Before the
DEPARTMENT OF COMMERCE
NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION
Washington, DC

In the Matter of	)	
	)	
American Recovery and Reinvestment Act	)	**Docket No. 090309298-9299-01**
Broadband Initiatives	)	

COMMENTS OF THE FIBER-TO-THE-HOME COUNCIL
IN RESPONSE TO REQUEST FOR INFORMATION

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TABLE OF CONTENTS

Page

SUMMARY

The Fiber-to-the-Home ("FTTH") Council is a non-profit organization dedicated to educating the public and government officials about FTTH and to promoting and accelerating FTTH deployment and the resulting quality of life enhancements FTTH networks make possible. The FTTH Council's members, including approximately 150 service providers, represent all areas of the broadband access industry, including telecommunications, computing, networking, system integration, engineering, and content-provider companies, as well as traditional service providers, utilities, and municipalities.

At the beginning of the American Recovery and Reinvestment Act of 2009 ("ARRA"), the "economic stimulus" purposes and principles of the legislation are clearly enunciated, and these are reiterated in the March 20, 2009 *Presidential Memorandum*. Therefore the NTIA should give priority to broadband projects that create the most jobs, deploy infrastructure that provides long-term economic benefits, and can be initiated promptly by experienced entities. There is substantial evidence to support the conclusion that deployment of FTTH infrastructure (in unserved and underserved areas) best fits these ARRA objectives.

The FTTH Council believes that "broadband service" and "unserved" and "underserved" areas should be defined based on: (1) the economic stimulus objectives of the ARRA; (2) the policy objective of ensuring there is universal access to broadband services; and (3) the type of broadband service that is being offered in the market today and during the period when the grants will be awarded and funding expended. Accordingly, it proposes that unserved areas are those where a significant number of customers lack access to current generation (6 Mbps/1.5 Mbps) broadband service and underserved areas include those where a significant number of customers lack access to a competitive provider of current generation broadband service or any provider of advanced broadband service (25 Mbps/ 6 Mbps). By using these definitions, grants should be awarded to projects for deployments of more advanced broadband networks, which should be beneficial to the creation of jobs and the development of infrastructure with long term benefits.

As with these definitions, the system for awarding grants (the scoring system) should be based largely on the economic stimulus objectives of the ARRA. The FTTH Council therefore submits the following system for scoring applications for projects in unserved and underserved areas: Job creation (up to 20 points); Project feasibility, initiation, and completion (up to 25 points); Infrastructure capabilities and long-term sustainability (up to 30 points); Cost-effective deployments (up to 10 points); Affordability (10 points); and State endorsements, community connectivity/support, and disadvantaged small businesses (up to 5 points).

Finally, the NTIA should encourage the submission of projects that are "turn-key" or involve "design-build" construction techniques by experienced providers. This will enable projects to be initiated and completed more quickly and will assist the agency in monitoring compliance.

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The Fiber-to-the-Home Council ("FTTH Council"), through its undersigned counsel, hereby respectfully submits its comments to the Department of Commerce, National Telecommunications and Information Administration ("NTIA") in response to the March 12, 2009 *Federal Register* notice for comments ("Notice") to implement the Broadband Technology Opportunities Program ("BTOP") in the American Recovery and Reinvestment Act of 2009 ("ARRA").[1]

The FTTH Council is a non-profit organization established in 2001. Its mission is to educate the public and government officials about fiber-to-the-home ("FTTH") and to promote and accelerate FTTH deployment and the resulting quality of life enhancements FTTH networks make possible. The FTTH Council's members represent all areas of the broadband access industry, including telecommunications, computing, networking,

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[1] *In the Matter of the American Recovery and Reinvestment Act of 2009 Broadband Initiatives,* Request for Information, Docket No. 090309298-9299-01, Rel. March 12, 2009. The BTOP is established in Section 6001 of the ARRA.

system integration, engineering, and content-provider companies, as well as traditional service providers, utilities, and municipalities.[2]

I. NTIA Broadband Technology Opportunities Program

A. The Broadband Grant Program: A Unique Opportunity to Invest Federal Funds in Future-Proof Infrastructure

For years, the United States has been slipping behind other countries in deploying broadband networks and services. The Information Technology & Innovation Foundation in 2008 ranked the United States 15th, lagging many Asian and European countries.[3] The Organization for Economic Co-operation and Development reached a similar conclusion,[4] and the just issued report from Akamai found that the United States ranked 17th in average internet access speed.[5]

More importantly, other countries are not standing still. Instead, they recognize that advanced broadband infrastructure is fundamental to their ability to foster business development and economic growth and are accelerating their efforts to build these networks. Australia, for instance, just announced a program to spend $31 billion to bring FTTH – with internet access at 100 megabits per second -- to 90% of the nation's

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2 As of today, the FTTH Council has more than 200 entities as members. A complete list of FTTH Council members can be found on the organization's website, http://www.ftthcouncil.org.

3 *See*, http://www.itif.org/files/2008BBRankings.pdf. The ITIF rankings are based on penetration, speed, and price.

4 *See,* http://www.itif.org/files/BroadbandRankings.pdf.

5 *See*, http://www.akamai.com/html/about/press/releases/2009/press_033009_1.html.

households and workplaces in the next eight years. This FTTH project will support up to 25,000 jobs on average for each year of the deployment.[6]

Fortunately, the federal government has begun to react to our flagging position with the ARRA and the new broadband programs. We have an opportunity to begin our effort to keep pace with other countries and achieve the President's objective of promoting "next-generation [broadband] facilities"[7] by spending these funds on "future-proof" infrastructure, such as FTTH, which can be upgraded readily without major new construction and which provides long-term benefits for residents, businesses, and our economy as a whole. This should be the vision for the NTIA as it implements the BTOP.

B. The Purposes of the Grant Program: Projects that Further Economic Growth and Job Creation Take Precedence.

At the beginning of the ARRA, the purposes and principles of the legislation are clearly enunciated:

- "Preserve and create jobs and promote economic recovery."
- "Invest in...infrastructure that will provide long-term economic benefits."
- "[Commence] expenditures and activities as quickly as possible consistent with prudent management."[8]

These purposes – "stimulating economic growth and job creation" -- are later echoed in the *Conference Report* on the provision establishing the BTOP.[9] Moreover, the March

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6 *See,* http://www.pm.gov.au/media/Release/2009/media_release_0903.cfm.

7 *See*, http://www.barackobama.com/pdf/issues/FactSheetScience.pdf.

8 Public Law 111-5, Section 3 (a)(1), (a)(4), (b).

9 *See, Summary, Division B, Title VI, Broadband Technologies Opportunities Program, Conference Report on H.R. 1, American Recovery and Reinvestment Act of 2009*, February 12, 2009. ("*Conference Report*")

20, 2009 Memorandum from the President, *Ensuring Responsible Spending of Recovery Act Funds*, states that "merit-based selection criteria...shall be formulated to ensure that the funding furthers the job creation, economic recovery, and other purposes of the Recovery Act."[10] The NTIA accordingly should give priority to broadband projects that:

- Create the most jobs;
- Can be initiated promptly by an experienced entity; and
- Deploy infrastructure that spurs economic development.

There is substantial evidence to support the conclusion that deployment of FTTH infrastructure (in unserved and underserved areas) best fits these objectives. First, in terms of immediate jobs and economic output, FTTH deployments are enormous construction projects, involving far more outside plant work than other technologies.[11] This conclusion is supported by a recent study by the economic consulting firm Empiris, LLC, which was commissioned by the FTTH Council, on the economic effects of tax incentives for the deployment of broadband infrastructure. (A full copy of the report is appended to these comments.) Of particular relevance to the discussion here, the report states:

> [A] majority (54 percent) of capital spending required in outside plant build-out for FTTH is spent on construction. This heavy reliance on

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10 *Memorandum for the Heads of Executive Departments and Agencies, Subject: Ensuring Responsible Spending of Recovery Act Funds*, The White House, released March 20, 2009, Sec. 1.

11 This conclusion is supported in the *Grant Distribution Considerations and Broadband Speed, Title VI* section of the *Conference Report*, which provides, "The Conferees are also mindful that the construction of broadband facilities capable of delivering next-generation broadband speeds is likely to result in greater job creation and job preservation than projects centered on current-generation broadband speeds."

> construction for FTTH is due in large part to the burying of new infrastructure in the ground...$1 million of investment in FTTH deployment will result in almost 20 jobs, whereas a million dollars of investment in wireless broadband will result in fewer than 15 jobs. This is largely due to our estimate that only 7 percent of wireless broadband capital expenditures go to the construction industry.

In addition to the immediate benefits of creating economic growth and jobs, in terms of economic development, FTTH deployments provide by far the most capabilities (through higher symmetrical bandwidth) for customers to send and receive data and video, and these networks are "future-proof." Once the fiber is installed, upgrading the capabilities of the network is readily accomplished by changing the electronics. In addition, fiber networks are most valuable to businesses, which increasingly demand dedicated amounts of bandwidth, and to their employees.[12] As the former Mayor of Ft. Wayne, Indiana, Graham Richard, stated on March 16, 2009, at a meeting of the National League of Cities, "If you don't have [FTTH], [companies] won't invest in your city. [Broadband deployment] is just as important as public safety, water and sewer systems."[13]

Because of the paramount importance of the ARRA's economic stimulus objectives, in determining which of the five purposes set forth in Section 6001(b) of the BTOP, the NTIA should favor – and expend more funding on – those purposes that best achieve these overriding objectives. If there are too many projects that achieve all of

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12 A 2007 survey sponsored by the FTTH Council found that "a substantial portion of Americans who get their home Internet services through direct fiber optic connections are using those services to telecommute an average of one-third of the time or to run their own home-based businesses," *See*, http://www.ftthcouncil.org/?t=262.

13 *See, TR Daily, Local Involvement Urged in ARRA Grant Program*, March 16, 2009. It should be noted that Mayor Richard stated that job creation was the "number one" benefit from FTTH deployment.

these objectives and the NTIA needs to examine other, secondary factors, it is important to note that the statutory text of Section 6001 does not favor one purpose over another. Thus, once the overall purposes of the ARRA are met, the BTOP provisions do not dictate that one purpose should outweigh another. The *Conference Report* sheds some light on how to proceed by stating that the "NTIA has discretion in selecting the grant recipients that will best achieve the broad objectives of the program."[14] In sum, the NTIA is not obligated to favor one purpose over another and has significant discretion in determining how to allocate the funding -- with one critical exception, it must first favor those projects that meet the primary "economic-jobs" purposes of the ARRA.[15]

The *Conference Report* provides insight as to the intentions of the Conferees as to which projects best achieve these primary purposes – "[T]he construction of broadband facilities capable of delivering next-generation broadband speeds is likely to result in greater job creation and job preservation than projects centered on current-generation broadband speeds. Therefore, the Conferees instruct the NTIA to seek to fund, to the extent practicable, projects that provide the highest possible, next-generation broadband speeds to consumers."[16] As discussed above, the report by Empiris, LLC provides support for this conclusion that FTTH deployments generate the most jobs and economic

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14 *Summary, Title VI, Conference Report.*

15 More specifically, there is no indication in the statute or *Conference Report* that unserved areas should be favored over underserved areas in awarding grants, or vice versa – nor does the legislation provide any criteria for NTIA to use in establishing priorities. In fact, the *Conference Report (Summary, Title VI)* states that the "Conferees intend that the NTIA award grants serving all parts of the country, including rural, suburban, and urban areas."

16 *Grant Distribution Considerations and Broadband Speeds, Title VI, Conference Report.*

output. Further, FTTH networks are critical for subsequent economic development because of their great capabilities for businesses and their employees, community and public safety organizations, educational institutions, faculty, and students, and heath care institutions, their personnel, and patients.

C. Defining Unserved and Underserved Areas

In the Notice, the NTIA asks for comments on defining two critical terms: unserved and underserved areas. Neither the statute nor the *Conference Report* provides any insight into how these terms are to be defined, and the report merely instructs the NTIA to consult with the FCC. Of these two terms, an unserved area is somewhat easier to define – that is, the natural reading of the term is that it is an area without any broadband service. Two questions then arise: what is broadband service in this context, and what number of customers in an area need to receive that service for the area to be declared served? The FTTH Council submits that, for unserved areas, the aim of the BTOP should be to provide on a universal basis at least the same type of broadband service most generally available in served areas. For wireline and other fixed broadband service, there is sufficient evidence to conclude that the "current" generation broadband service that is generally available in served areas has at least the following performance characteristics: 6 Mbps (Rate Code 6) downstream and 1.5 Mbps upstream (Rate Code 4).[17] (The FTTH Council believes the information collected by the FCC in its FCC Form

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[17] The FTTH Council submits that providing an objective measure of broadband performance is essential to the success of the BTOP. It will enable the agency to judge applications on their merits, and, just as importantly, ensure that entities receiving grants are properly monitored. While determining performance by broadband speed alone may not be optimal, there is no other objective standard. Moreover, it is the standard by which current broadband service providers

. . .*Continued*

477 will be relevant to the NTIA as it reviews applications and therefore links its recommended performance characteristics with the FCC's Rate Codes.) There is considerable evidence to support this conclusion. For instance, a recently issued report from the consulting firm, Point Topic, found that in the 4th quarter 2008 the average cable download speed was 9.7 Mbps, while the digital subscriber line ("dsl") speed was 3.9 Mbps.[18] This is supported by examining the offerings of individual providers. Cox's Preferred service has speeds of 10 Mbps downstream and 2 Mbps upstream.[19] Verizon, for its dsl service, routinely offers between 3-7 Mbps downstream and approximately 1 Mbps upstream.[20] It is thus not surprising that a just published New York Times article reported, "The United States has an average [downstream] speed of 5.2 Mbps."[21] Finally, it should be noted that similar speeds (5 Mbps/1 Mbps) were included in the House passed ARRA legislation (H.R. 629) in its definition of basic broadband service.[22]

As for the second issue of the "sufficiency of current generation service" – that is determining how many customers in an area need to lack access to broadband service for the area to be declared unserved -- the FTTH Council submits that the objective of the Program should be to achieve "universal" broadband service. One methodology to define

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advertise and offer their services – and it is the standard used in the *Conference Report*.

18 Data supplied by Point Topid Ltd. *See*, http://point-topic.com/.

19 *See*, http://ww2.cox.com/residential/connecticut/internet/preferred-internet.cox.

20 Verizon offers a Power Plan (3 Mbps/768 Mbps) and a Turbo Plan (7.1 Mbps/ 768 Mbps) *See*, http://www22.verizon.com/Residential/HighSpeedInternet/Plans/Plans.htm.

21 *See*, http://bits.blogs.nytimes.com/2009/03/10/the-broadband-gap-why-is-theirs-faster/.

22 Sec. 1002(j)(3).

"universal" is to examine the current nationwide reach of broadband service and use that as a benchmark. In that regard, the Federal Communications Commission, in a January 2009 report, found that people in 9% of the zip codes in the United States do not have access to either cable modem or dsl.[23] This statistic is supported by the cable industry, which just stated that cable operators reach over 90% of the households in the United States.[24] Thus, there is sufficient evidence to conclude that a Census Tract should be declared unserved where more than 10% of the customers lack access to broadband service. The FTTH Council has proposed in its rules and comments submitted for the Rural Utilities Service program a slightly more conservative approach -- a standard of "20% lacking access" -- but it does not object to the more rigorous approach to ensuring universal service. This will ensure that broadband service is brought to almost all users in the country.

> *Unserved Area* means a geographic area described by Census Tracts where more than 20% of the customers (either residential or business or both) to be served by the project currently lack access to a provider of Broadband Service.[25]

Defining underserved areas is more challenging. As noted above, neither the statute nor the *Conference Report* nor the original House and Senate bills provides any indicia of Congressional intent. Some context for the meaning of the term can be gleaned from the purpose of the statute – "provide improved access to broadband service" – and

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2323 *High Speed Services for Internet Access: Status as of December, 31, 2007, Industry Analysis and Technology Division*, Wireline Competition Bureau, Federal Communications Commission, January 2009 at Table 16.

24 *See, Moving the Needle on Broadband* at http://www.ncta.com/PublicationType/WhitePaper/Moving-the-Needle-on-Broadband.aspx.

25 Either current generation or advanced broadband service.

from statutory criteria for awarding grants – "provide the greatest possible speed" and "increased affordability."[26] There is precedent for using in the definition both the concept that an underserved area is one where access to advanced broadband service is insufficient and where there are select groups of customers needing more affordable access to broadband service. For instance, the concept of insufficient access to advanced broadband service is used in the definition of underserved adopted for the California Advanced Services Fund grant program and in broadband tax legislation introduced this year in the U.S. House of Representatives.[27] Other broadband tax legislation introduced this year in the House and Senate keys the term to groups of customers where affordability is a concern.[28]

Because the overall purpose of the ARRA is to stimulate the economy and provide long-term infrastructure, the FTTH Council encourages the Agency to adopt a definition for underserved areas that would enable projects that achieve those essential economic stimulus objectives – and that melds them with the two concepts of bringing sufficient access to advanced broadband service to areas and in ensuring affordable access by select groups of customers. Accordingly, the FTTH Council believes the definition of underserved area should be the following:

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26 Sec. 6001(b)(2) and (h)(2)(A) and (B). The FTTH Council believes that any affordability standard needs to be judged on the basis of the performance of the broadband service required, and, in the application scoring system discussed later, uses the concept of cost per service as represented by performance speed (megabit per second).

27 *Resolution T-17143. Approval of the California Advanced Services Fund (CASF) Application Requirements and Scoring Criteria for Awarding CASF Awards*, Public Utilities Commission of the State of California, June 12, 2008, p.6. H.R. 760, Advanced Broadband Infrastructure Bond Initiative of 2009, 111th Congress.

28 *See,* S. 350, Sec. 48D(e)(24), and H.R. 691, Sec. Sec. 45R(c)(3).

Underserved Area means:
(1) a geographic area described by Census Tracts that is not an unserved area where more than 33% of the customers (either residential or business or both) to be served by the project currently lack access to more than one provider of Current Generation Broadband Wireline Service;
(2) a geographic area described by Census Tracts that is not an unserved area where more than 33% of the customers (either residential or business or both) to be served by the project currently lack access to a provider of Advanced Broadband Wireline Service;
(3) a geographic area described by Census Tracts where more than 25% of the Community Anchor Institutions to be served by the project currently lack access to a provider of Advanced Broadband Wireline Service; or
(4) any Census Tract that is located in (i) an empowerment zone or enterprise community designated under section 1391, (ii) the District of Columbia Enterprise Zone established under section 1400, (iii) a renewal community designated under section 1400E, or (iv) a low-income community designated under section 45D.[29]

The first part of the proposed definition – (1) – seeks to ensure affordability by encouraging greater competition for an entire area. The other parts – (2), (3), and (4) -- of the proposed definition are directed towards ensuring that most customers in general and key segments of the community in particular have "first-time" access to advanced broadband service. This part not only achieves a universal service objective but is most important in meeting the ARRA's economic objectives since it will foster the deployment of new advanced broadband networks, which as discussed above in the case of FTTH networks are significant generators of jobs and economic growth – as well as the construction of infrastructure with long-term benefits.

There are two terms used in the proposed definition that require elaboration – the definition of advanced broadband service and the issue of insufficient access to such

service. First, as to the definition of Advanced Broadband Wireline and other Fixed Service, the FTTH Council proposes the following definition:

> *Advanced Broadband Wireline and other Fixed Service* means providing on an advertised and generally available basis a dedicated service to each customer from the internet access node an information transfer rate equivalent to at least 25 megabits/second from the provider to the customer (downstream) and at least 6 megabits/second from the customer to the provider (upstream).

This definition is based on current performance characteristics for high-speed broadband services many customers receive or about to receive. (The downstream speed fits within Rate Code 8 of the FCC Form 477 and the upstream speed within Rate Code 6.) Verizon's FiOS network, for instance, today provides a 50 Mbps downstream – 20 Mbps upstream service,[30] and AT&T's U-verse today provides a 18 Mbps/1.5 Mbps service.[31] In addition,[32] Comcast offers a 50 Mbps/10 Mbps service;[33] Cablevision a 30 Mbps/5 Mbps service,[34] and Cox just launched a 50 Mbps/5 Mbps service.[35] These performance

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29 For both unserved and underserved areas, the Agency should ensure that any existing provider is viable and that its service is sufficiently substitutable with the broadband service proposed in the application.

30 *See,* http://investor.verizon.com/news/view.aspx?NewsID=925.

31 *See*, http://www.att-services.net/att-u-verse/uverse-internet.html.

32 It should be noted that the performance metrics offered by cable operators are based on providing a shared service, that is a service where all customers do not receive these high-speeds simultaneously. In its proposed definition of advanced broadband wireline service, the FTTH Council provides that the 25 Mbps/6 Mbps performance requirements must be met by providing a dedicated service to ensure all customers receive the proposed speeds simultaneously.

33 *See*, http://www.cmcsk.com/phoenix.zhtml?c=118591&p=irol-newsArticle&ID=1215838&highlight=. Comcast's current, general high-speed offering is 16 Mbps/2 Mbps.

34 *See*, http://www.optimum.com/order/boost/.

35 See, http://sev.prnewswire.com/computer-electronics/20090401/CL9228901042009-1.html.

characteristics are, of course, snapshots of the current market, and, given the previous growth rates, the Agency should conclude that even higher-speeds will be available in the next few years – when the networks built by the broadband stimulus grants are completed. There is thus sufficient evidence for the Agency and the Commission to conclude that advanced broadband service should be defined as at the least as 25 Mbps downstream – 6 Mbps upstream.

Additional support for this definition, reflecting recent Congressional intent, can be found in the definition for "advanced broadband service" used in the House version of the NTIA broadband stimulus program in the ARRA – "at least 45 megabits per second downstream and at least 15 megabits per second upstream."[36] While this definition was not included in the final bill, Congress required the NTIA to favor applications for grants that offered the "greatest possible broadband speeds."[37] Clearly, Congress understands that higher speeds provide the greatest capabilities for customers – in addition to leading to the greatest benefits in terms of economic growth and job creation. The FTTH Council would welcome the Agency's adoption of the definition provided by the House but also believes the definition provided above is sufficient to achieve the ARRA's intent.

The other term that requires elaboration is the threshold – 33% of the customers lacking access -- for triggering an area to be underserved. This determination should be driven by the overall objective of bringing to underserved areas the same level of service – that is, advanced broadband service -- found in served areas. For advanced broadband service, the major broadband providers will pass a majority of their customers in the next

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36 *See*, Section 1002(j), H.R. 629, 111th Congress.

year, and this level of access will continue to grow. In terms of a current snapshot, Verizon's FiOS network will pass approximately 18 million households by the end of 2010 – over 50% of the households it serves.[38] Comcast, the nation's largest cable company, advanced broadband service will be provided to approximately 10 million homes shortly.[39] Cablevision, another major cable operator, currently offers most of its customers its high-speed service.[40] AT&T's U-verse will pass approximately 55% of the households it serves by the end of 2010.[41] It is on this basis – of generally available advanced broadband service offered during the period when infrastructure using grant funding from the Program will be built -- that the FTTH Council submits that the area should be declared underserved if more than 33% of the customers lack access to advanced broadband service.

D. The Role of the States.

The statute and the *Conference Report* clearly provide that authority and responsibility for awarding grants under the BTOP rests solely with the NTIA and that

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37 *See, Grant Distribution Considerations and Broadband Speeds, Title VI, Conference Report.*

38 *See,* http://investor.verizon.com/news/view.aspx?NewsID=925.

39 *See,* http://www.cmcsk.com/phoenix.zhtml?c=118591&p=irol-newsArticle&ID=1215838&highlight=. An article in *Communications Daily* on April 13, 2009 (p. 6) states that Comcast "is aiming to wire 65 percent of its footprint for wideband by the end of this year, and expects to complete the deployment by sometime next year."

40 *See,* http://www.optimum.com/order/boost/.

41 *See,* http://www.att-services.net/att-u-verse/uverse-internet.html and http://www.att.com/gen/investor-relations?pid=5711.

the Agency has discretion in considering any state submissions.[42] States may identify and supply to the NTIA information about unserved and underserved areas. States also may provide advice about how to allocate funding among projects in the state – but, again, the NTIA has the ultimate responsibility (and discretion) and must adhere to the objectives of the ARRA. Thus, should the NTIA decide to consult with a state, for a state's submission to carry any weight, it needs to be accompanied by supporting documentation that sufficiently sets forth the bases for its conclusions and, where relevant, how those conclusions meet the purposes of the ARRA. Those submissions that meet these requirements should be accounted for in scoring applications.

The statute also provides that states may apply directly for grants. When this occurs, state filings should be treated the same as any other filings and should be judged solely on the merits of the project submitted.

E. **Eligible Grant Recipients.**

The statute gives the NTIA the discretion to expand the eligible grant recipients to any entity so long as that determination is in the public interest and to the extent practicable promotes the purposes of the BTOP in a technologically neutral manner. The *Conference Report* provides further insight by stating that the Conferees intend "that, consistent with the public interest and purposes of this section, as many entities as possible be eligible to apply for a competitive grant." To ensure that the projects that

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42 The statutory text states that NTIA "may consult a State," implying the agency has significant discretion (Sec. 6001(c)). The *Conference Report* appears to support this approach, although the language is more opaque since it states that the conferees "expect and intend that the NTIA, at its discretion, will seek advice and assistance from the States." In any event, since the statutory language is clear, there is no need to refer to the report.

best achieve the purposes of the statute are submitted, the FTTH Council supports opening the grant process to as many legally-organized entities as possible.

F. Eligible Projects and Use of Grant Funds for Unserved and Underserved Areas.

The eligibility of projects in unserved and underserved areas should be based on the objectives of the BTOP and flow directly from the definitions of those areas. Consequently, in unserved areas, projects should seek – and funds should be made available – to provide either Current Generation or Advanced Broadband Wireline Service, although grantees that seek to deploy advanced service should be preferred. In underserved areas, project funding should only be for the provision of Advanced Broadband Wireline Service. In addition to these requirements, the Agency should permit any project to serve customers in unserved and underserved areas to include so-called high-speed middle-mile connections, that is from the access plant to the internet node. Middle-mile facilities, which may be costly to construct especially in rural areas, are critical to ensuring customers do not face "broadband bottlenecks." Moreover, the effectiveness of other demand-side and infrastructure projects funded under BTOP could be severely diminished without adequate investment in middle-mile facilities. Finally, funding should be directed towards infrastructure deployment with the exception of assisting in ensuring access to community anchor institutions and vulnerable populations. The proposed FTTH Council rule is as follows:

(a) ELIGIBLE GRANT PURPOSES FOR PROJECTS IN UNSERVED AND UNDERSERVED AREAS
Grant funds may be used to finance:
(1) In unserved areas, or in underserved areas (defined by enabling a second entrant), the acquisition of equipment, instrumentation, networking capability, hardware and software, digital network technology, and infrastructure used in the provision of Current

Generation or Advanced Broadband Wireline Service and the construction and deployment of such service related infrastructure;

(2) In underserved areas (where no or insufficient Advanced Broadband Wireline Service), the acquisition of equipment, instrumentation, networking capability, hardware and software, digital network technology, and infrastructure used in the provision of Advanced Broadband Wireline Service and the construction and deployment of such service related infrastructure;

(3) To ensure the service performance requirements in (1) and (2) above are met, the acquisition of equipment, instrumentation, networking capability, hardware and software, digital network technology, and infrastructure and the construction and deployment of such service related infrastructure to connect access networks with the point of access to the internet (middle-mile connections);

(4) Access to Broadband Service, including use of end-user equipment, by Community Anchor Institutions;

(5) Access to Broadband Service, including use of end-user equipment, by low-income, unemployed, aged, and otherwise vulnerable populations; and

(6) The purchase of land, buildings, or building construction needed to carry out the project.

(b) INELIGIBLE GRANT PURPOSES

For projects seeking to provide Broadband Service in unserved or underserved areas, operating expenses incurred in providing such service are ineligible for grants, except as provided in subsection (a)(3) and (a)(4) of this section.

G. **Allocating Funding Between Unserved and Underserved Areas.**

As for the allocation of funding between unserved and underserved areas, under the statute, the NTIA has discretion but must act consistently with the overall intent of the ARRA, that is, it should determine which projects best stimulate the economy.[43] In interpreting this requirement, the Agency first must determine how grant funding will be expended. For projects in underserved areas (at least for the first two parts of the FTTH Council's proposed definition), entities will need to deploy infrastructure over which the

[43] The FTTH Council suggests for the allocation of the overall funding that the agency seek to award most of the money in the first two of the three rounds of funding. This would to maximize the immediate impact on the economy.

provider offers advanced broadband services, which it defines as a service with speeds of at least 25 Mbps downstream and 6 Mbps upstream.[44] As discussed earlier in these comments, such infrastructure inherently creates more jobs and economic growth than projects for current generation services – thus better achieving the purposes of the ARRA – and, as such, should receive a greater allocation of funding. The FTTH Council accordingly suggests for the initial round that funding the Agency allocate more funds to underserved areas than to unserved areas.[45] This ratio can be adjusted in subsequent rounds to ensure the objectives of the statute are best achieved.

H. Streamline Construction

As noted frequently throughout these comments, the objective of the ARRA is to stimulate the economy by expending funds on worthwhile projects as quickly as possible. The Agency thus should seek to ensure that projects begin and proceed expeditiously once grants are awarded. To that end, it should permit entities to file "turn-key" or "design-build" projects, whereby the provider joins with or otherwise obtains commitments from equipments vendors, construction companies, and other participants in the project in advance of filing the application. In essence, all of these entities become

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44 As noted earlier in the comments, the House legislation defined advanced broadband service as 45Mbps/15Mbps. While the FTTH Council supports this definition because such service is a current offering by many providers over FTTH networks, it acknowledges that infrastructure capable of providing broadband service at a speed of 25Mbps/6Mbps also will meet the ARRA's intent.

45 As noted in its discussion of which entities should be eligible to apply for grants, the FTTH Council urged an expansive approach which was technology neutral. The statute, however, does not require that grants be awarded on a technology neutral basis. Rather, NTIA is to award grants based on the purposes of and specific requirements in the statute, which, when applied, may result in one technology being favored over another.

part of the project team and are included in the application as participants. This will obviate the need for post-award bidding and negotiations between the applicant and suppliers, which will only delay initiation of the project.

I. Establishing Selection Criteria for Grant Awards in Unserved and Underserved Areas.

The selection criteria for grant awards needs to flow from the purposes of the ARRA and the text of the statute. Thus, the major criteria must be: job creation, economic stimulus, and deployment of infrastructure with long-term benefits. In a scoring system, these components (and their surrogates) should comprise the majority of points. The BTOP statute also lists a series of considerations that the Agency must consider, some of which may overlap with the criteria described above, including: increase affordability and subscribership; provide the greatest broadband speed to the greatest population; enhance service for health care delivery, education, or children; and not result in unjust enrichment as a result of support for non-recurring costs through another federal program. The FTTH Council appreciates the challenge that the NTIA has in weighing all these factors, and it proposes the following criteria and points for evaluating infrastructure deployment projects in unserved and underserved areas (out of a maximum of 100).[46]

> UNSERVED AND UNDERSERVED INFRASTRUCTURE SCORING CRITERIA
> The following formulas shall be used to score an application that seeks to provide access in unserved areas or improved access in underserved areas. Unless specifically stated otherwise, the same formulas will be used for each services

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[46] Outside of the context of infrastructure projects dedicated to unserved and underserved areas, the FTTH Council supports an approach that would independently address projects focused solely or largely on the two other important purposes in the statute: education/awareness/training and public safety.

category and for underserved and unserved areas. All eligible applications shall receive points (Maximum 100 points) pursuant to the following scoring criteria:

SCORING CRITERIA DEFINED

1. *Jobs Creation* (up to 20 points). The number of jobs directly involved in the project, including for construction, support, and management. The points awarded shall be determined by the following formula:

$$\text{Jobs Points} = (j_1 / tc_1) / (\text{Max}(j / tc)) * 20$$

j = Direct jobs proposed to be created by the project (expressed in person-hours of work to be expended by all individuals directly working on the project)

tc = Total cost of project

(1) "j_1 / tc_1" is the ratio "j / tc" for the specific project being scored;

(2) "Max(j / tc)" is the highest ratio "j / tc" of any project submitted by an applicant during the current filing window.

2. *Project Feasibility, Initiation, and Completion* (up to 25 points). The Agency shall not consider whether the applicant has requested or receives a waiver of the Matching Funds requirement in making any of these scoring determinations. The Agency shall not preclude or otherwise discriminate against applications where project design, construction, and installation are engaged in simultaneously or in advance of filing the application, that is, "design-build" or "turn-key" projects.

A. *Feasibility* (up to 15 points). This criterion measures the project's overall chances for successful completion. Among the factors to be considered are:

(1) The experience of the applicant;

(2) The ability of the applicant to obtain the necessary labor and materials at the price specified in the application;

(3) Use of proven technologies; and

(4) Existence of legal barriers.

B. *Initiation and Completion* (up to 10 points). This criterion measures the number of months the applicant has proposed to take to complete the project in light of the total cost of constructing the project (that is, exclusive of the cost of materials, including electronics). (Using only the construction budget will better correlate with the direct jobs and immediate economic stimulus caused by the project.) Points shall be determined based on the following formula:

Timeliness Points = (Min (m / tc) / (m_1 / tc_1)) * 10

(1) Where "m" is the number of months between the date of the grant award and the proposed date of completion of the specific project being scored; "m_1" is the "m" for the specific project.

(2) Where "tc" is the total cost of construction of the proposed project; "tc_1" is the "tc" for the specific project. ("tc" should be expressed in millions of dollars.)

(3) Where Min (m / tc) is the smallest ratio for any project submitted of the proposed number of months to complete the project divided by the total cost. (The ratio should be expressed in months per millions of dollars.)

(4) The Agency has the discretion to alter "m" for projects in areas where construction is infeasible because of inherent weather conditions, *e.g.* states in very cold climates. In such instances, the Agency may alter "m" by delaying the initiation date of the project from the date of the grant award to the date when weather permits construction to be undertaken and may "stop the clock" if the project is to continue through subsequent periods when construction is infeasible.

3. *Infrastructure Capabilities and Long-Term Sustainability* (up to 30 points)

A. *Broadband Transmission Speed* (up to 20 points). This criterion represents the difference between the current average advertised and generally available dedicated broadband transmission speed per customer and the applicant's proposed advertised and generally available dedicated speed per customer in the proposed service areas. Points will be determined separately for each service category based on the following formula:

Speed Points = b / Max(b) * 20

(1) "b" is the "b" value for the specific project being scored;

(2) "b" = (proposed service upload speed – current service upload speed) + (proposed service download speed – current service download speed). If no current broadband service, the speed shall be zero. (All speeds used in the formula should be for the tiers with the maximum speeds which are advertised and generally available).

(3) Max(b) is the highest "b" value of any project submitted by an applicant during the current filing window – to a limit of 50 Mbps downstream and 20 Mbps upstream;

B. *Long-Term Sustainability* (up to 10 points). The Agency shall award up to 10 points based on its assessment of the proposed project's likelihood of sustainability, including whether the project includes infrastructure that can be readily upgraded to provide greater performance.

4. *Cost-Effective Deployments* (up to 10 points). This criteria shall be determined based on the number of customers the applicant will be able to serve divided by the funding amount requested from the Agency. It is conditioned on the requirement that applicants must provide at least Current Generation Broadband Service in Unserved Areas, and Advanced Broadband Service in Underserved Areas. (The Agency can modify this requirement to account for the provision of speeds in excess of the required speeds by including an additional multiplier similar to the one included in the 3(A) – Broadband Transmission Speed (b/Max(b))). Points will be determined based on the following formula:

Unserved Areas:

$$\text{FRPPC Points}_{\text{unserved}} = ((\text{Min}(a) / a_1) * (\text{Min}(d) / d_1)) * 10$$

Underserved:

$$\text{FRPPC Points}_{\text{underserved}} = (\text{Min}(a) / a_1) * 10$$

a = Funds Requested per Potential Customers (FRPPC) expressed as dollars per household passed; "d" is the average number of homes per square mile in the proposed service territory.

(1) "a_1" is the "a" for the specific project being scored;

(2) "Min(a)" is the lowest "a" value of any project submitted by an applicant during the current filing window;

(3) A density factor is included for unserved areas, which are most likely to be rural, to account for higher cost in these areas. "d_1" is the "d" for the specific project being scored;

(4) "Min(d)" is the lowest "d" for any project submitted by an applicant during the current filing window.

5. *Affordability* (10 points). 10 points shall be awarded to an applicant that commits to charge each customer served over the infrastructure constructed as part of a grant a price/Mbps for Broadband Service equal to or less than the average price/Mbps for existing internet access service (whether broadband or dial-up service) in the area covered by the project for a period of at least two (2) years after service is initiated. (All prices and speeds (Mbps) should be for the tier with the maximum speed which is advertised and generally available.)

6. *State endorsements, community institution connectivity and support, and socially and economically disadvantaged small business concern* (up to 5 points). In the discretion of the Agency, applicants may receive up to 5 points for obtaining support from a Governor of a state (or the Governor's designee), connecting community anchor institutions, obtaining community support, or demonstrating that it is a socially and economically disadvantaged small business concern.

J. **Non-Discrimination and Interconnection Contractual Conditions.**

The statute requires the NTIA publish non-discrimination and network interconnection obligations, which at a minimum shall include the FCC's Wireline Broadband principles.[47] These obligations will be contractual conditions of grants. The *Conference Report* provides no additional commentary on the Conferees intent on this issue. The FTTH Council urges the NTIA to act conservatively in implementing this requirement and limit the obligation to the FCC's principles for two primary reasons. First, the main purpose of the ARRA is to stimulate the economy, and the creation of a new set of obligations will take additional time, generate uncertainty, and potentially foster disputes – all of which will slow implementation. The FCC's principles, in contrast, are a known quantity. Second, there is a consensus in the public and private sectors in support of the FCC's principles, and there is every indication that providers,

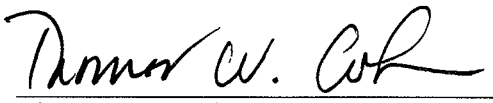
47 FCC Docket No. 05-15, adopted August 5, 2005.

with rare exception, live by them. The number of complaints brought for non-compliance have been minimal. In addition, there have been few complaints about practices of providers that may fall outside the principles. In sum, for this targeted program, the FTTH Council believes relying on current policies has real value.

II. Conclusion

The BTOP provides the Agency with a great opportunity to achieve the economic stimulus aims of the ARRA and propel the deployment of broadband infrastructure that provide long-term benefits to residents and businesses – which in turn will enhance our international competitiveness. The FTTH Council believes that deployments of FTTH networks best meet these objectives, and it stands ready to assist the Agency as it moves forward in implementing this Program.

Respectfully submitted,



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ECONOMIC EFFECTS OF TAX INCENTIVES FOR BROADBAND INFRASTRUCTURE DEPLOYMENT

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ECONOMIC EFFECTS OF TAX INCENTIVES FOR BROADBAND INFRASTRUCTURE DEPLOYMENT

EXECUTIVE SUMMARY

Investments in next generation broadband infrastructure, such as fiber to the home networks, generate both immediate and long-term benefits for the U.S. economy. In the short run, increased capital investment leads directly to increased employment and output. In the longer run, the rapid deployment of affordable broadband services transmitted over next generation infrastructure is essential to U.S. competitiveness. Tax incentives to encourage deployment of these high-speed broadband services therefore represent an efficient mechanism for increasing both short-term economic growth and long-run economic competitiveness.

We analyzed four proposals: (1) 100 percent expensing of investments made in next generation broadband networks – defined as those networks capable of delivering at least 100 megabits downstream and 20 megabits upstream; (2) 50 percent expensing of broadband investments in rural and underserved areas capable of delivering at least 5 megabits downstream and 1 megabit upstream; (3) tax-credit bonds for private investments in next generation broadband infrastructure; and (4) tax-credit bonds for public sector investments in next generation broadband infrastructure.

Our results demonstrate that each of these proposals would generate substantial net benefits for the U.S. economy. Specifically:

- The two tax credit bond proposals would have the largest impact on the economy, generating more than $30 billion in new investment in next generation broadband infrastructure and more than $100 billion in additional GDP over the next three years, and directly creating approximately 215,000 net new jobs in each of the next three years.

- The expensing proposals – which are far less "expensive" in terms of forgone tax revenues – would also have significant effects on investment, growth and employment, generating up to $6 billion in new investment and over $18 billion in increased GDP over the next three years, and directly creating approximately 37,000 net new jobs in each of the next three years.

- All of the proposals represent efficient mechanisms for stimulating economic activity and employment. Even ignoring the offsetting tax revenues that would result from increased employment and economic activity, and counting only direct employment effects, the tax expenditure per new job created is between $50,000 and $57,000 for the three proposals involving next generation networks, and approximately $71,000 for the rural/underserved proposal.

- The proposals would significantly increase next generation broadband availability overall and current generation availability in rural and underserved areas, reduce broadband prices

(as measured by price per megabit), increase broadband penetration, and thus result in substantial indirect effects on productivity, growth and employment. Under the two expensing proposals, for example, up to 6.6 million additional homes would be passed by fiber to the home type networks, and broadband service would become available to 4.0 million homes in rural and underserved areas that do not have broadband access.

- Increased broadband penetration resulting from lower prices and increased availability would result in additional "indirect" job creation. For example, the two tax-credit bond proposals would result in a sustained increase in employment of nearly 360,000 new jobs.

Finally, it should be noted that these proposals, if adopted, would affect economic activity almost immediately. Private sector firms are already in the field deploying new broadband infrastructure and have the ability to further accelerate planned deployments. The temporary nature of the four proposals analyzed here would give these firms very strong incentives to "front-load" investment activities that might otherwise be stretched out over the course of many years (especially in view of the current downturn in economic activity).

The results of our analysis are summarized in Table 1, which is reproduced below.

TABLE 1: SUMMARY OF ANNUAL DIRECT ECONOMIC EFFECTS ON JOBS AND OUTPUT, 2009-2011

	100% Expensing for 100/20 Mbps	50% Expensing for 5/1 Mbps (Rural/Underserved Areas only)	Private Sector Tax Credit Bonds	Public Sector Tax Credit Bonds
Direct Effects				
– Output ($Billion, 2009-2011 total)	5.214 - 15.334	1.051 - 3.091	93.878	9.388
– Jobs (Annual Increase)	10,965 - 32,250	1,840 - 5,413	197,437	19,744
Forgone Tax Revenues over Investment Life ($Billion)	0.583 - 1.715	0.131 - 0.386	11.178	0.985
$ Forgone Tax Revenue per Direct Effect Job	**$53,182**	**$71,229**	**$56,616**	**$49,889**
Direct Jobs per $Million Forgone Tax Revenue	**18.804**	**14.039**	**17.663**	**20.045**

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CONTENTS

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I. INTRODUCTION

1. We have been asked by the Fiber-to-the-Home Council (FTTH Council) to analyze the economic impact of proposed tax incentives for broadband deployment. We analyze four specific proposals:

A) Immediate expensing of 100 percent of investments providing 100 megabit downstream/20 megabit upstream service to any area in the United States for three years (2009-2011),

B) Immediate expensing of 50 percent of investments providing 5 megabit downstream/1 megabit upstream service to rural and underserved areas in the United States for three years (2009-2011),

C) Issuance by private sector entities of up to $10 billion in tax-credit bonds per year over the next three years (2009-2011) to fund investments on broadband deployments providing 100 megabit downstream/20 megabit upstream service to any area in the United States; and

D) Issuance by public sector entities of up to $1 billion in tax-credit bonds per year over the next three years (2009-2011) to fund investments on broadband deployments providing 100 megabit downstream/20 megabit upstream service to any area in the United States.

2. Each of these proposals will generate significant benefits for the U.S. economy, measured both in increased GDP and increased employment. GDP and employment will increase over the next three years because of the increased investments by broadband providers resulting from the tax relief ("direct effect"). Table 1 shows the economic impact of each of the four proposals.

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3. As Table 1 shows, the impact on economic output from 2009 to 2011 ranges from $1.051 billion for the 50 percent expensing proposal to $93.878 billion for the private sector tax-credit bonds. The increase in average annual employment ranges from 1,840 net new jobs for the 50 percent expensing proposal to 197,437 net new jobs for the private sector tax-credit bond proposal.

4. Table 1 also shows the forgone tax revenues from each proposal. Our estimates of forgone tax revenues represent only the direct effect of each policy, and do not account for offsetting revenues resulting from increased incomes for suppliers of the inputs for broadband deployment (e.g., income taxes resulting from increased employment). Our estimates of the forgone tax revenues over the 15-year depreciable life of the investments made from 2009 to 2011 range from $131 million to $11.2 billion for each of the four proposals. Thus, from 2009 to 2011, each of the four proposals will sustain an average of between 14 and 20 net new jobs per million dollars of forgone tax revenue as a result of the direct effect of increased broadband capital expenditures.

II. THE IMPACT OF TAX INCENTIVES ON INVESTMENT AND THE ECONOMY

5. Investment tax incentives affect the economy by reducing the after-tax cost of investment and thus increasing the effective rate of return on investment (ROI) from what it would be in the absence of the tax incentive. As a result, firms choose to make investments that would otherwise be uneconomic, and the overall amount of investment in the economy increases accordingly.

6. By increasing investment, investment tax incentives have a direct effect on employment and output. The direct effects are jobs and economic activity created as a direct result of increased outlays for equipment, increased employment for installation, and associated expenses (e.g., jobs resulting from increased purchases of equipment needed for installation, such as bucket trucks and construction equipment). The most authoritative and generally accepted means of estimating the direct effect of increased investment is the RIMS II model, developed by the Bureau of Economic Analysis.

III. PROPOSALS ANALYZED

7. We analyzed four specific proposals. In this section, we briefly describe each.

A. Expensing Proposals

8. Expensing (or accelerated depreciation) affects the after-tax cost of investment by allowing a firm to deduct from its taxable earnings the full amount spent on the investment, rather than stretching that deduction out based on the depreciation schedule for that investment. The after-tax cost of the investment is thus reduced by the difference between the value of the tax deduction taken in year one, on the one hand, and the present value of the flow of tax deductions that would otherwise be taken over the life of the equipment. The impact of

expensing thus depends on the depreciation life (for tax purposes) of the eligible investment, and on the applicable tax rate.

9. **100/20 Mbps**: The specific expensing proposal we were asked to analyze would allow for immediate expensing of 100 percent of investments made over three years (2009-2011) that provide 100 megabit downstream/20 megabit upstream service to any area in the United States.

10. **5/1 Mbps Rural & Underserved**: The second specific expensing proposal we were asked to analyze would allow for immediate expensing of 50 percent of investments made over three years (2009-2011) that provide 5 megabit downstream/1 megabit upstream service to rural and underserved areas of the United States.

B. Private Sector Tax-Credit Bond Proposal

11. Tax-credit bonds are debt instruments that qualify bondholders to receive tax credits from the U.S. Treasury, effectively reducing the bondholders' tax liability by an amount equal to the tax credit. As a result, the yield required to sell such bonds at par is reduced by the value of the tax credit to the bonds' purchasers.

12. The tax-credit bond proposals we were asked to analyze call for the Secretary of the Treasury to establish tax credits which allow issuers to sell the bonds at a zero coupon rate. Thus, bondholders would receive tax credits equal to the amount they would have received in interest had the bonds been sold without the tax credit. Under this proposal, private sector entities would be able to borrow up to $10 billion in tax-credit bonds per year over the next three years (2009-2011) to fund investments on broadband deployments providing 100 megabit downstream/20 megabit upstream service to any area in the United States.

C. Public Sector Tax-Credit Bond Proposal

13. Our analysis of the public sector tax-credit bond proposal is similar to the analysis of the private sector tax-credit bond proposal. The public sector proposal would allow for public sector entities to partner with private sector entities in the deployment of broadband. This access to lower-cost funding would induce a firm to invest more in broadband deployments than it would absent the tax incentive.

14. The specific tax-credit bond proposal we were asked to analyze would allow for the issuance by public sector entities of up to $1 billion in tax-credit bonds per year over the next three years (2009-2011) to fund investments on broadband deployments providing 100 megabit downstream/20 megabit upstream service to any area in the United States. The FTTH Council believes that providing $1 billion per year in bonds is appropriate for this program, as compared to the larger $10 billion in bonds for the private sector program described above, because to date public sector entities have been involved more selectively in deploying broadband infrastructure and because, at least for municipalities, they are limited in the scale of their deployments by the

geographic limitations of their jurisdictions. In addition, public sector entities typically take substantially longer to deploy broadband networks than private sector entities – in some recent cases, approximately three years from proposal to groundbreaking.

IV. ANALYSIS OF DIRECT EFFECTS

15. Our analysis of each proposal entailed estimating the direct effects of increased spending resulting from the tax incentives. All of our models include various baseline assumptions related to the number of homes passed and served by broadband technology and the investment required to deploy and maintain broadband lines. For estimates relating to modeling broadband service of 100/20 Mbps, we use historical data and projections on fiber-to-the-home (FTTH), the most prevalent form of technology currently used to achieve the speeds required to meet the tax incentive thresholds. For estimates relating to modeling broadband service of 5/1 Mbps, we use historical data and projections on cable and digital subscriber line (DSL) broadband service.

A. Description of Data

- **100/20 Mbps Service (FTTH)**

16. We use historical data and an average of forecasts of homes passed and homes served by FTTH through 2013 from RVA Market Research (RVA). Dividing RVA's forecasts of the number of homes passed and homes served by Morgan Stanley's forecasted number of households through 2011[1] yields annual fiber penetration rates and adoption rates.

17. To estimate the cost to deploy and serve a home with fiber, we use estimates from a proposal for fiber deployments for the city of Portland, Oregon.[2] According to the 2007 proposal by Uptown Services, capital expenditures per home passed with FTTH were $765 in outside plant build-out costs. Uptown Services estimated that subscriber capital investments, which would include optical network terminals (ONTs), drop cables, connectors, ONT power supply, and set top boxes would be between $667 (without digital video recorder (DVR)) and $817 (with DVR) per new subscriber. Therefore, we assume that the investment required to pass a home with fiber is $765 and the additional investment required to serve a home is $742 (average of $667 and $817) in 2007. After 2007, we assume a 5 percent annual decrease in the investments required to pass and serve a home with fiber.

18. Finally, we assume that 100 percent of forecasted fiber capital expenditures would meet the speed limits necessary for eligibility for the tax expensing and tax-credit bond proposals

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[1] Simon Flannery, Benjamin Swinburne, David Gober, Daniel Gaviria, & Chad Harris, Morgan Stanley, *Cable/Sat & Telecom Broadband Outlook: Online Usage Growth Favors Cable, DirecTV Remains HD Leader* (July 18, 2008), at Ex. 26.

[2] Uptown Services, LLC, "Phase 2 Business Case for a Community Fiber Network, Prepared for the City of Portland by Uptown Services, LLC," Nov. 2007, at 25.

because RVA's forecasts are based on deployments that can meet the 100/20 Mbps speed thresholds.

- **5/1 Mbps Service (Cable and DSL)**

19. To estimate the number of homes passed by 5/1 Mbps service without the tax incentive, we use data from Morgan Stanley's forecast of residential cable and DSL subscribers through 2011.[3] Morgan Stanley presents forecasts of broadband subscribers by cable and combined DSL+Fiber service. We estimate DSL subscribers by subtracting the RVA forecasts of fiber subscribers from Morgan Stanley's forecast of DSL+Fiber subscribers. Morgan Stanley forecasts the number of homes passed for cable broadband services, but does not forecast the number of homes passed by DSL service.[4] We assume that if a home is not passed by cable broadband, then it is not passed by DSL. Based on Morgan Stanley's forecasts of homes passed by cable broadband and total households, an average of 7.3 million homes (equal to 6.0 percent of all households) will not be passed by broadband from 2009 through 2011 without the proposed tax incentives.

20. To estimate the cost to deploy and serve a rural or underserved home with cable, we use capital expenditure estimates of cable deployment from Morgan Stanley. Both cable and DSL broadband require three types of capital expenditures: (1) deployment capital expenditures, or investment in upgrading networks; (2) expenditures on customer premises equipment (CPE), such as modems; and, (3) maintenance capital expenditures. Morgan Stanley forecasts capital expenditures through 2012 on rebuilds and upgrades of cable networks for advanced services, including broadband, digital cable, and telephony, per basic subscriber, expenditures on CPE per net additional broadband subscriber, and maintenance capital expenditures on broadband per existing subscriber.[5] Morgan Stanley's average forecasted estimates for cable broadband capital expenditures between 2009 and 2011 were (1) $100 per new subscriber in CPE, (2) $3 per total basic cable subscriber in investments to upgrade service to broadband capability, and (3) $20 in maintenance investments per cable broadband subscriber. Morgan Stanley's $3 estimate of capital expenditures for upgrades is low because it is an average expenditure for *all* basic subscribers, not just those who are being upgraded. Using the estimates of basic subscribers and new homes passed, Morgan Stanley's estimates show that the cost to upgrade service is $213 per new home passed in 2009. This is the estimate we use for estimating the cost to upgrade cable for providing broadband service to a rural or underserved customer in 2009, and we assume that this cost declines by 5 percent each year.

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[3] Simon Flannery, Benjamin Swinburne, David Gober, Daniel Gaviria, & Chad Harris, Morgan Stanley, *Cable/Sat & Telecom Broadband Outlook: Online Usage Growth Favors Cable, DirecTV Remains HD Leader* (July 18, 2008), at Ex. 26.

[4] *Id.* at Ex. 23.

[5] Richard Bilotti, Benjamin Swinburne, & Megan Lynch, Morgan Stanley, *Truth, Lies and Truck Rolls: Understanding Product Profitability* 8 (Oct. 4, 2002).

21. To estimate the cost to deploy and serve a rural or underserved home with DSL, we use a Bear Stearns report that forecasts DSL deployment and CPE capital expenditures per new customer and DSL maintenance capital expenditures per existing customer through 2005.[6] After 2005, we assume that each line-item expenditure in Bear Stearns's capital expenditure forecasts decreases by 10 percent annually.

22. Additionally, Bear Stearns presents capital expenditure forecasts for two categories of customers: those located within 18,000 feet of a service provider's central office and those beyond 18,000 feet. The cost to deploy DSL to a customer beyond 18,000 feet is higher than the cost to deploy DSL to a customer within 18,000 feet. Because the deployments under the proposed expensing legislation would be made to rural and underserved areas, we use the higher deployment costs from the Bear Stearns report for customers beyond 18,000 feet of the service provider's central office when estimating increased capital expenditures in rural and underserved areas.

23. We estimated capital expenditures on DSL and cable broadband without the tax incentive by multiplying the various components of capital expenditures by the relevant factor—new homes passed, gross subscriber additions, or existing subscribers. In calculating gross subscriber additions, we assume that 75 percent of new fiber subscribers each year are former DSL subscribers and that 15 percent of new fiber subscribers each year are former cable broadband subscribers. Thus, the number of gross subscriber additions is equal to Morgan Stanley's forecasted net subscriber additions plus the number of DSL and cable broadband subscribers we assume switched to fiber.

24. Finally, our analysis required an assumption about the share of cable and DSL capital expenditures that would be eligible for the proposed tax incentive. We assume that all expenditures would meet the speed threshold. We assume that 63 percent of the forecasted cable and DSL capital expenditures would meet the rural and underserved area qualifications for 50 percent tax expensing. In earlier work by two of the authors of this study, we estimated the rural-underserved share of homes passed to apply to the total capital expenditures. We assumed that this share was equal to the percentage of households served by at least four broadband providers that reside in zip codes that are rural or underserved. To calculate this figure, we first classified zip codes as being rural or underserved if at least 50 percent of the Census tracts intersecting the

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[6] Robert Fagin, Bear Stearns, *Wireline Services: The DSL Report: Demystifying the Economics of Digital Subscriber Line*, Exhibit 6 (Sept. 2002). Our estimates differ from Bear Stearns in that we calculate maintenance capital expenditures per existing DSL subscriber in a year to be equal to 15 percent of the sum of deployment equipment, incremental bandwidth, and ATM switching capacity capital expenditures per newly deployed DSL customer in that year. This estimate of maintenance capital expenditures produces results that more closely match the DSL maintenance capital expenditures per line estimated by other analysts. *See, e.g.*, Douglas S. Shapiro, Banc of America Securities, *Broadband Brief: DSL Economics, Game Theory and What Happens to Broadband Pricing Next* 4 (Sept. 8, 2003). Banc of America estimates annual DSL maintenance capital expenditures per subscriber to be $46 in 2003 and $36 in 2008. Using our methodology and Bear Stearns's estimates of deployment capital expenditures, we estimate annual DSL maintenance capital expenditures per existing subscriber to be $42 in 2009.

boundaries of the zip code are classified as rural or underserved according to the definitions used in previous legislation that is consistent with the current proposal. We then matched these zip codes with June 2000 and June 2002 data from the FCC that shows the number of firms providing broadband service by zip code. We estimated that 18 percent of the households in zip codes that were served by at least four high-speed service providers were in rural or underserved zip codes in June 2000. We calculated that this share grew to 28 percent in June 2002—a 10-percentage-point increase over two years. Based on this increase, we assume that the share continued to increase by 5 percentage points each year. Therefore, we assume that, absent the tax incentive, 63 percent of capital expenditures on current generation technology in 2009 will be spent on deployments in rural and underserved areas, 68 percent will go to rural and underserved areas in 2010, and so forth. When capital expenditures increase as a result of the tax incentive, we assume that 100 percent of the additional DSL and cable customers and homes passed resulting from the tax incentive would be located in rural and underserved areas.

- **Multipliers**

25. The incremental residential broadband capital expenditures that result from these policies will have a multiplicative effect on the economy when the economy is at less than full employment, as it is today.[7] To estimate this multiplicative effect, we use the most recent RIMS II multipliers on detailed industries by NAICS code, based on 1997 national benchmark input-output data and 2006 regional data. Broadband deployment requires capital spending on equipment and construction. Therefore, we use multipliers for telephone apparatus manufacturing, fiber optic cable manufacturing, and construction. Table 2 shows the industry multipliers we use and the weights assigned to each industry to estimate the average multiplier for broadband investment.[8]

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[7] The multiplier is a standard principle in the macroeconomics literature. See, e.g., RUDIGER DORNBUSCH & STANLEY FISCHER, MACROECONOMICS 66 (McGraw Hill 6th ed. 1994). Richard Kahn first introduced the multiplier concept as an "employment multiplier." See Richard F. Kahn, *The Relation of Home Investment To Employment*, 41 ECON. J. 173, 173-98 (1931). John Maynard Keynes expanded upon this concept by introducing the "investment multiplier," which is the multiplier used in our analysis. *See* John Maynard Keynes, A GENERAL THEORY OF EMPLOYMENT, INTEREST, AND MONEY 115 (Harcourt Brace & Co. 1964) (1936).

[8] U.S. Department of Commerce, Bureau of Economic Analysis, Regional Input-Output Modeling System (RIMS II), Table 1.5 (2008). Multipliers are based on the 1997 Benchmark Input-Output Table for the Nation and 2006 regional data. These industries approximately match the expenditures made to deploy and connect broadband more closely than any other multiplier category. According to the 1997 NAICS definition, industry 334210 (Telephone apparatus manufacturing) consists of "[e]stablishments primarily engaged in manufacturing wire telephone and data communications equipment. These products may be standalone or board-level components of a larger system. Examples of products made by these establishments are central office switching equipment, cordless telephones (except cellular), PBX equipment, telephones, telephone answering machines, and data communications equipment, such as bridges, routers, and gateways." Industry 335921 (Fiber optic cable manufacturing) consists of "[e]stablishments primarily engaged in manufacturing insulated fiber-optic cable from purchased fiber-optic strand." Industry 230000 (Construction) includes, among other types of construction establishments, "[e]stablishments primarily responsible for the entire construction (i.e., new work, reconstruction, or repairs) of electric power and communication transmission lines and towers, radio and television transmitting/receiving towers, cable laying, and

TABLE 2: MULTIPLIERS FOR BROADBAND CAPITAL EXPENDITURES

NAICS Industry	Final Demand: Output (GDP $ per Invested)	Final Demand: Employment (Jobs per Million $ Invested)	FTTH Industry Weight	Cable Industry Weight	DSL Industry Weight	Wireless Industry Weight
334210 Telephone apparatus manufacturing	2.6424	11.7592	30%	80%	80%	
334220 Broadcast and wireless communications equipment	2.8309	13.7828	0%	0%	0%	93%
335921 Fiber optic cable manufacturing	3.0284	14.4066	20%	0%	0%	
230000 Construction	3.4617	26.6692	50%	20%	20%	7%
FTTH Weighted Average Multiplier	**3.1293**	**19.7437**				
Cable Weighted Average Multiplier	**2.8063**	**14.7412**				
DSL Weighted Average Multiplier	**2.8063**	**14.7412**				
Wireless Weighted Average Multiplier	**2.8739**	**14.6618**				

26. According to Uptown Services, a majority (54 percent) of capital spending required in outside plant build-out for FTTH is spent on construction.[9] This heavy reliance on construction for FTTH is due in large part to the burying of new infrastructure in the ground. Construction is given a larger weight for FTTH than for DSL, cable or wireless because much of the infrastructure over which cable (e.g., conduits and HFC cable), DSL (i.e., copper), and wireless (i.e., towers) already exists and does not require new construction. As Table 2 shows, the multipliers for the construction industry are substantially larger than the multipliers for the other three industries. For example, $1 million of investment in FTTH deployment will result in almost 20 jobs, whereas a dollar of investment in wireless broadband will result in fewer than 15 jobs.[10] This is largely due to our estimate that only 7 percent of wireless broadband capital expenditures go to the construction industry.[11]

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cable television lines; (2) establishments identified as power and communication transmission line construction management firms; and (3) establishments identified as special trade contractors engaged in activities primarily related to power and communication transmission line construction." Industry 334220 (Broadcast and wireless communications equipment) includes "establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment. Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment." *See* U.S. Census Bureau, 1997 NAICS and 1987 SIC Correspondence Tables, *available at* http://www.census.gov/epcd/www/naicstab.htm.

[9] Uptown Services, LLC, "Phase 2 Business Case for a Community Fiber Network, Prepared for the City of Portland by Uptown Services, LLC," Nov. 2007, at 25.

[10] The employment multipliers in Table 2 represent the effect of investments on jobs within the United States. As Table 2 shows, the employment multiplier for the construction industry is approximately twice as large as the multipliers for the other industries. This difference is due in large part to the concentration of construction jobs

27. The multiplier specific to the industries shown in Table 2 translates the effect of broadband capital spending on U.S. employment and gross domestic product (GDP). The multiplicative effect occurs because higher expenditures on broadband deployment—equivalent to higher demand for construction and the products of equipment manufacturers—causes the equipment manufacturers and construction firms to hire more employees to meet the increased demand. The equipment manufacturers' incomes and construction firms' incomes increase as well due to the increased expenditures, which, according to the consumption function, will increase their consumption as well. The increased consumption of equipment manufacturers and construction firms will in turn increase the income and employment of their suppliers. The income and employment of those suppliers will then increase, and so on.

28. Table 2 shows that a one-million dollar increase in the final demand for communications infrastructure investment by fiber broadband providers would create nearly 20 new jobs nationally. The timeframe over which employment would increase is debatable. In most cases, the BEA considers one year to be the appropriate time horizon for its multipliers to have achieved full effect.[12] Other economists have estimated that at least two years may be required for incremental investment to achieve its full impact on the economy.[13] The multiplier effect is most fully realized when there is substantial excess capacity, during economic recessions or sharp declines in specific sectors. Because the economy is in the midst of a recession,[14] excess capacity exists. Accordingly, our estimates of the multiplier effect of increased capital expenditures reasonably capture the effect that increased capital spending by broadband providers would have on the U.S. economy.

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within the United States relative to the other industries. For example, a dollar spent on telephone equipment may be spent in a factory overseas, resulting in an increase in foreign employment. Construction, on the other hand, is a local industry that requires U.S.-based workers to perform its essential functions. Therefore, a dollar spent on the construction industry will lead to more U.S. job growth than a dollar spent on other industries in which much of the main output is produced overseas.

[11] According to a report by the WiMax Forum, 7 percent of the 5-year capital expenditures on WiMax deployment in rural areas (the only areas in which WiMax would be eligible for any of the tax proposals we analyze) would be spent on "site acquisition and civil works." This component appears to be focused more on the construction industry, whereas the other components of capital expenditures in the WiMax report are focused on equipment such as CPE, base station equipment, and base station backhaul. WiMax Forum, *Business Case Models for Fixed Broadband Wireless Access based on WiMAX Technology and the 802.16 Standard* (Oct.10, 2004), at 20.

[12] U.S. DEPARTMENT OF COMMERCE, BUREAU OF ECONOMIC ANALYSIS, REGIONAL INPUT-OUTPUT MODELING SYSTEM REGIONAL MULTIPLIERS: A USER HANDBOOK FOR THE REGIONAL INPUT-OUTPUT MODELING SYSTEM (RIMS II), at 8 (Mar. 1997).

[13] *See, e.g.*, OLIVER BLANCHARD, MACROECONOMICS 72-73 (Prentice Hall 1997).

[14] In its December 2008 announcement that the current recession began in December 2007, the National Bureau of Economic Research noted that payroll employment had declined in ***every*** month since December 2007. *See* National Bureau of Economic Research, *Determination of the December 2007 Peak in Economic Activity*, *available at* http://www.nber.org/cycles/dec2008.html (Dec. 11, 2008).

- **Tax-Credit Bonds**

29. As discussed above, the tax-credit bond proposals we examine call for the Secretary of the Treasury to establish tax credits that allow the bonds to be sold at a zero coupon rate, i.e., providing the eligible borrowers with interest-free financing for the eligible projects. We assume that these terms are sufficiently attractive that the bonds would be utilized up to the specified limits, i.e., $10 billion annually for private tax-credit bonds and $1 billion annually for public tax-credit bonds. We assume that an equal amount of $10 billion in private sector tax-credit bonds are issued annually. Because public sector projects may take longer to begin than private sector projects, we assume that no public sector tax-credit bonds are issued in 2009, $1 billion is issued in 2010, and $2 billion is issued in 2011 (pursuant to the catch-up provisions of the tax proposal in which the $1 billion limit in public sector tax-credit bonds for a subsequent year is increased if the full amount of the bonds are not issued in a given year).

30. Further, because the proposal calls for the bonds to be used only to finance projects approved by state public utility commissions (for private bonds) and state governments and the U.S. Department of Commerce (for public bonds), we assume that 100 percent of the investment that results is incremental, i.e., used for projects that would not otherwise have been undertaken. Hence, we assume that the effect of both tax-credit bond proposals is to increase total investment in FTTH projects by an average of $11 billion annually for three years.

- **Other Assumptions**

31. Each expensing proposal lowers the after-tax cost of the goods and services purchased through broadband provider's capital investments. Under the 100 percent tax expensing proposal, expenditures are expensed completely in the year they are made. Without the expensing proposal, those expenditures would have been expensed over several years according to the appropriate depreciation schedule. To estimate the effective decrease in cost resulting from the tax expensing proposal, we estimate the net present value (NPV) of the forgone tax savings in future years for the broadband provider resulting from the immediate expensing of capital in year one under the proposal. We assume that the investment is 15-year depreciable property, and the taxpayer follows a half-year convention and applies a 150 percent declining balance depreciation method. Therefore, from a $100 investment, we deduct $5.00 for normal first year depreciation. This leaves $95 to be deducted under broadband expensing. We then determine the NPV of a $95 tax deduction, which we estimate at $33.25, assuming a 35 percent corporate tax rate. Next, we reduce $33.25 by the NPV of the year 2-15 depreciation deductions that would have been available in the absence of broadband expensing, equal to $18.17 (using a weighted average cost of capital (WACC) of 10 percent). Reducing $33.25 by $18.17, the remaining $15.08 would be the benefit of 100 percent broadband expensing, equating to 15.08 percent of the total investment. Using a similar calculation for the rural and underserved area tax incentive, the benefit of 50 percent broadband expensing would be 7.54 percent of the total investment.

32. To estimate changes in capital expenditures resulting from the lower after-tax cost of the products and services purchased by broadband providers due to the expensing proposals, we assume that the elasticity of the broadband providers' demand for those products and services is between -0.85 and -2.5. With an elasticity of demand of -0.85, a reduction in the broadband provider's cost of expenditures of 1 percent will increase its demand for those products and services by 0.85 percent. Likewise, an elasticity of -2.5 indicates that a reduction in the broadband provider's cost of expenditures of 1 percent will increase its demand for those products and services by 2.5 percent.

33. Finally, all of our estimates assume continuation of the current regulatory environment for broadband deployment and access. Any additional regulations, such as open access rules for FTTH, would decrease our estimates of broadband investments and their direct effects on economic output and employment.

B. Direct Effects of 100/20 Mbps Expensing (100 percent)

34. Table 3 shows our estimates of the direct effect of increased capital expenditures in FTTH if the 100/20 Mbps broadband expensing proposal is implemented for 2009-2011.

TABLE 3: DIRECT ECONOMIC EFFECT OF 100/20 MBPS TAX EXPENSING PROPOSAL

	2009	2010	2011	**Total**
FTTH Capital Expenditures before Tax Proposal ($Billion)	4.031	4.314	4.651	**12.996**
FTTH Capital Expenditures after Tax Proposal ($Billion)	4.548 - 5.551	4.867 - 5.940	5.247 - 6.405	**14.662 - 17.896**
Increase in Capital Expenditures ($Billion)	0.517 - 1.520	0.553 - 1.627	0.596 - 1.754	**1.666 - 4.900**
Direct Effect on GDP ($Billion)	1.617 - 4.757	1.731 - 5.090	1.866 - 5.488	**5.214 - 15.334**
Direct Effect on Employment (Jobs)	10,204 - 30,012	10,919 - 32,114	11,772 - 34,624	**10,965 - 32,250**

35. As Table 3 shows, we estimate that the 100/20 Mbps expensing proposal will increase capital expenditures on FTTH by between $1.7 billion and $4.9 billion from 2009 to 2011. This increase will directly result in an increase in GDP of between $5.2 billion and $15.3 billion over the three years. On average over the three years, the increased investment will maintain an additional 10,965 to 32,250 jobs per year.

C. Direct Effects of 5/1 Mbps Expensing (50 percent)

36. Table 4 shows our estimates of the direct effect of increased capital expenditures in FTTH if the 5/1 Mbps broadband expensing proposal is implemented for 2009-2011.

TABLE 4: DIRECT ECONOMIC EFFECT OF 5/1 MBPS TAX EXPENSING PROPOSAL

	2009	2010	2011	**Total**
Cable/DSL Capital Expenditures before Tax Proposal ($Billion)	3.076	2.931	2.619	**8.626**
Cable/DSL Capital Expenditures after Tax Proposal ($Billion)	3.200 - 3.441	3.059 - 3.307	2.742 - 2.980	**9.001 - 9.728**
Increase in Capital Expenditures ($Billion)	0.124 - 0.365	0.128 - 0.376	0.123 - 0.360	**0.375 - 1.102**
Direct Effect on GDP ($Billion)	0.349 - 1.025	0.359 - 1.054	0.344 - 1.012	**1.051 - 3.091**
Direct Effect on Employment (Jobs)	1,831 - 5,385	1,883 - 5,539	1,807 - 5,314	**1,840 - 5,413**

37. As Table 4 shows, we estimate that the 5/1 Mbps expensing proposal will increase capital expenditures on cable and DSL by between $375 million and $1.1 billion from 2009 to 2011. This increase will directly result in an increase in GDP of between $1.1 billion and $3.1 billion over the three years. On average over the three years, the increased investment will maintain an additional 1,840 to 5,413 jobs per year.

D. Direct Effects of Private Sector Tax-Credit Bonds

38. Table 5 shows the direct effect on the economy of $10 billion in additional investment on FTTH each year from 2009 to 2011 that results from the proposed private sector tax-credit bonds.

TABLE 5: DIRECT ECONOMIC EFFECT OF PRIVATE SECTOR TAX-CREDIT BONDS

	2009	2010	2011	**Total**
FTTH Capital Expenditures before Tax Proposal ($Billion)	4.031	4.314	4.651	**12.996**
FTTH Capital Expenditures after Tax Proposal ($Billion)	14.031	14.314	14.651	**42.996**
Increase in Capital Expenditures ($Billion)	10.000	10.000	10.000	**30.000**
Direct Effect on GDP ($Billion)	31.293	31.293	31.293	**93.878**
Direct Effect on Employment (Jobs)	197,437	197,437	197,437	**197,437**

39. As Table 5 shows, we estimate that the private sector tax-credit bond proposal will increase capital expenditures on FTTH by $30 billion from 2009 to 2011. This increase will directly result in a $93.9 billion increase in GDP over the three years. On average over the three years, the increased investment will maintain an additional 197,437 jobs per year.

E. Direct Effects of Public Sector Tax-Credit Bonds

40. Table 6 shows the direct effect on the economy of the additional investment on FTTH each year from 2009 to 2011 that results from the public sector tax-credit bonds.

TABLE 6: DIRECT ECONOMIC EFFECT OF PUBLIC SECTOR TAX-CREDIT BONDS

	2009	2010	2011	**Total**
FTTH Capital Expenditures before Tax Proposal ($Billion)	4.031	4.314	4.651	**12.996**
FTTH Capital Expenditures after Tax Proposal ($Billion)	4.031	5.314	6.651	**15.996**
Increase in Capital Expenditures ($Billion)	0.000	1.000	2.000	**3.000**
Direct Effect on GDP ($Billion)	0.000	3.129	6.259	**9.388**
Direct Effect on Employment (Jobs)	0	19,744	39,487	**19,744**

41. As Table 6 shows, we estimate that the public sector tax-credit bond proposal will increase capital expenditures on FTTH by $3 billion from 2009 to 2011. This increase will directly result in a $9.4 billion increase in GDP over the three years. On average over the three years, the increased investment will maintain an additional 19,744 jobs per year.

V. IMPACT ON TAX REVENUES

42. The impact on tax revenues of the expensing proposals is dependent upon the change in investment and the change in the timing of expensing. When a firm incurs additional costs, it will be able to deduct those costs from its taxable income, thereby reducing the firm's tax liability. Although changes in the timing of expensing will reduce tax revenues in the short-run, (undiscounted) tax revenues over the life of the investment will be unchanged as long as the amount invested does not change, and assuming the firm's marginal tax rate remains constant over time.

43. We estimate the forgone tax revenues resulting from the proposed tax expensing incentives by calculating the annual tax savings each firm enjoys both with and without the incentive. A firm's tax savings in year t (tax_t) from any investment originally made in year k (inv_k) can be written as:

$$tax_t = \underbrace{(inv_k * taxrate_t * exp\_rate_{t=k})}_{(a)} + \underbrace{(inv_k * taxrate_t * (1 - exp\_rate_k) * dep\_rate_t)}_{(b)}$$

Part (a) represents the tax savings from an expensing rate of *exp_rate* in the year of the investment. Part (b) represents the tax savings from the depreciation schedule where dep_rate_t is the percent of the investment remaining after expensing that is depreciated in year t. With no tax incentives, the expensing exp_rate_k rates is zero. With the 100 percent expensing proposal, inv_k increases (relative to no tax incentive) and exp_rate_k is 100 percent. With the 50 percent expensing proposal, inv_k increases (relative to no tax incentive) and exp_rate_k is 50 percent. We assume a 35 percent marginal tax rate $taxrate_t$ when estimating the tax revenue impact.

44. The forgone tax revenues resulting from the tax-credit bond proposals are functions of interest rates and tax rates. The effective interest rate on private borrowings under the tax-credit bond proposal will reflect two factors. First, since interest on the bonds will effectively be paid by the U.S. Treasury (in the form of tax credits), the default risk on the interest component is effectively zero. Second, the default risk on the principal will be a function of the risk characteristics of the issuers, which may range from major U.S. corporations to smaller (and hence riskier) companies. For purposes of arriving at an estimate of the forgone tax revenues, we assume that these two factors result in an effective interest rate of 4.14 percent, equal to the average of the current yield for 10-year (5.5 percent) and 20-year (5.98 percent) A-rated corporate bonds and the current yield for 10-year (2.16 percent) and 20-year (2.92 percent) Treasury bonds.[15] The forgone tax revenues in each year until maturity resulting from the private tax-credit bond proposal is equal to the effective interest rate multiplied by the amount issued.

45. The effective interest rate on public borrowings under the tax-credit bond proposal will reflect two factors. First, since interest on the bonds will effectively be paid by the U.S. Treasury (in the form of tax credits), the default risk on the interest component is effectively zero. Second, the default risk on the principal is a function of the risk characteristics of the issuers, which may range from state governments to local municipalities. For purposes of arriving at an estimate of the forgone tax revenues, we assume that these two factors result in an effective interest rate of 3.94 percent, equal to the average of the current yields on 10-year (4.81 percent) and 20-year (5.87 percent) A-rated municipal bonds and the current 10-year (2.16 percent) and 20-year (2.92 percent) Treasury yields as of December 22, 2008.[16] The forgone tax revenues in each year until maturity resulting from the public tax-credit bond proposal is equal to the effective interest rate multiplied by the amount issued.

46. Table 7 shows the estimates of forgone tax revenues resulting from the tax incentives and changes in capital expenditures. Table 7 shows both the impact on tax revenues from 2009-2011 and the impact on revenues over the entire life of the investments made in 2009-2011.[17] Following the Joint Committee on Taxation, we do not discount the tax revenue cost of the proposals.[18]

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[15] Yahoo! Finance, Composite Bond Rates (http://finance.yahoo.com/bonds/composite_bond_rates); Federal Reserve Board, Federal Reserve Statistical Release H.15, Selected Interest Rates (http://www.federalreserve.gov/releases/h15/data.htm). Rates as of December 22, 2008.

[16] *Id.*

[17] For tax-credit bonds, we calculate forgone tax revenues based on the Joint Committee on Taxation's usual method of estimating tax effects over a ten-year budget window, rather than the entire life of the bonds.

[18] Joint Committee on Taxation, *Overview of Revenue Estimating Procedures and Methodologies Used by the Staff of the Joint Committee on Taxation* (Feb. 2, 2005), at 12 (http://www.house.gov/jct/x-1-05.pdf).

TABLE 7: IMPACT OF TAX INCENTIVE PROPOSALS ON TAX REVENUES ($BILLIONS)

Proposal	2009-2011 Tax Revenue Reduction	Tax Revenue Reduction over Entire 15-Year Life of 2009-2011 Investments*
100% Expensing for 100/20 Mbps	4.506 - 5.638	0.583 - 1.715
50% Expensing for 5/1 Mbps (Rural/ Underserved Areas only)	1.363 - 1.508	0.131 - 0.386
Private Sector Tax-Credit Bonds	2.484	11.178
Public Sector Tax-Credit Bonds	0.158	0.985

* Forgone revenues in this column for tax-credit bonds represent interest payments over ten years from 2009-2018.

47. As Table 7 shows, the proposed 100 percent expensing proposal's effect on increased capital expenditures reduces 2009-2011 tax revenues by between $4.5 billion and $5.6 billion. The effect over the entire life of the increased investments made in 2009-2011 is between $583 million and $1.7 billion for the 100 percent expensing proposal. The effect over the entire life of the investments is smaller than the effect over 2009 to 2011 because the Treasury receives more in tax revenues in the years after 2011 under 100 percent expensing than it does without 100 percent expensing. When 100 percent of an investment is expensed in the first year, there will be no more investment to deduct from future years earnings. Without 100 percent expensing, there are depreciated costs to deduct from earnings in every year through year 16 of the investment.

48. By focusing only on firms' increased expenses, Table 7 overstates the true net impact of the various tax proposals on tax revenues. We do not attempt to estimate the *increase* in tax revenues that would result from the tax incentives in our analysis. For example, increased employment through the direct effects would result in increased personal incomes, which would result in increased income tax revenues. In addition, firms making the investments would see their profits increase through greater consumption of their broadband services, which would increase their corporate income taxes. The Joint Committee on Taxation (JCT) recently estimated the combined cost of the 100/20 Mbps expensing provision and the 5/1 Mbps expensing provision to be $72 million over ten years for a three-year provision. In making its revenue impact calculations, the JCT generally accounts for income effects and other indirect effects (discussed below) not included in Table 7 that increase tax revenues.

VI. ANALYSIS OF INDIRECT EFFECTS

49. This study focuses on the direct effects on the economy of each tax proposal. In addition to these direct effects, the additional availability of broadband services will result in increased adoption, which in turn will lead to increased productivity and demand for other goods and services ("indirect effect"). The indirect effects of increased broadband investment result from the productivity increases, price reductions, and related savings associated with increased broadband adoption. The tax incentives at issue here would increase broadband adoption due to both (a) increased broadband availability in rural and underserved areas and (b) reduced prices and improved quality associated with the availability of more technologically advanced broadband infrastructures generally. Our estimate utilizes reasonable assumptions regarding the

impact of increased availability, and applies the results of authoritative empirical research on the impact of broadband adoption on employment to estimate these indirect effects. In this section, we estimate the indirect effects from increased broadband adoption resulting from the increased deployment that broadband providers will make as a result of the tax proposals discussed above.

A. Methodology and Assumptions

50. In our analysis of the direct effects of the tax proposals, we estimated the effects of each proposal that result directly from increased investment in broadband infrastructure. The ultimate effect of this investment, however, will be to increase the availability of next-generation broadband services to households which already have some form of broadband available, and to make broadband available in rural and underserved areas where broadband service is unavailable today.

51. We model the adoption effect of increased high-speed broadband (100/20Mpbs) as an effective reduction in the price, where price is measured as the monthly cost per downstream megabit.[19] As shown in Table 8 below, the price per megabit for high speed services is far lower than for slower DSL and cable connections.

TABLE 8: COMPARISON OF BROADBAND SPEEDS AND PRICES

Provider	Service Type	Download Speed	Monthly Price	$/Mbps
Cox	Cable	768 Kbps	$19.89	$25.90
Verizon	DSL	768 Kbps	$19.99	$26.03
Qwest	DSL	1.5 Mbps	$14.99	$9.99
AT&T	DSL	1.5 Mbps	$25.00	$16.67
Cox	Cable	1.5 Mbps	$29.99	$19.99
AT&T	DSL	3.0 Mbps	$29.95	$9.98
Verizon	DSL	3.0 Mbps	$29.99	$10.00
AT&T	DSL	6.0 Mbps	$35.00	$5.83
Comcast	Cable	6.0 Mbps	$57.95	$9.66
Qwest	DSL	7.0 Mbps	$24.99	$3.57
Comcast	Cable	8.0 Mbps	$67.95	$8.49
Cox	Cable	9.0 Mbps	$43.99	$4.89
Verizon	FiOS	10 Mbps	$47.99	$4.80
EarthLink	Cable	10 Mbps	$72.95	$7.30
Qwest	DSL	12 Mbps	$46.99	$3.92
Cox	Cable	15 Mbps	$56.95	$3.80
Verizon	FiOS	20 Mbps	$57.99	$2.90
Verizon	FiOS	50 Mbps	$144.95	$2.90

Source: Company websites.

[19] Price per megabit is a widely utilized measure of broadband pricing, since it captures the "quality" element associated with higher speed services. See, e.g., http://www.oecd.org/sti/ict/broadband.

52. We estimate conservatively that the effect of 100/20 Mbps fiber deployment in an area already served by broadband is to reduce the average price of broadband in that area by $3.67 per month per megabit, i.e., approximately the difference between an average of the current pricing plans for 3 Mbps – 15 Mbps ($6.57/Mbps/month) and Verizon's current 50 Mbps plan ($2.90/Mbps/month).

53. To estimate the effect of reduced prices on broadband penetration in these areas, we rely on Atkinson, *et al*, who find that a $1/month reduction in price per megabit increases broadband penetration by 2.4 percentage points.[20] We assume the full effect of reduced prices would be felt over four years, beginning once the deployment has been made (i.e., at the end of each year). Thus, a $3.67 reduction in price/Mbps would result in an 8.81 percentage point increase in broadband penetration by the end of the third year of our projection period.[21]

54. The impact of increased availability of any type of broadband can be estimated more directly. According to Morgan Stanley, the national residential broadband penetration rate is approximately 56 percent of all households as of 2009, and is forecasted to increase to 61.1 percent as of 2011.[22] We assume that households who receive broadband availability as a result of the rural/underserved tax expensing proposal will begin subscribing to broadband in the year following deployment, and that once subscriptions begin, they will subscribe to broadband at the national average rate over the course of three years, i.e., that 20 percent of households will subscribe in the first year, 40 percent in the second year, and 60 percent in the third year. Under this assumption, 20 percent of all homes passed by broadband for the first time as a result of the rural/underserved tax expensing proposal would be subscribers as of 2011. In addition, we assume that 10 percent of all homes passed by fiber as a result of the various 100/20 Mbps proposals would be located in areas that would not have broadband availability without the expanded fiber deployment. Therefore, we assume that 20 percent of those newly passed homes become broadband subscribers by the end of 2011.

55. Finally, to estimate the impact of increased broadband penetration on employment, we rely on the results of a 2007 study published by the Brookings Institution. In that study, Robert Crandall, William Lehr and Robert Litan found that a one percentage point increase in broadband population penetration (defined as broadband lines per person) will

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[20] Robert D. Atkinson, Daniel K. Correa, and Julie A. Hedlund, *Explaining International Broadband Leadership*, Information Technology and Innovation Foundation (May 2008)

[21] For example, if the number of households passed by FTTH increased by 1,000 as a result of one of the proposals we examined, we estimate that 88.1 additional households become subscribers during the period of our projection.

[22] Simon Flannery, Benjamin Swinburne, David Gober, Daniel Gaviria, & Chad Harris, Morgan Stanley, *Cable/Sat & Telecom Broadband Outlook: Online Usage Growth Favors Cable, DirecTV Remains HD Leader* (July 18, 2008), at Ex. 26.

increase private, nonfarm employment by 293,200 jobs (when the economy is not at full employment).[23]

B. Results of Indirect Effects Analysis

56. Table 9 shows the results of our analysis of the effects of each proposal on broadband adoption, and the resulting indirect economic effects on job creation. Specifically, we find that the various proposals would increase the number of U.S. broadband subscribers by between 268,800 and 3.39 million, increase the U.S. broadband penetration rate (defined as broadband subscriber lines per person) by between 0.09 percent and 1.08 percent, and increase employment by between 25,160 jobs and 317,000 jobs.

TABLE 9: SUMMARY OF INDIRECT EFFECTS ON JOBS CREATION, 2009-2011

	100% Expensing for 100/20 Mbps	50% Expensing for 5/1 Mbps (Rural/Underserved Areas only)	Private Sector Tax-Credit Bonds	Public Sector Tax Tax-credit Bonds
Additional Homes Passed (000)				
– Fiber	2,995.1 - 6,552.5	-	34,114.2	4,523.5
– Any Broadband	299.5 - 655.3	1,343.9 - 3,952.7	3,411.4	452.4
Additional Subscribers (000)				
– Fiber	297.3 - 650.5	-	3,386.6	449.1
– Any Broadband	297.3 - 650.5	268.8 - 790.5	3,386.6	449.1
Increase in Overall U.S. Broadband Population Penetration Rate[24]	0.09% - 0.21%	0.09% - 0.25%	1.08%	0.14%
Additional Jobs	**27,831 - 60,888**	**25,160 - 73,999**	**317,000**	**42,034**

VII. CONCLUSION

57. In this study, we have calculated the total economic impact of four different tax incentive proposals relating to increasing broadband deployment and adoption. We find that each of the four proposals generates substantial benefits to the U.S. economy through both increased GDP and increased employment. Each of the tax proposals would directly result in thousands of additional jobs sustained per year from 2009 to 2011. The number of new jobs sustained from 2009 to 2011 resulting directly from the private sector tax-credit bond proposal *alone* is as high

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[23] Robert Crandall, William Lehr, & Robert Litan, *The Effects of Broadband Deployment on Output & Employment: A Cross Sectional Analysis of U.S. Data*, 6 ISSUES IN ECONOMIC POLICY 12-14 (July 2007).

[24] Based on Morgan Stanley's baseline forecast of 75.156 million residential broadband subscribers in 2011 and the U.S. Census Bureau's U.S. population forecast of 313.2 million in 2011. Simon Flannery, Benjamin Swinburne, David Gober, Daniel Gaviria, & Chad Harris, Morgan Stanley, *Cable/Sat & Telecom Broadband Outlook: Online Usage Growth Favors Cable, DirecTV Remains HD Leader* (July 18, 2008), at Ex. 26; U.S. Census Bureau, U.S. Population Projections, National Population Projections (Released 2008) (http://www.census.gov/population/www/projections/downloadablefiles.html).

as 197,437. These proposals result in even further job creation through their indirect effect of increased broadband adoption. Given these proposals' relatively small impact on tax revenues compared to the large resulting increases in GDP and employment, their long-run benefits in increasing productivity and competitiveness, and their significant and virtually immediate impact on economic activity,[25] the adoption of any of these proposals would create substantial net benefits to the U.S. economy.

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[25] For a discussion of the importance of timing in the effectiveness of fiscal stimulus policies, see Peter R. Orszag, *Options for Responding to Short-Term Economic Weakness,* Testimony Before the Committee on Finance, United States Senate (January 22, 2008), especially at 5 ("The timing of fiscal stimulus is critical. If the policies do not generate additional spending when the economy is in a phase of very slow growth or a recession, they will provide little help to the economy when it is needed.") and at 8 ("Tax cuts for business investment may be more effective in boosting short-term demand if they are temporary than if they are permanent. Firms may view them as one-time opportunities for tax savings, which may induce firms to move up some of their future investment plans to the present.")