramatically expanded the advanced network over which it provides Ethernet-based BDS. Nationally, Comcast Business’s Ethernet services are delivered over an advanced network that spans 140,000 miles across 39 states and the District of Columbia.¹⁴² This network embodies state-of-the-art technology that is scalable to offer services to customers desiring any bandwidth up to 10 Gbps.¹⁴³ Similarly, other competitive providers have demonstrated a willingness and propensity to invest. Level 3 has been adding 3,000 to 4,000 buildings to its fiber network per year.¹⁴⁴

¹³⁹ <http://corporate.comcast.com/news-information/news-feed/comcast-business-services-is-the-worlds-first-carrier-ethernet-2-0-service-provider> (viewed June 25, 2016).

¹⁴⁰ {{ }}

¹⁴¹ This supply elasticity of competitors is a well-recognized catalyst to competitive outcomes in markets. See, e.g., Landes, William M., and Richard A. Posner. “Market Power in Antitrust Cases.” *Harvard Law Review* (1981): 937-996. See also, the Commission’s own embrace of this concept. See FNPRM, at ¶59.

¹⁴² <https://business.comcast.com/resource-library/press-releases/2016/comcast-business-to-bring-10-gigabit-internet-service-to-huntsville> (viewed June 25, 2016).

¹⁴³ See e.g., <https://business.comcast.com/resource-library/press-releases/2016/comcast-business-to-bring-10-gigabit-internet-service-to-huntsville> (viewed June 25, 2016); <https://business.comcast.com/resource-library/press-releases/2016/comcast-business-expands-fiber-network-to-city-of-manvel> (viewed June 25, 2016).

¹⁴⁴ FNPRM, at ¶230.

112. While the investment necessary to add capacity can in some instances be daunting, in other cases BDS can be extended to customers at relatively modest costs. For instance, a recent investment project by Comcast to expand its BDS offerings in Bellevue, Washington had costs of under {{ }} per business.¹⁴⁵ In light of the significant demand growth anticipated for BDS there is every reason to believe that investment by all firms in the marketplace will continue to be vigorous.
113. Finally, the FNPRM opines that “the record makes clear that the market for lower-bandwidth TDM business data services...is non-competitive in significant measure.”¹⁴⁶ Not only is this conclusion inconsistent with the data presented above, it also ignores the important observation made elsewhere in the FNPRM that “a supplier providing any bandwidth could easily provide any other bandwidth at that location.”¹⁴⁷ From an economic perspective, the ability of competitive providers of one bandwidth of service to offer BDS services at other bandwidths defeats any meaningful discussion of distinctions in the competitiveness of lower-bandwidth services (e.g., DS1) and higher speed (e.g., high bandwidth) services. My understanding is that Ethernet services are entirely scalable and capable of providing services that are directly competitive with DS1, or DS3, or higher bandwidth services.

V. Squaring the Circle: Principles for a Forward Looking Policy Framework

114. I applaud the intent of the Commission in its appeal to developing a regulatory framework for “not only today’s marketplace, but tomorrow’s as well.”¹⁴⁸ In this

¹⁴⁵ <https://business.comcast.com/resource-library/press-releases/2016/comcast-business-expands-network-and-increases-capacity-in-bellevue-s-office-parks> (viewed June 13, 2016). The presence of such low costs in some instances does not mean that the Commission should avoid opportunities before it to reduce barriers to entry and expansion that it identifies.

¹⁴⁶ FNPRM, at ¶353.

¹⁴⁷ FNPRM, at 218.

¹⁴⁸ FNPRM, at ¶8.

spirit, the Commission claims that its proposed regulatory framework “applies minimal regulatory oversight of competitive markets.”¹⁴⁹ Yet the de-regulatory rhetoric notwithstanding, the Commission's FNPRM proposes an artificial and constrained filter to assess competition in the provision of BDS. As seen above, the Commission’s filter ignores a number of readily observable and vital indicators of the vigor of competition in the provision of BDS. Additionally, rather than designing a governance mechanism for tomorrow's marketplace, the contemplated regulatory structure rests entirely on a rear-facing empirical analysis of the marketplace. The distortions associated with this rear-facing perspective are especially profound because, by all accounts the market is evolving rapidly. The result is that the contemplated regulatory regime will over-extend the reach of regulation in this marketplace beyond that which is required to protect consumers. Additionally, the contemplated regulatory scheme is laden with costs that will be imposed on regulators, suppliers and consumers moving forward.

115. The FCC should adopt a definition of “competition” and an empirical methodology for more accurately determining its presence than what is embodied in the current FNPRM. The Commission's definition and empirical test should reflect the degree to which competitive pressures are manifesting themselves to the benefit of BDS consumers.¹⁵⁰
116. In light of the distorted competitive analysis presaged by certain of the Commission’s regulatory proposals, the Commission should reset its goals for the BDS market around the following fundamental principles:
 - a) The Commission should take actions that reduce, not heighten barriers to entry.
 - b) The Commission should avoid the introduction of new barriers to entry.

¹⁴⁹ FNPRM, at ¶8.

¹⁵⁰ See Section IV above.

- c) The Commission should assiduously avoid price regulation of entrants, who, under any interpretation, have no monopoly power.
- d) Any regulation of the BDS marketplace should be tailored to current and emerging market conditions rather than the market that existed in 2013 (or before).
- e) Any regulation should minimize the imposition of new administrative, regulatory, and transactions costs imposed on the Commission, firms and consumers.

VI. Conclusion: Too Many Questions, Too Few Answers

117. The espoused purpose of the FNPRM is to create a new start to regulatory oversight of the provision of BDS. It is natural in that context that the FNPRM solicit input from various affected parties. That said, the FNPRM poses nearly 400 questions.¹⁵¹ While one may wish to compliment the number of questions as an indication of the openness with which the Commission is approaching the evolution of policy toward the provision of BDS, another perspective is that the extraordinary number of questions is itself a signal of the half-baked understanding of the dynamic BDS marketplace that has evolved rapidly since the Commission established the current regulatory framework in 1999. Similarly, the Commission’s assessment of competition and regulatory design for this marketplace is equally half-baked.
118. Given the numerous lingering questions, the Commission should re-double its efforts to get “caught up” with this market and begin the process of earnestly seeking to adopt a set of policies that is truly forward looking. The anticipated policy framework proposed in the FNPRM fails to accomplish this.

¹⁵¹ As measured by the number of question marks (“?”) contained in the document.

Date:

June 28, 2016

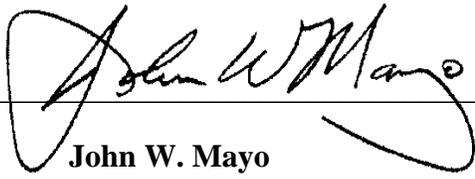

John W. Mayo

EXHIBIT 1

VITA

JOHN W. MAYO

**Georgetown University
McDonough School of Business
527 Hariri Building
37th and O Streets, N.W.
Washington, D.C. 20057**

Email: mayoj@georgetown.edu, Telephone: (202)-687-6972

ACADEMIC APPOINTMENTS:

Georgetown University, McDonough School of Business

Professor of Economics, Business and Public Policy 1998-present

Executive Director, Georgetown Center for Business and Public Policy, 2002 – present

Dean, 2002-2004

Senior Associate Dean, 1999-2001

Georgetown University, Department of Economics

Professor of Economics (by courtesy), 2011-present.

Stanford University

Visiting Scholar, February 2013, February 2015

Stanford Institute for Economic Policy Research

University of California, Berkeley

Visiting Scholar, January-May 2011

Haas School of Business

University of Tennessee, Knoxville

Professor of Economics, 1994-1998

Research Associate Professor, Center for Business and Economic Research 1989-1994

Associate Professor of Economics, Department of Economics, 1989-1994

Research Assistant Professor, Center for Business and Economic Research, 1981-1989

Assistant Professor of Economics, Department of Economics, September 1981-1989.

Virginia Polytechnic and State University (Virginia Tech)

Visiting Assistant Professor, fall 1983

EDUCATION:

Honorary Doctorate in Economics, 2007, University of Basel, Basel, Switzerland

Ph.D., Economics, 1982, Washington University in St. Louis

Dissertation: "Diversification and Performance in the U.S. Energy Industry"

A.M., Economics, 1979, Washington University in St. Louis

B.A., Economics, 1977, Hendrix College, Conway, Arkansas

FIELDS OF SPECIALIZATION:

Industrial Organization

Regulatory and Antitrust Policy

Applied Microeconomics

Econometrics

NON-ACADEMIC APPOINTMENTS

U.S. Senate, Small Business Committee

Chief Economist, Democratic Staff, June 1984 - June 1985

International Institute for Applied Systems Analysis (IIASA)

Energy Research Fellow, Laxenburg, Austria, summer 1979

Transportation and Public Utilities Group

President, 2005-2006; 2014-15.

National Safety Council,

Board of Directors, Vice President, October 2002- 2006.

HONORS, AWARDS, AND GRANTS:

Undergraduate: Mosley Economics Prize (#1 graduating economics major), Alpha Chi (scholastic), Blue Key Honor Society, Senior Honors Seminar.

Graduate: University Fellowship, Washington University (1977-78); National Academy of Sciences Young Research Fellow, Laxenburg, Austria (1979); President, Washington University Economics Graduate Student Association (1979-81); Dissertation Fellowship, Center for the Study of American Business, Washington University (1980-81).

Post-Graduate: Public Utility Research Center Distinguished Service Award (2006); Zaeslin Fellow of Law and Economics, University, of Basel, Basel, Switzerland (2000 - present); William B. Stokely Scholar, College of Business Administration, The University of Tennessee (1993-1995); South Central Bell Research Grant (1988); Research Affiliate, Center of Excellence for New Venture Analysis, The University of Tennessee (1985); Summer Faculty Research Fellowships, The University of Tennessee (1983-1985).

COURSES TAUGHT:

Undergraduate: The Miracle of Markets?, Principles of Microeconomics, Economic Foundations of Commerce, Current Economic Problems, Government and Business, Intermediate Microeconomics, Energy Economics

Graduate: Managerial Economics (MBA), Firm Analysis and Strategy (MBA), Managing in a Regulated Economy (MBA), Economics (Executive MBA), The Economics of Strategy (MBA), Business and Public Policy (MBA), Competition and Competition Policy (MBA), Regulation and Deregulation in the American Economy (MBA), Strategic Pricing: Theory, Practice and Policy (MBA), Understanding International Business (MBA), Industrial Organization and Public Policy (Ph.D.), The Economics of Antitrust and Regulation (Ph.D.)

PUBLICATIONS:

A. JOURNAL ARTICLES

“When Do Auctions Ensure the Welfare-Maximizing Allocation of Scarce Inputs?” (with David E.M. Sappington), RAND Journal of Economics, forthcoming.

“Can you Hear me Now: Exit, Voice and Loyalty Under Increasing Competition” (with T. Randolph Beard and Jeffrey T. Macher). Journal of Law and Economics, forthcoming.

“Influencing Public Policymaking: Firm-, Industry- and Country Institution-Level Determinants,” (with Jeffrey T. Macher) Strategic Management Journal, forthcoming.

“Revenue Adequacy: the Good, the Bad and the Ugly” (with Jeffrey T. Macher and Lee F. Pinkowitz), Transportation Law Journal, Volume 41, 2014, pp. 85-127.

“The Evolution of Innovation and the Evolution of Regulation: Emerging Tensions and Emerging Opportunities in Communications” (with Larry Downes) CommLaw Conspectus: Journal of Communications Law and Policy, Vol. 23, 2014, pp. 10-51.

“Moving Past the Ideological Debate: A Results-Based Regulation Approach to Net Neutrality,” Democracy: A Journal of Ideas, No. 34, fall 2014, pp. 21-27.

“The Evolution of Regulation: 20th Century Lessons and 21st Century Opportunities,” Federal Communications Law Journal, Vol. 65, April 2013, pp. 119-156.

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“Regulator Heterogeneity and Endogenous Efforts to Close the Information Asymmetry Gap: Evidence from FDA Regulation,” (with Jeffrey T. Macher and Jackson A. Nickerson), Journal of Law and Economics, Vol. 54, February 2011, pp. 25-54.

“From Network Externalities to Broadband Growth Externalities: A Bridge Not Yet Built” (with Scott Wallsten), Review of Industrial Organization, Vol. 38, March 2011, pp. 173-190.

“The Influence of Firms on Government” (with Jeffrey T. Macher and Mirjam Schiffer), The B.E. Journal of Economic Analysis & Policy, Vol. 11, Issue 1, January 2011, pp. 1-25.

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“Warm Glow and Charitable Giving: Why the Wealthy Do Not Give More to Charity” (with Catherine H. Tinsley), Journal of Economic Psychology, Vol. 30, June 2009, pp. 490-499.

“Common Costs and Cross-Subsidies: Misestimation Versus Misallocation” (with Mark L. Burton and David L. Kaserman), Contemporary Economic Policy, April 2009, pp. 193-199.

“It’s No Time to Regulate Wireless Telephony,” The Economists’ Voice, Vol. 5 : Iss. 1, pp. 1-4, 2008.

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“A Graphical Approach to the Stiglerian Theory of Regulation,” (with T. Randolph Beard and David L. Kaserman), Journal of Economic Education, Vol. 38, Fall 2007, pp. 447-451.

“Antitrust Economics Meets Antitrust Psychology: A View From the Firms” (with Mirjam Schiffer), International Journal of the Economics of Business, Vol. 13, July 2006, pp.281-306.

“Regulatory Opportunism and Investment Behavior: Evidence from the U.S. Electric Utility Industry,” (with Thomas P. Lyon) RAND Journal of Economics, Vol. 36, Fall 2005, pp. 628-644.

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“A Graphical Exposition of the Economic Theory of Regulation” (with T. Randolph Beard and David L. Kaserman), Economic Inquiry, Volume 41, October 2003, pp. 592-606.

“Regulation, Competition, and the Optimal Recovery of Stranded Costs,” (with T. Randolph Beard and David L. Kaserman) International Journal of Industrial Organization, Volume 21, June 2003, pp. 831-848.

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"Regulatory Policies Toward Local Exchange Companies Under Emerging Competition: Guardrails or Speedbumps on the Information Highway," (with David L. Kaserman) Information Economics and Policy, Volume 11, December 1999, pp. 367-388.

“Open Entry and Local Telephone Rates: The Economics of IntraLATA Toll Competition,” (with David L. Kaserman, Larry R. Blank, and Simran Kahai) Review of Industrial Organization, Vol. 14, June 1999, pp. 303-319.

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Reprinted in The Foundations of Regulatory Economics, Robert E. Ekelund, Jr., (Ed.), Edward Elgar Publishing, Northampton, MA.

"Cross-Subsidization in Telecommunications: Beyond the Universal Service Fairy Tale" (with David L. Kaserman and Joseph E. Flynn), Journal of Regulatory Economics, Volume 2, Number 3, September 1990, pp. 231-250.

"Barriers to Trade and the Import Vulnerability of U.S. Manufacturing Industries" (with Don P. Clark and David L. Kaserman), Journal of Industrial Economics, Volume 38, Number 4, June 1990, pp. 433-448.

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B. BOOKS, MONOGRAPHS, AND OTHER PUBLICATIONS

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"Bringing Mobile Broadband to Rural Americans," (with Anna-Maria Kovacs) Roll Call, May 9, 2014.

"Modernized Telecom Policy Must Reflect That Change is the Only Constant," Roll Call, February 7, 2014.

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"Regulating Early Termination Fees: When 'Pro-Consumer' Legislation Isn't," Economic Policy Vignette, Georgetown Center for Business and Public Policy, January 2010, available at <http://cbpp.georgetown.edu/publications/>.

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"The Quest for Universal Service: The Misfortunes of a Misshapen Policy," (with David L. Kaserman) in Telecommunications Policy: Have Regulators Dialed the Wrong Number?, Donald L. Alexander, Editor, Praeger Publishing Group, Westport, CT, 1997, pp.131-144.

Government and Business: The Economics of Antitrust and Regulation (with David L. Kaserman), The Dryden Press, Harcourt Brace College Publishers, 1995.

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Monopoly Leveraging Theory: Implications for Post-Divestiture Telecommunications Policy (with David L. Kaserman), Center for Business and Economic Research: University of Tennessee, April 1993.

State-Level Telecommunications Policy in the Post-Divestiture Era: An Economic Perspective (with William F. Fox), Center for Business and Economic Research, University of Tennessee, March 1991.

A review of After Divestiture: The Political Economy of State Telecommunications Regulation, by Paul E. Teske. Albany: State University of New York Press, 1990. Publius, Winter 1991, pp. 164-166.

Deregulation and Market Power Criteria: An Evaluation of State Level Telecommunications Policy" (with David L. Kaserman) in Telecommunications Deregulation: Market Power and Cost Allocation Issues, J. Allison and D. Thomas (eds.), Quorum Books, 1990.

The Economics of Local Telephone Pricing Options (with J. E. Flynn), Center for Business and Economic Research, The University of Tennessee, October 1988.

Firm Entry and Exit: Economic Linkages in Tennessee (with J. E. Flynn), Center for Business and Economic Research, The University of Tennessee, Knoxville, July 1988.

"The Economics of Regulation: Theory and Policy in the Post-Divestiture Telecommunications Industry" (with David L. Kaserman) in Public Policy Toward Corporations, Arnold Heggstad, editor, University of Florida Presses, 1988.

"Entries and Exits of Firms in the Tennessee Economy: Foundations for Research," Survey of Business, The University of Tennessee, Vol. 23, Summer 1987, pp. 21-23.

"The Relationship of Manufacturing and Nonmanufacturing Firm Entry and Exit in Tennessee" (with Joseph E. Flynn), Survey of Business, The University of Tennessee, Volume 23, Number 2, Fall 1987, pp. 11-16.

A Review of Municipal Ownership in the Electric Utility Industry, by David Schap. New York: Praeger Publishing Company, 1986. Southern Economic Journal, Volume 54, Number 1, July 1987.

Entries and Exits of Firms in the Tennessee Economy (with W. F. Fox, et al.), Center for Business and Economic Research, University of Tennessee, Knoxville, May 1987.
Condensed report published in Survey of Business, The University of Tennessee, Volume 23, Number 2, Fall 1987, pp. 3-10.

"The U.S. Economic Outlook," Survey of Business, The University of Tennessee, annual contributor, 1986-1994.

An Economic Report to the Governor of the State of Tennessee, Center for Business and Economic Research and the Tennessee State Planning Office, Annual Contributor, 1981-1994.

"An Economic Analysis of a Monitored Retrieval Storage Site for Tennessee" (with W. F. Fox, L. T. Hansen, and K. E. Quindry), Final Report and Appendices, December 17, 1985.

CONGRESSIONAL AND REGULATORY TESTIMONIES:

U.S. Senate (Commerce, Science and Transportation Committee; Energy and Natural Resources Committee, Subcommittee on Water and Power); U.S. House of Representatives, Subcommittee on Railroads, Pipelines, and Hazardous Materials); Federal Communications Commission; U.S. International Trade Commission; Tennessee State Legislature (Senate Finance, Ways and Means Committee; Special Joint Legislative Committee on Business Taxation; and, Senate State and Local Government Committee); Maryland State Legislature (Environmental Works Committee); Pennsylvania Public Utility Commission; Michigan Public Service Commission; Missouri Public Service Commission; Illinois Commerce Commission; West Virginia Public Utility Commission; Wyoming Public Utility Commission; Washington Utilities and Transportation Commission; Utah Public Service Commission; Wisconsin Public Service Commission; California Public Utilities Commission; Florida Public Service Commission; Delaware Public Service Commission; Montana Public Service Commission; Maryland Public Service Commission; Massachusetts Department of Public Utilities; Georgia Public Service Commission; Colorado Public Utilities Commission; North Carolina Public Utilities Commission; Missouri Public Service Commission; Texas Public Utility Commission; Arkansas Public Service Commission; Connecticut Department of Public Utility Control; Kansas State Corporation Commission; and New Jersey Board of Public Utility Commissioners.

INVITED SEMINARS AND SELECTED CONFERENCE PRESENTATIONS:

Columbia University, University of Chicago, London Business School, University of Paris (Dauphine IX), Vanderbilt University, INSEAD, Washington University in St. Louis, University of Michigan, Ohio State University, University of Minnesota, University of Florida, University of Arkansas, University of Texas, University of Missouri, Florida State University, Rutgers University, American University, University of Missouri, Kansas University, University of Utah, University of Colorado, University of Basel (Switzerland), University of Freiburg (Germany), University of Central Florida, American Enterprise Institute, Brookings Institution, Federal Communications Commission, Australian Competition and Consumer Commission (ACCC), Telecommunications Policy Research Conference (TPRC), National Conference of State Legislatures, U.S. Advisory Commission on Intergovernmental Relations

SELECTED CONSULTING:

U.S. Department of Justice, Antitrust Division; U.S. Federal Trade Commission; AT&T; Sprint; MCI Telecommunications; Verizon; Optus Communications (Australia); United Parcel Service; Commonwealth of Virginia, Tennessee Valley Authority; Antitrust Division, Office of the Attorney General, State of Tennessee; U.S. Senator Howard Baker, Jr., U.S. Senate Majority Leader; Oak Ridge National Laboratory; AmerenUE; Arkansas Consumer Research; Division of Energy Conservation and Rate Advocacy, Office of the Arkansas Attorney General; U.S. Department of Energy

PROFESSIONAL PRESENTATIONS:

American Economic Association Annual Conference, Western Economic Association Annual Conference, Southern Economic Association Annual Conference, European Association for Research in Industrial Economics Annual Conference, Center for Research in Regulated Industries Eastern Annual Conference, Center for Research in Regulated Industries Western Annual Conference, Southeastern Economic Analysis Conference

WORKING PAPERS:

“Demand in a Portfolio Choice Environment: The Evolution of Telecommunications” (with Jeffrey T. Macher, Olga Ukhaneva and Glenn Woroch), October 2014.

“Targeting Efforts to Raise Rivals’ Costs: Moving from ‘Whether’ to ‘Whom’” (with David M. Mandy and David E.M. Sappington), January 2015.

“Now It’s Getting Personal: Universal Service in a Wireless World,” (with Jeffrey T. Macher Olga Ukhaneva and Glenn Woroch), December 2014

“International Telecommunications Demand” (with Olga Ukhaneva), March 2015.

“Regulation in a ‘Deregulated’ Industry: Railroads in the Post-Staggers Era” (with David E.M. Sappington), May 2015.

EDITORIAL REVIEWER:

National Science Foundation, Brookings Institution, Federal Trade Commission, The MIT Press, American Economic Review, Quarterly Journal of Economics, Journal of Law and Economics, Economic Journal, Journal of Business, RAND Journal of Economics, Journal of Regulatory Economics, Review of Economics and Statistics, Economic Inquiry, Journal of Industrial Economics, Journal of Economics & Management Strategy, Journal of Law, Economics and Organization, Journal of Economic Behavior and Organization, Review of Industrial Organization, Scandinavian Journal of Economics, Eastern Economic Journal, Southern Economic Journal, Contemporary Economic Policy, Economic Development and Cultural Change, Industrial Relations, Growth and Change, Review of Regional Studies, Journal of Economics and Business, Quarterly Review of Economics and Business, Journal of Policy Analysis and Management, Quarterly Journal of Business and Economics, Regional Science and Urban Economics, Financial Review, Journal of Money, Credit, and Banking, Social Science Quarterly, Telecommunications Systems, Public Finance Quarterly, Japan and the World Economy, Energy Economics, Information Economics and Policy

EDITORIAL AND ACADEMIC OVERSIGHT BODIES

Associate Editor, Information Economics and Policy, 2007-2011.

Editorial Board, Journal of Regulatory Economics, 1999-present.

Editorial Board, Review of Industrial Organization, 2002-2003; 2010-present.

Associate Editor, Economic Inquiry, 2013-present.

Board of Academic Advisors, The Free State Foundation, 2008 – 2009.

Research Advisory Committee, National Regulatory Research Institute (Ohio State University), 1993-1997.

PROFESSIONAL MEMBERSHIPS:

American Economic Association

Western Economic Association

Southern Economic Association

American Law and Economics Association

International Telecommunications Society

European Association for Research in Industrial Economics

EXHIBIT 2

**COMCAST BUSINESS
REVENUES FOR BDS
2012 – 2015**

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EXHIBIT 3

**RYSMAN TABLE 20 SENSITIVITIES SUMMARY
SAMPLE WITH START YEAR 2013**

{{

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EXHIBIT 4

COMCAST BUSINESS

CELL BACKHAUL

MRC AND NRC PRICE REDUCTION EFFECT ON IRR

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EXHIBIT 5

COMCAST BUSINESS

CELL BACKHAUL

MRC AND NRC PRICE REDUCTION EFFECT ON IRR

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EXHIBIT 6

COMCAST BUSINESS

CELL BACKHAUL

MRC AND NRC PRICE REDUCTION EFFECT ON IRR

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EXHIBIT 7

**COMCAST BUSINESS
CELL BACKHAUL
MRC PRICE REDUCTION EFFECT ON IRR
{**

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EXHIBIT 8

**COMCAST BUSINESS
CELL BACKHAUL
MRC PRICE REDUCTION EFFECT ON IRR
{**

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EXHIBIT 9

**COMCAST BUSINESS
CELL BACKHAUL
MRC PRICE REDUCTION EFFECT ON IRR
{**

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EXHIBIT 10

**COMCAST BUSINESS
CELL BACKHAUL
MRC AND NRC PRICE REDUCTION EFFECT ON IRR
2012 – 2016**

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EXHIBIT 11

**COMCAST BUSINESS
CELL BACKHAUL
MRC PRICE REDUCTION EFFECT ON IRR
2012 – 2016**

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APPENDIX 1

**RYSMAN TABLE 20: REGRESSION OF ADJUSTED PRICE
ON COMPETITION IN THE BLOCK BY PRICE FLEX REGULATION
SAMPLE WITH START YEAR 2013
WITHOUT STANDALONE INDICATORS OF PHASE 1 OR PHASE 2**

{{

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APPENDIX 2

**RYSMAN TABLE 20: REGRESSION OF ADJUSTED PRICE
ON COMPETITION IN THE BLOCK BY PRICE FLEX REGULATION
SAMPLE WITH START YEAR 2013
WITH STANDALONE INDICATORS OF PHASE 1 OR PHASE 2**

{{

}}

APPENDIX 3

**RYSMAN TABLE 20: REGRESSION OF LOG ADJUSTED PRICE
ON COMPETITION IN THE BLOCK BY PRICE FLEX REGULATION
SAMPLE WITH START YEAR 2013
WITHOUT STANDALONE INDICATORS OF PHASE 1 OR PHASE 2**

{{

}}

APPENDIX 4

**RYSMAN TABLE 20: REGRESSION OF LOG ADJUSTED PRICE
ON COMPETITION IN THE BLOCK BY PRICE FLEX REGULATION
SAMPLE WITH START YEAR 2013
WITH STANDALONE INDICATORS OF PHASE 1 OR PHASE 2**

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APPENDIX 5

**RYSMAN TABLE 20: REGRESSION OF LOG ADJUSTED PRICE
ON COMPETITION IN THE BLOCK BY PRICE FLEX REGULATION
FULL SAMPLE
REPLICATION**

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APPENDIX 6

**RYSMAN TABLE 19: REGRESSION OF LOG ADJUSTED PRICE
ON NUMBER OF COMPETITORS IN THE CENSUS BLOCK**

**FULL SAMPLE
REPLICATION**

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Exhibit C

DECLARATION OF JOHN GUILLAUME

1. My name is John Guillaume, and I am Vice President, Product Management & Strategy, of Comcast Business, a division of Comcast Cable (“Comcast”). This declaration is based on my personal knowledge and a review of Comcast’s business records.

2. For more than six years I have been responsible for product management and development, business strategy, and business development for Comcast’s business data services (“BDS”). In my current role, I am responsible for Comcast’s entire portfolio of retail business data services. Prior to joining Comcast, I served as Senior Vice President of Sales, Product, and Marketing at New Global Telecom, a wholesale communications service provider, and as Vice President of Enterprise Services at Level 3 Communications.

3. Comcast did not enter the BDS marketplace to any significant extent until late-2009, when the company began selling Metro Ethernet services. Three years later, in 2013, Comcast’s network evolved to allow for region-to-region Ethernet offerings. Since that time, the percentage of Comcast’s headends that have been upgraded to deliver Ethernet services has grown substantially.

4. Comcast offers retail business customers two primary BDS services: dedicated Internet access and Ethernet transport. We are able to offer these retail services throughout much of our facilities-based footprint, as well as out-of-footprint through the purchase of wholesale access services. Comcast’s retail offerings are widely available, subject to meeting financial return targets, but are typically targeted towards businesses with at least 50 employees, multiple locations, and a budget of approximately {{ }} a month for telecommunications services. Potential customers typically seek unique bundles of services that are tailored to meet the varying needs of each of their locations and business purposes. Given the distinct product

offerings described below, with varying speed increments and service tiers available for each, there are myriad combinations available to business customers.

5. Comcast’s dedicated Internet access service is called “Ethernet Dedicated Internet” or “EDI.” EDI service is usually provided via fiber and offers speed increments from 1 Mbps to 10 Gbps. Unlike the TDM-based services with which EDI competes, EDI is easily scalable and can grow alongside a business without requiring the addition of new lines. Comcast’s EDI service typically costs less per Mbps than legacy DS-1 or DS-3 services. Comcast’s EDI service provides a service level agreement (“SLA”) committing to 99.99% availability when delivered over Comcast’s fiber network.

6. Comcast also offers EDI using Ethernet over HFC or “EoHFC” technology, but this product is sold in a relatively small number of instances. Speeds for the EoHFC product are limited to 10x10 Mbps and the SLA for availability is 99.9% (rather than 99.99%). These two factors limit the appeal of the EoHFC-based EDI product to a limited market segment, given price differentials between EoHFC and substitutable services. While Comcast’s EoHFC product serves as a “gap-filler” for some customers—providing network access for hard-to-reach, off-network locations—it does not provide the value proposition that the vast majority of businesses seeking Ethernet services demand, including full carrier-grade performance, speeds, and availability. As of December 2015, Comcast provided EoHFC EDI service to only about {{ }} business locations, out of approximately {{ }} business locations to which it provided EDI service. Thus, only about {{ }} percent of all EDI sites were serviced via EoHFC.

7. In addition, Comcast is capacity-constrained in its ability to grow EoHFC to scale in the unlikely event that customer demand for the product were to increase substantially. Unlike dedicated fiber services, EoHFC is reliant on the capacity of Comcast’s HFC access network,

which was designed primarily to support Comcast's more than 20 million residential customers purchasing video, broadband Internet access, and voice services. Comcast's HFC network could not support large-scale growth of EoHFC without eventually impacting residential subscribers of those services. It would be far more efficient to build new fiber connections than to undertake significant expansions of HFC capacity to support dedicated connectivity to business customers.

8. Comcast offers three Ethernet transport products: Ethernet Network Service, Ethernet Private Line, and Ethernet Virtual Private Line. These Ethernet transport services are primarily delivered via dedicated fiber connections, though the latter two products are also offered over Comcast's HFC network.

9. Comcast's "Ethernet Network Service" or "ENS" is the company's multipoint-to-multipoint Ethernet service. This service is typically a replacement for legacy TDM-based Wide Area Networks (WANs). Customers can create and manage their own virtual local area network ("VLAN") without coordinating with Comcast. This service is available via fiber in speed increments from 1 Mbps to 10 Gbps and in three service tiers (Basic, Priority, and Premium) offering a range of performance assurances for latency, jitter, and packet loss. All three tiers offer the same 99.99% SLA for availability via fiber.

10. Comcast's "Ethernet Private Line" or "EPL" service provides dedicated connectivity between two customer locations using any VLANs or Ethernet control protocols without coordination with Comcast. This service is available via fiber in speed increments from 1 Mbps to 10 Gbps and in three service tiers (Basic, Priority, and Premium) offering a range of performance assurances for latency, jitter, and packet loss. All three tiers offer the same 99.99% SLA for availability when delivered via fiber, and a 99.9% SLA for availability when delivered via HFC.

11. Comcast’s “Ethernet Virtual Private Line” or “EVPL” service is similar to its EPL service, but with the additional capability of supporting several remote sites that need to connect to a regional or central hub. Fiber-based EVPL offers the same speed and service tiers as EPL, while the HFC service, as mentioned, offers a lesser 99.9% SLA for availability.

12. For all of Comcast’s retail products, almost all sales are proactive, with Comcast sales representatives reaching out to potential customers. While Comcast does receive and bid on requests for proposal, doing so is less common and is typically associated with larger projects for healthcare, education, and government customers. When Comcast does submit a bid in response to a request for proposal it typically faces robust competition and {{
}}.

13. Comcast’s retail customers have observed a steady year-over-year decline in pricing for purchasing dedicated Internet access and Ethernet transport services. Buyers are keenly aware that service offerings are rapidly improving and that prices are measurably declining, providing limited incentive for {{
}}. For example, Comcast’s EDI service has seen a {{
}} decline in prices over just 12 months. For most of Comcast’s retail products, the key differentiator among competitors is price. Pricing competition also has generally required Comcast to forgo certain fees and service charges. {{
}}

14. Although Comcast has standard “rack” rates for all of its retail services, contracts generally are individually negotiated, with rates and other terms dependent on term, volume, and total commitment.

15. Comcast competes against incumbent telephone companies and competitive providers. Invariably, Comcast offers service in competition with a well-entrenched incumbent LEC that has many advantages, including far more extensive network connectivity to business locations, much larger sales and marketing operations, and long-term customer relationships. In addition, Comcast typically competes against a variety of CLECs and dark fiber providers (such as Level 3, XO, Zayo, and Windstream), cable overbuilders (such as WOW and RCN), and, in some instances, fixed wireless providers.

16. Comcast is often bidding to replace legacy TDM (often DS-1) lines that provide lower bandwidth at a higher cost than Comcast's Ethernet-based services. Whereas adding capacity to a TDM-based network may take weeks and require pulling new cable, Comcast's fiber services can grow elastically along with a business's needs.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed this 28 day of June, 2016.



John Guillaume
Vice President, Product Management &
Strategy
Comcast Cable

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Exhibit D

DECLARATION OF WILLIAM R. STEMPER

1. My name is William Stemper. I hold an MBA from the University of Pennsylvania's Wharton School of Business and a B.S. in Electrical Engineering from Marquette University. I am currently employed as President, Comcast Business. The Comcast Business division is the unit of Comcast Cable that provides businesses of all sizes with advanced communications solutions, including Ethernet transport, Internet access, and voice services, as well as video and other value-added products and services. This declaration is based on my personal knowledge and a review of Comcast's business records.

2. I have more than thirty years of leadership experience in the business services sector. Prior to my arrival at Comcast, I served as Vice President of Business Services for Cox Communications and held executive positions within AT&T Corporation that focused on serving the needs of business customers in the United States and Europe.

3. During my tenure at Comcast Business, I have both witnessed and fostered Comcast's significant investment of risk capital and its increasing commitment to expanding its business services offerings. Those efforts have been successful. Comcast's Ethernet (fiber and HFC) services experienced revenue growth from 2014 to 2015 of approximately {{ }}. Additionally, Comcast's overall BDS revenues increased from {{ }} in 2013 to {{ }} in 2015.

4. Much of Comcast Business's revenue growth has coincided with the vast infrastructure investments Comcast has made to upgrade its network and technology to offer dedicated business data services ("BDS"). Building on our local presence in many top markets, we have continued to increase the reach of our fiber network and enter new market segments in

which Comcast was not previously competitive, such as providing cell backhaul services and offering enterprise-class BDS services to the country's largest businesses.

5. Comcast also has recruited an expanded sales force and built the required service delivery and service assurance expertise and systems to support its BDS offerings. Comcast now has approximately {{ }} employees dedicated to supporting its provision of BDS.

6. Comcast's large and continuing investments to expand its fiber network are indicative of its ability and desire to compete with incumbent LECs and more established CLECs on a broader geographic basis for the types of high-performance BDS offerings that enterprise customers demand. As of today, however, Comcast Business is still a relatively small player in the market for BDS. Comcast Business has a revenue share of under {{ }} in the mid-market segment (firms with over 20 employees) and under {{ }} in the markets for cell backhaul and network carrier operations, and thus far we have achieved less than {{ }} revenue share among Fortune 1000 firms, a nationwide market with a total size of between \$13 and \$15 billion.

7. I believe that, as a new entrant, Comcast already has made an important competitive impact in the BDS marketplace within a relatively short time span, driving legacy providers to reduce prices and to upgrade their services. Imposing rate regulation on BDS likely would dampen Comcast's willingness to invest capital and resources in BDS, as it would reduce rates of return, thus impacting Comcast's growth, its competitive influence, and customer choice.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed this 28th day of June, 2016.

A handwritten signature in black ink, appearing to read 'William Stemper', written over a horizontal line.

William Stemper
President
Comcast Business Services

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Exhibit E

DECLARATION OF DAVID ALLEN

1. My name is David Allen. I am employed as Vice President, Carrier Services at Comcast Business, a division of Comcast Cable (“Comcast”). This declaration is based on my personal knowledge and a review of Comcast’s business records.

2. I have held my current position for more than two years. I have primary responsibility for sales of Comcast’s business data services (“BDS”) provided to carriers. Before joining Comcast, I served in a similar capacity at XO Communications, where I managed carrier and enterprise sales for more than a decade.

3. Comcast’s carrier services consist primarily of cell backhaul services sold to wireless carriers, E-Access services sold to large service providers, and resold end user circuits (Type II connections).

4. To date, the largest segment of Comcast’s provision of dedicated connectivity to carrier customers has consisted of cellular backhaul. Comcast provides cellular backhaul service to large wireless carriers that require dedicated, fiber-based connectivity. Sales to these carriers represent approximately {{ }} of Comcast’s revenue from its carrier services business. Cellular backhaul sales are reliant on the presence of available fiber or Comcast’s ability to deploy new fiber facilities at a cost that will yield an acceptable rate of return. In order to continue to win cellular backhaul business from mobile carriers, Comcast will need to continue to build new fiber capacity into its network.

5. Wireless providers are increasingly demanding long-term leases of dark fiber facilities to meet their backhaul needs. Comcast’s sales experience has demonstrated that demand among wireless providers for its lit fiber service is diminishing. Based on its

interactions in the marketplace, Comcast expects that as small cell locations increase in number, demand will principally be for dark fiber in support of this technology.

6. As Comcast has planned for the development of 5G wireless services and the prospect of increased demand for backhaul services, the company’s sales experience and interactions with customers have made clear that Comcast’s hybrid fiber-coaxial cable (“HFC”) network is unlikely to play a significant role or offer any significant advantages vis-à-vis other providers of backhaul services. As noted, wireless providers have expressed a strong preference for dark fiber over lit services. And where wireless providers are willing to purchase lit services, they have insisted on fiber-based services for macro tower backhaul based on such services’ superior performance and reliability, as well as bandwidth capacity.

7. Comcast’s EoHFC service is not capable of the minimum symmetrical speeds that wireless carriers require for cell sites, including small cells. Dedicated EoHFC speeds are limited to 10x10 Mbps, far below the minimum of 50x50 Mbps that carriers typically require today, let alone the much higher capacity that likely will be required to support 5G networks. Moreover, while Comcast’s EoHFC services are provided pursuant to SLAs, those SLAs offer fewer and less robust performance assurances and targets than fiber SLAs, and in particular does not include an SLA for availability at the 99.99% level typically demanded by wireless carriers. Accordingly, Comcast’s extensive HFC network provides no technical advantage to Comcast in its provision of backhaul services (or, as a general matter, most other BDS services); BDS customers generally desire the performance metrics that can be achieved only through fiber-based connectivity.

8. Furthermore, even if carrier customers were willing to purchase HFC-based BDS service in any significant quantity, Comcast could not add significant wholesale BDS traffic to

its shared HFC network without significant expansions of capacity required to avoid adverse impacts on the broadband Internet access, video, and voice traffic supported by that network, including impacts to residential subscribers. It would be far more efficient to build new fiber connections than to expand HFC capacity to support dedicated connectivity to mobile providers.

9. Comcast also provides an E-Access service that allows other service providers to purchase wholesale fiber-based Ethernet connectivity and, to a far more limited degree, Ethernet over HFC service, to businesses within Comcast's footprint. On a footprint-wide basis, Comcast sells its E-Access service to nearly {{ }} carriers.

10. Comcast works with other providers to establish a network-to-network interface ("NNI") through which its E-Access services can be delivered to the other provider's customer. This is a Layer 2 service for which Comcast provides only connectivity. E-Access customers generally require participating wholesale providers, including Comcast, to list all on-network buildings within their respective footprints, and to provide fixed price lists and one-time costs and timing for reaching each building. When a carrier customer is seeking connectivity to a building outside of its footprint, it simply enters the address and receives instant price quotes from all participating wholesale providers. The typical E-Access customer may have 30 to 40 providers within its pricing tool, with individual bidders varying depending on the geographic locations requested. Some E-Access customers are also able to consider near-network buildings within their pricing tool, allowing them to also consider bids from wholesale providers that would require a degree of new construction to serve a particular address. In almost all cases, the service order for building to any particular location for these wholesale services goes to the lowest cost bidder. As a result, Comcast has been forced to reduce prices over time in order to maintain a foothold in this business.

11. While larger service providers negotiate highly customized NNI arrangements and rely on the automated pricing tools, smaller carrier customers without NNI agreements may purchase Comcast’s retail Ethernet offerings for resale to business customers.

12. Until recently, Comcast has built out its fiber network to business locations only reactively, in response to a customer’s request for service. Comcast now has begun to undertake proactive buildouts in select downtown markets. These newly developed “hyperbuilds”

{{ }, representing a substantial capital risk. The continued allocation of capital to prospective construction is dependent on forecasting sufficient new profitable business to justify the cost.

13. Comcast’s cellular backhaul service and E-Access service are both structured and offered by the company as private carriage services. Comcast does not hold itself out indifferently to the public or any class of customers to provide cellular backhaul or E-Access services. Rather, Comcast makes individualized determinations as to the circumstances in which and the customers to whom it will offer wholesale service. Where Comcast does offer these wholesale services, its contracts are highly individualized. {{

}}

The contracts are heavily negotiated by the parties, resulting in highly individualized terms and prices. Comcast’s E-Access service is available only to a limited number of carriers with which Comcast chooses to create a network-to-network interface. These services are not broadly available and pricing and other terms is customized for each NNI counterparty.

14. Comcast faces robust competition as a new entrant in the wholesale BDS marketplace. Invariably, Comcast offers service in competition with a well-entrenched incumbent LEC that has many advantages, including far more extensive network connectivity to

business locations, much larger sales and marketing operations, and long-term customer relationships. In addition, Comcast typically competes in the cell backhaul and broader wholesale marketplace against a variety of CLECs and dark fiber providers (such as Level 3, XO, Zayo, and Windstream), cable overbuilders (such as WOW and RCN), and, in some instances, fixed wireless providers.

15. Comcast also must compete vigorously to capture business in the broader wholesale marketplace to provide connectivity to retail business locations. Such competition is most robust in larger, more densely populated areas, where pricing tools employed by wholesale purchasers seeking to serve regional or national multi-location businesses typically include 10 to 15 providers with whom Comcast must compete (generally based on price, but sometimes based on service quality metrics and vendor/network diversity requirements as well). Even in less densely populated areas served by Comcast, there is always a well-entrenched incumbent ILEC present and often other competitors as well, meaning that Comcast invariably must offer a competitive price in order to win a customer’s business.

16. By way of example, wholesale prices for Comcast’s dedicated Ethernet services have been declining substantially for several years. In 2013, when Comcast delivered 100 Mbps fiber service, it could expect to be able to charge market-based rates between {{

}} per month. Today, Comcast typically charges less than {{ }} a month for the same service.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed this 28 day of June, 2016.



David Allen
Vice President, Carrier Services
Comcast Cable

Exhibit F

DECLARATION OF DEVESH RAJ

1. My name is Devesh Raj, and I am Senior Vice President, Corporate Strategy for Comcast Corporation (“Comcast”). This declaration is based on my personal knowledge and a review of Comcast’s business records.

2. Prior to Comcast, I spent 14 years at Boston Consulting Group (BCG) in New York where I served as a Senior Partner and Managing Director leading the firm’s Telecommunications, Media, and Technology practice in North America. In that capacity, I focused on strategy and assessment for leading companies and emerging businesses in technology, media, software development, cloud innovations, and customer service transformations. Since joining Comcast in 2014, I have played a key role in Comcast’s business planning, with responsibility for the company’s capital allocation, economic strategy, and business forecasting.

3. Comcast is a global media and technology company with a variety of assets and interests grouped within two primary businesses, Comcast Cable and NBCUniversal. As a cable operator, we are one of the nation’s leading providers of video, high-speed Internet, and voice services to residential customers under the XFINITY brand. Comcast Cable also provides these and other services to business customers. In addition, we sell local, regional, and national television and digital advertising through Comcast Spotlight, a division of Comcast Cable.

4. Our operations for NBCUniversal consist of four business segments: (i) cable networks, consisting primarily of our national cable networks, regional sports and news networks, international cable networks, and cable television studio production operations; (ii) broadcast television, consisting primarily of the NBC and Telemundo broadcast networks, including our ten NBC-owned and 17 Telemundo-owned local broadcast television stations, and

our broadcast television studio production operations; (iii) filmed entertainment, consisting primarily of the operations of Universal Pictures, which produces, acquires, markets and distributes filmed entertainment worldwide; and (iv) theme parks, consisting primarily of our Universal theme parks in Orlando, Florida and Hollywood, California.

5. In addition to these core businesses, Comcast owns Comcast Spectacor and Comcast Ventures. Comcast Spectacor is a sports and entertainment business that owns the Philadelphia Flyers and also owns and operates the Wells Fargo Center arena in Philadelphia, Pennsylvania. Comcast Ventures invests in technology startup companies.

6. As is typical of any high-performing company, Comcast regularly allocates and re-allocates investments between and among its different business units. We use operating income before depreciation and amortization, excluding impairment charges related to fixed and intangible assets and gains or losses from the sale of assets, if any, as the measure of profit or loss for our operating segments. Doing so eliminates the significant level of noncash depreciation and amortization expense that results from the capital-intensive nature of certain of our businesses and from intangible assets recognized in business combinations. We use this measure to evaluate our consolidated operating performance and the performance of our operating segments and to allocate resources and capital to our operating segments.

7. More generally, Comcast makes decisions on how to allocate its capital based on multiple factors, including current performance of the business unit relative to expectations, strategic priorities, the expected rate of return for specific investments, and overall market conditions and capital costs (among other considerations). Our comparison of risks and potential rewards also plays an integral role in our allocation of capital. We typically are more willing to invest (both in the form of capital and operations expenditures, and in terms of executive

attention) in business units that deliver a high return on investment or that offer the potential for future growth, than in business units where the future is more clouded.

8. Between annual budgeting and capital allocation processes, we regularly monitor and adjust investments as needed to respond to changing market, competitive, and regulatory conditions. We will add resources during the year as new opportunities arise and we will reduce our expected investment if necessary to respond to increased risk. The diversity of Comcast's business has allowed the company as a whole to invest strategically and to direct resources toward businesses with the greatest prospects. Comcast continually monitors all of the industries in which it operates and generally is unwilling to invest in lines of business that face unreasonable restraints on their potential growth. This includes unreasonable governmental regulatory restraints.

9. In assessing opportunities for growth and attractive returns for the provision of business data services ("BDS") Comcast will consider whether and to what extent increased regulatory risks and burdens—including the potential imposition of rate regulation on recent entrants such as Comcast Cable—might render continued investments less attractive than other business opportunities that compete for capital. Just as Comcast Cable must take into account the regulatory landscape in assessing how much capital to devote to its business services vis-à-vis its other lines of business (including residential offerings of video, broadband Internet access, and voice services), Comcast as a parent company must make similar judgments in allocating capital among Comcast Cable, NBCUniversal, and other subsidiaries. All else being equal, increased regulatory risks affecting one line of business tend to make other lines of business more attractive as a relative matter, and thus influence the flow of capital away from any business units facing increased regulatory risks.

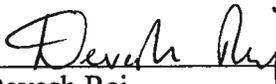
10. As a relatively new entrant into the BDS marketplace that has not historically been subject to rate regulation, Comcast Cable has invested substantially in the provision of various BDS products and offerings. Specifically, Comcast Cable has invested more than \$5 billion since 2010 to compete in the business services market as a new competitor offering highly innovative products that appeal to business customers of all sizes.

11. The provision of enterprise-grade services typically requires extensive infrastructure investments, demanding the extension of fiber networks and other upgrades to serve each individual customer. Comcast Cable expects that the demand for further substantial infrastructure investment in BDS products and offerings will continue, particularly as customers demand more backhaul capacity. Since entering the BDS market, Comcast Cable has aggressively made these investments in an effort to win new business and expand the availability of BDS within its footprint. These substantial investments likely would not have occurred or would have been greatly curtailed, however, if Comcast Cable, as a new entrant, had been subject to (or was at risk of being subjected to) rate regulation and other burdens typically reserved for dominant providers. Indeed, Comcast Cable's investment expectation has been based on an assumption that new entrants would not be subject to such regulatory schemes.

12. The FCC's adoption of new rules that threaten to lower the anticipated revenues and return on investment in the BDS marketplace, while simultaneously increasing the costs of regulatory compliance, would likely affect the allocation of capital not only within Comcast Cable, but among Comcast Cable, NBCUniversal, and other Comcast businesses. Ultimately, if the BDS marketplace proves to be less profitable, the result would be less aggressive investment by Comcast in BDS.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed this 28th day of June, 2016.



Devesh Raj
Senior Vice President, Corporate Strategy
Comcast Corporation

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Exhibit G

DECLARATION OF ROBERT VICTOR

1. My name is Robert Victor. I am employed as Senior Vice President, Finance and Business Operations, of Comcast Business, a division of Comcast Cable (“Comcast”). This declaration is based on my personal knowledge and a review of Comcast’s business records.

2. During my eight years at Comcast, I have been responsible for financial planning and analysis, capital allocation, and long-range strategic planning. In my current capacity, in which I have served for over two and a half years, I have carried out these responsibilities for Comcast’s business services. One of my primary responsibilities is to determine when and where the company should deploy its financial resources to expand its network for offering business data services (“BDS”).

3. Every time Comcast considers whether to provide BDS to a new location, whether as a result of Comcast’s own sales efforts or through a request from a potential customer, the company applies a financial rate-of-return model to determine whether extending facilities would be economically justified. This model is designed to allow the company to make prudent allocations of the capital designated for building connections to new customers. While Comcast has made aggressive investments to reach new customers, {{

}}

4. When a customer requests any type of BDS service, either through a Comcast sales representative or through a request for proposal, {{

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5. {{

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6. {{

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7. {{

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8. {{

}} More broadly, we have observed a substantial decline in market prices for BDS offerings in recent years across most product segments and geographic service areas.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed this 28 day of June, 2016.



Robert Victor
Senior Vice President, Finance and Business
Operations
Comcast Cable

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Exhibit H

Business Data Services and the Future of Wireless 5G

Von McConnell
Bob Azzi

June 28, 2016

Authors

Von McConnell has over 30 years of experience in the telecommunications industry with companies such as Bell Atlantic, Illuminet, Sprint and Huawei. His most recent responsibilities have spanned numerous positions at Sprint such as Operations Director for the 4G Business Unit, Managing Director of Innovation and Advanced Labs, as well as VP and CTO for Huawei. He also holds over 70 U.S. patents in network architecture and services. He is presently with TM Group and is an advisor and consultant to several startup and technology companies.

Robert “Bob” Azzi has over 37 years of experience leading network organizations for local, global and wireless networks. Bob is currently an advisor and consultant to innovative technology companies. Previously, Bob was the Chief Network Officer of Sprint. In this role, he was accountable for network planning, development, engineering, deployment, access management and service assurance for the wireless and global IP networks. During his tenure he led the Network Advantage outsourcing contract, Network Vision wireless network upgrade and the iDEN decommissioning programs.

Background

The FCC has recently proposed re-regulating Special Access services, or Business Data Services, which are essentially “enterprise-level broadband” communications services.¹ Among the reasons the FCC sets forth for re-regulating these services is that BDS is used by wireless carriers for backhaul, and BDS is “critical to the ability of wireless carriers to expand and operate their networks today and will be even more critical as the advent of 5G wireless drives the creation of the dense thicket of cell sites that will be needed to deliver high bandwidth wireless services.”² And as Chairman Wheeler recently reiterated, “all these small cell sites will need to be connected, so we’ll need a lot more backhaul.”³

Notwithstanding the FCC’s laudable efforts to plan ahead for the future of 5G wireless backhaul, it is important for the agency to understand that the technical requirements for 5G are still very much unsettled. It would be premature for the FCC to regulate backhaul services based on the uncertain requirements for 5G services. In particular, the implication in the FNPRM that BDS could include services offered by cable companies using hybrid fiber coaxial technology (“HFC”) is entirely inapposite when considering 5G backhaul.⁴ While HFC may have capacity that “is greater than the incumbent LEC’s legacy copper-based infrastructure,”⁵ it falls far short of the requirements for 5G wireless services.

The mobile industry is positioning itself to build wireless infrastructure in order to support new innovative services at higher data rates and with more connections than the current 4G infrastructure supports. The industry is currently developing new 5G technologies and standards to support these services. The infrastructure connecting the

¹ See *Business Data Services in an Internet Protocol Environment; Investigation of Certain Price Cap Local Exchange Carrier Business Data Services Tariff Pricing Plans; Special Access for Price Cap Local Exchange Carriers; AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services*, WC Docket Nos. 16-143, 15-247, 05-25, RM-10593, Tariff Investigation Order and Further Notice of Proposed Rulemaking, FCC 16-54, ¶ 1 (rel. May 2, 2016) (“FNPRM”).

² *Id.* ¶ 5.

³ Remarks of FCC Chairman Tom Wheeler, “The Future of Wireless: A Vision for U.S. Leadership in a 5G World,” National Press Club, Jun. 20, 2016, *available at* https://apps.fcc.gov/edocs_public/attachmatch/DOC-339920A1.pdf.

⁴ FNPRM ¶ 189.

⁵ See *id.* ¶¶ 61, 249.

wired network to the wireless radio nodes is an important component for delivering these advanced services.

New 5G requirements will mandate the use of dark fiber⁶ for the wired backhaul infrastructure to support both speed and latency requirements. Although current Hybrid Fiber Coax (“HFC”) infrastructure may be able to support 3G and some 4G wireless network radio nodes, it will not support 5G requirements and the radio virtualization concepts that 5G introduces.⁷ This paper will examine the tenuous state of 5G development, and explain why, notwithstanding the uncertainty, the emerging 5G technologies can only be supported by fiber—and, most likely, dark fiber.

The FCC should adopt policies and encourage state and local governments to encourage the continued investment in dark fiber deeper into the network infrastructure. A fiber-based infrastructure that provides the availability and flexibility to adopt future wireless technologies, 5G and beyond, will enable the US to be a global leader.

Introduction

Roughly every ten years, the wireless industry develops a new generation of mobile technologies. The first generations of mobile technologies focused on mobile voice communications and the beginnings of slow data communications. 3G networks increased data speeds to make email and internet use more practical. 4G networks further increased data speed and capacity and it also created a true mobile IP network to set the stage for voice over LTE (VoLTE) and other IP based services. This pattern of continuous evolution and focus on mobile technology is responsible for the world-wide market penetration of smartphones and ever increasing wireless usage.

4G is the dominant mobile technology throughout the world and will be for several more years. Many of the core technology concepts being put forward for 5G have their origins in 4G due to the architectural advancements that 4G introduced. The industry has begun introducing new enhancements such as simple Multiple In/Multiple Out

⁶ See generally Interoute, *What is Dark Fibre?*, available at <http://www.interoute.com/what-is-dark-fibre>.

⁷ See Martha DeGrasse, *RAN Virtualization Explained*, RCRWireless News, Aug. 26, 2015, available at <http://www.rcrwireless.com/20150826/network-infrastructure/ran-virtualization-explained-tag4>.

(MIMO) antennas,⁸ fronthaul,⁹ small cells, etc., both to reduce costs and to achieve faster speeds with lower latency.

At present there are numerous unresolved issues regarding 5G, including how it should be architected and how it should perform. But the entire industry can agree that the future architecture of the wireless network will look and function drastically different in five to eight years than it does now.

The realization of a new and different wireless network architecture, in parallel with the development of 5G, is already underway around the world to virtualize network functions (NFV), and to create economies of scale and scope by re-architecting network features into cloud-based environments. Even the radio network is moving into the virtualized cloud. For example, wireless operators such as AT&T (Domain 2.0) and Telefonica (UNICA) and others are showing that significant cost reductions and efficiencies can be obtained by virtualizing and pooling radio baseband processing into a cloud because they no longer need to provision individual cells for peak capabilities on a per-site basis.¹⁰ In short, there are many technical areas within a wireless network that are anticipated to be impacted by 5G and this paper will provide a brief introduction to a few of them. This paper will address the changing definition of backhaul and the tremendous demand for dark fiber that 5G will create.¹¹

The current wired network supports 4G wireless with infrastructure that includes wireless backhaul, dark fiber, Ethernet and hybrid fiber coax. These technologies have been important, but not all of them can support the evolving requirements of 5G. Notably, HFC is a technology that, despite steady performance improvements, will not be suitable for 5G networks because of 5G's demands for near instant responses and huge bandwidth requirements in its backhaul as the radio networks' densify and radio

⁸ Multiple In/Multiple Out (MIMO) essentially leverages the Wi-Fi concept of employing multiple antennas on the receiver/handset and the transmitter/antenna to utilize the multi-path effects that always exist to transmit additional data, rather than causing interference. This greatly improves customer experience and cell capacity, especially at the edges of the cell.

⁹ Fronthaul is the physical link and transport between the radio headunit and the baseband unit. More definition is provided on pages 9-11 of this paper.

¹⁰ See Frank Rayal and Joe Madden, *Cloud RAN Is a Disruptive Technology. Here's Why*, Fierce WirelessTech, Jan. 20, 2015, available at <http://www.fiercewireless.com/tech/story/cloud-ran-disruptive-technology-heres-why/2015-01-20>.

¹¹ See Mona Jaber, Muhammad Ali Imran, Rahim Tafazolli, and Anvar Tukmano, *5G Backhaul Challenges and Emerging Research Directions: A Survey*, at 1748, available at <http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=7456186> ("*5G Backhaul Challenges*").

controllers move into the cloud. Because 5G is expected to create a huge demand for backhaul due to the anticipated overwhelming volume of traffic, many wireless carriers are attempting to aggressively move to dark fiber¹² and this trend is expected to continue well into the era of 5G. Accordingly, this paper will also explain why the existing HFC infrastructure would not be used for the 5G small cell network. What is more, a case will be made for policies that promote additional investment in fiber, especially dark fiber, in order to have the resources in place to support future 5G architecture.

5G Industry Drivers and Standards

Almost all carriers around the world are aggressively deploying 4th generation wireless capabilities into their networks. The technology has and will continue to introduce many new wireless IP packet concepts to increase base wireless capabilities such as peak speeds up to 1GB/s, increased cell density via dense small cells, massive MIMO,¹³ Cloud RANs, etc. These concepts have established basic network architecture principles that will continue to evolve with the introduction of LTE Advanced (Rel 16) production systems, starting around 2017/2018. Since innovation in the mobile industry is continuous, these concepts will also evolve and be leveraged into 5G standards and deployments.

Current specifications for 4G standards will continue at least through 2020. The standards bodies and forums of the wireless industry are only now beginning to add clarity to what the industry wants from 5G functionality. That said, there is an ever-growing list of the base requirements the industry wants to achieve with 5G. The following is a partial set of the 5G high-level requirements being discussed:¹⁴

¹² See Sean Buckley, *Verizon's 5G Plans Could Spell Dark Fiber Opportunities for Zayo, Level 3, Others*, FierceTelecom, Apr. 26, 2016, available at <http://www.fiercetelecom.com/story/verizons-5g-plans-could-spell-dark-fiber-opportunities-zayo-level-3-others/2016-04-26>.

¹³ Today four transmit antennas at the cell site and 2 receive antennas on the device (4x2) MIMO is used. For 5G, MIMO is expected to be expanded to 8x8 and even 16x16 and higher at some time in the future. This will greatly increase transmission speeds, especially when coupled with the anticipated higher frequencies being discussed for 5G. See Nutaq, *Large MIMO Systems (12x12, 16x16, 32x32) – Part 1*, available at www.nutaq.com/blog/large-mimo-systems-12x12-16x16-32x32---part-1.

¹⁴ See Rachid El Hattachi and Javan Erfanian, *NGMN 5G White Paper*, Feb. 17, 2015, available at https://www.ngmn.org/uploads/media/NGMN_5G_White_Paper_V1_0.pdf.

1. Radio latency of <1 millisecond response time with 1 – 10 millisecond end-to-end response times
2. Peak speeds up to 1- 10 GB/s per individual connections (e.g., highly mobile vs less mobile)
3. Ultra dense networks with ultra-high capacity – e.g., 1000x improvements over 4G
4. 10,000 times more traffic due to Internet of Things (IOT)
5. Massive data consumption capabilities – e.g., 1000x more than 4G
6. Increased uptime reliability of 99.999%

The anticipated timeline for the first grouping of standards that could be called 5G is around mid-2019. At present, these 5G standards are being targeted as IMT-2020, Release 17 by industry standards,¹⁵ because it continues and extends the standards work started with 4G. The earliest industry-compliant 5G equipment is expected to be available is 2020. Anything prior to 2020 will be considered “4.5G” technology if the marketing trends continue as they have in the past.

Evolving Network Architectures

There are hundreds of new technologies and techniques that are already planned for 4G LTE Advanced (Release 16) deployments that can be enhanced for 5G. This paper focuses on only two—higher radio frequencies and small cells—because they both have significant impacts on backhaul.

Mobile networks operate almost exclusively on radio frequencies below 3 GHz. However, radio extension into higher frequency bands, including frequencies above 10 GHz, are being considered for 5G. Frequencies of 3 GHz to 30 GHz are in the centimeter wavelength band, and frequencies of 30 GHz to 300 GHz are in the millimeter wavelength band. The main benefit of frequencies above 10 GHz is the potential availability of large and continuous spectrum blocks to support multi-Gbps data rates. The tradeoff for using higher spectrum bands is higher signal path loss. This signal loss can be partly compensated for by using more advanced antenna configurations, i.e. making use of the reduced size of the basic antenna elements at higher frequencies. The expected explosion of 5G small cell technology will leverage these higher

¹⁵ See Press Release, International Telecommunications Union, *IMT-2020 Makes Progress in Developing 5G Standard*, Feb. 26, 2016, available at http://www.itu.int/net/pressoffice/press_releases/2016/07.aspx#.V2894_nyuM8.

frequencies to the cell sites' advantage because small cells will only cover 10 – 100 square meters.¹⁶

Small cells are starting to be aggressively deployed as part of 4G. This trend is likely to continue for the next several years, and then grow exponentially with the deployment of 5G and its use of higher radio frequencies. The additional capacity created by small cells will improve coverage to the existing macro cell site coverage, as well as increase transmission speed by increasing available spectrum and bandwidth. This is due to the fact that hundreds or maybe thousands of small cells can be deployed within an existing single macro cell.

Although it is hard to estimate the available bandwidth or backhaul requirements of a single small cell given all of the anticipated variables such as size, population density, usage, MIMO, etc., some engineers have stated that a 5G small cell deployment in 6-30 GHz band (cmWave) with a 500 MHz carrier bandwidth could provide hundreds of Gb/s/km² by 2025 and beyond. A future estimate of a 5G small cell deployment may lead up to 100 GHz band (mmWave) with 2 GHz carrier bandwidth, and provide a Tb/s/km² by 2030 and beyond.¹⁷ And this capacity will surely be consumed. Some industry experts are anticipating a continued doubling of end user traffic each year through at least 2030 which amounts to about 10,000 times more traffic than existed in 2010.¹⁸

An often over-looked supporting element for this rapid expansion of the deployment and installation of a small cell strategy for 5G and beyond is the need for extensive investment in additional new fiber in the backbone of the network. Like an apple tree bearing a prodigious yield of fruit, the development of the small cell paradigm cannot succeed without a strong supportive trunk, or in this case, an ample base (core network infrastructure) of fiber. The need to increase investment in the fiber supporting structure for this future wireless architecture should lead the FCC to adopt policies that incentivize companies to continue investing heavily in their fiber networks.

¹⁶ Xiaohu Ge, Song Tu, Guoquang Mao, Cheng-Xiang Wang, and Tao Han, *5G Ultra-Dense Cellular Networks*, at 2, Dec. 11, 2015, available at <https://arxiv.org/pdf/1512.03143.pdf> ("*5G Ultra-Dense Cellular Networks*").

¹⁷ Nokia, *Ten Key Rules of 5G Deployment Enabling 1 Tbit/s/km² in 2030*, at 2, available at <http://networks.nokia.com/file/39891/ten-key-rules-of-5g-deployment>.

¹⁸ *Id.* at 4.

Changing Backhaul Definitions

It is difficult to fully understand or even estimate the true holistic impacts of the Internet of Things (IOT) or the wireless network as a high-speed communications hub (versus a traditional mobile network) at this time. Industry experts are largely guessing about how much additional capacity will be added in ultra-dense cellular networks, especially using small cells. Some have stated that by utilizing massive MIMO antennas and millimeter wave communication technologies, each small cell is anticipated to provide up to 10Gbps of throughput in 5G ultra-dense cellular networks. With the predicted 5G usage scenario, business Ethernet and HFC will be insufficient, constraining the small cell densification in 5G ultra-dense cellular networks, specifically for defined areas.¹⁹ Dark fiber infrastructure, however, deployed deeply into the network to be available for 5G radios and antennas, is critical for enabling the higher speeds and significant device densities to be specified in future 5G standards.

Historically, the term “backhaul” in the mobile industry has referred primarily to bearer traffic leaving the cell tower (e.g., the BTS or eNodeB) to be terminated to an end point. It was represented by connections to DS1 or fiber. However, as we mature toward “cloudification” or network function virtualization (NFV), and especially as we move into 5G, the industry’s conception of “backhaul” as a general term will evolve and expand.²⁰ For example, where does backhaul originate from in a virtualized eNodeB, or where does a radio path really begin and end in a virtualized network cloud in the evolving 5G network? The evolving definition of backhaul needs to include any critical real-time traffic (signaling or bearer) that has to be brought back to specific locations to be terminated intra-or inter-network for the completion of a session.

Fronthaul is Backhaul

In the context of some small cells (or even macro cells) in present day Distributed Antenna System (DAS) deployments, the traditional definition of backhaul continues to work well because the radio control unit is co-located with the baseband unit as it has been for years. All radio processing is undertaken at or near the actual antenna or BTS. However, as we move forward and the industry matures, cell sites will be defined by a distributed architecture where the radio elements are divided into two primary

¹⁹ *5G Ultra-Dense Cellular Networks* at 7.

²⁰ *5G Backhaul Challenges* at 1750.

components: the remote radio unit (RRU) and the baseband unit (BBU). The RRU and BBU perform different functions with respect to radio signal processing. The RRU is responsible for the air interface to a mobile user’s handset and the corresponding RF processing (including amplification, filtering, and frequency conversion). The BBU performs signal modulation as well as administration and control of the RRU. The transmission link between the RRU and the BBU is referred to as the “fronthaul” so as to distinguish it from the traditional term of “backhaul,” which typically describes the physical transmission link from the BBU/eNB to the rest of the network.

The fronthaul messaging between the BBU and the RRU is called common public radio interface (CPRI) and was originally defined as an internal base station interface to allow antenna functions to be moved to the top of the tower or the rooftop, away from the baseband processing in the cabinet.²¹ Additionally it allowed for sourcing of radio heads from multiple suppliers. Over time, the extensions of the CPRI specification allowed for the physical separation of the RRU and BBU in such a way that the distance between the two elements could be over 20 miles. Wireless carriers welcome as much distance between the RRU and BBU as possible because they are able to cluster and aggregate multiple RRUs into a single BBU, thereby obtaining increased efficiencies in handoffs between cell sites, and also reducing operational costs (since only the antenna and small RRU are at the cell site). Critically, dark fiber is the only suitable carriage technology for CPRI transmission since it is based on the digital radio over fiber (D-RoF) specification. Depending on the capacity, configuration of the cell and location of the baseband unit, there may be a dedicated fiber strand per antenna, per radio sector and/or carrier.²²

To achieve the separation between the RRU and the BBU, stringent speed and latency requirements have to be followed because the CPRI connection is carrying the actual sampled radio signal from the end user’s device to the BBU. The BBU has significant bandwidth and latency demands. Supported CPRI data rates are 2.4Gbps, 3.0Gbps, 4.9Gbps, 6.1Gbps, 9.8Gbps and higher.²³ The distance between the RRU to the BBU is

²¹ See Nathan J. Gomesa, Philippe Chanclou, Peter Turnbull, Anthony Mageec, and Volker Jungnickel, *Fronthaul Evolution: from CPRI to Ethernet, Optical Fiber Technology*, at 2, Dec. 2015, available at <https://kar.kent.ac.uk/50278/1/Fronthaul%20Evolution%20and%20CPRI%20OFT-prepub.pdf>.

²² See Philippe Chanclou, Anna Pizzinat, Fabien Le Clech, To-Linh Reedeker, Yannick Lagadec, Fabienne Saliou, Bertrand Le Guyader, Laurent Guillo, Qian Deniel, Stephane Gosselin, *et al.*, *Optical Fiber Solution for Mobile Fronthaul To Achieve Cloud Radio Access Network*, available at http://www.ict-combo.eu/data/uploads/review_files/publications/other/funems_2013_orange_chanclou_final.pdf.

²³ See Gary Macknofsky, *Understanding the Basics of CPRI Fronthaul Technology*, available at http://www.equicom.hu/wp-content/uploads/EXFO_annotate310_Understanding-Basics-CPRI-Fronthaul-

also determined by maximum latency per link which is well under <1 ms (or about 0.60 ms roundtrip)²⁴ which allows the CPRI to be transported up to 10-40km away.²⁵ In other words, the CPRI messaging is designed today for point-to-point communications that require speeds and latency that can only be delivered over fiber.²⁶ The issue of CPRI and its fronthaul carriage becomes absolutely critical in any discussion of small cell backhaul.

Cloud RAN

Another significant driver behind the need for dark fiber-based connections is the growing use of Cloud Radio Access Network (“C-RAN”) technology in backhaul systems. The larger wireless carriers around the world are aggressively moving toward separating the RRU from the BBU because this separation enables them to establish a C-RAN, or a pool of aggregated BBUs. From this common BBU radio controller, carriers can better manage their most valuable asset: the radio spectrum. In addition to reducing operational costs by having less equipment at the cell site, the C-RAN enables the handoffs to be controlled via common-pooled BBUs. C-RAN further enables denser RRU deployments rather than traditional ones since interference among base stations can be better mitigated.²⁷ C-RAN also allows for the cell site to undertake near-time self-optimization or adjustment as traffic patterns change, which is called a self-optimizing network (SON).

The high speeds and reliability that fiber-based technologies enable are critical in this context, as the aggregation of CPRI streams will only be compounded with the expected increased utilization of massive MIMO for small cells. Once massive MIMO is applied to radio transmissions, CPRI capacity between BBU and each RRU (and therefore, increased

Technology_en.pdf. Please note that this payload *is in addition to* what is traditionally considered backhaul.

²⁴ See Dr. Harrison J. Son and S. M. Shin, *Fronthaul Size: Calculation of Maximum Distance Between RRH and BBU*, NetManias, Apr. 1, 2014, available at <http://www.netmanias.com/en/post/blog/6276/c-ran-fronthaul-lte/fronthaul-size-calculation-of-maximum-distance-between-rrh-and-bbu>.

²⁵ See Harpinder Sing Matharu, *Ethernet Technology Summit, Motivations for Ethernet Fronthaul*, Apr. 16, 2015, available at http://www.ethernetsummit.com/English/Collaterals/Proceedings/2015/20150416_2A_Matharu.pdf

²⁶ See Ceragon, *Transitioning the Backhaul Network to 4G and Beyond*, Aug. 6, 2014, available at http://www.doubleradius.com/c.283276/site/stores/ceragon/Ceragon_Ebook_Backhaul__4G_and_Beyond.pdf.

²⁷ See Antonio de la Oliva, Jose Alberto Hern, David Larrabeiti, and Arturo Azcorra, *An Overview of the CPRI Specification and Its Application to C-RAN Based LTE Scenarios*, IEEE Communications Magazine, Jan. 2016, available at <http://www.it.uc3m.es/aoliva/pdf/CPRI.pdf>.

fiber investment) will have to be enhanced dramatically. For example, if channel bandwidth is 20MHz and an RRU has 16 antennas, then 19.6Gbps of CPRI capacity is required between the BBU and the RRU. Moreover, the bandwidth is no longer 20MHz as it is in 4G LTE. It will be even further beyond 100MHz and even 400MHz, eventually requiring tens or hundreds of Gbps of CPRI capacity per RRU.²⁸ Such capacity can only be delivered over fiber. The presence of extant dark fiber in the network with direct access to ever evolving optical equipment will allow for the flexibility required to handle the expected and continued growth in bandwidth requirements of 5G with minimal delay.

In addition, there is work underway to allow the C-RAN to disruptively evolve into a virtual radio access network or V-RAN. In a V-RAN, BBU functions are virtualized in the form of software defined functions (or network function virtualization – NFV) hosted on general purpose IT hardware. It also means that traditional element terms like eNodeBs might become virtualized and move into centralized data centers. Work is already underway on modeling how the industry could begin offering RAN as a service (or RANaaS).²⁹ It also allows for the opportunity to sell services or network functions based on the radio resources utilized per session. Aggregating wireless NFV resources in centralized data centers would make it possible for wireless operators to act like any large-scale internet company.³⁰ A combination of all the above benefits of a C-RAN is the primary reason that carriers are beginning to aggressively leverage dark fiber—which gives wireless carriers far greater control over their service experience, enabling them to increase capacity on demand to meet their evolving backhaul needs. Dark fiber is critical to the evolving success of the technology, especially as the industry moves into 5G.

HFC and Wireless Broadband Backhaul

HFC was built and designed for video delivery and it does a great job of delivering streaming content as well as auxiliary services such as WIFI, etc. In addition, the

²⁸ See Dr. Harrison J. Son and Dr. Michelle M. Do, *Mobile Network Architecture for 5G Era – New C-Ran Architecture and Distributed 5G Core*, NetManias Tech Blog, Oct. 6, 2015, available at <http://www.netmanias.com/en/post/blog/8153/5g-c-ran-fronthaul-kt-korea-sk-telecom/mobile-network-architecture-for-5g-era-new-c-ran-architecture-and-distributed-5g-core>.

²⁹ See *5G Backhaul Challenges* at 1748.

³⁰ See FierceWireless Special Report, *Verizon, Sprint and Others Circle the C-RAN Wagons*, Mar. 16, 2016, available at <http://www.fiercewireless.com/tech/special-reports/verizon-sprint-and-others-circle-c-ran-wagons>.

technology and network delivery methods can support wireless backhaul in the 3G environment and some 4G applications.

However, even today for 4G small cell deployments, the control signaling performance requirements for 4G radio access networks are stringent and may present a challenge for HFC. For instance, during a handover preparation phase (one cell handing off to another), the source and target cells need to quickly exchange configuration information through backhaul interfaces. The longer the handover preparations phase, the higher the chance of handover failure. Failure to meet the delay requirements for bearer signaling can result in significant service degradation. Even with active queue management on an uncongested HFC network, latencies of 4-8 ms are typical which makes HFC unusable as backhaul for 5G.

HFC performance characteristics related to packet delivery, jitter, signal loss, throughput, and availability are designed for delivering content (to consumers, by and large), but create challenges for small cell networks which are much more demanding on performance issues.³¹ Moreover, the HFC network does not natively support the sustained speeds of multiple Gbps with <1ms that backhaul functionality generally requires. Even where Ethernet over HFC services are provided pursuant to service level agreements (“SLAs”), those SLAs have tended to offer fewer and less robust guarantees on performance and reliability than fiber SLAs. As a result, even though there has been a large increase in the use and deployment of small cells over the last three years, the vast majority have been fiber-fed to the strand or pole³² and not via the cable carrier’s HFC networks. Meanwhile, cable providers’ Ethernet over HFC services typically are limited to symmetrical speeds of 10 Mbps (download and upload). Wireless carriers thus do not view cable-provided HFC-based services as a robust substitute for fiber-based backhaul connections, even in today’s 4G environment.

As the wireless industry begins to race toward 5G and all the additional speeds and functional capabilities that 5G is anticipated to bring, any suggestion that the HFC network can provide backhaul capabilities for 5G small cells is not founded on an understanding of where the technology is heading. Even with HFC’s increased speeds

³¹ See Alan Breznick, *Cable’s Value Proposition for Small Cells*, Heavy Reading, Dec. 2015, at 5, available at http://www.lindsaybroadbandinc.com/wp-content/uploads/2015/06/HR_Accedian_Small_Cells_WP_11-25-15.pdf.

³² See Sean Buckley, *Dark Fiber, Small Cells Represent the Next Stage of Wireless Backhaul Land Grab*, FierceTelecom, Oct. 6, 2014, available at <http://www.fiercetelecom.com/story/dark-fiber-small-cells-represent-next-stage-wireless-backhaul-land-grab/2014-10-06>.

created by channel bonding and quality of service (QoS) improvements, there is no reasonable prospect that today's 10 Mbps top-end Ethernet over HFC service will ever catch up to the needs of wireless carriers as the 5G revolution charges forward. Moreover, the HFC-based network architecture likely will not deliver the less than <1ms latency requirements being introduced in the evolving C-RAN. When 5G latency requirements are coupled with the multiple-Gbps demands of each session of fronthaul activity, combined with the basic requirements of the traditional backhaul payload, HFC not be able to deliver the capacity needed for a fully loaded 5G small cell in the future. Only fiber will be able to support all the proposed requirements needed to meet industry and customer expectations for 5G and its future iterations.

Summary

The mobile industry continues to evolve and take significant steps forward to provide end users a mobile experience that is leaps and bounds ahead of today's technology. As we evolve and extend 4G for the next several years and then step to 5G and its world of virtualization, the pace of change will dramatically challenge today's known topologies and capabilities. Traditional definitions of functionality will have to be updated and changed to meet evolving expectations.

Dark fiber will be a critical infrastructure to support 5G services.

- Dark fiber provides the flexibility for wireless operator to modify the protocols, performance, and technologies at the end points – critical in this early stage of the 5G technology cycle.
- Dark fiber provides the substantial data capacity and speed required for 5G
- Dark fiber provides the low latency to support 5G architectures

The evolution will not only affect wireless networks, but will also affect the wireline networks that support them. As we move into 5G, the demands for near instant responses and the absolute volume of backhauled information will be staggering. Policy makers therefore need to be focused on forward-looking solutions that promote the deployment of more fiber to support wireless 5G networks. With the general public's ever-increasing appetite for bandwidth-dense applications, and the ever-increasing requirements for businesses to have the technology already in place to support these market needs, it is clear that fiber is the future of the 5G communications network.