Product Substitution, Functional Equivalency, and the Technology Transition

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Executive Summary

The technology transition is well underway. Customers are not waiting for the FCC or State commissions to designate functionally equivalent services but are moving from the traditional Public Switched Network (PSTN) and time division multiplexed (TDM) products to new services made possible by changes to network infrastructure at a rapid rate. Based on their adoption of new services, these customers appear to see few differences between the traditional wired copper network and the new IP and wireless networks.

Switched voice circuits continue to decline year over year, as VoIP connections and customers cutting the cord altogether increase, bringing us closer to the "tipping point" where the investment in traditional service may not support its few remaining customers. As of December 31, 2013, the FCC's Local Telephone Competition report showed that approximately 28% of residential consumers had already moved from traditional Time Division Multiplexed (TDM) voice service to VoIP products, primarily cable.[1] The December 2015 CDC wireless substitution statistics show that 46.7% of adults have "cut the cord" entirely and use only wireless voice service,[2] leaving fewer than 25% of residential consumers with traditional TDM voice service.

While for some, the transition is moving swiftly, there remain others who cannot or will not move for various reasons, including the need for specialized services not yet available via the new infrastructure or because they are located in parts of the country where broadband capable of supporting these new services has not yet reached, limiting customer choice to products that may not be adequate substitutes for their current service. As the transition moves forward, state regulators will need to identify these customers and determine how they may be supported until the infrastructure catches up with consumer needs. In the end, the ultimate success of the transition will turn on the ability of all parties (the States, the FCC, carriers, and consumers) to identify and, manage the transition to products that are adequate substitutes for traditional TDM wireline service, based on location-specific and customer-specific needs.

The FCC has proposed eight examination points to determine whether the substitute products/services available in a specific area are adequate replacements for traditional switched voice service. Because one size rarely if ever fits all, the States have also begun to consider how to identify functional substitutes for traditional TDM products. Two states (Michigan and Ohio) have begun to evaluate the needs of their own citizens. These states are addressing the question of how to identify replacement products, map them to customers, and determine where limitations on products and networks will require special intervention to ensure that

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[1] Industry analysis and Technology Division, Wireline Competition Bureau, Local Telephone Competition: Status as of December 31, 2013, Figure 2, p.3, available at https://www.fcc.gov/encyclopedia/local-telephone-competition-reports.

[2] Centers for Disease Control, National Center for Health Statistics, Wireless Substitution: Early Release of Estimates from the National Health Interview Survey, January-June 2015, 12/2015, available at http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201512.pdf.

telecommunications services (both voice and broadband) remain available to all, regardless of their location.

State regulators will need to understand the definition of functional substitution in order to ensure that new products meet the needs of all citizens. Exploring the way in which customers, industry, and regulators have addressed other network transitions will provide a background for moving forward with the technology change. In other addition, other industries have developed methodologies for defining and testing functional equivalence. To that end, the model used by the Food and Drug Administration (FDA) and the drug industry to identify "biosimilar" products may serve as a model for states working through the transition.

As background for assessing the ability of new products to substitute for traditional products, this paper reviews definitions for functional equivalency and suggests ways in which the states may direct their review of functional equivalency to determine whether the new products made available as part of the transition will meet the needs of their citizens. To that end, this paper reviews traditional processes for identifying substitutable products/services, as well as other models. It focuses on points to consider in defining functionally equivalent products that may substitute for each other. The paper reviews the key economics definitions of substitutability (e.g., demand substitution, price constraints, etc.), as well as the impact of customer behavior in defining substitutable products, and explores whether consumer behavior is the ultimate arbiter of functional equivalency.

State regulators are faced with three questions in assessing functional substitution.

1. What is the definition of functional equivalence? Is it complete interchangeability or may it be something less depending on customer needs?

2. To what extent must a functionally equivalent product support "old" technologies such as fax machines and analog security systems? Must the new products support these functions indefinitely or does transition imply that there is a point where support for "old" services is no longer necessary?

3. Are the key requirements for a "substitutable" product quantifiable? Are these requirements finite or do they change depending on the needs of the end user?

As the transition moves forward, the States will continue to have a significant role in determining the availability, reliability, and acceptability of the products made possible by the change from the underlying network structure from TDM voice to broadband.

Ultimately, the definition of functional substitution may be in the eye of the beholder. Those who have transitioned to the new services made possible by IP networks and growing wireless services view these products not just as functionally equivalent to the products they replace, but in many cases as superior. Those who have not made the transition find value in the features of the existing networks that may not necessarily be replicated in the new networks, for example, line powered service that does not require in-home battery backup, the ability to bring problems/concerns to the public utility commissions in those states that have retained oversight of traditional wireline service (a diminishing but still important number), and the availability of standalone voice service at affordable prices. The task of the states will be to identify areas

where customers may no longer have an option for the type of service they need (or want) after the transition. This task will be critical in ensuring that functional product substitutes are available and understood by all who need them. Based on work done in areas like pharmacology, the states that choose to examine functional substitution may use four factors to determine where and when new products may substitute for old.

1. Identify customer-specific reference products
2. Create a data base of replacement product availability
3. Address wireless, wireline, and over the top VoIP products separately
4. Evaluate the effect of bundling on affordability
5. Assess customer adoption and satisfaction

The transition continues to move forward at a rapid pace. By understanding functional substitution, the States can assume a lead role in ensuring that customers remain connected as old services are discontinued in favor of new.

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I. Introduction

The technology transition is well underway. [3] Customers are not waiting for the FCC or State Commissions to designate functionally equivalent services but have already embraced the opportunity to move to new products, both wired and wireless. Based on the rapid adoption of these new products, customers appear to have few concerns about the differences between the traditional wired copper network and the new IP and wireless networks.

The FCC's 2013 wireline competition data shows a continuing decline in switched voice lines coupled with increases in VoIP subscriptions and the number of customers cutting the cord altogether and moving to mobile wireless communications products.[4] As of December 31, 2013, the FCC's Local Telephone Competition report showed that approximately 28% of residential consumers had already moved from traditional Time Division Multiplexed (TDM) voice service to VoIP products, primarily cable.[5] In addition, the December 2015 CDC wireless substitution statistics show that 46.7% of adults have "cut the cord" entirely and use only wireless voice service,[6] leaving fewer than 25% of residential consumers with traditional TDM voice service.[7]

Clearly, these mass market consumers[8] are not waiting for an official decision on whether and which products are functionally equivalent to their current service, but have already made

[3] We use the term technology transition in this paper to refer to both the transition of the PSTN from time division multiplexed (TDM) service to IP-enabled service, as well as the movement of customers from the current TDM network to VoIP and fixed and mobile wireless services.

[4] FCC statistics do not track customers who move to a fixed wireless product, but industry data suggests that this number remains small.

[5] Industry analysis and Technology Division, Wireline Competition Bureau, Local Telephone Competition: Status as of December 31, 2013, Figure 2, p.3, available at https://www.fcc.gov/encyclopedia/local-telephone-competition-reports. The FCC report shows that approximately 10% of VoIP customers purchase service from the ILEC via fiber to the home services such as FiOS and U-Verse.

[6] Centers for Disease Control, National Center for Health Statistics, Wireless Substitution: Early Release of Estimates from the National Health Interview Survey, January-June 2015, 12/2015, available at http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201512.pdf. The percentage of children in homes with wireless service has only now reached 55.3%. The CDC report does not track customers who have switched to fixed wireless service, although anecdotal reports from industry show this number to be relatively small.

[7] Id. The CDC report shows that only 8% of households rely on wired service only (i.e., do not have cell phones).

[8] For the purposes of this paper, we consider residential and small business customers as "mass market consumers" and use the term "consumers" to describe both groups.

their own decision on this issue, abandoning traditional switched voice service for VoIP and wireless technologies from a variety of providers. They are adopting the new services offered over fiber at a rapid rate, often without a clear understanding of the differences (good and bad) between old products and new, including limitations on service availability, quality, and reliability.

As the percentage of customers using traditional copper-based switched voice services diminishes, carriers are seeking ways to move forward with the transition, including discontinuing what they deem to be underutilized or unprofitable services. They are rapidly replacing their embedded copper-based infrastructure with fiber and in some areas are beginning the process of petitioning the FCC under Section 214 of the Telecommunications Act of 1996 to allow the withdrawal of existing services where that copper infrastructure has failed or new fiber facilities can offer customers more advanced services.[9] Simultaneously, the FCC and the states are seeking ways to increase broadband availability and adoption in order to provide the underlying infrastructure necessary for these new services.

The technology transition is moving forward as a result of both customer choice and carrier decisions. The ultimate success of the transition will turn on the ability of all parties (the States, the FCC, carriers, and consumers) to identify and, based on their own needs, select products that are adequate substitutes for traditional copper-based wireline service. The FCC has asked for guidance on the replacement products in the Technology Transition NPRM, [10] proposing eight examination points to determine whether the substitute products/services available in a specific area are adequate replacements for traditional switched voice service. In addition, two states (Michigan and Ohio) have begun to address the question of how to identify replacement products, map them to customers, and determine whether some customers will be left behind by the transition.

The process of determining adequate substitutes for traditional switched wireline service has been complicated by state legislation reducing telecommunications oversight, including the oversight of service availability and quality. In most states, this legislation has defined competition based on the number of carriers offering service in a given area without an assessment of the ability of these products to meet consumer needs.[11] Thus, while consumers may have "choice," they may not have the protections regulation offered prior to the limitation on oversight. Without these protections, for example, quality of service metrics and traditional

[9] See, Wireline Competition Bureau Short Term Network Change Notification Filed by Verizon Pennsylvania LLC, October 1, 2015, available at http://www22.verizon.com/about/networkdisclosures/

[10] Federal Communications Commission, Technology Transitions et al., GN Docket 13-5 et al., Report and Order on Reconsideration and Further Notice of Proposed Rulemaking and Declaratory Ruling, FCC 15-97, Released August 7, 2015

[11] See Lichtenberg, Sherry, Ph.D., Examining the Role of State Regulators as Telecommunications Oversight is Reduced; National Regulatory Research Institute, August 2015, available at www.nrri.org. See also, Lichtenberg, Sherry, Characterizing Competition: A Look at State Processes, National Regulatory Research Institute, Report No. 14-01, February 2014, available at www.nrri.org

complaint reporting and resolution, customers and regulators may lack the information necessary to best manage the technology transition. States can help to resolve these issues by defining "functional equivalency" for their own citizens and implementing processes for identifying those new technologies and products that are adequate substitutes for traditional wireline service. The states are best positioned to identify where competition provides consumers with a choice that will allow them to select products that meet their needs without losing the features, functions, and reliability they have today. Finally, the States must understand the tradeoffs between the old and the new technologies so that they may adequately represent their constituents.

This paper suggests a methodology the states may use to define functional equivalency as they evaluate the process for transitioning from the existing TDM network to newer technologies and products (including fiber-based TDM service, VoIP, and fixed and mobile wireless). The paper reviews traditional processes for identifying substitutable products/services, focusing on the way in which we define products that are "functionally equivalent" and therefore can substitute for each other. The paper reviews the primary indicators of substitutability (demand substitution, price constraints, etc.), as well as the impact of customer behavior in defining substitutable products, and explores whether consumer behavior is the ultimate arbiter of functional equivalency.

It addresses three questions about product substitution.

1. What is the definition of functional equivalence? Is it complete interchangeability or may it be something less depending on customer needs?

2. To what extent must a functionally equivalent product support "old" technologies such as fax machines and analog security systems? Must the new products support these functions indefinitely or does transition imply that there is a point where support for "old" services is no longer necessary?

3. Are the key requirements for a "substitutable" product quantifiable? Are these requirements finite or do they change depending on the needs of the end user?

It is important to note that this paper does not judge replacement services or prescribe a methodology the States or the FCC should use in evaluating whether one service is "functionally equivalent" to another. Rather, it suggests ways to determine whether such services meet the criteria for functional equivalency. To that end, it provides recommendations for ways in which the states may determine whether (and when) one product can fulfill the same need as another, even if they are "not quite the same."

Part I of this paper is this introduction.

Part II reviews traditional economic definitions for product substitution.

Part III reviews previous technology transitions, including the PSTN's transition from analog to digital switching, the transition from analog to digital wireless service, and the DTV transition.

Part IV of the paper reviews how product requirements may be defined as part of the Technology Transition. The paper does not provide a definitive list of requirements for functional substitutes but simply puts forward a methodology for determining if and where substitutes are available. It discusses the questions raised by the FCC's Technology Transitions Copper Retirement NPRM, as well as questions raised in other proceedings. Part IV also addresses the key questions regulators need to answer to determine whether, when, and where products can substitute for each other and reviews a potential model from the drug industry to address the definition of substitute products. Because different parts of the country have different requirements, States must choose their own path through the Technology Transition.

Part V reviews state actions on the definition of product substitution and proposes ways in which the states may respond to this issue.

Part VI provides recommendations for evaluating product substitution on an on-going basis.

Defining the products that are adequate substitutes for basic wireline service at the state and wire center level will provide the foundation for ensuring a successful transition. State public utility commissions and legislators have a critical role in preparing customers for the transition and ensuring that they remain universally "connected" regardless of the technology they choose.

II. Defining Product Substitution

This section of the paper provides a brief overview of traditional economic models for determining whether one product can be an adequate substitute for another. It is not meant to be a primer on economics but only an introduction to the question of how State public utility commissions can begin the task of determining whether the new products made available by the technology transition can be adequate substitutes for traditional telecommunications services.

A. Classical Microeconomic Model

The classic microeconomic model defines two products as substitutable if they serve the same purpose (two dishwashing liquids), if they are "functionally equivalent" (that is they both clean dishes), or if they can be used to perform the same task (washing dishes). Substitutes may be "perfect" (exactly the same in all aspects) or "imperfect," but acceptable, capable of performing the same task but different in certain aspects, such as quality or price.

Classical microeconomic literature defines substitutable products based on a consumer's behavior when faced with a choice between or among equivalent offers.

> Substitute goods are goods that can be used in activities aimed to satisfy the same needs, one in the place of another. The buyer carries out an actual and conscious process of choice about them, which leads the buyer to prefer one to another.[12]

The microeconomic model described here suggests that any product may be substituted for any other based on consumer behavior. It assumes that a rational consumer is able to make the decision of which product to choose based on her/his own understanding of the product and her/his innate ability to determine which choice will be better. This model thus turns on the assumption that an informed consumer can judge the difference between two products on his/her own, without outside support. In this model, rational consumers

> Actively analyze, judge, and compare [the] (material and immaterial) properties of goods so to establish whether they can satisfy their needs, how well this can happen, and with what side-effects (positive and negative). They take into account time limitation and affordability.[13]

Applied to the technology transition, microeconomic theory would suggest that consumer choice is an accurate way of determining whether one product can substitute for another, assuming, of course, that the consumer clearly understands and evaluates the dimensions of each product. In real life, however, the sheer number of choices and the way they are presented (i.e., product bundles) makes this analysis difficult (if not impossible).

> A commercial catalogue of products can contain several sets of substitute goods, with the consumer induced to make comparison according to the information inside. There are limits of the number of pages or to the time the person [has] available to spend in such comparison.[14]

Of course, not all products are identical substitutes and not all consumers have the time or initiative to compare them and select the one most suited to the task at hand. To solve this problem in the real world, consumers look to both the provider of the products offered and objective outside sources (for example the State commission) to help them make the substitutability analysis.

B. Demand Substitution

The classical microeconomic model speaks to a universe with an unlimited supply of identical products offered at the same price. In real life, however, choice is generally limited by the availability of competitive offerings and the price differential among them. This is particularly true in telecommunications, where some markets have a variety of competitive offers and others have only a few.

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[12] Piana, Valentino, Substitute Goods, Economics Web Institute, 2005, available at http://www.economicswebinstitute.org/glossary/substitute.htm

[13] Piana

[14] Piana

> A substitute good . . . is a good with a positive cross elasticity of demand. This means a good's demand is increased when the price of another good is increased. Conversely, the demand for a good is decreased when the price of another good is decreased.[15]

Demand substitution turns on the behavior of consumers to choose among similar (but not necessarily identical products) based on price and availability. For the

> Rational consumer, substitution is limited to a small set of goods which are carefully compared, usually not only in terms of prices and quantities, but even more importantly in terms of quality and time.[16]

Of course, the definition of a "rational consumer" may vary depending on the consumer's knowledge of the product choices, her willingness to select one product over another, and the way the replacement products are portrayed in the marketplace, to name just a few. Consumers may be "seduced" into selecting one product over another for a variety of reasons, including the information provided by competing suppliers, the consumer's overall knowledge of the product and its features, and other behavioral characteristics. For this reason, consumers may need a "certified guide" to determine when one product is truly "substitutable" for another. State commissions may play this role in the technology transition.

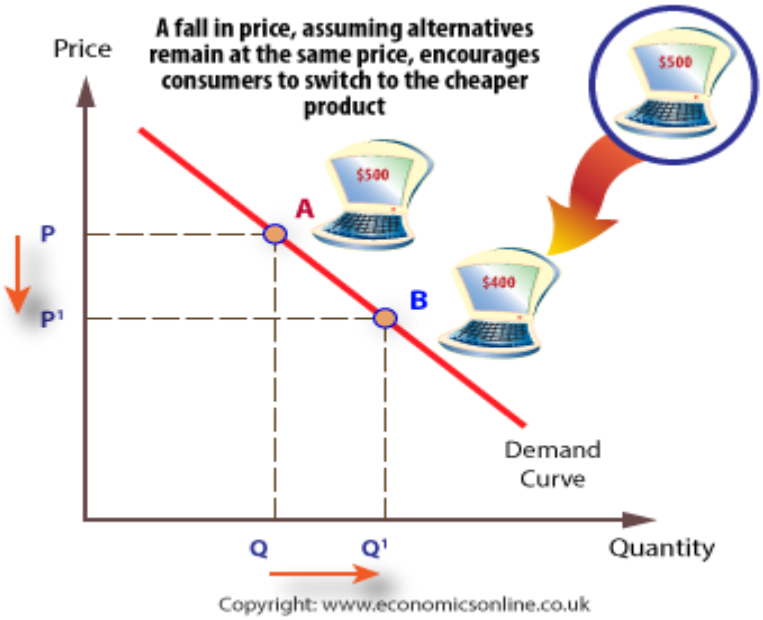
The demand theory postulates that other things being held constant, the lower the price of a good (or service), the greater the quantity of it that will be demanded by purchasers at any given time.[17] Figure 1 shows the relationship between price and consumer purchases.

[15] Wikipedia, Demand Substitution definition, available at https://en.wikipedia.org/wiki/Substitute_good

[16] Piana, p.9

[17] Johnson, Paul M., A Glossary of Political Economy Terms, Auburn University, 2005, available at www.auburn.edu/~johnspm/gloss/substitute_goods

Figure 1: Price influences demand[18]



As this figure shows, consumers who perceive products as similar enough to substitute for each other will generally choose the lower priced equivalent.

> This kind of relationship occurs when the two kinds of goods can be consumed or used in place of each other in **at least some of their common uses**. (Of course, substitutability of one for the other is a matter of degree, ranging from almost perfect interchangeability to only partial interchangeability.) The relative cost of using one good versus its substitute[s] is apt to play a major role in determining which one each user chooses to purchase.[18]

When the price of the substitute good rises, consumers will switch back to their first choice product, and the cycle will start over again. Thus,

> Demand substitution constitutes the most immediate and effective disciplinary force on the suppliers of a given product, in particular in relation to their pricing decisions.[19]

As applied to telecommunications product substitution, demand substitution is one of the key economic forces driving the technology transition.[20] That is, the difference in end user

[18] Id. Emphasis added

[19] Organization for Economic Co-Operation and Development, Defining the Relevant Market in Telecommunications, 2014, available at http://www.oecd.org/competition/defining-relevant-market-in-telecommunications.htm

prices between VoIP products and traditional service or between wireless and wired services, as well as the difference in cost to the supplier, appears to be a significant reason for the shift away from these traditional services and to new offers. In this case, the "technology transition" may simply be catching up with consumer behavior.[21] The difference here, however, is that telecommunications users may not be able to return to their initial product choice once it has been removed from the marketplace.

Traditionally, product substitution has been examined in the context of mergers. If two companies merge, will they have enough market power to drive substitute products out of the marketplace, raise prices, and create a monopoly? Will the availability of substitute products provide consumers with the ability to move between products as prices move and thus guard against price gouging?

The DOJ Horizontal Merger Guidelines focus on demand substitution as a method for determining whether a merger poses a potential risk of monopoly. The key requirements for examining the effect of a merger on price and availability are identifying the relevant market and determining whether there are sufficient substitutable products to protect consumers from unreasonable price changes.

> Markets are most commonly defined on the basis of the 'hypothetical monopoly' test, also known as the SSNIP test, which is well established in antitrust practice. The objective of this exercise is to define the smallest possible markets both in the product and geographic dimension, whereby a hypothetical monopolist could profitably and permanently raise the price of the products by 5 to 10 per cent above the competitive level. Loosely, a market defined by such a methodology is "something worth monopolizing," and therefore high market shares within such a market might imply the ability to exercise market power. The relevant market includes all those products which the consumer regards as sufficiently interchangeable or substitutable to prevent such a price rise. To empirically test whether identified products impose significant price constraints, economists examine cross-price elasticities and diversion ratios.[22]

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[20] The economics of the new technologies obviously apply to both consumers and providers. As the price of the IP infrastructure diminishes in relationship to the price of circuit switching, carriers will increasingly encourage customers to switch to the new product. At the same time, customers will choose to move to the substitute based on differences in price and functionality. It should be noted, however, that some commentators fear that substitution will result in higher prices. See AARP reply comments, Copper Retirement NPRM WC 15-25.

[21] The price difference among these services may be attributed to bundling or to the lower surcharges on the non-traditional services. This difference may disappear as the FCC addresses the USF contribution model.

[22] OECD, Defining the Relevant Market in Telecommunications, 2014, available at http://www.oecd.org/competition/defining-relevant-market-in-telecommunications.htm

This same process can be used to determine the effects of withdrawing a product from the market.

C. Functional substitution

Products do not have to be identical to be adequate substitutes for each other. They may be "functionally equivalent;" that is, they may be "different from another object, but can perform the same functions."[23] For example, water and iced tea can be said to be "functionally equivalent," since both may be used to quench thirst, despite the difference in their ingredients. They have the same function but do not contain the same ingredients and may be metabolized differently, but end users who substitute one for the other, perceive them as functionally the same.

Similarly, circuit switched telecommunications (i.e., traditional POTS lines) and interconnected VoIP telecommunications perform the same function and so may be functional substitutes for each other. Both services provide voice communications between two parties on a fixed line basis. Both use the customer's existing telephone to provide this service, although the VoIP product also requires a connection to a broadband network. Thus, there are differences in technology, but not necessarily in functionality, a similarity borne out by customer adoption.

Fixed wireless products may offer similar functionality and so may serve as functional substitutes for traditional telecommunications services under certain circumstances. Again, it depends on the way in which the "voice communications" function is defined (and, in many cases, who develops the definition)**.** This makes defining and measuring the function(s) to be provided by the substitute product a key task for both regulators and companies.

The FCC definition of functional equivalence as it applies to telecommunications relay service (TRS) provides a good baseline for understanding functional equivalence.

> Telecommunications relay services (TRS) [are] telephone transmission services that provide the ability for an individual who has a hearing or speech disability to engage in communication by wire or radio with a hearing **individual in a manner that is functionally equivalent** to the ability of an individual who does not have a hearing or speech disability to communicate using voice communication services by wire or radio…[24]

Functional equivalency means that two products perform the same functions, even if they do so in a different way.

> This means, what a hearing person has, we as deaf and hard-of-hearing people are entitled to the same thing. Like, picking up the phone, a hearing person gets dial

[23] Watson, Clifton, What is Functionally Equivalent, eHow, available at http://www.ehow.com/info_8765138_functionally-equivalent.html?utm_source=eHowDesktopShare%26utm_medium=email

[24] 47 C.F.R. § 64.601, paragraph 15

> tone. For us, when we "pick up the phone" by dialing, we get an agent. A hearing person does not have to wait for dial tone. We should not wait too long for a dial tone. The FCC has rules saying that 20 seconds should be the maximum wait time for a call to be answered by the agent.[25]

Thus, the key to determining whether one product can be a functional substitute for another is defining the aspects of the two products to be compared. We examine some recent technology transitions below. We discuss a methodology for defining the functional substitutes in Part IV.

III. Technology transitions and product substitution

The question of how to define substitutable products in the context of the technology transition is not new. Networks have undergone many changes over time – from the transition from the manual cord board to mechanical (and then electronic) switching to the transition from analog service to digital service in both the fixed and wireless networks. Each change has required customer adjustments, often including the need to purchase replacement customer premises equipment.

Most recently, the transition from analog to digital television (the DTV transition) has required providers, customers, and regulators to address the question of the functional equivalency of new products and their price, quality, and availability compared to the old. In each case, an old product has been discontinued in favor of a new product, requiring users, regulators, and providers to identify and examine the attributes of functional substitution.

We discuss these transitions briefly below in order to put the technology transition into context with other network changes.

A. Analog to Digital Switching in the PSTN

The telephone network was originally composed of a series of manual circuits that allowed operators to connect calls from one subscriber to another. In the network's earliest incarnation, this was done using cord boards that allowed the operator to manually create a connection (circuit) between one location and another. If two calls were carried by the same switch, only a single operator was necessary; if the customer was making a call to a location outside the local exchange, the first operator connected the call to a "trunk" circuit between the two locations, and the second operator connected the call to the end party.

Manual call connection gave way to automatic call connection with the invention of the first mechanical switch in 1889, and customers were required to change their behavior to accept the new technology.

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[25] Dr. Z and You, What is meant by the term "functionally equivalent" as defined by the FCC, available at http://www.drzvrs.com/2009/07/what-is-meant-by-the-term-functionally-equivalent-as-defined-by-the-fcc/

> In the Strowger switch, pulses generated at a subscriber's telephone directly moved electromagnetic contacts in a two-way motion in a stack of rotary contacts, thus selecting a telephone number, one digit at a time, without operator intervention.[26]

The mechanical switch gave way to the electronic switch in 1916, when AT&T (then the Bell System) began to install the first of its electronic panel switches in its local exchanges. A key part of this transition was ensuring that the change was as transparent as possible to end users.

> The change to fully-automatic urban switching was made possible with a plan devised in 1916 by AT&T engineer W. G. Blauvelt. It allowed the transition to automatic dialing to take place without requiring every subscriber to get a new telephone number in addition to getting a new telephone with a dial. Blauvelt simply added letters to the numbers on the dial. Telephone numbers in large cities, such as New York, consisted of the exchange name and a 4-digit number. So instead of asking the operator for Pennsylvania 5000, the subscriber would dial PEN 5000. This also eased the connection between automatic and manual telephone exchanges, since the dialer could dial the entire number, and an operator could receive the number and know the manual exchange to which it should be forwarded.[27]

The public switched network initially carried calls in analog format but began to move to digital switching in 1976 as new network architecture was deployed. This "behind the scenes" transition provided the initial infrastructure for the current technology transition.

Figure 2 below shows the key milestones in the transition of the public switched telephone network over time.

[26] ETHW, Electromechanical Telephone Switching, available at http://ethw.org/Electromechanical_Telephone-Switching

[27] Id.

Figure 2: Key changes to the PSTN

Figure 2. Key changes to the PSTN

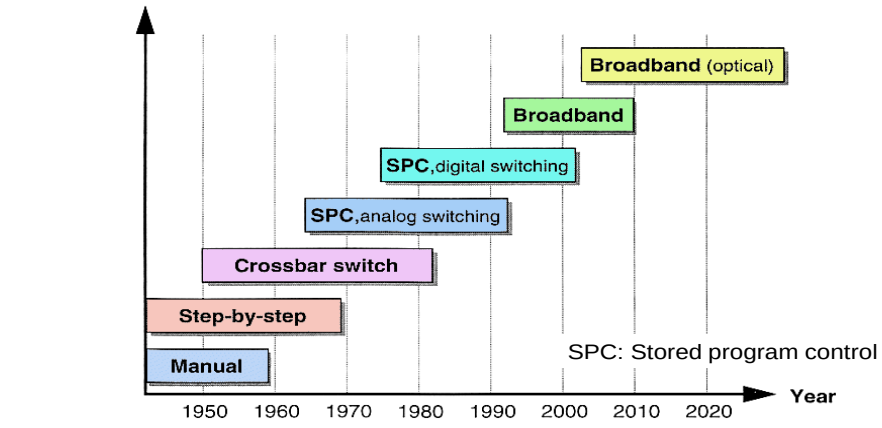

Diagram from Public Switched Network , UT Comms Lab., Timo O. Korhonen

The transition of the public switched network continues with the transition to IP technology. The need to ensure a seamless transition with as little customer disruption as possible should continue to be a key goal.

B. Cellular Service: The Analog to Digital Conversion

The wireless voice network underwent a similar analog to digital transition beginning in 2000. The change brought consumers the ability to use wireless data services increased service quality, and ultimately resulted in today's robust wireless network. Like today's technology transition, however, it also required customers to participate in the change and raised concerns about the impacts of the new technology on both end users and other service providers.

> As of midnight on February 18, 2008, cellular telephone companies were no longer required to provide analog service. While most wireless telephone users [were not] affected by this transition (often called the "analog cellular sunset"), [others] were. In addition, the transition could affect some alarm systems and some users of OnStar in-vehicle communications service.[28]

Because existing analog handsets were not compatible with the new digital wireless network, customers were required to actively participate in the transition by trading their analog handsets for digital ones. The notification period for this change was lengthy, based in large part

[28] See, Cellular Back Door, The End of Analog Cellular, available at http://www.cellularbackdoor.com/analog.shtml. Although most analog cellular systems were shut down at the end of the transition period, others continued to operate until all equipment was replaced. This is similar to the rolling transition taking place in the TDM network.

on the need for customers, particularly those with hearing impairments and other special needs to obtain new equipment. The FCC managed the transition to ensure that consumers were protected and not left without service due to the change.

> While the Commission concluded that the original goals of the analog requirement had been largely accomplished, it set out a transition period because it recognized that certain consumers, specifically persons with hearing disabilities and consumers that exclusively use their phones to access 911 emergency services, might not have readily available alternatives to analog service, and would be unduly affected by the immediate elimination of the analog requirement. In order to monitor the development of hearing aid-compatible devices, and to ensure that wireless services are continuing to be made available to persons with hearing disabilities as well as 911-only consumers, the Commission required nationwide cellular carriers to file reports in February 2006 and February 2007.[29]

Because this transition was similar in scope to the current transition from circuit switched to IP and wireless services, it may provide guidance in managing such a change.

The key aspects of the cellular transition were identifying functionally equivalent products (substitute goods), including those that met the needs of special populations such as the hearing impaired, notifying customers that the change was imminent, and working with carriers to ensure the availability of products to ensure a smooth transition. Indeed, the FCC requirements for the transition were strikingly similar to those proposed for the current technology transition, as were the concerns raised by carriers and others, including the manufacturers of alarm systems.[30]

Like the discussion surrounding the potential shutdown of the PSTN in favor of IP and wireless based services, the requirements for the cellular transition focused on customer awareness, notification, service continuity, and the availability of equipment that met customer needs. Interestingly, as in the current technology transition, the final requirements for product development and availability came only after customers had already begun the migration to digital wireless service.

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[29] Id. Cellular Backdoor

[30] A number of different industries raised concerns about the transition, particularly in terms of the requirement that they change their equipment to interface with the new network. Alarm companies raised strong concerns about the cellular transition, as they have with the Technology Transition. These companies requested delays in the cellular transition to allow them time to develop equipment that would support the new networks. See Alarm Industry Communications Committee (AICC), Comments Technology Transitions NPRM, available at apps.fcc.gov/ecfs/. "When a carrier seeks to discontinue TDM-based service and replace it with an IP-based service or a wireless service in an entire exchange or service area, which could impact a large number of alarm customers, a longer notification period is necessary for the alarm company to make all of the premise visits that may be necessary and to acquire any new alarm equipment that may be needed."

> We require all cellular licensees to notify any remaining analog service subscribers of the analog sunset. At a minimum, licensees must notify each analog-only subscriber of their intention to discontinue analog service before such discontinuance (by a billing insert, for example). In addition, we seek to reduce the financial, administrative, and technical burdens that would be associated with filing a revised Cellular Geographic Service Area (CGSA) determination when a carrier decommissions analog service, while also ensuring that consumers will be afforded comparable digital service.[31]

The success of the analog to digital cellular transition provides an example of the importance of defining functionally equivalent products, meeting customer needs, and ensuring that customers understand the requirements of the transition. The transition from analog to digital television illustrates a similar process. We review the DTV transition briefly below.

C. DTV Transition

Like the cellular transition, the change from analog to digital television required consumers using traditional over-the-air television infrastructure to purchase new equipment to receive digital television signals.[32] Unlike both the cellular transition and the current transition from TDM service to IP-enabled and wireless products, however, the DTV transition was a "flash cut," where the old network was shut down on a certain date, leaving consumers who had not made the transition unable to watch broadcast television.[33] Because of the significant impact on customers, the DTV transition provides an example of the need for customer outreach and education in technology transitions, including identifying functional substitutes for existing products and services.

The timeline for the DTV transition stretched over nearly 13 years, from the passage of the 1996 Act, which mandated a transition on December 31, 2006, to the actual cutover in 2009. The primary reasons for the delay were the need to develop new equipment that could accept the digital broadcast signals and the need to notify users and prepare them for the transition. In anticipation of customer issues, including the need to purchase new television sets, equipment manufacturers provided "converter boxes" to allow analog sets to receive digital signals. To further ensure customer acceptance of the transition, the government provided financial support for customers purchasing digital converter boxes.

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[31] In the Matter of the Sunset of the Cellular Radiotelephone Service Analog Service Requirement and Related Matters, RM No. 11355, May 25, 2007

[32] Although cable systems ultimately transitioned to digital signals, their subscribers continued to receive television signals using their existing equipment.

[33] The Technology Transition may ultimately result in a "flash cut" as the copper network is retired and all services are moved to IP-based infrastructure, but unlike the DTV and cellular transitions, current statistics show that few customers will be left behind.

Because the development and notification process was complex, the transition was pushed out an additional 3 years (to June 2009) to ensure that customers were adequately prepared.

> On June 12, 2009 . . . all U.S. based television signals [began to be] transmitted digitally. The great majority of U.S. households (97.5%) were prepared for the digital transition in the week prior to the power turn-off. . . Most homes acquired a digital converter box to make their television ready for the change. . . With super sharp high-definition programming and the ability to show multiple standard definition digital programs simultaneously, digital programming offer[ed] many advantages over analog television for viewing broadcast TV.[34]

The success of the DTV transition was due in large part to the outreach to consumers to ensure that they both understood and were prepared for the change. Consumers need to be aware of the change and of the benefits it will bring. As US Telecom points out in its comments on the Technology Transition NPRM,

> Even where [some] functionality or some features are lost, technology transitions will result in net gains because of the new features and applications that will be possible. Just as digital TV opened up an unprecedented level of quality and options for video consumers, modern networks and services have connected more Americans to the services and content of their choice, bringing new and improved communications services to the marketplace.[35]

The key issue in managing the success of this transition is defining functional substitutes for the traditional products that will be withdrawn from the market and reaching out to customers to ensure that they understand and are prepared for the change. We discuss this issue in Part IV, below.

IV. Developing a framework for assessing product substitution

There is no question that over the long term, the network will transition from the current circuit switched technology to a primarily IP and wireless infrastructure. The Technology Transition is moving forward rapidly as a result of both industry and customer decisions. As the transition continues, however, it is important to keep in mind that the underlying question is not simply about turning off the telephone network as we know it today, in favor of some new, only partially tested infrastructure. Rather, the transition is about opening the network to a series of new technologies that may work differently than the existing circuit switched TDM

[34] Neilson News, The Switch from Analog to Digital TV, Media and Entertainment, 11-2-09, available at http://www.nielsen.com/us/en/insights/news/2009/the-switch-from-analog-to-digital-tv.html

[35] US Telecom Association, Comments, In the Matter of the Technology Transitions, GN Docket No. 13-5, RM-11358, WC Docket No. 05-25, RM-10593, FCC 15-97 (rel. Aug. 7, 2015) (Further Notice) (Technology Transitions NPRM), available at http://ustelecom.org/news/filings?page=8&imz_ed=www.ustelecom.org

infrastructure but will still provide the connectivity, reliability, and access to emergency services provided by today's PSTN. What is important is identifying the key attributes of the new services and then testing them against the new products to ensure that key attributes are not left behind. This will be particularly important as customers begin to rely on broadband networks to provide both voice and data connectivity, sometimes through over-the-top third party applications.

As the technology transition moves forward, industry is developing new communications products to support a more technologically demanding population. Customers are dropping their traditional TDM service to move to these new technologies based on price and functionality.

> Government data indicate that by the end of 2013; only 27 percent of U.S. households opted for legacy voice service from a traditional provider and trends indicate that this figure had fallen to 16 percent by the end of 2015. Approximately half of U.S. households will have "cut the cord" and gone wireless-only for voice service by the end of 2015, and among the remaining households using landlines, almost two-thirds will have moved from a legacy to a VoIP service. [36]

At the same time, some customers are choosing not to participate in the transition for a number of reasons, including the fear of change, concerns about connectivity with other networks and devices, questions about the reliability of the new networks, special needs that cannot yet be met by the IP or wireless based products available in their areas, or simply inertia. While this number appears to be dwindling, customers without a viable alternative to their existing service will require special attention and care. It is in resolving these questions that state regulators will have the most impact.

As the transition accelerates, state regulators will face the increasingly important task of identifying functional substitutes for existing services, including standalone voice services, and protecting those who cannot or will not make the transition. This need will increase as broadband penetration grows, offering customers the ability to choose new product bundles, including voice service offered over the top of the customers' broadband connection. What will be most difficult is determining which (if any) traditional services must be maintained or whether the new services made possible by the technology transition provide functionally adequate substitutes for traditional wireline connectivity.

This section of the paper provides models regulators may use to assess the availability of functional substitutes for the traditional telecommunications services that will be phased out as part of the Technology Transition. These models include the criteria for identifying functional substitutes laid out by the FCC in the Copper Retirement NPRM, and customer adoption as a key indicator of functional substitutability. This section also reviews a potential model for defining functional substitutes based on the Food and Drug Administration (FDA) process for evaluating and approving generic and "biosimilar" drugs as substitutes for existing products.

[36] Id. US Telecom Technology Transition comments

A. Defining functional equivalency

The American Heritage dictionary defines the term "equivalent" as "being essentially equal;" that is, "having the same capability, quantity, or effect as another."[37] Based on this definition, we can judge whether a product is "functionally equivalent" by determining whether it performs the same task as the product for which it is substituting, even though it may perform this task in a somewhat different way and perhaps with somewhat different qualities.

Functionally equivalent products may be substituted for each other in terms of their use. Customers who cannot obtain Product A to perform a task may substitute Product B to perform the same function. The customer may do this because the price of product A rises, because Product A becomes unavailable, or because Product B offers increased functionality. Traditionally, customers may return to Product A when its price is reduced or when it again becomes available.

As we noted earlier, in economic terms, functional equivalence depends on a product or service's use, availability, and, perhaps most importantly, on customer behavior. Customers may be the ultimate definers of functional equivalency. The "customer perception test" is a key dimension of substitutability. If customers switch to a new product, they do so because in their mind it is "functionally equivalent" to the old product. If customers do not switch to the new product, they may not perceive it as "functionally equivalent" for their particular need, even if it has the same characteristics as the original. If customers do switch, they have made the decision that the new product is functionally equivalent to the old. If they do not switch, they see something in the old product that is missing from the new, a limitation that makes the new product a less than acceptable equivalent to the old. Understanding the behavior of customers who do not switch when faced with the opportunity to transition to a new product or service is thus a key indicator of functional equivalency.[38]

For example, a fountain pen and a ballpoint pen may be said to be functionally equivalent, since both can be used to sign documents. They are not identical but depend on different technologies to perform the same function. The fountain pen uses liquid ink drawn up into its barrel, while the ballpoint pen uses ink in a cartridge. They are functionally equivalent products, because they provide the same end result – a signature. If fountain pens become unavailable, the user will switch to a ballpoint pen. If the ballpoint pen provides additional functionality, perhaps the ability to write in different colors of ink, she may choose to continue to use it, even when the fountain pen again becomes available. If the customer refuses to switch to the new product, she does not perceive it as equivalent.

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[37] American Heritage Dictionary of the English Language, available at https://www.ahdictionary.com/word/search.html?q=equal&submit.x=45&submit.y=28

[38] Consumer groups and some customers cite the lack of line powered service and the need for customer-provided battery backup equipment as a limitation that makes IP-enabled products unequal substitutes for line-powered TDM service. The FCC has resolved this issue by requiring providers to inform customers of this limitation and offer them the ability to purchase battery backup equipment. See, Report and Order, In the Matter of Ensuring Continuity of 911, PS Docket No. 14-174, August 7, 2015, available at https://www.fcc.gov/document/ensuring-continuity-911-communications-report-and-order

This definition suggests that the entire category of writing instruments may be considered functionally equivalent, but are they? The key to determining whether a product is functionally equivalent is defining the dimensions of substitutability. In the case of the fountain pen, we could define a functionally equivalent product simply as a "writing instrument, capable of making marks on paper," a definition that could include a pencil, a crayon, or even a lipstick! But if the function of that product is to create a permanent signature, only a product that depends on indelible ink will be an adequate functional substitute.

Applying this concept to telecommunications, how can we identify which of the new services are equivalent to traditional service provided via a TDM connection (traditional circuit switched voice, POTS, and other basic telephone services)? Are TDM voice, interconnected VoIP (cable telephony, fiber to the home, fiber to the node, etc.), fixed or mobile wireless, or over the top voice "functionally equivalent" to each other, because they perform the same function, or must they meet other criteria? Which criteria are most important and how should state regulators apply them?

To assist in answering these questions, the following section reviews potential models for functional equivalency. Defining the dimensions of functional equivalency is the first task for stakeholders in the technology transition process. Clear definitions will help customers identify and obtain equivalent services.

B. Models for Examining Functional Equivalency

1. The FCC test

As they begin to discontinue TDM products and transition customers to new IP and wireless-based services, incumbent providers will need to follow the Telecommunication Act's Section 214 service discontinuance process to identify functional substitutes (or determine that no substitute is required in cases where the product is no longer used) for their existing services. AT&T has issued its initial requests for Section 214 approval for a limited set of products in its technology trial locations in Alabama and Florida. They have made this request where there is no or only a limited customer base.[39]

The existing Section 214 process requires carriers to provide notification of product discontinuance to the FCC, State commissions, competitive carriers, and customers. As in Carbon Hill, this process has generally been applied on a case by case/product by product basis and has been used primarily in cases where customers have already made the transition to new technology.

As the technology transition accelerates, the phase out of older products, including residential TDM-based wireline service, will also pick up speed. This has led the FCC, State commissions, and consumer advocates to consider ways to identify substitute products that meet the needs of the customers transitioning to these new networks. The FCC requested comment on

[39] AT&T, Section 63.71 Application of Bellsouth Telecommunications, LLC/DBA AT&T Southeast to Discontinue the Provision of Services under Section 214 of the Telecommunications Act of 1934, available at http://apps.fcc.gov/ecfs/document/view?id=60001333515

the criteria to be used to identify functional substitutes and approve the discontinuance of existing products in a Notice of Proposed Rulemaking (NPRM), issued in August 2-15.[40] The NPRM seeks comment on "what constitutes an adequate substitute for the retail service being discontinued, reduced, or impaired." [41] The NPRM would create a new process for approving product discontinuance based on the availability of functional substitutes for the product to be discontinued. The substitute products may be from the carrier's own product line or could be "created" by combining the new products offered by the carrier with products available from third party suppliers, for example, apps offered by outside vendors or wireless service providers.[42]

The NPRM proposes eight areas to consider in determining whether an existing retail product (for example, residential TDM voice) may be discontinued in favor of a functionally equivalent service.

> A carrier seeking to discontinue an existing retail service in favor of a retail service based on a newer technology must demonstrate that any substitute service offered by the carrier or alternative services available from other providers in the affected service area meet the following criteria in order for the section 214 application to be eligible for an automatic grant pursuant to section 63.71(d) of the Commission's rules: (1) network capacity and reliability; (2) service quality; (3) device and service interoperability, including interoperability with vital third-party services (through existing or new devices); (4) service for individuals with disabilities, including compatibility with assistive technologies; (5) PSAP and 9-1-1 service; (6) cybersecurity; (7) service functionality; and (8) coverage.[43]

[40] Technology Transitions, Policies and Rules Governing Retirement of Copper Loops by Incumbent Local Exchange Carriers, Special Access for Price Cap Local Exchange, AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services, Report and Order, Order on Reconsideration, and Further Notice of Proposed Rulemaking, GN Docket No. 13-5, RM-11358, WC Docket No. 05-25, RM-10593, FCC 15-97 (rel. Aug. 7, 2015) (Further Notice) (Technology Transitions NPRM) (Copper Retirement NPRM) https://apps.fcc.gov/edocs_public/attachmatch/FCC-15-97A1.pdf. The NPRM does not specify exactly how the Commission will make the decision that a product actually is a functional substitute. Nor does it specify how it will handle on-going oversight of the replacement product.

[41] Id. ¶92

[42] Public Knowledge refers to these potential product combinations as "unicorns," although chimeras may be a better term. The availability of equivalent products from competing suppliers is a key point in state legislation reducing regulation. We discuss that point in Section B.2, below.

[43] Id, p.109 Carriers seeking approval to discontinue products that do not meet the criteria would still be able to discontinue products but would not be able to do so on a streamlined basis.

These proposed criteria focus on ensuring that new services provide a functional equivalent to the services currently provided by traditional wireline products, particularly in terms of end-user requirements.[44]

In addition to direct product/service replacement by the incumbent carrier, the NPRM contemplates a scenario where providers point to other products available in the marketplace as functional substitutes for the service being discontinued.[45] The NPRM would make the ILEC responsible for ensuring that the third party product met the criteria established as a guide for functional substitution. The FCC suggests that these "third party offers" may fulfill all or part of the requirements for substitutability, suggesting that customers might buy two IP or wireless based products to replace a single TDM product. For example, a customer might buy a broadband enabled product that does not provide battery backup and then use their cell phone in case of emergencies.

As expected, commentary on the NPRM has been mixed. The incumbent LECs have expressed concerns that the FCC criteria are unnecessary, because the current Section 214 process is working successfully. They believe that establishing new criteria for determining whether a substitute product is functionally equivalent to the service to be discontinued will merely serve to delay the transition; not ensure that end users have access to functional substitutes. The incumbent carriers state that a key flaw in the proposed criteria is the requirement for "backwards compatibility" with products like fax machines and calling cards that are no longer used or are used only occasionally. Finally, the incumbent carriers complain that the proposed discontinuance process is targeted solely at them and does not include service discontinuances proposed by their competitors.

> Remarkably, the premise from which all of them proceed is the patently absurd notion that ILECs, which are the only service providers that will be subject to the new standards, retain bottleneck control over communication services, and thus Commission micromanagement of their transition from TDM to IP services is necessary to protect consumers and public safety, preserve universal service, promote competition. . . The criteria and other requirements proposed by the Commission and its supporters will impose a host of new and onerous regulatory

[44] The FCC criteria are based in large part on the eight criteria suggested by Public Knowledge. Letter from Harold Feld et al., Public Knowledge, to Tom Wheeler, Chairman, FCC, GN Docket 12-353, available at www.fcc.gov; See also, Lichtenberg, Sherry, Ph.D., Examining the Role of State Regulators as Telecommunications Oversight is Reduced, National Regulatory Research Institute, August 2015, available at www.nrri.org.

[45] The NPRM does not discuss what happens should these alternate providers decide to discontinue their service as well. It is unclear, for example, whether cable companies providing IP service must request Section 214 approval to discontinue their products.

> requirements that only ILECs must meet before they can replace legacy TDM with IP-based services.[46]

Comments from industry also point to the fact that the process of replacing old products with new ones is not something that has happened simply as a result of the technology transition. Old products (for example, dot matrix printers) are discontinued as new products (laser printers) become more universally available. Support for the old product disappears as the new product achieves a greater market share. For this reason, carriers like AT&T challenge the "backward looking" nature of the criteria and suggest that the requirements listed in the NPRM will slow the pace of broadband deployment and adoption.

> The criteria and other requirements proposed by the Commission and its supporters will impose a host of new and onerous regulatory requirements that only ILECs must meet before they can replace legacy TDM with IP-based services. These requirements will impose significant costs and delays on ILECs as they complete the transition from TDM to IP, hindering their incentive and ability to expand deployment of broadband networks and services.[47]

Verizon's comments are similar.

> Rather than add new requirements or expand the Section 214 process, the Commission should look for ways to further streamline the transition . . . The Commission should automatically grant Section 214 applications which involve outdated, legacy services when discontinuing the service will not terminate the end user's ability to call 9-1-1. Similarly, the Commission should find that the VoIP, wireless, or over-the-top based services that customers today subscribe to, whether carried over fiber, wireless, or cable technology, are an adequate substitute for traditional telephone service.[48]

Finally, CenturyLink points out that the new rules could slow rather than speed up the technology transition, leaving those with traditional TDM services with a "technology deficit," unable to take advantage of the new features and functions made possible by IP technology.

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[46] AT&T Reply Comments, p.2. CLECs must also provide notice of product discontinuance or market exit, but there is currently no requirement that IP- based providers, such as cable companies, provide notice.

[47] See AT&T Reply Comments, p.3 AT&T's comments point out the tension between the push for broadband adoption and the requirement that products offered using that new technology mimic existing services.

[48] Verizon, Reply Comments, In the Matter of the Technology Transitions Policy Task Force, Policies and Rules Governing Retirement of Copper Loops by Incumbent Local Exchange Carriers, 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, GN Docket 13-5, WC Docket 05-25, 11/25/15

> With [their] declining share of the market [as customers move to new technologies], it would be impossible for ILECs to pass on the costs of complying with these new, unilateral regulatory requirements. Faced with these additional costs of decommissioning legacy services and the infrastructure used to provide them, ILECs will inevitably decelerate their technology transition plans despite the financial drag of maintaining duplicative and underutilized facilities and services. These new regulatory requirements would also serve little purpose, as they would apply to, at most, a quarter of the market. As aptly noted by AT&T, if a requirement is truly necessary to protect an "enduring" value, it should apply to all competitors.[49]

On the other side of the equation, CLECs, consumer groups and the State commissions filing comments in the proceeding support the FCC's proposal to require substitute products to meet the eight criteria proposed by the NPRM. They argue that these criteria are critical to ensuring that all end users have access to services that are comparable to existing services and will meet the needs of users that depend on these features, particularly those in rural and insular areas and those with disabilities.

For example, Granite points to the need for replacement products to provide functionality equivalent to that used by customers today, including functions provided by products ordered under commercial agreements.

> [The FCC's] assessment of functional equivalency should include not only functions relating to voice calls (e.g., the ability to use caller ID, call hunting, message waiting), but also the ILEC replacement service's compatibility with non-call functionality of third-party CPE and services that communities expect and rely upon to support home or business security and fire alarm systems, elevator alarm systems, fax machines, medical alert monitors, broadband (e.g., DSL, Ethernet over Copper), credit card processing, point of sale systems, and other functions currently supported by the PSTN.[50]

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[49] Reply comments of CenturyLink, available at http://apps.fcc.gov/ecfs/document/view?id=60001344167

[50] Granite also uses this opportunity to recommend that the FCC codify a requirement that ILECs provide commercial agreements for products such as AT&T's Local Wholesale Complete at prices equivalent to what CLECs pay today. See Granite Telecommunications, LLC, Comments, In the Matter of Technology Transitions, Policies and Rules Governing Retirement of Copper Loops by Incumbent Local Exchange Carriers, Special Access for Price Cap Local Exchange, AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services, Report and Order, Order on Reconsideration, and Further Notice of Proposed Rulemaking, GN Docket No. 13-5, RM-11358, WC Docket No. 05-25, RM-10593, FCC 15-97 (rel. Aug. 7, 2015) (Further Notice) (Technology Transitions NPRM) (Copper Retirement NPRM)

Network and product reliability are key concerns for these commenters, particularly as they affect the possible certification of wireless as the functional equivalent of wired service.[51]

> Public Knowledge fully supports the evaluation of wireless as a potential adequate replacement service under 214, so long as it is done in a technologically neutral manner, using the same criteria as those used to evaluate wireline services. However, the current state of wireless services indicates that this is, at best, a hypothetical future development; current CMRS services fall far short of the technical reliability needed to adequately replace TDM service. Existing CMRS services are currently unable to fulfill the standard of reliability and consistency required for [a Section] 214 discontinuance due to their wide variation in availability and . . . geographic and atmospheric factors.[52]

In their comments, the Joint States[53] suggest that products deemed "functionally equivalent" to the TDM products being phased out must meet the needs of all customers who will be affected by the transition, particularly those located in areas without competition or who have limited competitive choices. The states share the concern of consumer-focused organizations like AARP and Public Knowledge that some end users will be unable to afford new products sold as part of a bundle rather as standalone basic local service or may have to "settle" for what they perceive as less functional fixed wireless technology.

The Joint States urge the FCC to include affordability as a measure of functional equivalency.[54]

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[51] The potential that customers will be "relegated" to fixed wireless has been a subtext in much of the transition discussion. Despite Verizon and AT&T's statements that customers are fully informed of the limitations of fixed wireless service, there appears to be a strong concern that some users will be "forced" to accept what consumer groups such as AARP feel is a "substandard" product.

[52] Comments of Public Knowledge, et. al.Technology Transitions, Policies and Rules Governing Retirement of Copper Loops by Incumbent Local Exchange Carriers, Special Access for Price Cap Local Exchange, AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services, Report and Order, Order on Reconsideration, and Further Notice of Proposed Rulemaking, GN Docket No. 13-5, RM-11358, WC Docket No. 05-25, RM-10593, FCC 15-97 (rel. Aug. 7, 2015) (Further Notice) (Technology Transitions NPRM) (Copper Retirement NPRM) , November 24, 2015, available at https://prodnet.www.neca.org/publicationsdocs/wwpdf/112515pk.pdf

[53] The Joint States include Michigan, Minnesota, Nebraska, Pennsylvania, and Washington.

[54] The FCC did not include affordability in its eight criteria, since price has not traditionally been a part of the Section 214 service discontinuance process. "We tentatively conclude that we should not adopt . . . affordability, because the evaluation process in this context should focus on the nature of the service and because cost is not part of the equation in determining whether an available alternative service constitutes an adequate substitute for the service sought to be discontinued . . ." Copper Retirement Order ¶234

> The Joint States believe that while establishing clear standards is important, it is essential that the criteria preserve fundamental features of the legacy service such as connection quality and persistence, 9-1-1 access service, and services for persons with disabilities. The transition should maintain consumers' access to reliable and affordable communications services and support those competitive services that rely on the underlying facilities.[55]

Most importantly, the Joint States point to the need for state by state transition reviews, rather than simply accepting a federally-defined one size fits all solution.

> Local considerations such as demographics and geography may necessitate referral to the states. For example, the comments of the California Public Utilities Commission (CPUC) underline the significance of state-specific carrier of last resort obligations (COLR) for the evaluation of such technology transitions. Local testing, proposed by the Michigan Public Service Commission, would serve to ensure the viability of the replacement service. [56]

In an interesting twist, Verizon appears to support this point in its comments, stating that, ultimately, despite any criteria established by the FCC, states with basic service and/or carrier of last resort requirements will be required to resolve questions regarding the phase out of traditional **local** exchange service products and the transition to IP.[57]

> The Commission's proposed criteria might be appropriate, at most, for a narrow group of Section 214 applications: those seeking to discontinue interstate voice services expressly in connection with the transition from TDM to IP or from wireline to wireless.[58]

We discuss the state response to the need to identify functional substitutes in Section V, State Product Substitution Initiatives.

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[55] Joint States, Reply Comments, available at https://prodnet.www.neca.org/publicationsdocs/wwpdf/112415state.pdf

[56] Id. p.3

[57] Verizon makes this same point in its Reply comments, "Of course, the Commission does not have the jurisdiction to apply Section 214 to . . . local voice, only to interstate telecommunications services. Verizon Reply Comments, fn 6. See, for example, the request of Sage Telecommunications to discontinue local service in Michigan. Sage Telecommunications, In the Matter of Sage Telecom Communications, LLC's Application to Discontinue Basic Local Exchange Service in Michigan, Case U-18004, available at https://efile.mpsc.state.mi.us/efile/viewcase.php?casenum=18004

[58] Id. p.4

2. Customer adoption

Defining functional substitutes requires gathering evidence to prove that the new products perform the same functions as the old. The process turns on questions such as, to what extent does the new product mimic the old? Must "old" functions be replicated entirely or do new services (for example direct text as a replacement for TTY service for the deaf and hearing impaired) provide equivalent or perhaps even better functionality? While the FCC's proposed eight point checklist will provide guidance in determining where and when a product may be discontinued in the context of a Section 214 application, it does not speak to a key aspect of functional equivalency--customer perception. Actual customer adoption of new products provides a real life touchstone for determining product equivalency. Customers will ultimately make the decision as to what products are equivalent to their current service.

As many in the industry have pointed out, the level to which customers adopt new products on their own, particularly where similarly priced traditional products remain available, provides

> Undisputed evidence . . . that consumers view interconnected VoIP and 3G/4G wireless voice services to be "reasonable substitute[s]" for traditional telephone service.[59]

The level of customer adoption of these new products provides evidence that customers see them as equivalent in functionality to the old, at least for those who have made or are making the transition.[60]

> Nearly [75%] of residential voice consumers have already migrated away from POTS ("Plain Old Telephone Service") service. Half of all adults under 35 now live in households without wireline phone service. With the advent of more "VoIP" non-telephony calling applications, the impact on businesses has been similar. Businesses need fewer trunks to their PBX since there are fewer calls. While the use of IP telephony and VoIP connections grew 17 percent from 29

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[59] CenturyLink comments, p.3, available at https://prodnet.www.neca.org/publicationsdocs/wwpdf/102715cl.pdf

[60] At this point in the transition, the customers moving to new products are doing so of their own volition. The satisfaction with new products may change as the remaining customers for traditional products are "forced" to migrate to new services. Commenters such as Public Knowledge, AARP, and CWA provide anecdotal evidence that at least some customers are displeased with their new service and want to migrate back to traditional copper wireline service. See District of Columbia Public Service Commission, Formal Case No. 1102, In The Matter of the Investigation Into the Continued Use of Verizon Washington, Dc, Inc.'s Copper Infrastructure to Provide Telecommunications Services, available at http://www.dcpsc.org/edocket/docketsheets.asp?chkTelco=on&cbofctype=all&CaseNumber=1102&ItemNumber=&orderno=&PartyFiling=&FilingType=&yr_filing=&Keywords=&FromDate=&ToDate=&toggle_text=Full+Text&show_result=Y&hdn_orderNumber=&hdn_chk_whole_search=&hdn_AssesmentType=

> million to 34 million, retail switched access lines decreased 8 percent, from 122 million to 112 million, between June 2010 and June 2011.[61]

Consumer advocates and others counter this evidence by pointing to specific functions that may not be available with the new products, including battery backup, support for special functions required for service to persons with disabilities, third party applications like third party billing, calling card services, some medical monitoring devices, and analog alarm services, to name just a few. According to these commenters, customer adoption must be reviewed by population type and location before it may be seen as an indicator of functional equivalency.

> The fact that a technology has found popularity among urban or suburban customers does not indicate that it serves as an adequate substitute for the unique needs of rural, low-income, or disabled individuals. [Regulators] cannot judge substitutability by permeation alone, despite the urgings of parties such as Verizon.[62]

As these commenters point out, one size does not fit all. Differing requirements for customers in different geographic locations points to the need for the states to determine whether products are "functionally equivalent" on a location specific basis before accepting them as a suitable substitute for customers under their jurisdiction.

3. Biosimilarity

The question of functional equivalency has become particularly important in pharmacology as companies develop generic drugs and products that are biologically similar to existing medicines but not absolute equivalents. The Food and Drug Administration (FDA) tests these products to ensure that they perform the same functions as the products for which they may substitute, despite differences in their chemical makeup or the way in which they perform their disease-fighting functions. The process developed by the FDA for judging whether these products are functionally equivalent to the products they mimic may offer guidance for states reviewing the availability of functionally equivalent products as part of the technology transition.

The FDA differentiates between products that are "identical," for example, generic drugs, and products that are "functionally equivalent," for example, biosimilar drugs. The way in which these definitions have been developed and the method by which products are placed into these categories are similar to the questions the States and the FCC are addressing in determining what products may be substituted for TDM service as part of the technology transition.

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[61] Taylor, Richard, Issues in the Transition of the U.S. PSTN From TDM To IP, Institute for Information Policy, The Pennsylvania State University, 8/7/13, available at www. academia.edu

[62] Public Knowledge Comments, 11/24/15, p, 4, available at https://prodnet.www.neca.org/publicationsdocs/wwpdf/112515pk.pdf

> A generic drug is identical -- or bioequivalent -- to a brand name drug in dosage form, safety, strength, route of administration, quality, performance characteristics and intended use.[63]

Generic drugs are chemically identical to their branded counterparts. They are the same in "dosage, safety, strength, quality, the way [they] work, the way [they are] taken and the way [they] should be used.[64] They are literally the same drug, manufactured by a different company than the original and often offered at a reduced price.

In telecommunications terms, a generic drug would be a TDM residential voice product offered to a customer by a CLEC under resale or a commercial contract like AT&T's Local Wholesale Complete, often at a reduced price. There is no question that such a product is a "functional equivalent" to the product it replaces.

As in telecommunications, companies have developed drugs that perform the same functions as name brand drugs but are not chemically identical. These "functional substitutes" can be viewed as the pharmacological equivalent of the products made available as part of the technology transition. The FDA defines a "biosimilar" drug as

> Highly similar to the [original] . . . product notwithstanding minor differences in clinically inactive components, and [specifies] that there are no clinically meaningful differences between the biological product and the reference product in terms of the safety, purity, and potency of the product.[65]

The FDA makes this decision by evaluating the proposed biosimilar product against a known "reference product" (in the case of telecommunications, for example, wireline TDM service). The agency uses what it refers to as a "totality of the evidence" approach to determine whether the product under consideration is "substantially similar" to the reference product and thus can substitute for it. The FDA uses

> A stepwise approach to demonstrating biosimilarity, which can include a comparison of the proposed product and the reference product with respect to structure, function, animal toxicity, human pharmacokinetics (PK) and

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[63] US Food and Drug Administration, Generic Drugs: Questions and Answers, available at http://www.fda.gov/Drugs/ResourcesForYou/Consumers/QuestionsAnswers/ucm100100.htm

[64] Id. Some drugs do not have generic equivalents.

[65] U.S. Department of Health and Human Services Food and Drug Administration, Scientific Considerations in Demonstrating Biosimilarity to a Reference Product, Guidance for Industry, April, 2015, available at http://www.fda.gov/downloads/DrugsGuidanceComplianceRegulatoryInformation/Guidances/UCM291128.pdf

> pharmacodynamics (PD), clinical immunogenicity, and clinical safety and effectiveness.[66]

The formal FDA review process compares the substitute product to a reference product and ensures comparable effectiveness, safety, and availability. The products are "biosimilar" not "bio the same;" that is, there may be some variation based on medical need or the manufacturing process.

> To demonstrate biosimilarity, a sponsor must provide sufficient data and information to show that the proposed product and the reference product are highly similar notwithstanding minor differences in clinically inactive components and that there are no clinically meaningful differences between the two products in terms of safety, purity, and potency.[67]

Differences between the reference product and the biosimilar product must be disclosed and explained as part of the sale process.

Products accepted as "biosimilar" are monitored on an on-going basis to ensure that they are safe and effective. The FDA retains oversight of these products and uses the results of post-approval monitoring to ensure that the drug remains safe and effective.

A process for identifying functionally equivalent products similar to the formal process used by the FDA could help the states evaluate the functional adequacy of product replacements proposed by carriers transitioning to new networks or withdrawing traditional products. As with the FDA process, the states would define a "reference product" (or potentially multiple reference products depending on customer needs), test the proposed substitutes against the reference product, and publish information to consumers showing to what extent the "technologically similar" product will meet their needs. The process would allow variation based on customer requirements (e.g., the need to interface with medical monitoring equipment, backup power, etc.) and then track the effectiveness of the product through customer satisfaction surveys, collecting complaint data, or other means allowed by state regulations.

We review the ways in which states are identifying and tracking substitute products in Section V below.

V. Modeling Product Comparability

The FCC's proposed Section 214 checklist, customer adoption statistics, and the FDA process for evaluating biosimilarity provide potential models for determining whether a new IP or wireless service is the functional equivalent of the existing wireline products. Ultimately, it will be the states which determine how they will proceed in managing the technology transition.

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[66] Id.

[67] Id. p 9

While the Section 214 process requires carriers to seek FCC approval to discontinue interstate services and products, State commissions retain a key role in managing and monitoring the transition of intrastate and local services. This is particularly true in areas where the State commission retains jurisdiction over carriers of last resort (COLR) and Eligible Telecommunications Carriers (ETCs). Although deregulation has reduced commission oversight in many states, state regulators remain key decision makers in determining which products should be defined as functionally equivalent. In addition, to the extent that these products replace basic local service, State commissions retain a public interest duty to assess and monitor the quality of these products.

Ohio has begun the process of identifying areas where customers will and will not have access to functional substitutes for traditional TDM products. Michigan has begun to review its options for defining functionally equivalent products and overseeing the IP transition. A recommendation from Maryland on the transition process is due in the first quarter of 2016.

This section reviews this work being done in Ohio and Michigan and provides recommendations for ways in which the states may develop a process for evaluating product substitution products.

A. Ohio

Ohio's FY 2016-2017 budget bill, HB 64, addressed the Technology Transition by directing the commission to examine options for allowing companies to withdraw basic local exchange service, in favor of a new, unregulated, product referred to simply as "voice service".[68] The Ohio bill provides a framework for evaluating functional equivalency in advance of granting applications for service withdrawal. The bill modified the rules covering service discontinuance to require that (1) the ILEC give notice to customers and the commission of its intent to discontinue service, and to ensure that (2) customers have the opportunity to purchase an equivalent service from another vendor.

A key part of the Ohio legislation was the requirement that the PUCO convene a collaborative composed of representatives from industry, competitive providers, consumer advocates, and interested members of the public to identify functional substitutes for Basic Local Exchange Service (BLES).

> Focus on the internet-protocol-network transition processes underway at the Federal Communications Commission and [address] the issues of universal connectivity, consumer protection, public safety and reliability, expanded availability of advanced services, affordability, and competition. The

[68] Ohio deregulated the majority of its retail telecommunications services in 2010 but retained commission jurisdiction over basic local service, intrastate access services, and wholesale requirements. The commission has no jurisdiction over VoIP or other IP-enabled services. Ironically, the PUC retains oversight of service withdrawal but will have little or no jurisdiction once the customer has transitioned to a VoIP or wireless product. See, Lichtenberg, Sherry, Examining the Role of State Regulators as Telecommunications Oversight is Reduced, NRRI, August 2015, available at nrri.org

collaborative process shall ensure that public education concerning the transition is thorough.[69]

The collaborative will determine the number and location of basic local service customers in Ohio, study their service requirements, and identify the service alternatives (both wired and wireless) for which these customers may qualify. The collaborative will also proactively identify any areas of the state where customers will be unable to obtain equivalent service at comparable prices. The commission will retain oversight of these areas and may require the ILEC to continue service until a comparable alternative is available.

At its first meeting in December, 2015, the collaborative focused on how to identify products that may serve as functional replacements for basic local service, where such products are available, and where alternative suppliers may offer service if the ILEC chooses to discontinue service. Questions addressed by the collaborative included:

1. What information does the collaborative need in order to determine the number and characteristics of basic local exchange service (BLES) customers in Ohio? What granularity is required, e.g., serving wire centers, exchanges, census block etc.?
2. What information is necessary to determine the identification of alternative providers to BLES customers?
3. What information is necessary to determine the prospects of alternative providers where none exist today?
4. What type of tracking systems or database should the Commission establish for the identification of BLES customer's without sufficient alternative services?[70]

A significant point raised by participants in the collaborative was the need to obtain granular information about where substitutable products are and are not available. The collaborative participants focused on the need to identify "reasonable and comparatively priced" alternative service, including whether fixed wireless can be a functional replacement for BLES.[71] Only by looking at product availability on a location specific basis, will the Collaborative be able to identify areas where customers will have limited or no choice of providers and may be forced into solutions which may not serve their needs.

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[69] Id. Sec. 749,10 (B)

[70] See PUCO, Meeting Minutes, Telephone Network Transition Agenda, 12/3/15, available at http://content.govdelivery.com/accounts/OHPUC/bulletins/12be00e. Basic Local Exchange Service (BLES) remains under Commission regulatory jurisdiction until an ILEC chooses to withdraw the regulated product in favor of a "voice service," a new service category introduced by HB 64.

[71] The debate over fixed wireless as a TDM replacement product appears in nearly all discussions of the technology transition. While commenters are in agreement that fixed wireless should be "considered" as a functional equivalent to TDM POTS, they continue to focus on the deficiencies of the VoiceLink service offered on Fire Island after Hurricane Sandy. Both AT&T and Verizon have acknowledged the limitations of the current fixed wireless product but state that they are working on enhanced versions that will resolve these issues.

The Ohio Collaborative will meet four times in 2016, with a final report planned for September 2016. The process adopted by Ohio provides a starting point for other states as they begin to examine the availability of functional substitutes for TDM service.

B. Michigan

Michigan Act 52 (2014) provides a process for carriers to follow in phasing out traditional TDM local voice services. Section 313 of the Act provides that

> A telecommunication provider that provides either basic local exchange or toll service, or both, shall not discontinue either service to an exchange unless 1 or more alternative providers for toll service, or 2 or more alternative providers for basic local exchange service, are furnishing a comparable voice service to the customers in the exchange.[72]

The Act defines "comparable voice service" operationally using a straight forward definition for determining whether a service is "comparable" to existing local service. Comparable voice service is

> Any 2-way voice service offered through any form of technology that is capable of placing and receiving calls from a provider of basic local exchange service, including voice over internet protocol services and wireless services.[73]

As in many other states, Michigan legislation views the availability of functionally equivalent products through the lens of competition. Using this definition, products offered by competitors are functionally equivalent to TDM service by definition, regardless of their quality, reliability, or universal availability.[74]

Act 52 maintains the current rules for phasing out basic local exchange service until 2017. These rules require carriers to notify the MPSC and customers 60 days in advance of service discontinuance. Customers or competitors may petition the commission to investigate the proposed discontinuance to determine whether it is allowed under the rules. The commission has 120 days to resolve the issue.

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[72] See Michigan Public Act 52 (52 PA 2014) enacted 3/25/14, available at http://legiscan.com/MI/text/SB0636/2013

[73] Id.

[74] See Lichtenberg, Sherry, Ph.D., Examining the Role of State Regulators as Telecommunications Oversight is Reduced; National Regulatory Research Institute, August 2015, available at www.nrri.org. Nine states, DE, ID, SC, SD, KS, KY, MS, OH, and TX, define competition based on the number of available competitors offering voice service using any technology. Eleven other states, AL, FL, HI, IL, IN, ME, MI, MO, NH, ND, and WI have no finite competitive test but simply designate all areas of the state as competitive based on the availability of alternate technologies, most often wireless.

In anticipation of an FCC decision on the identification of functionally equivalent products and the implementation of a process to allow the phase out of TDM service, Act 52 requires carriers to

> adhere to all rules, regulations, and guidelines set forth in the FCC trials order , , , for each of that telecommunication provider's exchanges in [Michigan], whether or not the discontinuance is undertaken pursuant to an official trial under the FCC trials order . . . [75]

Michigan's comments in the IP Transition NPRM support this requirement by focusing on the need to review the availability of functionally equivalent products on a granular, location-specific basis, and to ensure that replacement services meet quality, reliability, and availability standards. Product requirements, availability, and a successful transition may depend on local conditions and require location specific implementation and customer notification.

> Local testing may be the only way to ensure that the new service works as a replacement for traditional phone service. A possible approach might be to require providers to file monthly reports on certain service metrics, either with the FCC or the state commissions, for a period of one year after transitioning customers in an area before final approval is given.[76]

The MPSC shares the concern of many states that there will be areas where the broadband infrastructure necessary for implementing wired transition products is not sufficiently deployed to ensure that all consumers have a competitive choice that meets or exceeds the requirements for replacement service eventually imposed by the FCC. To that end, like Ohio's investigation into areas where customers may not have adequate competitive choices once the TDN infrastructure is withdrawn, Michigan is proposing to develop a map to identify areas without alternate service (or with limited alternate service) and to create a database of provider availability on an exchange by exchange basis. This will help the Commission determine where the IP transition must be managed on a case by case basis to ensure that all consumers have access to comparable offerings. [77]

Finally, the Commission is proposing development of a plan for consumer outreach to ensure that all citizens understand both the new technologies being offered and their own responsibilities. For example, consumers using fixed or mobile wireless technologies will be responsible for ensuring that their 911 location is accurately reported should they choose to move their service. Consumers must also be aware of backup power issues, and of ensuring that the technology they choose as part of the transition will meet their specialized requirements, including issues interfacing with medical monitoring devices, fax machines, equipment for the

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[75] Id.

[76] Michigan Public Service Commission, Comments of the Michigan Public Service Commission, Copper Retirement NPRM, available at fcc.gov

[77] Email from Robin Ancona to Sherry Lichtenberg, 7/2/15

deaf and visually impaired, etc. As we pointed out earlier, customer adoption is a key point in determining whether one product is a functional replacement for another. Ultimately, the decision to adopt a new product lies with the consumer herself.

VI. Recommendations

The Technology Transition presents challenges for state regulators, industry, and consumers alike, but a structured approach to identifying and assessing functional substitutes for traditional service will ensure success.

Ultimately, the definition of functional substitution may be in the eye of the beholder. Those who have transitioned to the new services made possible by IP networks and growing wireless services view these products not just as functionally equivalent to the products they replace, but in many cases as superior. Those who have not made the transition find value in the features of the existing networks that may not necessarily be replicated in the new networks, for example, line powered service that does not require in-home battery backup, the ability to bring problems/concerns to the public utility commissions in those states that have retained oversight of traditional wireline service (a diminishing but still important number), and the availability of standalone voice service at affordable prices. It will be up to the states and industry to work with these customers to determine how they can remain connected as old services are discontinued in favor of new. The work underway to identify areas where customers may no longer have an option for the type of service they need (or want) after the transition will be critical in ensuring that functional product substitutes are available and understood by all who need them.

The states will retain a key role in identifying functionally substitutable products and assessing their quality as the technology transition moves forward. Despite limitations on commission oversight of IP-based and wireless services, the state commission remains a customer's first stop in trying to resolve product and service issues. By participating fully in the technology transition, the states can ensure that the products carriers offer continue to meet and exceed customer expectations.

To that end, we make the following recommendations for developing and implementing a process for determining functional substitutability.

1. <u>Identify customer-specific reference products</u>

The FDA process for identifying biosimilar products speaks to the need to identify a reference product to which substitutes may be compared. As we noted earlier, one size does not fit all. By identifying reference products based on customer-specific groups, for example, those who use assistive devices, the states can define requirements for the specific products those groups will need. By grouping products based on customer requirements, the states can identify gaps in product availability and work with industry to meet those needs. Identifying customer-specific reference products will also allow the states to work with industry to ensure that customer reference material is tailored to specific groups.

2. Create a data base of replacement product availability

As Michigan and Ohio have both found, the availability of replacement products differs based on location. Some areas of the state will have a number of competitors, while others will have only the ILEC and a wireless provider. By mapping locations and providers, the states can identify pockets of customers who may need to continue to be served with traditional wireline products until new technologies are available and widely deployed. This is particularly important in areas with few, if any, wired competitors.

Colorado has used this process successfully in identifying the level of competition available in wire centers throughout the state. Colorado telecommunications staff has conducted a granular study of the availability of competitive products and suppliers in these areas to ensure that they are actually providing customers with the services they need. Areas who meet the requirements for competition set by the Commission will be declared competitive and will no longer receive Universal Service (USF) high cost funds.[78] These areas will presumably also be approved for the phase out of TDM service as the technology transition continues.

The Colorado process could provide a roadmap for evaluating product and service availability to determine where functional substitutes for TDM wireline service are available and where existing services must be maintained until new products and services are available.

3. Address wireless, wireline, and over the top VoIP products separately

As commenters in the FCC Copper Retirement proceeding have pointed out, wireless, wireline, and over the top VoIP products have characteristics that make them suitable for some customers but not for others. For example, over the top VoIP products like Magic Jack require consumers to have a high speed broadband connection and depend on the quality of that connection for their own quality. The fixed wireless services offered by AT&T and Verizon provide basic voice telecommunications service only and so may not be suitable for customers who need a data connection in order to use products like medical monitoring devices or point of sale terminals.

By reviewing these products separately, states can develop a catalog of functionally equivalent products matched to customer needs.

4. Evaluate the effect of bundling on affordability

Consumer advocates and others have voiced concerns that many of the new services available as part of the technology transition require the purchase of a bundled service. These commenters worry that the need to buy a product bundle, including features and functions that consumers may not want or the requirement that a customer purchase multiple products to create a service will unnecessarily drive up costs. Although the majority of states have only limited

[78] Swinnerton, Judith V., Direct Testimony and Attachments of Staff of the Colorado Public Utilities Commission, Proceeding 14M-0947, Competition for Basic Service Under § 40-15-207, C.R.S., In Certain Areas Served By Qwest Corporation, DBA CenturyLink QC; El Paso County Telephone Company; CenturyTel of Colorado, Inc.; and CenturyTel Of Eagle, Inc., 4/30/15

oversight of pricing, a focus on product affordability will help to determine whether a suggested replacement product provides an acceptable substitute for basic local service.

5. Assess customer adoption and satisfaction

As we noted earlier, customer adoption is a key indicator of whether one product is functionally equivalent to another. An additional strategy in determining functional equivalency is seeking comments from customers on their reason for transitioning and their satisfaction with the new product in comparison to TDM service. California and other states have successfully used the Open Commission Meeting process to determine customer requirements, issues, and approval of the products and services. A similar process could be adopted to assess the effects of the technology transition.

Implicit in these recommendations is the public interest requirement of ensuring that the products and services replacing the current copper-based wireline network continue to meet customer needs and expectations, regardless of their location, ability to pay for new products and services, and technical sophistication. The public interest requirement remains a key duty of the state commission and forms the cornerstone of any decision to define product substitutability. By reaching out to customers who have chosen to transition to new technologies, the states can learn how best to communicate information about the transition and what products and services to recommend to disparate customer groups. Customer contact can also help the states understand the benefits and limitations of the new products in order to develop good customer contact materials.

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