
MONITOR GROUP MEMO

To: The FCC NBP Team

From: The Monitor Group

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Re: Identifying Uncertainties for the National Broadband Plan

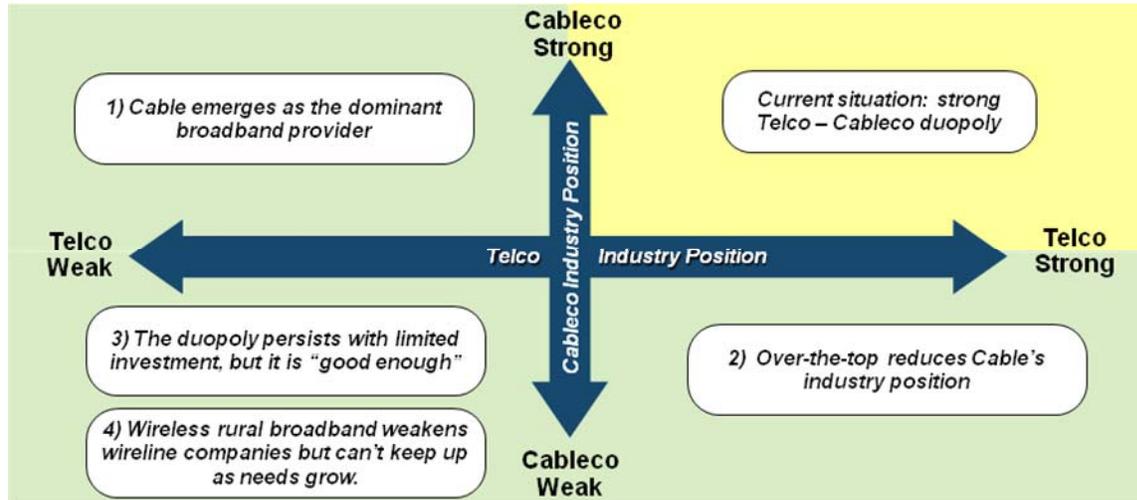
Context

Based upon our expertise on scenario planning and uncertainty development, and ongoing conversations with the FCC and others, Monitor is providing our perspective on, and identify key uncertainties for the National Broadband Plan (NBP), to be reported to Congress in March 2010. In addition to reviewing FCC documents, press information, and other commentary, the Monitor team spoke with David Isenberg on 01/12/10 to discuss the FCC's existing plans of broadband in the United States. In this document we identify a number of critical areas of uncertainty and potential scenarios that may broaden the scope of the NBP, and provide additional perspectives on the implications of these uncertainties.

Scenarios & Implications for the NBP

We have developed six scenarios for the future of the broadband industry, four of which address evolution of existing competition, while two envision new competition:

Possible Scenarios for the Future Broadband Industry Structure



Scenarios in which new entrants gain power:

- 5) The Telco "pivot to mobile" fails, new competitors & new wireless technologies emerge.
- 6) New category of infrastructure player emerges based on strength in devices or applications.

1. Cable emerges as dominant broadband provider

Telcos fail to respond competitively to Cableco DOCSIS 3 rollout, while Cablecos move aggressively to offer very strong triple play bundles. Telcos find themselves unable to compete with cable on broadband speeds, except for the limited (18 million) fiber households (mostly Verizon FIOS) and experience a rapid loss of landline customers. This sudden Telco weakness curtails investments in landline infrastructure capable of competing with DOCSIS 3. A series of divestitures and acquisitions leaves Cableco the dominant supplier of landline broadband connections. This results in Cablecos feeling little competitive pressure to upgrade beyond DOCSIS 3 without additional impetus.

The U.S. infrastructure fails to rise to the level required for healthcare, education, etc., while other nations continue their advance. The U.S. broadband landscape fragments into three archetypes. Regions where fiber to the home exists become small islands of competition with high speeds at relatively low prices. However, the majority of the remaining 97 million households will receive high speed broadband, but at substantially higher prices charged by the Cableco. Cableco has little incentive to invest in more

costly to reach rural areas, and Telco has little ability, leaving rural America to rely upon low-speed DSL.

Implications:

- Policy makers should identify ways to stimulate additional competition between Cable and Telco. One way to do this would be via depreciation rules based on relative functionality that would (e.g.) tend to devalue comparatively obsolete DSL plant.
- Policy makers should consider the feasibility of advocating legislation prohibiting Cablecos from acquiring Telcos.

2. Over the Top TV-over-IP weakens the incumbent video entertainment subscription model, rendering broadband providers to manage “dumb pipes”

Rapid advances in Internet video (better quality, new devices, access to a very wide variety of content) spur a shift in consumer preferences towards new models for delivery of video entertainment. Advances in video compression reduce the importance of broadband speed; basic DSL and wireless speeds suffice. Mobility and convenience trump quality, further weakening the need for broadband speed. There's a new wave of mobile video platforms; these are stylish, hi-touch and easy to use. Web-based video, RSS, and other Internet video models predominate over broadcast and proprietary video-on-demand. Market power shifts to Hulu, AppleTV, Google (via YouTube 2.0) and new players that pop up opportunistically. Such Over the Top players accelerate their deal making with content owners. Hulu and Apple offer subscriptions to premium content at significantly reduced prices compared to Cable. Customers abandon their monthly subscriptions to Cableco and Telco video packages.

This affects both Telco and Cable sectors, but because video is a bigger revenue stream for Cablecos, they suffer more. Paradoxically, the Cable upgrade to broadband speeds of DOCSIS 3 hastens the erosion of the video subscription model at the high end, where it hurts them most. In addition, the increased power of content providers reduces pricing power of broadband providers. The result is a weakened Cable sector, and a Telco sector that can, indeed, compete with cable in video entertainment without major investments in network upgrades. Telcos seize the lead in video on mobile platforms via wireless broadband. As Telcos respond to this new revenue opportunity, they decelerate landline network investment.

As Telcos gain on Cable, a major Telco acquires one of the U.S. direct broadcast satellite (DBS) companies to further weaken Cable competitors. Then the Telco slows landline investment even more, bringing it to a standstill in regions where competition is weakened. The result is a Telco strengthened by new revenues, a Cable sector weakened by competition, mobile technology and changing patterns of video entertainment, and no competitive impetus on either side to build out landline broadband.

Implications:

- Policy makers should consider contingency plans to help Cablecos complete their Docsis 3 rollout, if revenue weakness threatens to curtail these plans.
- Policy makers should consider the feasibility of advocating legislation prohibiting Telcos from acquiring Cablecos.

3. The duopoly persists with limited investment, broadband is “good enough” but growth is slow and “trailing-edge.”

Given the continuing recession and limited access to capital, neither Cablecos nor Telcos commit to make significant investment in infrastructure. As a result, no new competing technology is deployed, and the Cableco and Telco duopoly remains comfortably static, without driving significant advances.

However, Americans are able to make do with lower speed broadband, and come to see it as “good enough”. The focus of computing is increasingly mobile with lower bandwidth requirements, and compressed video. The highest value innovations are low bit rate applications (viz. Twitter, texting). Carriers see the highest returns on infrastructure investments at the very lowest-end. Supporting this, we know that carriers offering leading-edge speeds (e.g., 50 mbit downloads) are seeing unexpectedly low willingness to pay.

One result might be that investment decisions are driven by the idea that high-speed networks have already exceeded speeds that yield high rates of return. The risk of such thinking is the de-funding of private U.S. broadband investment, which could bring a self-fulfilling absence of high-speed application deployment.

A broader result might be that U.S. technology and media companies face a harder time competing internationally, as Asian and European companies that operate in high bandwidth environments gain share in international markets. Meanwhile China continues to develop its own Internet and technology companies, and expands its economic influence in the technology sector more broadly. As we approach 2020, a global standards battle ensues both in technology, as well as infrastructure.

Implications:

- Policy makers should consider a contingency plan to subsidize broadband deployment to achieve full rollout to be put into operation if the U.S. broadband infrastructure continues to fall behind the rest of the world..

4. 4G weakens rural landline telcos, then struggles to meet demand

In many rural states, major telephone companies (Verizon, for example) have sold their landline assets. In other words, today's sales of landline plant, (Hawaii Telephone and Fairpoint Communications' acquisition of Maine, New Hampshire and Vermont) continue. The companies that buy these landline assets are not financially strong enough to invest in new technology (fiber and next generation DSL) needed to stay on the leading edge of broadband. They offer DSL in town where they can. Out of town, DSL is even spottier.

For rural state cable companies, broadband is offered in towns, where population densities support adequate returns on investment. Where possible, existing cable companies roll out DOCSIS 3. Customers find DOCSIS 3 much superior to landline telco DSL; thus the landline telco loses customers, which further undermines its financial status.

Meanwhile, wireless companies, established companies with existing wireless assets, invest in 4G (predominantly LTE) wireless broadband. The new 4G services offer broadband speeds that are markedly better than the landline telco's DSL. Very rapidly, 4G services covers towns, major highways, and all but the sparsest, most rugged rural areas. Rural customers who didn't have broadband are happy to get 4G. Rural customers who had DSL are delighted to switch to 4G. Many give up their wired telephone too, going completely wireless. Consequently, the landline telco is weakened even further.

Cable is reluctant to invest in extending their footprint out of town into the most rural areas. Costs are high, and satellite dish-based video entertainment is a readily available source of competition. Also, many rural customers find 4G broadband is good enough. As a result, the return on further cable buildout is projected to be too low for cable to extend much beyond town population centers.

Initially, 4G wins in rural states. Cable survives. The landline telephone companies in rural states flounder with inadequate technology and second-best services. They fail to attract any investment. Some go under; whole states become wireless. Others merge, or scale back drastically, lay off workers, sell off assets.

Meanwhile, demand for increased broadband speeds evolves faster than network providers expected. This is especially true in the most rural areas of rural states, as tele-health care, distance learning and video telephony applications evolve, become popular, and even become necessary to rural life. Video content providers such as Apple, YouTube and Hulu offer new, exciting interactive content that displaces satellite broadcast video.

Suddenly, the new 4G infrastructure, which once appeared to be the best platform for rural broadband, is overloaded. The landline telco plant that might once have been upgradable to provide future broadband services, is now decrepit, in pieces, and all but impossible to reassemble. Cable service is still limited to towns.

Customers have one choice for broadband in larger towns; DOCSIS 3 based cable service. Rural customers find their lives dependent on a new tier of bandwidth-hungry applications

and services, but the overloaded wireless infrastructure that delivers them has become slow and undependable. The next significant wireless technology upgrade is still a decade away.

Implications of Scenarios 1-4, above, with general goal of increasing competition:

- Policy makers should stimulate development of alternative technologies and encourage investment in emerging technologies, including wireless, advanced DSL and fiber to the home with the aim of spurring effective competition.
- Policy makers should act to increase available spectrum and to stimulate technologies that use spectrum more efficiently to expand mobile competition and fixed-mobile substitution.
- Policy makers should advocate removal of barriers to entry for “third pipe” providers, e.g., through advocacy of a Community Broadband Act.

5. The Telco "pivot to mobile" fails, but new competitors emerge utilizing new wireless technologies & spectrum.

Telcos such as AT&T expect to become mobile telephone companies, relying on mobile revenues as landline revenues decline. Cable takes advantage of this and starts a price war for landline services, which impacts landline revenues on both sides.

Meanwhile, a cadre of new wireless broadband competitors appears using newly available spectrum and new ways to use existing spectrum. Some of these new mobile players skillfully exploit new devices and Internet capabilities to become major players. The nation's investment in mobile infrastructure grows rapidly, but a corresponding investment in landline infrastructure fails to materialize because both sides of the landline duopoly are weakened by the new, unexpectedly competitive wireless landscape.

The result for customers is moderately fast broadband at substantially reduced prices. These reduced broadband speeds are acceptable, while low prices and a wide array of new mobile devices spur new customers and new uses. The risk here is that at least one side of the landline duopoly is weakened, with correspondingly weak development of very high speed applications that the nation needs for education, healthcare and other advanced communications.

Implications:

- National Interest goals continue to be well served via high speed Internet access, and policy should focus on fostering competition and infrastructure investment from wireless technologies in addition to wired technologies.

6. A new category of infrastructure player emerges based on strength in devices, services or applications.

A company emerges with strength in applications (e.g., Google), services (e.g., Amazon), platforms (e.g., Apple) or some other fundamental area (TBD) to find it has significant bargaining power with infrastructure providers, such as Telcos and Cablecos. It is able to gain transport and data center access at rates that reflect economies of scale. Its business becomes important to supplier bottom lines. Consumer bonds to this new company are stronger than they are to Telco or Cableco. The new player finds itself able to leverage its own retail relationships to put together retail bundles for telephony, video entertainment and broadband services (perhaps in the context of its own cloud services) that rival Telco and Cableco bundles. The goal is to make that company the primary launch point for its own customers' Internet interactions. For example, assuming that Google were such a company, Google might e.g., assemble ad-supported bundles of infrastructure services that enable it to compete effectively against Cableco and Telco bundles, leading to a rapid gain in market share.

In the past, there have been major shifts in the structure of established industries caused by the introduction of an application (e.g., Napster, Skype) or a device (e.g., Personal Computer, iPod, iPhone). It is entirely plausible that it could happen for communications services. Its specific form may be difficult to foresee, but we should be alert that such a shift in industry structure could change the entire industry structure for broadband services.

Implications:

- Policy makers should incorporate plans to support broadband plans of players outside of Telcos and Cablecos. Major Internet and application/content distribution companies, such as Google and Apple are prime candidates.
- Future policy must be flexible enough to adapt to a new industry structure where outside players becomes dominant. It was unclear 5 years ago that Apple would be in its current dominant position in music or mobile telephony. Focusing on promoting broadband development via cable companies and telcos / MSOs may inhibit adoption of a new and better technology.
- In addition, policy makers should incorporate contingency plans for the consequences of such substantial changes in industry structure upon national broadband capabilities.

Additional Considerations

We have identified a couple of additional considerations that may be important for broadband policy:

1. *Demand for bandwidth may be greater than, or in a different form than planned for.*

Demand for broadband is expected to increase steadily as new devices and applications drive consumers' need for faster and more accessible connections. Projected demand growth may be underestimated due to a number of factors:

- **Increased demand for upstream bandwidth:** Increased reliance on peer-to-peer networks and user-generated content could drive demand for upstream bandwidth, requiring the realignment of upstream vs. downstream bandwidth requirements. Video sharing from PCs and from mobile devices could drive this. The number of texts sent daily by 12 year olds can be up in the hundreds, how many videos will they send?
- **New devices and applications driving demand:** Demand for broadband access could increase with the development and use of new, content-rich applications and more powerful devices. (3D TVs appeared at CES this year; some of these require up to 70 mbit/s.) Furthermore, as component performance improves and device prices fall, powerful devices will become more ubiquitous, shifting the role of device from edge of the value chain to the center.
- **The “Internet of Devices” drives demand:** With connectivity being embedded into a range of devices (TV, fridge, washer, vehicle, energy grid), machines could contribute significantly to the growth in Internet traffic.
- **Increase in telecommuting and home workers:** Americans are increasingly working from home and telecommuting. High-end teleconferencing systems will support this, but will require substantial two-way bandwidth.

There are many historical examples of infrastructure investment underestimating demand. AT&T is currently suffering from underestimating the volume of bandwidth requirements from iPhones.

Implications:

- Bandwidth requirement plans should allow for faster than expected demand growth, especially faster growth of demand for upstream bandwidth.

2. Demographic shifts, including the increasing population of Hispanic and other non-Caucasian groups, leads to different usage patterns and needs

Hispanic, Asian and black populations represent a growing percentage of Americans, with Hispanics expected to be the largest cultural group by 2050. As the range of cultures represented in the U.S. increases, so will the range of usage patterns of bandwidth, Internet and media. Some groups may rely more heavily on mobile phones, while others may have higher usage of bandwidth in the home. The same may be true for applications; there is evidence suggesting that Facebook and MySpace attract substantially different demographic groups.

New entrants to the labor force are increasingly non-white and non-native English speakers. Reaching out to under-represented segments of the population will be critical.

3. Generational differences in patterns of use are accelerating, with cohorts

60 year olds use email. 35 year olds are on Facebook and LinkedIn. 20 year olds use Twitter and ForeSquare. 14 year olds send hundreds of texts a day. As technological improvement accelerates and new methods of communication are introduced on a rapid development cycle, significant generational differences will become more fine-grained and relevant technological age cohorts will narrow. This fragmentation of usage patterns will impact the bandwidth needs.

Implications of #2 and #3:

- Given the Plan's charge to include "all Americans," it will be important to understand the usage patterns of needs of different groups, how they are evolving, and how large a portion of the population that these groups represent.
- Developing plans to promote a range of broadband technologies and devices, wired and wireless, would ensure that the needs of a diverse groups are addressed.

4. Political change could lead to a very different agenda

We could envision a number of different agendas that may affect the industry structure:

- The government could be seen to take a more limited role in regulating the industry. Would this strengthen the leading Cablecos and Telcos? If so, would they compete and invest more in infrastructure, or would they focus more on extracting greater economic rents from their existing infrastructure, leading to increased prices?
- Given the rapid increase in deficits the government may slash budgets, leaving policy makers with a reduced capability to impact the industry, leading to a similar set of questions above.
- The government may believe that broadband investment is critical to economic development and may be open do direct investment. Would this lead Cablecos and Telcos to reduce investment? Would this lead to reduced innovation?

5. The consequences of a major disruption of the Internet, despite the low probability of such an event, makes it essential to develop plans to increase the robustness of the network.

A major disruption of Internet functioning would lead to a major security, economic and health threat to the nation. Unfortunately, there are a number of plausible events that could lead to such disruptions:

- **Cyber-attack:** With the openness of existing network standards, one could easily envision Russia, China or a criminal organization unleashing a cyber-attack that

brings down critical parts of the nation's infrastructure. Precursors to this can be seen by Russia's purported attacks on Estonia and Georgia, as well as the recent attacks on Google originating in China.

- **Disaster:** The tragedies befalling New Orleans and Haiti clearly demonstrate the increased loss of life and economic damage that can result from the loss of regional communications infrastructure. Many of the U.S.'s population and economic centers are at risk of experiencing a major hurricane, earthquake or other disaster. More broadly a pandemic could affect multiple population centers.
- **Vandalism:** A recent outage due to vandalism in Santa Clara County in 2009 reveals vulnerability of the network to a multi-point, coordinated vandalism attack.

Implications:

- Improving the robustness of the network infrastructure, would require a combination of new technological development, standards setting and the application of policy. A plan should be created that would coordinate the private and public sector to drive this development.
- Coordination with FEMA to develop plans to ensure network uptime, recovery and access in a time of disaster is essential to reduce the health and economic impacts of a disaster.
- Utilizing existing and emergent technologies to develop early warning systems, and a broad communication platform to coordinate the population, would reduce health risks.

Reflecting on the set of scenarios suggests the need for a high degree of flexibility and adaptability in the plan. Both supply and demand for broadband will be shaped by a number of forces whose interaction can create a wide variety of outcomes. These forces include industry structure, competition, technology, consumer behavior and political and economic conditions. The recommendations of the plan, therefore, should include thoughts on how the planning process can be carried forward to facilitate the on going adaption that will inevitably be needed.