THE EFFECTS OF MANDATED NETWORK UNBUNDLING ON FTTP DEPLOYMENT

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Summary

1. I have been asked by TELUS to provide an analysis of certain issues raised by the Commission’s Review of Wholesale Services and Associated Policies. I am a Non-Resident Senior Fellow in Economic Studies at the Brookings Institution and an Adjunct Senior Fellow at the Technology Policy Institute, both located in Washington, DC. I file this testimony in my individual capacity and not on behalf of the Brookings Institution or the Technology Policy Institute. My Curriculum Vitae is attached as an Appendix to this testimony.

2. In this testimony, I explain why mandated wholesale access to new high-speed fiber-to-the-premises (FTTP) networks is unnecessary and counterproductive. I draw upon a body of applied empirical research on the regulation of wholesale access to incumbent telecommunications carriers’ networks to analyze the prospective effects of mandating access to new FTTP network deployments on investment and subscriber take-up of the ultra-fast broadband services they provide.

3. This analysis is conditioned on the fact that deployment of FTTP networks is expensive and risky, particularly where utilities must be buried or deployed outside major cities, because of continuing technological change and the fact that these fiber investments are irretrievably sunk. i.e., they cannot be redeployed if technologies or markets change in the future.

4. I conclude that:

   - Any prospective mandate for mandatory sharing of new FTTP facilities with competitors at regulated rates (“network unbundling”) necessarily reduces the incentive to deploy such facilities, particularly in areas of modest or low density and in high-cost areas.

   - In countries where regulators have pursued aggressive wholesale unbundling of copper networks and have suggested a similar policy towards new fiber networks, network investment has lagged severely, and FTTP has been rolled out much more slowly than in countries with less wholesale regulation.

   - There is strong empirical evidence that mandated wholesale unbundling of copper networks has not increased broadband subscriptions; there is no reason to believe that such policies, if extended to fiber, would be more successful.

   - Moreover, any discussion of potential regulation of new FTTP networks must take into account that such networks are not embedded “essential facilities.” Any of a number of carriers could build such facilities to compete with existing DSL, cable television, and satellite broadband and video services. In many countries, non-incumbent carriers have built their own fiber networks. They have not relied on access to regulated carriers’ fiber networks because, as in much of Canada, such networks have not yet been built.
Introduction

5. The continuing technological revolution in communications has spawned an ever-expanding demand for bandwidth as households and businesses download more and more data, photos, games, and video through a variety of devices. The telecommunications networks of ten or twenty years ago, while sufficient for the bandwidth demands of that period, are no longer sufficient to accommodate the demands of today’s – and especially tomorrow’s -- users of smartphones, tablets, and high-definition television receivers.

6. Canadian carriers are adapting to these expanding needs for bandwidth by investing substantially in new technologies. Cable television companies have deployed DOCSIS 3.0 widely, allowing them to offer hundreds of video channels and super-fast broadband Internet services. Wireless carriers have deployed 4-G technologies to allow the new generations of tablets and smartphones to receive (and transmit) a variety of video services, book-length manuscripts, and video games.

7. The traditional incumbent telecommunications companies have also responded by extending fiber optics farther and farther into their networks, allowing them to offer faster copper-based DSL services. But eventually extending fiber to subscriber premises may be necessary for carriers to offer the ultrafast broadband services that can compete in the modern communications marketplace and offer Canadians access to a wide variety of new services.

8. Unfortunately, the extension of fiber to the premises is both costly and risky, particularly in areas of moderate to low population density. As a result, in most countries, including Canada, FTTP accounts for very little of current broadband penetration. The OECD reported that at the end of 2012 only 15 percent of broadband subscribers in the most developed (34) countries were connected directly by fiber-to-the-home or fiber-to-the-building (also known as “Ethernet-to-the-suite” or “apartment LAN,” which is common in densely-populated urban areas in Asia).

9. In many countries, particularly in Europe, the incumbent telephone companies have deployed very little FTTP. As I shall show below, a likely reason for their reticence in this regard is a history of mandated wholesale access to traditional copper networks at low, regulated rates. Without assurances that similar regulation will not be imposed on new fiber networks, these carriers likely cannot justify the large investment required to deploy FTTP.

10. A large share of the new FTTP facilities in OECD countries has been deployed by non-regulated carriers. These include a variety of new entrants, electric utilities, non-incumbent fixed-wire and wireless carriers, and municipal authorities. These entities

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1 OECD, Broadband Portal, available at [www.oecd.org](http://www.oecd.org)
typically operate with fewer regulatory obligations than those faced by incumbent carriers.

**The Effect of Mandated Wholesale Access at Regulated Rates: Theory**

11. The theory underlying mandated wholesale access to telecommunications platforms is based on the deduction that some portion of an existing telecommunications network cannot easily be replicated and is therefore a monopoly bottleneck. In earlier years, when cable companies and wireless carriers were unable to compete in offering mass-market subscribers data and voice services, the incumbent telecommunications carrier’s “last-mile” copper wire connections to final subscribers were deemed to be such a bottleneck. Regulators, therefore, attempted to facilitate competitive entry into such service offerings by mandating network “unbundling” and the wholesale leasing of the unbundled last-mile connections to entrants at regulated rates.

12. For this network-sharing policy to work properly, it was essential that regulators be able to establish efficient wholesale prices for the leased network connections. Too high a price would frustrate entry, and too low a price would lead to inefficiently low network investment by incumbents and entrants alike. Moreover, regulators had to be cognizant of the costs of executing this unbundling since existing networks had not been designed to accommodate multiple carriers.

13. Although it is always difficult to establish the efficient wholesale price for unbundled network connections over the traditional copper-wire network, at least the regulators have had some idea of the cost of building such facilities since they had been setting cost-based rates for traditional telephone services over these networks for decades. Nevertheless, the appropriate rate, based on the forward-looking cost of such network facilities and the option-value to the entrant of not having to invest was often difficult to determine.²

14. For prospective new network facilities, however, the task of establishing efficient wholesale rates for competitor access is much more difficult for a number of reasons. First, there are a variety of network architectures that may be used to deploy FTTP. Each one presents different problems for establishing competitor connections and, therefore, requires different assessments for establishing the appropriate wholesale rates.

15. Second, there are not likely to be any established networks that can be used to provide “benchmarks” for wholesale rates. But if the rates under prospective wholesale regulation are not known ex ante, the incumbent carrier may be reluctant to deploy the FTTP network because of the added uncertainty in forecasting cash flows from such an investment.

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² By not having to invest in sunk facilities that are subject to premature obsolescence, the entrant using the incumbent’s facilities receives a “real option” to wait before making its own investments. See Avinash K. Dixit, *Investment under Uncertainty*. Princeton University Press, 1994.
16. Third, the regulator will not likely know how a given wholesale rate will affect competitors still leasing the older copper network. Nor will the regulator likely be able to forecast how any prospective wholesale rate for access to fiber will affect incumbent investments in new technologies based on the existing copper network, such as VDSL.

17. It is certain, however, that any wholesale regulation of prospective FTTP networks will affect the projected cash flows available to the carrier deploying the network. Since the prospective returns on such investments decline as they are deployed into less densely populated areas, any wholesale rate that results in competitors leasing access will likely cause the carrier deploying the network to consider a reduction in the geographical scope of its deployment.

18. Mandated wholesale access to incumbent facilities can also lead to a reduction in investment by new entrants, especially if the regulated wholesale rates are set inefficiently low. A theory advanced a decade ago held that mandated wholesale access can facilitate new entry by companies that subsequently climb a “ladder of investment” by building their own facilities. Eventually, according to this theory, the entrants may climb to the top rung of this ladder, building their own customer connections, replacing the network elements initially leased at regulated wholesale rates. However, the accumulated empirical evidence has been unkind to this theory, as I demonstrate below.

Empirical Evidence of the Effects of Network Unbundling: Network Investment

19. Mandated unbundling of copper loops has been in existence for nearly two decades. Copper loop unbundling began in Hong Kong in 1995. In 1996, the United States became the first major developed country to require unbundling of incumbents’ copper plant and competitors’ access to these unbundled facilities at low, regulated rates. Since that time, the U.S. Federal Communications Commission (FCC) has reduced the scope of these unbundling requirements and has importantly decided not to require the sharing of new fiber networks.

20. A common form of copper-loop unbundling is “line sharing” – allowing entrants to lease only the upper frequencies on the loop for the distribution of broadband Internet services. The United States initially imposed such line sharing on legacy copper networks under the 1996 Telecommunications Act, but a court decision forced the FCC to revoke this requirement in 2002. In its 2003 Triennial Review Order, the FCC decided not to require unbundling of Next Generation Networks, i.e., new fiber networks designed to offer ultra high-speed Internet and video services. The very next year,

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5 United States Telecom Association v. FCC, 290 F.3d 415 (2002).
Verizon began to deploy its FTTP service (FiOS) in Texas. Subsequently, the FCC deregulated all broadband services, including cable modem service and DSL.

21. The European Union, by contrast, has aggressively pursued network unbundling and requires line sharing on traditional copper loops to promote competition in broadband services. Moreover, the European Commission continues to advocate unbundling for new FTTP deployments although it has not been able to reach a consensus on the regulatory standards for accomplishing fiber unbundling. Thus, unlike the United States, the European Union has not foreseen the use of mandated network sharing for new fiber-based networks, and it continues to rely heavily on unbundling traditional copper loops.

22. The difference in regulatory approaches between the U.S. and the EU is reflected in the annual investment by (regulated) incumbent carriers on the two sides of the Atlantic. As Figure 1 shows, over the decade 2002-11, U.S. and Canadian carriers consistently invested more per communications path than their counterparts in the European Union.

Figure 1
Incumbent Telecom Companies’ Capital Spending per Communications Path
United States, Canada, and EU-15
($000)

Source: OECD, Communications Outlook, 2013.

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9 These data are available in the latest OECD, Communications Outlook (2013), Tables 3.8 and 4.1. Note that these data reflect spending by all carriers, not just the incumbent telecommunications companies. There are similar differences in capital spending by incumbent carriers among these three areas.
23. Moreover, the U.S. – having foresworn regulation of new fiber networks – has had far more penetration of FTTP than either the EU or Canada as Figure 2 shows. The difference in the extent of FTTP investment by EU and U.S. carriers suggests that the more aggressive regulatory approach found in the European Union has suppressed capital spending and the deployment of new FTTP networks.

Figure 2
Fiber Connections per Thousand Persons, 2012
Europe vs. North America

![Bar chart showing fiber connections per thousand persons in 2012 for EU-15, Canada, and U.S.](chart.png)

Sources: OECD, Communications Outlook 2013 (fiber connections); World Bank and U.S. Census Bureau (population)

24. The data in Figure 2 understate the difference between EU and U.S. incumbent-company deployment of FTTP. In the EU-15, most of the deployment of FTTP has been undertaken by non-incumbents who are not generally subject to wholesale access regulation, as I demonstrate below. In the U.S., most of the FTTP has been deployed by incumbents, particularly Verizon, who have been relieved of any unbundling responsibility for all broadband services.

25. The difference in incumbents’ share of FTTP can be seen in Table 1, which shows the relative shares of broadband subscribers by technology for major developed countries.
Table 1
Broadband Penetration by Modality
(Percentage of broadband subscribers)

<table>
<thead>
<tr>
<th>Country</th>
<th>(1) FTTP Share†</th>
<th>(2) Incumbent FTTP Telco Share</th>
<th>(3) DSL Share †</th>
<th>(4) Unbundled DSL Share*</th>
<th>(5) Cable Share†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>67%</td>
<td>48%</td>
<td>16%</td>
<td>10%</td>
<td>17%</td>
</tr>
<tr>
<td>Korea</td>
<td>61%</td>
<td>30%</td>
<td>12%</td>
<td>0%</td>
<td>27%</td>
</tr>
<tr>
<td>Sweden</td>
<td>34%</td>
<td>&lt;8%</td>
<td>47%</td>
<td>17%</td>
<td>19%</td>
</tr>
<tr>
<td>Denmark</td>
<td>17%</td>
<td>0%</td>
<td>55%</td>
<td>7%</td>
<td>28%</td>
</tr>
<tr>
<td>Portugal</td>
<td>15%</td>
<td>12%</td>
<td>45%</td>
<td>8%</td>
<td>40%</td>
</tr>
<tr>
<td>U.S.A.</td>
<td>7%</td>
<td>6%</td>
<td>34%</td>
<td>8%</td>
<td>57%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>6%</td>
<td>6%</td>
<td>49%</td>
<td>11%</td>
<td>45%</td>
</tr>
<tr>
<td>U.K.</td>
<td>0%</td>
<td>0%</td>
<td>75%</td>
<td>37%</td>
<td>20%</td>
</tr>
<tr>
<td>Spain</td>
<td>3%</td>
<td>3%</td>
<td>78%</td>
<td>25%</td>
<td>19%</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>3%</td>
<td>3%</td>
<td>86%</td>
<td>9%</td>
<td>10%</td>
</tr>
<tr>
<td>Italy</td>
<td>2%</td>
<td>&lt;1%</td>
<td>98%</td>
<td>37%</td>
<td>0%</td>
</tr>
<tr>
<td>Finland</td>
<td>2%</td>
<td>2%</td>
<td>66%</td>
<td>1%</td>
<td>18%</td>
</tr>
<tr>
<td>Canada</td>
<td>2%</td>
<td>2%</td>
<td>43%</td>
<td>2%</td>
<td>55%</td>
</tr>
<tr>
<td>Austria</td>
<td>1%</td>
<td>&lt;0.1%</td>
<td>68%</td>
<td>13%</td>
<td>31%</td>
</tr>
<tr>
<td>France</td>
<td>1%</td>
<td>0.7%</td>
<td>92%</td>
<td>42%</td>
<td>6%</td>
</tr>
<tr>
<td>Belgium</td>
<td>&lt;1%</td>
<td>0%</td>
<td>51%</td>
<td>3%</td>
<td>49%</td>
</tr>
<tr>
<td>Germany</td>
<td>&lt;1%</td>
<td>&lt;0.1%</td>
<td>83%</td>
<td>12%</td>
<td>16%</td>
</tr>
<tr>
<td>Greece</td>
<td>&lt;1%</td>
<td>0%</td>
<td>100%</td>
<td>14%</td>
<td>0%</td>
</tr>
<tr>
<td>Ireland</td>
<td>&lt;1%</td>
<td>0%</td>
<td>70%</td>
<td>2%</td>
<td>30%</td>
</tr>
</tbody>
</table>

† OECD. Broadband Portal, December 2012 estimates. * OECD Communications Outlook 2013, Table 2.8, number of unbundled loops, 2011, where available.

a. NTT, 2013 Annual Report, p. 35.
b. Based on June 2011 data from http://www.slideshare.net/DigiWorldIDATE/montagne-10250348
c. TeliaSonera has less than 25% of FTTH homes passed in Sweden; 95% of FTTH homes passed in its franchise area in Finland. SNL_Kagan, Marketing Fiber to the Global Consumer, November 20, 2012, p. 34.
e. Incumbent TDC owns a cable company deploying DOCSIS 3.0, no mention of FTTH subscribers in 2012 Annual Report.
f. Based on 2009 OECD data (the most recently available for these countries).
g. PT began deploying fiber in 2008 after favorable regulatory ruling. It appears to have about 80 percent of the country’s FTTP subscribers.
h. The incumbent KPN has bought a controlling interest in the country’s largest FTTH supplier, Reggefiber.
j. CMT, Geographical Analysis of Broadband Services and NGA Deployment in Spain, December 2012.
k. OTE is deploying only FTTC, not FTTP (2012 Annual Report, p.50.).

26. Table 1 shows that in very few countries have incumbents deployed FTTP to any measurable extent. Moreover, as Figure 3 (based on the data in Table 1) clearly demonstrates, the countries with the largest share of DSL delivered over unbundled loops generally have little or no broadband service delivered over fiber.
27. Of the European countries in Table 1, only Sweden, Denmark, Portugal and Netherlands have substantial FTTP penetration. In Denmark, the incumbent carrier, TDK, has no measurable FTTP subscribers. In Sweden, a very large share of FTTP subscriptions is accounted for by municipal government networks. In Netherlands, the incumbent, KPN, did not deploy fiber, but rather bought the largest independent FTTP provider after this new carrier had deployed large amounts of fiber. And in Portugal, the incumbent deployed FTTP only after the regulator guaranteed it freedom from wholesale regulation. Thus, incumbents in the EU-15 – subject to copper unbundling mandates and potentially subject to fiber unbundling – have generally avoided investing in new FTTP networks.

28. The countries that OECD credits with having the greatest FTTP penetration are Japan and Korea. Both have extremely high population density, high levels of Ethernet-to-the-suite (or “apartment LAN”), as opposed to true FTTP, and high degrees of government intervention in the form of planning and financial support for fibre deployment. Both also have substantial facilities-based competition in the delivery of broadband services over fiber networks. In Korea, three major carriers – KT, SK-Hanaro, and LG Telecom – compete actively using their own networks. KT, the incumbent carrier, has only about one-half of the country’s FTTP subscribers. In Korea, there has been never been much unbundling of copper loops, and today copper-loop unbundling is non-existent as

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column (4) shows. Moreover, the regulator, MIC, has exempted KT from unbundling its fiber facilities, as an OECD report explains:

“For fibre optics deployed before 2004, the MIC imposed obligations on Korea Telecom (KT) to open its fibre optics to alternative operators, with regulated wholesale charges set by the MIC. For KT fibre optics deployed after 2004, the MIC did not impose any regulations on KT … Regulatory forbearance was also applied for the fibre deployed by other operators.”

29. In Japan, the incumbent, NTT, has a larger share of FTTP subscribers than its Korean counterpart, but facilities-based competition is considerable in major urban areas. Electric utilities, USEN Corporation, and KDDI have also deployed fiber networks rather widely. By 2010, these competitors accounted for about 25 percent of Japanese subscribers to FTTP. Softbank, once a prominent supplier of DSL over NTT’s unbundled loops, has not ascended the ladder of investment to deploy fiber, choosing to concentrate on mobile services instead. As a result, the share of broadband connections over unbundled loops fell from nearly 37 percent in June 2006 to just 10 percent in 2011.

30. In addition to these cross-country comparisons of FTTP deployment, there is a substantial body of systematic empirical research that concludes that mandatory unbundling discourages investment. Cambini and Jiang’s authoritative 2009 review of the literature, which examined more than 20 empirical studies and concludes that while additional research could be useful, “most of the evidence shows that local loop unbundling discourages both ILECs and CLECs from investing in networks.”

31. More recent econometric studies, not covered by Cambini and Jiang, confirm these findings. For example, a 2009 study of European telecommunications companies by Grajek and Roller found that mandatory wholesale access at regulated prices reduced investment. “We find access regulation to negatively affect both total industry and individual carrier investment. Thus promoting market entry by means of regulated access undermines incentives to invest in facilities-based competition.”

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13 In Japan, the regulator, MIC, has nominally required NTT to unbundle its GPON network, but there is no evidence that rivals have been willing or able to use NTT’s facilities. As a result, competition in offering FTTP services is almost entirely based on competing platforms, not network sharing.
32. A 2010 study by Bacache, Bourreau and Gaudin finds that European entrants that use unbundled local loops do not ascend “the ladder of investment” and eventually build their own infrastructure.\textsuperscript{17} Briglauer, Eckler, and Kugler studied the relationship between copper unbundling and FTTP deployment in the EU-27 and found that regulation has negatively affected NGA deployment.\textsuperscript{18}

33. Earlier, Waverman \textit{et.al.}, used an econometric model to estimate the effect of low regulated wholesale rates for unbundled loops on competitors’ investment. They found that a 10 percent reduction in wholesale rates results in an 18 percent reduction in the deployment of network infrastructure by competitors.\textsuperscript{19} Finally, the primary author of the ladder of investment thesis, Dr. Martin Cave, now admits that his thesis “remains no more than a hypothesis, as scientific testing of an imprecise proposition of this kind remains problematic.”\textsuperscript{20}

\section*{Empirical Evidence on the Effects of Network Unbundling: Broadband Penetration}

34. It is possible that mandated network sharing of telecommunications networks, despite its adverse effects on network investment, creates benefits in the short run by reducing retail prices, particularly if the wholesale rates are set very low, and thereby increasing subscriber penetration. However, the empirical evidence generally does not even find a short-term benefit from mandated sharing.

35. The preponderance of the empirical evidence from studies of broadband penetration shows that inter-platform competition (principally, between cable television and telecommunications companies) increases broadband penetration, but intra-platform competition (from entrants relying on access to incumbent facilities) based on forced network sharing does not. Only one study using recent data finds a positive, but small impact of intra-platform competition that is facilitated by local-loop unbundling, but this effect erodes after three years.\textsuperscript{21}

36. Crandall, Eisenach and Ingraham review the empirical evidence on the effect of copper-loop unbundling on broadband penetration.\textsuperscript{22} In addition, they provide new evidence in


the form of a regression analysis of pooled annual time-series, cross-section data from 28 countries for 2001-10.

37. Crandall, Eisenach, and Ingraham’s empirical results show that broadband penetration increases over time after a broadband network is deployed, but the advance of subscriber penetration is not positively affected by the number of years that an unbundling regime has been in place. Indeed, in one specification they find that unbundling may even be associated with reduced levels of penetration over time, perhaps because of its effect on network investment.

38. After more than a decade of empirical research, economists have not been able to identify a systematic positive effect of mandated unbundling on subscriber penetration. While it is possible that low regulated wholesale rates result in lower retail broadband prices and some increase in subscriber penetration in the short run, the longer-run adverse effect on network investment appears to offset any short-term positive effect on subscriptions. At this juncture, there is simply little credible evidence that mandated network sharing, in the form of leased unbundled copper loops, contributes to broadband penetration in the long run.

New Fiber Networks Are Being Built by a Variety of Carriers

39. It is very difficult to argue that prospective FTTP networks are “essential facilities” that can only be built by incumbent telecommunications companies. If and when deployment of such networks is economically viable, they can deployed by a variety of different business entities – other fixed-wire carriers (perhaps out-of-region), wireless carriers, electric utilities, railroads, or even natural-gas distributors. Indeed, there is ample evidence that incumbent telephone carriers face FTTP-based competition from other carriers in many countries.

40. Recall that Table 1, above, showed that in countries with substantial FTTP penetration, the incumbent carriers often have a small share of FTTP subscribers. In Sweden, Korea, Denmark, and even Japan there is substantial platform competition, often from non-traditional carriers. And new entrants have sprung up in a number of other developed countries, as Table 2 demonstrates.
Table 2
Non-Incumbent Companies with FTTP Networks in Major OECD Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Carrier</th>
<th>Type of Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>TEPCO</td>
<td>Electric utility (Network sold to KDDI)</td>
</tr>
<tr>
<td></td>
<td>KDDI</td>
<td>Non-incumbent carrier</td>
</tr>
<tr>
<td>Korea</td>
<td>SK-Hanaro</td>
<td>Non-incumbent telco and cable TV company</td>
</tr>
<tr>
<td></td>
<td>LG Telecom</td>
<td>Non-incumbent carrier</td>
</tr>
<tr>
<td>Denmark</td>
<td>Dong Energy</td>
<td>Electric utility (purchased by TDC)</td>
</tr>
<tr>
<td></td>
<td>SEAS-NVE</td>
<td>Electric utility</td>
</tr>
<tr>
<td></td>
<td>Tre-For</td>
<td>Electric Utility</td>
</tr>
<tr>
<td></td>
<td>Parknet</td>
<td>Non-profit association</td>
</tr>
<tr>
<td>France</td>
<td>Iliad-Free</td>
<td>Non-incumbent carrier</td>
</tr>
<tr>
<td></td>
<td>SFR</td>
<td>Non-incumbent carrier</td>
</tr>
<tr>
<td></td>
<td>Bouygues Telecom</td>
<td>New entrant (owned by large industrial company)</td>
</tr>
<tr>
<td>Italy</td>
<td>Fastweb</td>
<td>New entrant (purchased by Swisscom, 2010.)</td>
</tr>
<tr>
<td></td>
<td>Metroweb</td>
<td>New Entrant</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Reggefiber</td>
<td>New entrant (acquired by KPN, 2010-13)</td>
</tr>
<tr>
<td></td>
<td>CIF Operator</td>
<td>Investment fund</td>
</tr>
<tr>
<td></td>
<td>Wiericke</td>
<td>New entrant (acquired by Vodafone, 2013)</td>
</tr>
<tr>
<td>Norway</td>
<td>Ventelo-Broadnet</td>
<td>Non-incumbent and wireless carrier</td>
</tr>
<tr>
<td></td>
<td>Lyse Energy-Altibox</td>
<td>Consortium of electric utilities</td>
</tr>
<tr>
<td>Sweden</td>
<td>Banverket ICT</td>
<td>Railroad</td>
</tr>
<tr>
<td></td>
<td>Telenor</td>
<td>Foreign carrier (Norwegian incumbent)</td>
</tr>
<tr>
<td></td>
<td>Tele2</td>
<td>Competitive entrant (residential fiber facilities purchased by Telenor, 2013)</td>
</tr>
<tr>
<td></td>
<td>Banhof Publ AB</td>
<td>Internet Service Provider</td>
</tr>
<tr>
<td></td>
<td>Municipal Fiber Systems</td>
<td>Over 150 municipally-owned systems</td>
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<tr>
<td>United Kingdom</td>
<td>City Fibre</td>
<td>New entrant</td>
</tr>
<tr>
<td></td>
<td>Horsebridge Network Systems</td>
<td>New entrant (Technology company)</td>
</tr>
</tbody>
</table>
Table 2 (continued)
Non-Incumbent Companies with FTTP Networks in Major OECD Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Carrier</th>
<th>Type of Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>Olds Fibre Ltd (O-Net)</td>
<td>Municipal utility</td>
</tr>
<tr>
<td></td>
<td>Novus Entertainment Inc.</td>
<td>CLEC</td>
</tr>
<tr>
<td></td>
<td>Groupe Maskatel LP</td>
<td>CLEC</td>
</tr>
<tr>
<td>United States</td>
<td>Burlington Telecom (VT)</td>
<td>Municipal utility</td>
</tr>
<tr>
<td></td>
<td>CDE Lightband (TN)</td>
<td>Municipal Utility</td>
</tr>
<tr>
<td></td>
<td>Google Fiber</td>
<td>Major technology company</td>
</tr>
<tr>
<td></td>
<td>LUS Fiber (LA)</td>
<td>Municipal utility</td>
</tr>
<tr>
<td></td>
<td>Mollala Communications Co. (OR)</td>
<td>Co-operative entity</td>
</tr>
<tr>
<td></td>
<td>Peak Internet (CO)</td>
<td>Independent ISP</td>
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</tbody>
</table>

41. In Sweden, for example, most of the fiber was deployed as much as a decade ago by municipal utilities, not the regulated incumbent, TeliaSonera. The incumbent began to invest in fiber much more recently in order to counter the strong platform-based competition coming from these municipal fiber systems.

42. In Denmark, the incumbent, TDC, has not deployed FTTP, but its ADSL and cable services compete with fiber-based services provided by electric utilities. In Norway, a variety of electric utilities have formed consortia to deploy FTTP. In the Netherlands, an independent carrier, Reggefiber, has deployed most of the FTTP. In 2009, KPN acquired a 41 percent stake in Reggefiber after the fiber network had been deployed; in 2012, KPN gained control of the company by acquiring another 10 percent of its equity. More recently, two new entrants – CIF Operator and Wiericke – have begun to deploy fiber.

43. In France, three non-incumbents are beginning to deploy fiber. One of these carriers is a new entrant owned by a diversified industrial company, Bouygues. In Italy, a new entrant, Fastweb, deployed fiber in the larger cities and then was acquired by Swisscom, the Swiss incumbent. More recently, another entrant, Metroweb, has begun to deploy fiber.

25 Despite repeated reports that France Telecom and its rivals are about to deploy fiber on a substantial scale, France still had fewer than 400,000 FTTP connections as of June 2013, according to the OECD Broadband Data Portal. Of these, about 300,000 were connected to the incumbent, France Telecom. Thus, the entrants that have relied on unbundled loops have switched only about 100,000 subscribers to fiber – a minuscule amount in a country with more than 24 million fixed broadband subscribers.
44. In Korea, strong platform competition from SK-Hanaro and LG Telecom provide substantial incentive for KT, the incumbent, to invest in FTTP. Korea relies on a policy of platform competition rather than mandating network unbundling, thereby encouraging, KT (the incumbent), SK-Hanaro, and LG Telecom, to compete fiercely using their own networks. Indeed, Korea’s success in deploying FTTP confirms the result of many empirical studies of telecommunications: platform competition is far superior to rivalry artificially induced by network unbundling.26

45. In Japan, NTT has deployed fiber widely, but it faces substantial rivalry from a variety of carriers. As explained above, electric utilities, USEN Corporation, and KDDI have also deployed fiber networks rather widely.

46. Finally, in the United States, a major new player, Google, has emerged to challenge the established telecom and cable companies with greenfield deployments of fiber. Google’s fiber networks are operating in Kansa City, KS and MO, and Provo, UT, and it has announced a major deployment in Austin, TX. In 21013, AT&T responded by announcing that it is extending fiber to the premises in Austin so as to be able to offer as much as 300 Mbs in broadband speed to its subscribers.27

47. Thus, in most OECD countries where substantial investments in fiber have occurred, the major deployments of FTTP are often not by the incumbents, but rather a variety of other entities. Given these diverse sources of investment in FTTP across OECD countries, it is clear that no incumbent’s prospective investment in a new FTTP network is likely to constitute an essential facility that is a candidate for network unbundling.

Conclusions

48. In this testimony, I have provided a review of the empirical evidence on the effects of mandated network sharing on network investment, broadband penetration, and fiber deployment. This review leads me to the following conclusions:

- Countries with substantial levels of FTTP either (1) generally do not have incumbent unbundling mandates or (2) the lion’s share of that FTTP has been deployed by non-incumbents.

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26 See, for example, Briglauer, Eckler, and Kugler’s conclusion: “Our results indicate that previous NGA (“next generation access”) deployment is determined by the extent of infrastructure-based competition stemming from cable operators and mobile networks… stricter previous sector-specific broadband regulation has negatively affected NGA deployment.” They then point out that their conclusions comport with the accumulating literature on the subject.

• The “ladder of investment” theory that has been provided as support for mandated network sharing has not been borne out by the facts over the past decade.

• Competitor access mandates neither increase broadband penetration nor investment in broadband facilities, particularly in the long run. To the contrary, they decrease investment in new facilities and, with it, penetration of next-generation broadband access services. This is the opposite of the desired result.

• Numerous non-incumbent companies, such as CLECs, public utilities, and ISPs, have deployed fiber throughout the developed world, thereby demonstrating that incumbent FTTP facilities—when they are deployed—are not “essential facilities,” that should be shared with competitors.
Appendix

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