The U.S. National Broadband Plan: A European Perspective

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NEREC, Madrid, 29 October 2010

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The National Broadband Plan

- Creating the National Broadband Plan (NBP)
- Broadband deployment and adoption in the U.S.
- The key recommendations
- The Comcast Decision
- The “Third Way”
- Implementation to date
- Implications for Europe

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Creating the National Broadband Plan

- The United States was rather late in creating a National Broadband Plan in comparison with other advanced countries.
- The NBP is generally a comprehensive and well thought out document.
- Key questions remain as to the degree with which it can or will be implemented.

Creating the National Broadband Plan

The national broadband plan … shall seek to ensure that all people of the United States have access to broadband capability and shall establish benchmarks for meeting that goal. The plan shall also include:

- an analysis of the most effective and efficient mechanisms for ensuring broadband access by all people of the United States,
- a detailed strategy for achieving affordability of such service and maximum utilization of broadband infrastructure and service by the public,
- an evaluation of the status of deployment of broadband service, including progress of projects supported by [this program], and
- a plan for use of broadband infrastructure and services in advancing consumer welfare, civic participation, public safety and homeland security, community development, health care delivery, energy independence and efficiency, education, worker training, private sector investment, entrepreneurial activity, job creation and economic growth, and other national purposes. (ARRA 2009)

Creating the National Broadband Plan

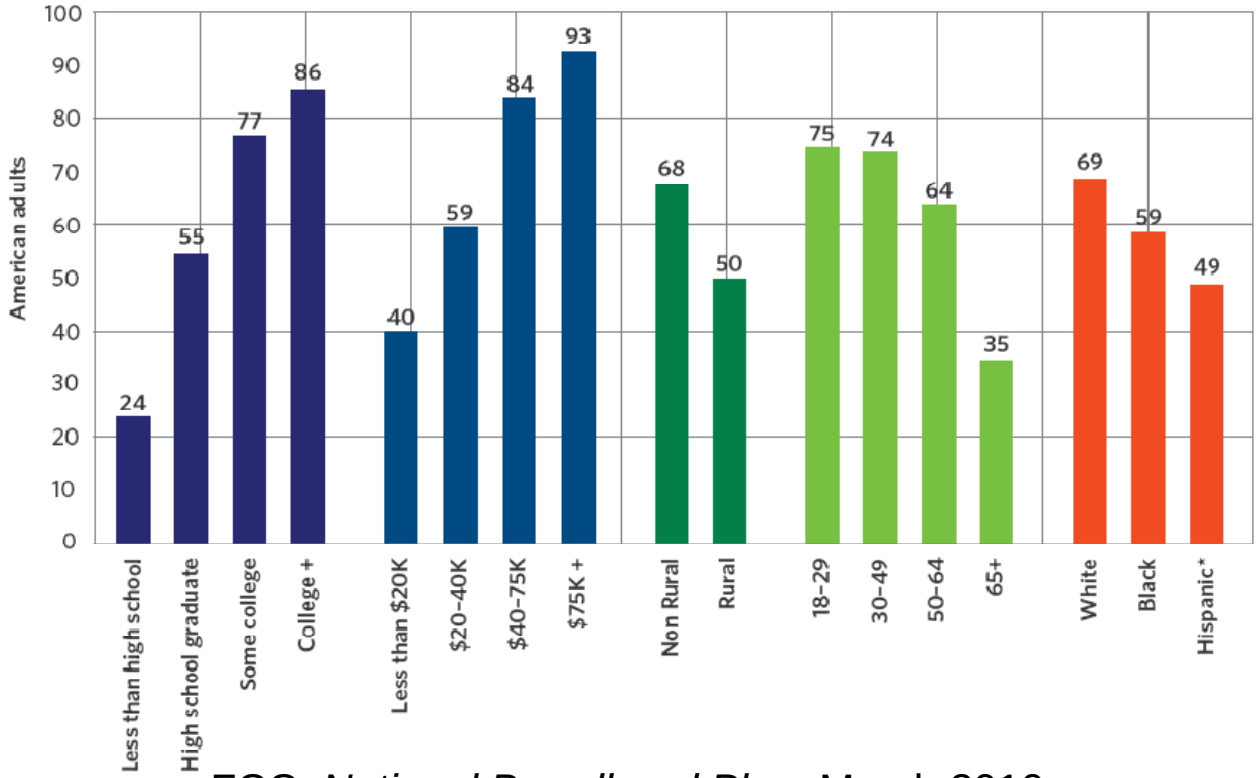
- The FCC started the process with a Notice of Inquiry (NoI) in April 2009.
- 36 public workshops were held at the FCC, nine more throughout the US.
- More than 10,000 in-person or online attendees.
- The FCC published 31 public notices.
- 23,000 responses to the notices (74,000 pages) from more than 700 parties.
- 1,100 *ex parte* filings totalling some 13,000

Creating the National Broadband Plan

- The NBP deals with:
  - Achieving broadband for all (universal service)
  - Promoting ultra-fast broadband for those who want it and can afford it (industrial policy)
- There is a traditional antipathy to industrial policy in the U.S.
- It is noteworthy that the FCC was tasked with the NBP, and not the NTIA.

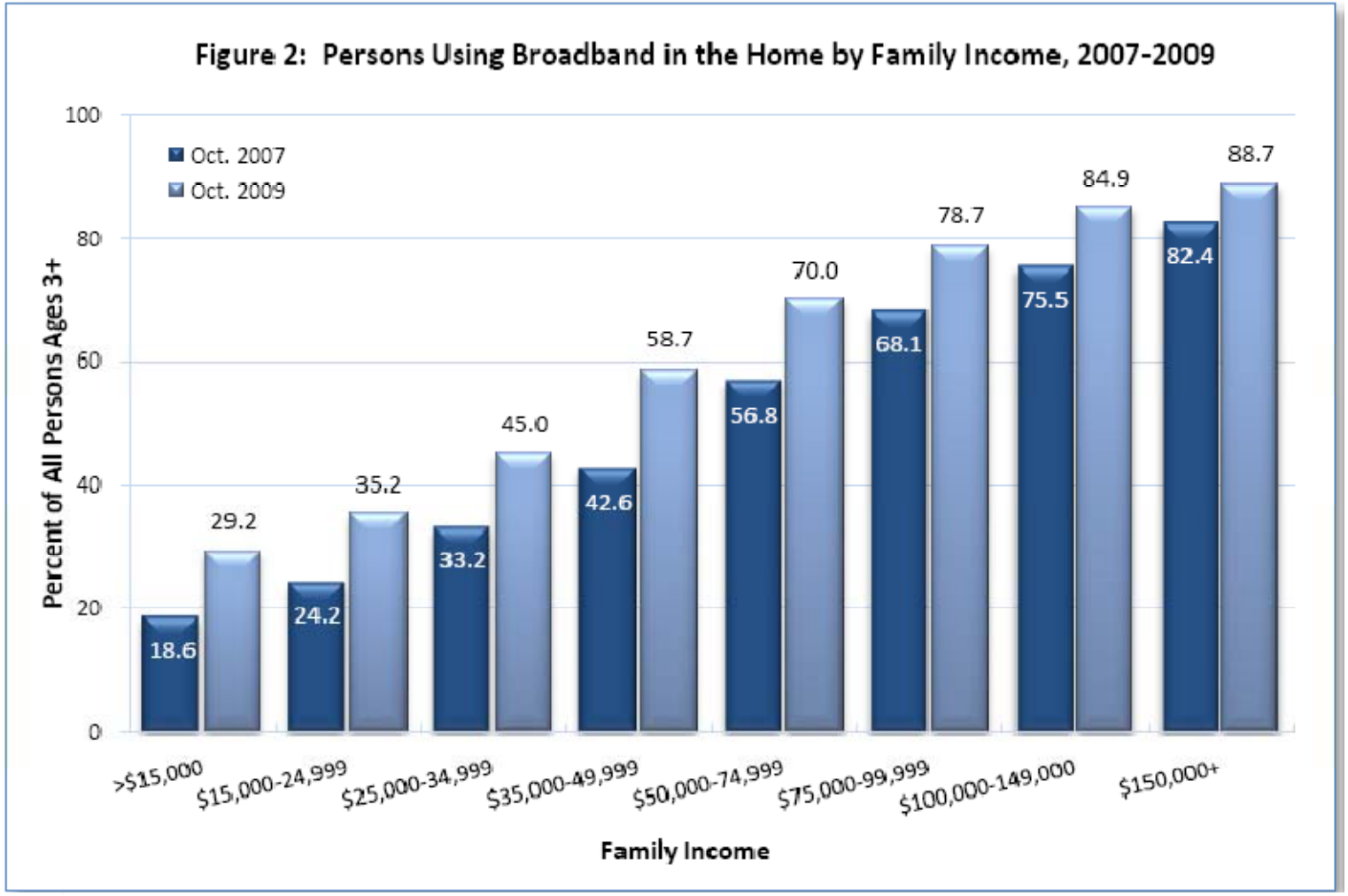
Broadband adoption in the US

- While 65% of American adults use broadband at home, 35% do not.
- Certain groups appear to be left behind.



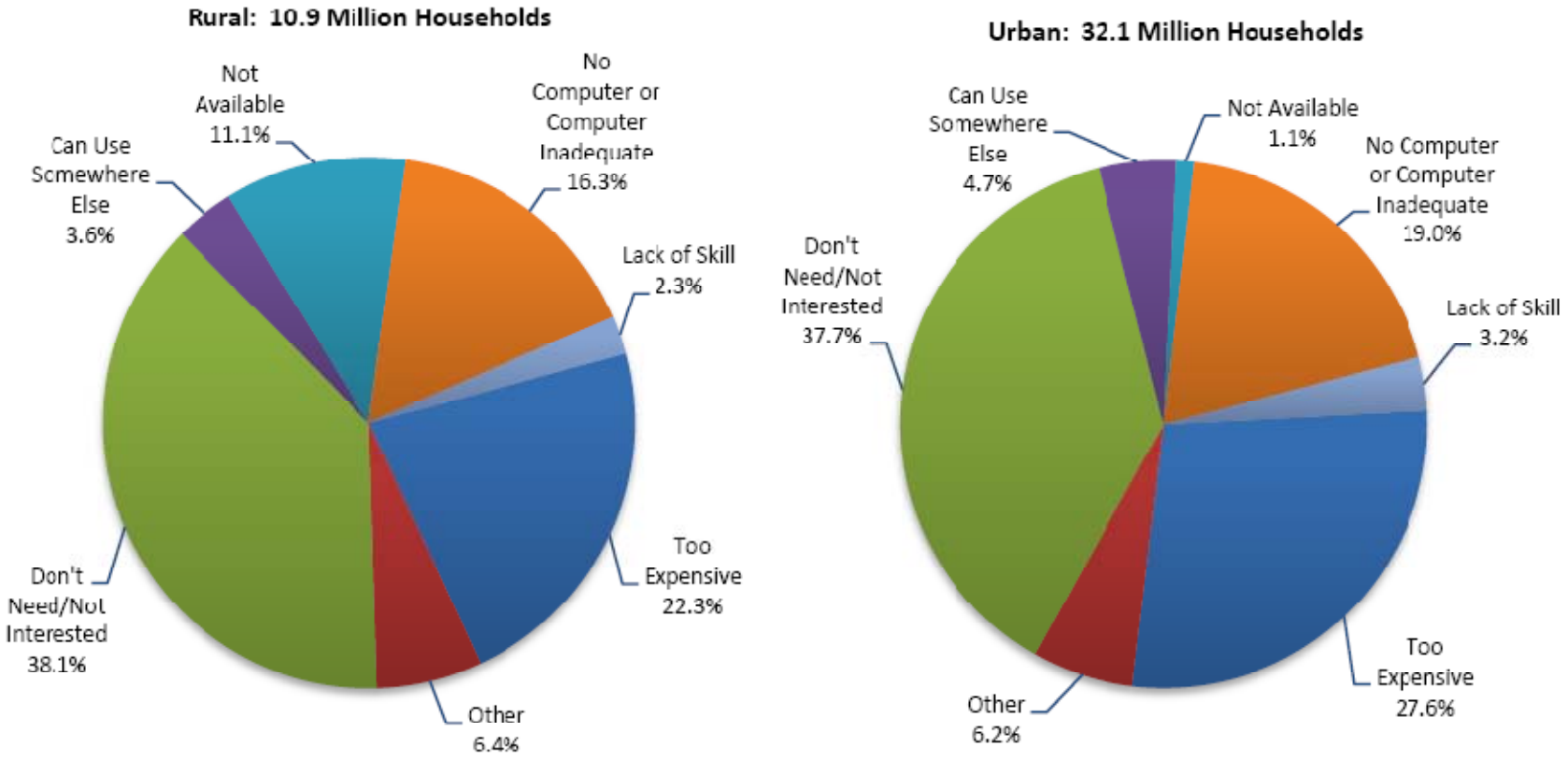
FCC, *National Broadband Plan*, March 2010

Broadband adoption in the US



Broadband adoption in the US

Figure 13: Main Reason for No High-Speed Internet Use at Home, Rural/Urban, 2009



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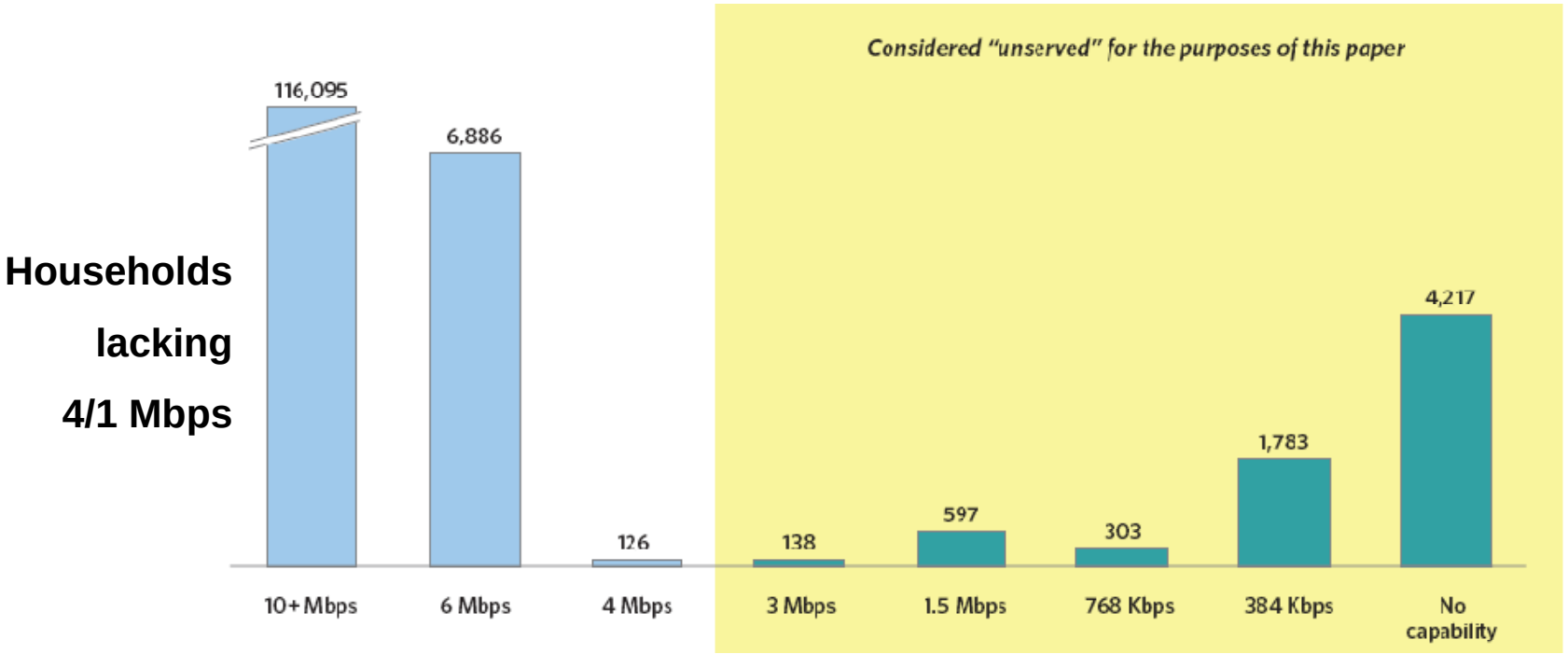
NTIA, *Digital Nation*, February 2010

NEREC, Madrid, 29 October 2010

Broadband deployment in the US

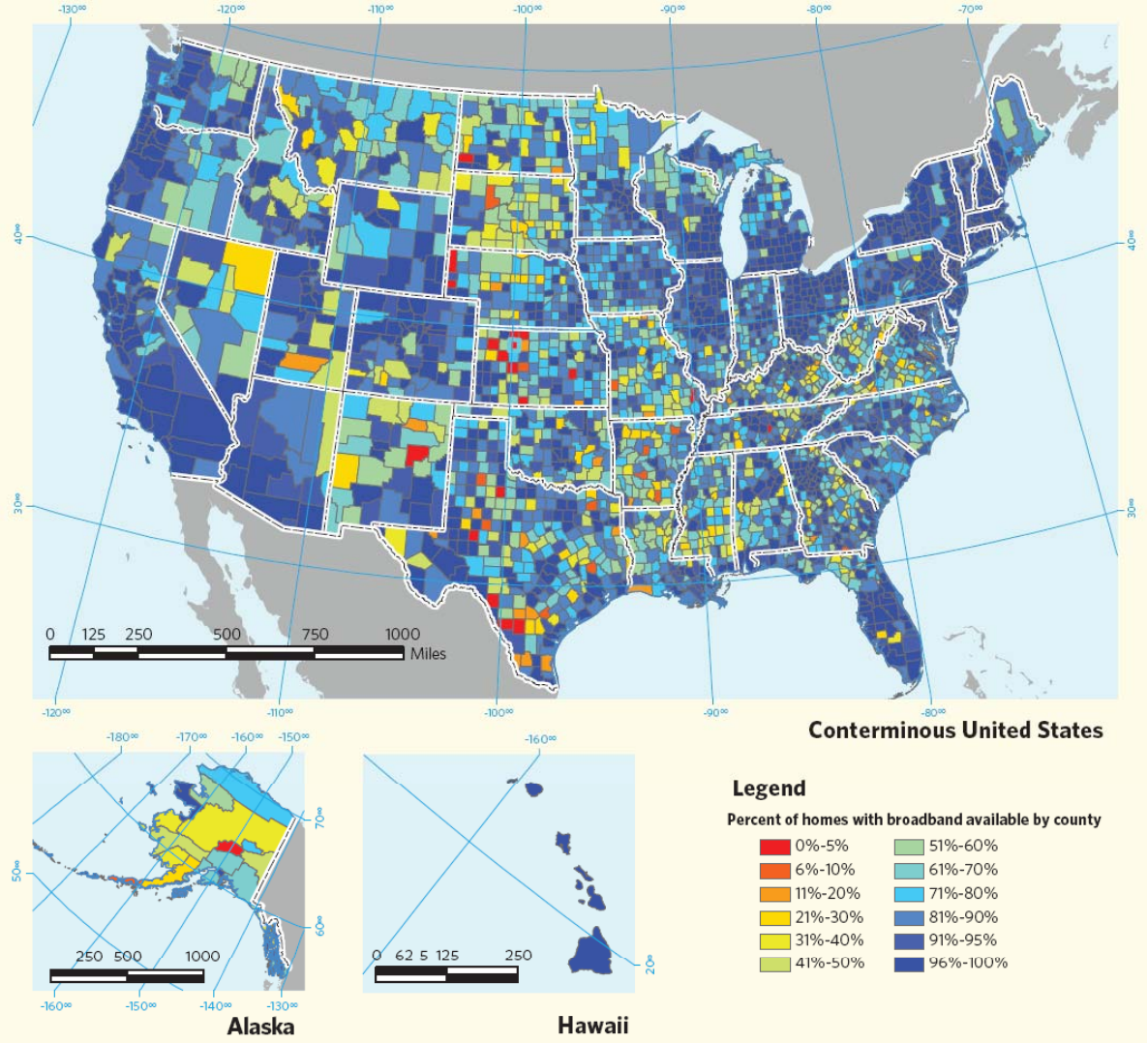
- The FCC sought to identify households served by less than 4 Mbps downstream / 1 Mbps upstream.
- Fastest available wired broadband appears below.



FCC, *The Broadband Availability Gap*, April 2010

Broadband deployment in the US

% of homes with 4/1 Mbps available

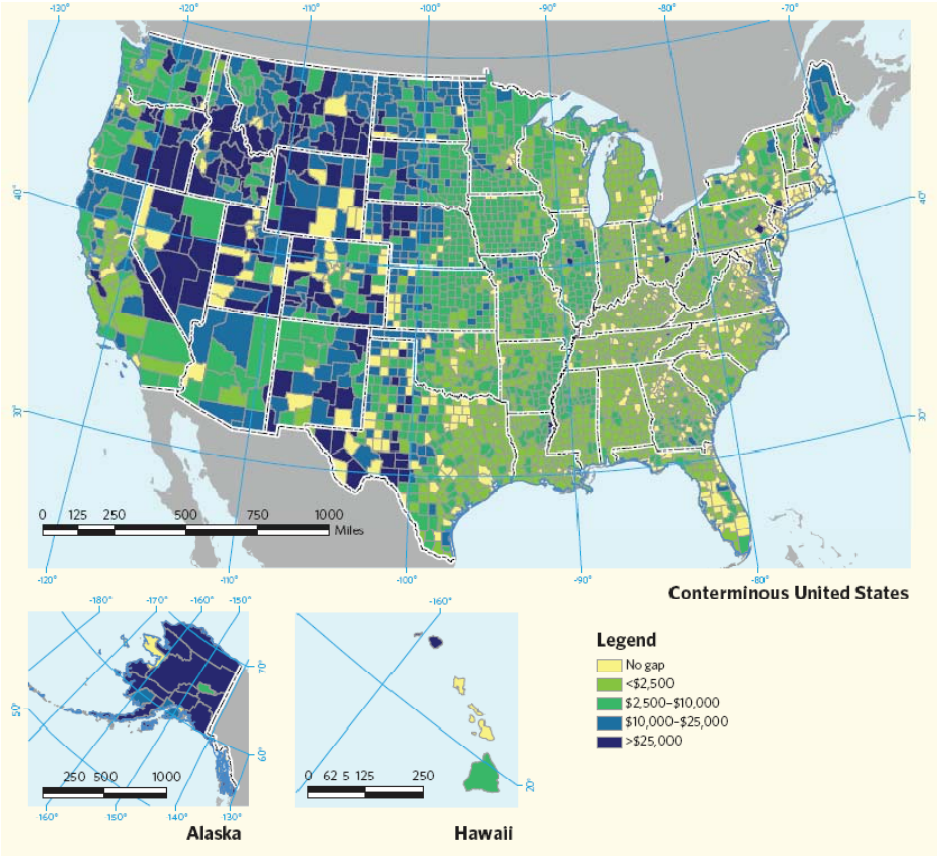


FCC, *National Broadband Plan*, March 2010

Broadband deployment in the US

- The FCC then calculated a Broadband Investment Gap in NPV, distinguishing CAPEX from OPEX.

Gap per household

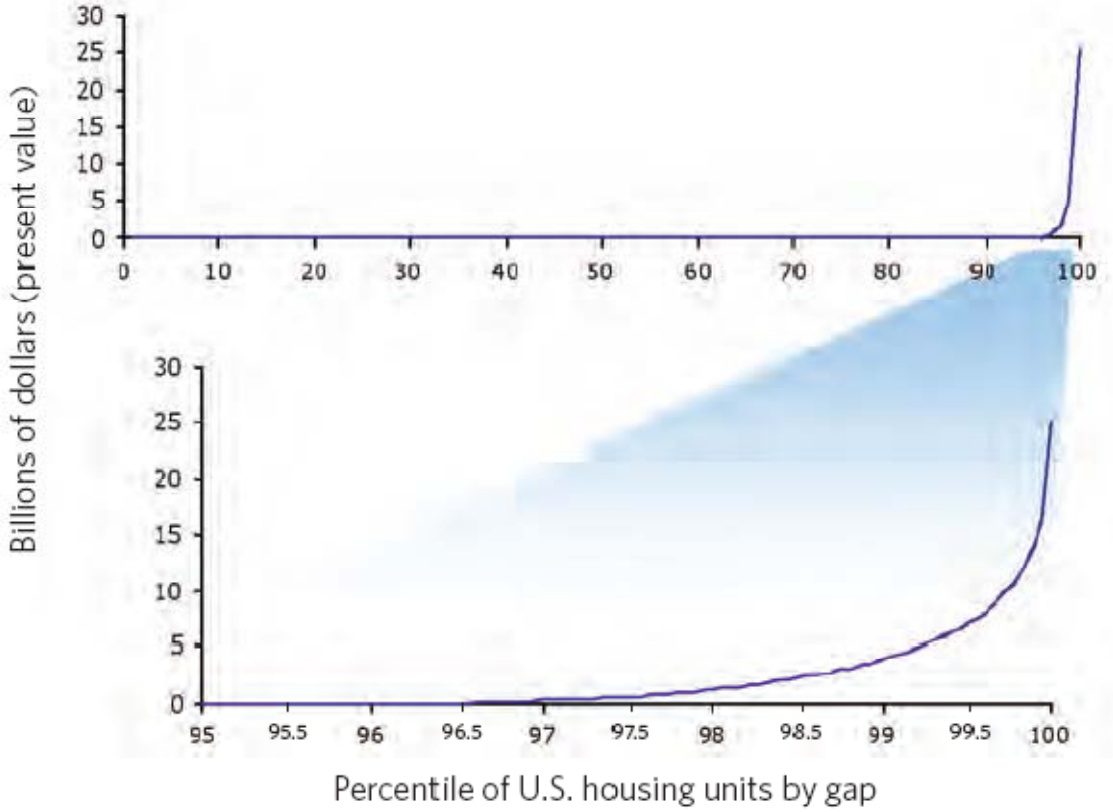


FCC, *The Broadband Availability Gap*, April 2010

NEREC, Madrid, 29 October 2010

Broadband deployment in the US

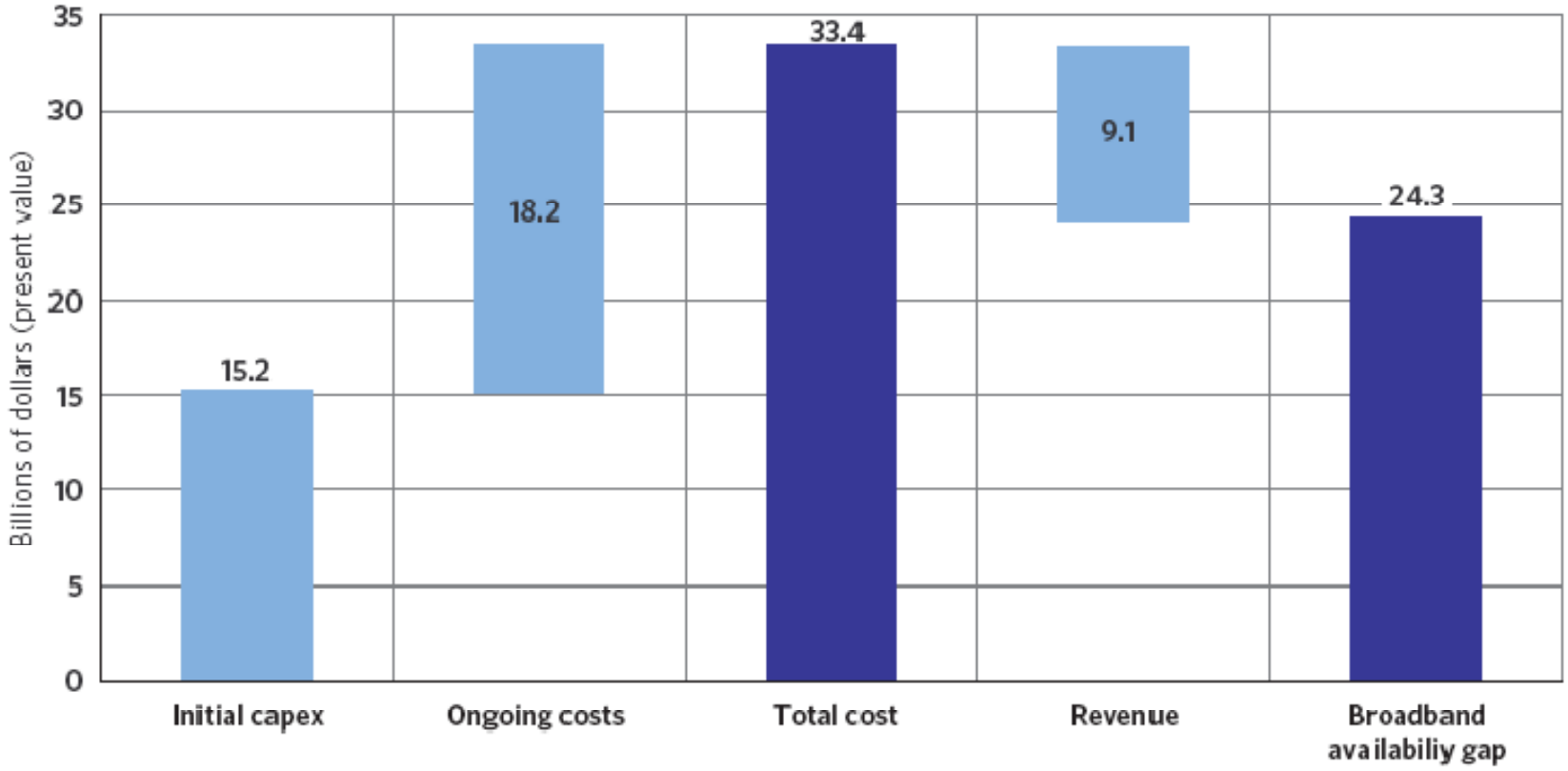
- The most expensive 0.2% (250K) of unserved households represent about half of the gap.



FCC, *National Broadband Plan*, March 2010

Broadband deployment in the US

- NPV gap is $24 billion (2010 dollars).



FCC, *National Broadband Plan*, March 2010

Recommendations: Long term goals

- **Goal No. 1:** At least 100 million U.S. homes should have affordable access to actual download speeds of at least 100 megabits per second and actual upload speeds of at least 50 megabits per second.
- **Goal No. 2:** The United States should lead the world in mobile innovation, with the fastest and most extensive wireless networks of any nation.
- **Goal No. 3:** Every American should have affordable access to robust broadband service, and the means and skills to subscribe if they so choose.
- **Goal No. 4:** Every American community should have affordable access to at least 1 gigabit per second broadband service to anchor institutions such as schools, hospitals and government buildings.
- **Goal No. 5:** To ensure the safety of the American people, every first responder should have access to a nationwide, wireless, interoperable broadband public safety network.
- **Goal No. 6:** To ensure that America leads in the clean energy economy, every American should be able to use broadband to track and manage their real-time energy consumption.

Key recommendations: Overview

1. Design policies to ensure ***robust competition*** and, as a result maximize consumer welfare, innovation and investment.
2. Ensure ***efficient allocation and management of assets government controls or influences***, such as spectrum, poles, and rights-of-way, to encourage network upgrades and competitive entry.
3. Reform current ***universal service mechanisms*** to support deployment of broadband and voice in high-cost areas; and ensure that low-income Americans can afford broadband; and in addition, support efforts to boost adoption and utilization.
4. Reform laws, policies, standards and incentives to ***maximize the benefits of broadband in sectors government influences*** significantly, such as public education, health care and government operations.

Key recommendations: Competition

- Collect, analyze, benchmark and publish detailed, market-by-market information on broadband pricing and competition, which will likely have direct impact on competitive behavior …
- Develop disclosure requirements for broadband service providers to ensure consumers have the pricing and performance information they need to choose the best broadband offers in the market.

Key recommendations: Competition

- Undertake a comprehensive review of wholesale competition rules to help ensure competition in fixed and mobile broadband services.
  - … appropriately balance the benefits of competitive entry with incentives for carriers to invest in their networks.
  - Leased lines / gigabit Ethernet
  - Balance in copper retirement policies

Key recommendations: Competition

- Clarify interconnection rights and encourage the shift to IP-to-IP interconnection where efficient.
- Reduce and ultimately phase out per-minute rates for the origination and termination of telecommunications traffic.

Key recommendations: Assets / Spectrum

- **Planning and transparency:** The FCC should create a spectrum “dashboard”, and should establish triennial strategic planning.
- **Increase available spectrum:** The FCC should make a total of 300 MHz available between 225 MHz and 3700 MHz within 5 years, and should make 500 MHz available within 10 years.

Key recommendations: Assets / Spectrum

- **Incentive auctions:** Congress should make it possible for license holders to relinquish spectrum assignment rights to others or to the FCC. This would enable the FCC to share auction proceeds with broadcasters who voluntarily agree to do so.
- This is a key element. It is intended to provide 120 MHz of spectrum, and to fund much of the deployment.

Key recommendations: Assets / Spectrum

- The notion of incentive auctions is not new. Cf. *A Proposal for a Rapid Transition to Market Allocation of Spectrum*, Evan Kwerel and John Williams, November 2002.
- There was, and is, considerable opposition from over-the-air broadcasters.
- This is a fine idea, but will it be implemented?

Key recommendations: Assets

- Low and uniform rates for pole attachment.
- Harmonize policies and provide better information on availability of poles, ducts, conduits, and rights of way.
- Use Federal highway funding to promote joint deployment of conduits.

Key recommendations: Universal service

- Create a *Connect America Fund (CAF)* to support the provision of affordable broadband and voice with at least 4 Mbps actual download speeds, and shift up to $15.5 billion over the next decade from the existing Universal Service Fund (USF) program to support broadband.
- Create a *Mobility Fund* for 3G/4G.

Key recommendations: Universal service

- Reform intercarrier compensation to eliminate implicit subsidies to universal service.
- Expand Universal Service to permit subsidies to low-income Americans to be used for broadband.
- Launch a National Digital Literacy Corps to provider every American with the opportunity to become digitally literate.

Key recommendations: national priorities

- The Plan includes numerous recommendations regarding health care, education, energy, and more.
- Implementation of most of these would fall to other agencies, or to the Congress.
- Noteworthy is a renewed attempt to deploy a nationwide, interoperable public safety mobile broadband network.

Conclusions: the NBP

- The National Broadband Plan provides a good, wide-ranging and visionary foundation.
- A huge amount of work remains to be done, not only for the FCC, but also for other Executive agencies and for the Congress.
- The US is more nearly at the beginning of a process than at the end.

Conclusions: the NBP

- Overall, this is an impressive piece of work.
- It is a wide-ranging and ambitious plan, but fully consistent with the terms of reference established by the Congress.
- Of the perhaps 200 recommendations, at most half are within the FCC's own implementation authority.

Conclusions: the NBP

- The Plan distinguishes clearly between two distinct objectives:
  - A *universal service regulatory objective* of ensuring that a 4 Mbps down / 1 Mbps up service is available to all Americans.
  - An *industrial policy goal* to provide 100 Mbps down / 50 Mbps up to at least 100 million homes.
  - Analogous to other countries (cf. *Digital Britain*).
  - The Plan recognises the difference between nominal line speed and real throughput.

Conclusions: the NBP

- In line with US political realities, the Plan attempts to characterise its initiatives as being neutral to revenue and cost.
  - Funds are *shifted* within the Universal Service Fund.
  - "If the spectrum auction recommendations are implemented, the plan is likely to offset the potential costs."
  - Will the Congress and the broadcasters agree to this use of auction proceeds?

Conclusions: the NBP

- The potentially most contentious aspect of the Plan has been deferred to a separate proceeding: the question of whether procompetitive remedies are needed in support of broadband deployment.
- A study conducted on behalf of the FCC by Yochai Benkler of Harvard University argued for “open access”.
- Is the FCC willing to reopen this question?

Comcast versus FCC

- The US Court of Appeals for Washington, DC, reached a decision on 6 April 2010.
- The FCC had previously found that Comcast had violated the FCC's "Broadband Policy Statement".
- The Appeals Court found that the FCC had not demonstrated that it had authority to impose Network Neutrality rules in the first place, and thus vacated the FCC's ruling.

Comcast versus FCC

- Much trade press coverage has suggested that this places the FCC's implementation of the National Broadband Plan in jeopardy.
- This is significantly overblown.
- The ruling did not say that the FCC lacks jurisdiction over broadband in general; rather, it says that when the FCC creates new rules not grounded in its authorising statute, it has to demonstrate a link to some statutory purpose. It had failed to do so.

Comcast versus FCC

- The court's ruling was specific to imposing obligations normally relevant to so-called Title II regulation on services that the FCC had previously found not to be subject to Title II.
- The impact on the FCC's proposed actions under the National Broadband Plan would appear to be limited.

Telecoms regulation in the U.S.

- Communications Act of 1934, substantially amended by the Telecommunications Act of 1996.
- Title I: establishes broad jurisdiction of the FCC, but imposes no obligations.
- Title II: imposes obligations on providers of telecommunications services (also referred to as *common carriers*).
- Other titles deal with wireless, cable.

Telecoms regulation in the U.S.

- The *Computer Inquiries* first looked at the regulatory regime that should apply to services that mixed computing with communications.
- Concluded that computing did not necessarily imply market power, therefore saw no need to regulate.
- An echo of the European system!
- Codified in the 1996 Act.

Telecoms regulation in the U.S.

- **Telecommunication service:** provision of telecommunications to the public for a fee.
- Subject to numerous obligations.
- **Information service:** "…generating, acquiring, storing, transforming, processing, retrieving, utilizing, or making available information via telecommunications …"
- Providers of information services are subject to few or no explicit obligations.

Telecoms regulation in the U.S.

- This established the pattern for the nineties.
- Internet service itself was treated as a largely unregulated information service.
- Access to the Internet, however, was typically provided over leased lines or dial-up, both of which were fully regulated telecommunication services.

Telecoms regulation in the U.S.: Stevens Report

- **Stevens Report:** Required by Congress in 1998. The late Senator Ted Stevens (Alaska) had been concerned that the Internet would undermine the basis for universal service.
- A report to Congress, with no regulatory weight.
- Went beyond existing practice to argue that Internet *access* should also be unregulated.

Telecoms regulation in the U.S.: Stevens Report

- Harvard University: The statue of the three lies:
  - John Harvard was a donor, not the founder
  - Wrong year, 1636 instead of 1638
  - Not a likeness of John Harvard

Telecoms regulation in the U.S.: Stevens Report

- **The First Lie:** The Stevens report argued that Internet service was “inextricably intertwined” with e-mail service, web hosting, and network news.
  - Web hosting?
  - E-mail service?
  - Network news? Give me a break!

Telecoms regulation in the U.S.: Stevens Report

- **The Second Lie:** They effectively denied that Internet access constitutes *telecommunications*, "… the transmission, between or among points specified by the user, of information of the user's choosing, without change in the form or content of the information as sent and received."
- If it constitutes telecommunications, and is delivered to the public for a fee, then it should have been a telecommunications service.

Telecoms regulation in the U.S.: Stevens Report

- **The Third Lie:** The Stevens report claimed that ISPs do not own their access. They leased capacity from regulated carriers, who were already subject to regulation.
- Largely but not always true at the time; surely not consistently true a few years later, and rarely true today.

Telecoms regulation in the U.S.: Stevens Report

- **The Un-Lie:** Hard to see how one could argue for a fully unregulated status without even considering whether market power might be present.
- Absence of market power had been a prime consideration in the Computer Inquiries decision not to regulate.
- Market power analysis was, however, never properly codified into US law or FCC rules.

Telecoms regulation in the U.S.

- The Stevens Report had no direct effect, but…
- The FCC during the George W. Bush years found it a convenient basis for deregulation.
  - 2002 – no regulation of Internet over cable.
  - 2005 – no regulation of Internet over phone lines, although firms could choose to remain regulated.
  - Complementary to other deregulatory initiatives, including elimination of shared access, reductions in the scope of LLU, and generally weak enforcement of procompetitive access remedies.

Comcast vs FCC

- The FCC had found that Comcast (the largest provider of consumer broadband) had interfered with the ability of customers to access peer-to-peer applications such as BitTorrent.
- Comcast agreed to end the practice.
- Comcast challenged the legal basis on which the FCC had ordered them to do so.

Comcast vs FCC

- The FCC had implemented an *Internet Policy Statement* that argued that "… consumers are entitled to access the lawful Internet content of their choice . . . [and] to run applications and use services of their choice …"
- It was a policy statement, not a rule.
- The FCC never issued a rule.

Comcast vs FCC

- Comcast claimed:
  - The FCC could not enforce a rule that they had never issued. Comcast had no way of knowing what was permissible, and what was not.
  - Procedural safeguards were bypassed.
  - The FCC lacked authority to impose such a rule in the first place, since the underlying broadband access as an information service was subject to no relevant regulations.

Comcast vs FCC

- The FCC has broad jurisdiction, but only limited authority to craft new rules out of whole cloth, under a doctrine known as *ancillary authority*.
- The courts have consistently recognised the FCC's prerogative to create rules where necessary to fill gaps in the Act, or to prevent properly grounded rules from being rendered ineffective.
- The FCC must be prepared in each case to

Comcast vs FCC

- On 6 April 2010, a Federal court ruled in Comcast's favour.
- The court found that the FCC had failed to demonstrate its authority, and therefore vacated (lifted) the FCC's order.
- The FCC had failed to identify any statutory mandate to which the rule could be considered ancillary.
- The Court never reached the other grounds, where the FCC was also weak.

Comcast vs FCC

- In the past few years, the FCC has relied on ancillary authority in part for:
  - VoIP access to emergency services
  - CALEA (wiretapping for law enforcement)
- The court's finding is a confirmation of long-standing US jurisprudence, and is not likely to go away.
- How can the FCC impose any rules at all on broadband with an ambiguous statutory mandate?

Comcast vs FCC

- **Net neutrality rules:** dead in the water.
- **Universal service for broadband:**
  - Contribution mechanisms are already in place, and are not threatened by Comcast vs FCC.
  - Explicit ability to disburse funds refers to “carriers”.
- **Possible way out:** The FCC claimed (unwisely?) in the past that Section 706 provides no independent authority. But they would have to declare deployment to be deficient.
- Some rural companies are carriers anyway.

What way forward?

- **No Way:** The FCC could let matters rest.
- **The First Way:** The FCC could seek to bolster its authority under *existing law*.
- **The Third Way:** The FCC could reverse itself and declare broadband Internet access, over whatever medium, to contain a telecommunications service and thus to be subject to regulation. It would then forbear from unnecessary regulation.
- **The Fourth Way:** The Congress could resolve these issues, either by

What way forward? The First Way

- **First Way:** Within the framework of existing law, to start from today's premise that broadband Internet access is an information service, and to selectively impose any obligations that are felt to be needed.
- Substantial risk of (successful) court challenges on any future regulatory initiatives relevant to broadband.
- Political dimension (Democrat/Republican)

What Way Forward? The First Way

- Some existing rules over broadband have been implemented without full reliance on ancillary authority.
  - Contributions to universal service fund
  - Portions of CALEA (law enforcement)
- Extending universal service disbursements to broadband might possibly be grounded in Section 706 of the 1996 Act.
- No obvious “anchor” for net neutrality.

What way forward? The Second Way

- **The Second Way:** This would represent making broadband subject to all Title II rules.
- This was a rhetorical device used in the FCC memoranda – makes their preferred "Third Way" seem moderate by comparison.
- Nobody (except for perhaps a radical fringe) would argue for this.

What way forward? The Third Way

- **The Third Way:** Within the framework of existing law, redefine part or all of broadband Internet access as a telecommunications service.
- Alleviate any obligations deemed to be inappropriate.
- Modify others as needed to make them suitable for an Internet-based service.

What way forward? The Third Way

- Alleviating rules is possible under Section 10 of the Communications Act, forbearance.
- FCC must "…consider whether forbearance from enforcing the provision or regulation will promote competitive market conditions, including the extent to which such forbearance will enhance competition among providers of telecommunications services."
- Potentially very valuable language.

What way forward? The Third Way

- FCC proposes to forbear from all but six sections of the Act.
- Sections 201, 202 and 208 relate to fair and nondiscriminatory prices, and are specifically relevant to net neutrality.
- Section 222: consumer privacy
- Section 254: universal service
- Section 255: consumers with disabilities

What way forward? The Third Way

- Ability to impose new obligations for Network Neutrality would be clear-cut, since they would implement well-established authority in Sections 201 and 202 of the Act as amended.
- The ability to implement obligations relative to the National Broadband Plan might be somewhat greater than under the current arrangements, but effects will vary case by case.
- The Third Way might not e.g. make much

What way forward? A Fourth Way

- To craft new law that imposes precisely the obligations that are needed.
- Could be a (long overdue) major overhaul of the 1934 Act, or a more targeted revision.
- The Congress would be unlikely to get this right. There would be a substantial risk of doing more harm than good.
- ***Dead in the water*** until at least 2013.

The Third Way: Conclusions

- The present regime is deeply flawed, and has outlived whatever usefulness it might have had.
- The Third Way would provide the FCC with necessary authority to move forward in several areas, and would also strengthen the underpinnings of several previous rulings that were appropriate in terms of public policy, but legally dubious under the present regime.

The Third Way: Conclusions

- A regime based on reclassification of the transmission portion of broadband Internet access to a telecommunications service, with selective application of forbearance, is entirely workable.
- However, it would require a much more comprehensive and nuanced analysis than that of the current FCC memorandum.
- The question of procompetitive remedies should be judged in its own time.

Universal Service Reform

- On 21 April 2010, the FCC launched an NOI and NPRM "… to begin the hard work of implementing the Plan's recommendations, which include cutting inefficiencies in existing support of voice services and creating a Connect America Fund (CAF) that directly supports broadband without increasing the size of the Universal Service Fund over the current baseline projection."

Universal Service Reform

- Seeks comment on the FCC's model of the cost of extending service to new areas.
- Presents "… a number of proposals to cut legacy universal service spending in high-cost areas and to shift support to broadband communications."

Universal Service Reform

- Proposals include "… capping the overall size of the high-cost program at 2010 levels; re-examining the current regulatory framework for smaller carriers in light of competition and growth in unregulated revenues; and phasing out support for multiple competitors in areas where the market cannot support even one provider."

Wireless broadband for public safety

- Motivated by the need for public safety agencies to work together across state or municipal boundaries.
  - Needed both for day to day business and in the case of a disaster.
  - It is also driven by increasing demands from the public safety community for high speed data and video.

Wireless broadband for public safety

- Key recommendation: USG should "… [s]upport deployment of a nationwide, interoperable public safety mobile broadband network, with funding of up to $6.5 billion in capital expenditures over 10 years, which could be reduced through cost efficiency measures and other programs. Additional funding will be required for operating expenses."

Wireless broadband for public safety

- A harmonised nationwide spectrum band for public protection and disaster relief had been a key recommendation following the September 11 attacks, but was never effectively put in place.
  - The FCC had sought to auction the so-called “D Block” in the 700 MHz band so as to provide primary use for public safety broadband, but to permit a secondary preemptible use by some commercial party.
  - The bids failed to reach the reservation price for

Implications for Europe

Implications for Europe: The good

- There is a great deal to be said for the NBP's holistic approach.
  - Broadband is approached not only in terms of general Internet access, but also in terms of its cross-sectoral impact on e-health, energy, and e-government.
  - Achieving the full benefits likely depends on complementary industrial policy iniatiatives.

Implications for Europe: The good

- NBP places emphasis on stimulation of demand, and especially on ensuring that consumers know how to use broadband services.
- Many of the most successful industrial policy implementations have done so, e.g. give-aways of PCs in South Korea.

Implications for Europe: The good

- The NBP is very much *data driven*, and to a degree that has been unusual in the U.S. in recent years.
  - The FCC captured and organised a great deal of complex information for the NBP, and did a reasonably objective job.
  - They were further aided by the complementary survey data compiled by the NTIA.

Implications for Europe: The good

- Some of the specific innovations in regard to spectrum management may prove to be important.
  - The use of incentive auctions might have value in Europe, as in the U.S., as a means of motivating broadcasters to voluntarily relinquish spectrum that they hold in a second Digital Dividend.
  - At a minimum, it forces the broadcasters to consider carefully the opportunity costs associated with holding spectrum, particularly in countries where the number of over-the-air

Implications for Europe: The good

- A harmonised allocation of spectrum for the U.S., while arguably a separate matter from consumer broadband deployment, is highly relevant to Europe.
  - The need for spectrum harmonisation at European level to enable interoperable high speed data and video communications for public protection and disaster relief (PPDR) has been recognised for many years.
  - Progress in terms of concrete implementation has been slow in Europe, as in the U.S.

Implications for Europe: The bad

- As long as market power (especially last mile market power) remains a problem in the sector, procompetitive access remedies should remain in place.
  - Deregulating in response to the siren call of seeking to promote faster deployment, at the cost of suppressing competition, ultimately benefits neither deployment nor competition.
  - Once market competition has collapsed, half-remedies like network neutrality rules of deployment subsidies are unlikely to prove satisfactory.

Implications for Europe: The bad

- Plans are all well and good, but plans alone do not achieve results.
  - Successful implementation is unlikely unless authority, responsibility and accountability are in balance.
  - Authority must be sufficient to the task at hand. If responsibility is too diffuse, little is likely to happen.
  - The necessary preconditions are not yet in place in the U.S.

Implications for Europe: The bad

- There are such a huge number of recommendations as to be scarcely manageable.
  - The report attempts to group the recommendations, but it does not go far enough.
  - A coherent, actionable plan should consolidate the recommendations into a number that is easier to grasp, and should provide some relative prioritisation.

Implications for Europe: The bad

- A great many initiatives are lumped into the NBP that, while relevant, would take place with or without implementation of any NBP.
  - It was perhaps expedient for the FCC and the Administration to be able to take credit for these items, but it confuses any assessment of the impact of the broadband initiatives alone.
  - One might also suspect that this was the only bus going out, and that everyone wanted to ride.

Implications for Europe: The bad

- The FCC could not really address where the money would come from
  - The FCC has attempted to divert funds so as to keep the initiative somewhat revenue neutral, but doing so still depends on the Congress.
  - Some of these funds arguably would have been there with or without the NBP.
  - The incentive auctions are unlikely to realize the envisioned revenues.

Implications for Europe: The ugly

- The Comcast decision is a reflection of a U.S. tendency to focus obsessively on statutory language, while losing sight of:
  - Underlying policy principles
  - Underlying economic principles

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Comments on:

A Prospective Analysis of the Deployment of Next Generation Access Networks: Looking for the Limits of Market Action: The Case of Spain

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NEREC, Madrid, 29 October 2010

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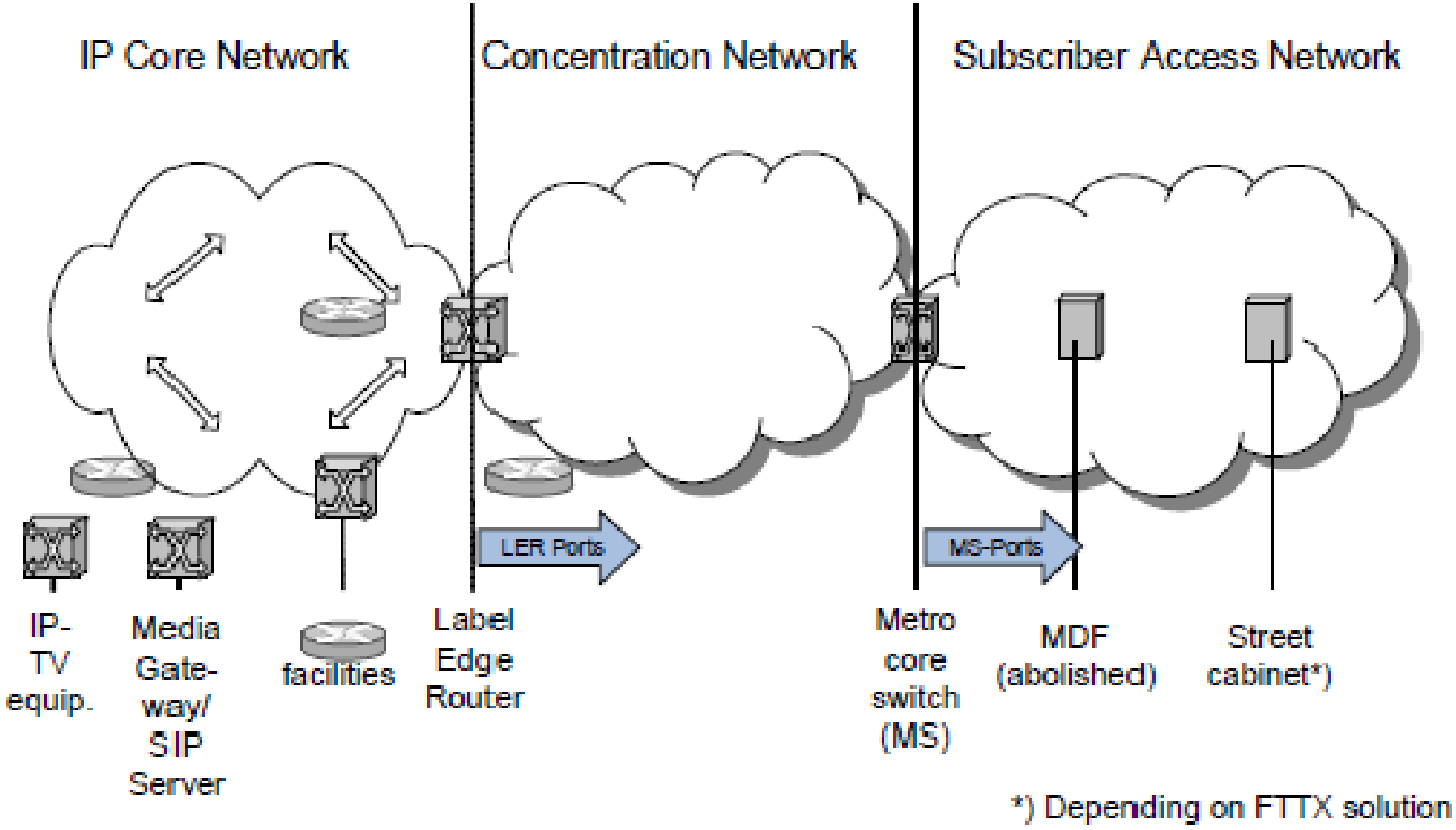
General Observations

- Initial impression: this is a really excellent piece of work.
- Does a fine job of addressing:
  - Relative costs of VDSL versus FTTH
  - Importance of re-use
  - Role of cable television
  - Role of wireless access
  - Importance of procompetitive remedies
  - Risk of remonopolisation

Next Generation Access Networks

- WIK report on Next Generation Access (NGA) for ECTA (2008)
- Sophisticated models of fibre roll-outs in France, Germany, Italy, Netherlands, Portugal, Spain
- Key findings:
  - No country likely to achieve full coverage without public stimulus/subsidy.
  - Only limited prospect of replicating infrastructure.
  - Maintenance of adequate procompetitive remedies is vital

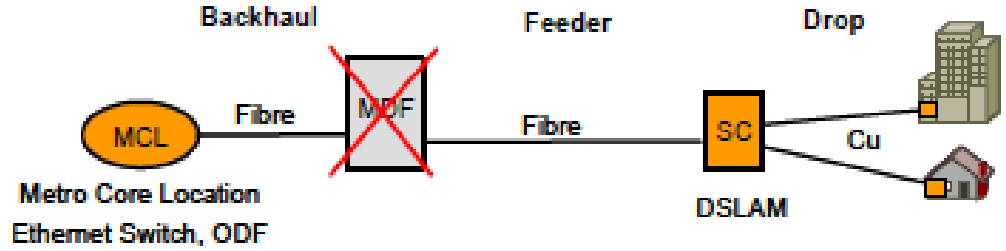
Next Generation Access Networks



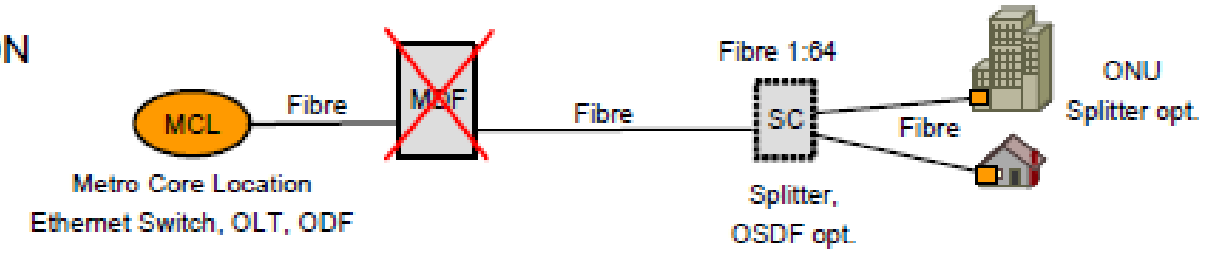
Source: WIK

Next Generation Access Networks

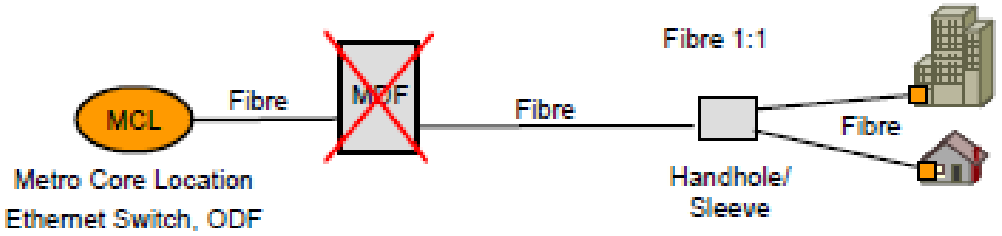
- VDSL



- FTTH PON



- FTTH P2P



Traffic concentration now on a higher level than MDF

Active Electronic Equipment

Source: WIK

Next Generation Access Networks

Investment per home connected (in Euro), market share 50%, urban cluster, stand alone first mover **

Network Type	Country [in €]					
	DE	FR	SE	PT	ES	IT
VDSL	457	n.v.	352	218	254	433
PON	2,039	1,580	1,238	1,411	1,771	1,110
P2P	2,111 (54%)	2,025	1,333	1,548	1,882	1,160

** Based on the investment of the urban cluster and a market share of 50%. If other marekt shares are used, it is mentiond in brackets.

Next Generation Access Networks

Viability of NGA roll-out for incumbents across countries and technologies

Network Type	Country					
	DE	FR	SE	PT	ES	IT
VDSL	71.5%	n.r.	18.3%	39.0%	67.4%	100.0%
PON	25.1%	25.2%	18.3%	19.2%	12.2%	17.6%
P2P	13.7%	18.6%	18.3%	19.2%	12.2%	12.6%

Next Generation Access Networks

Replicability of NGA roll-out for a second mover, 80 % access to existing ducts at current cost-based prices

Network Type	Country					
	DE	FR	SE	PT	ES	IT
VDSL	18.5%	n.r.	n.v.	39.0%	n.r.	17.6%
PON	0.3%	6.8%	n.v.	n.v.	n.v.	1.6%
P2P	0.0%	6.8%	n.v.	n.v.	n.v.	0.2%

Compatible with this new report?

- Probably – I have not had time to compare the models, nor to check the assumptions in detail.
- The findings are all directionally correct.

VDSL versus FTTH

- The report probably reaches the right conclusion, in my view.
- There is an unavoidable risk:
  - Consumers may not really need bandwidth, but
  - FTTH is more future-proof.
- Several countries initially planned VDSL build-outs, but eventually deployed FTTH, including New Zealand, Australia, Netherlands, and to some extent Germany.

Cable television

- Not just about linear video!!
- High speed data capabilities are comparable to those of fibre NGAN systems.
- EuroDOCSIS 3.0:
  - Nominal 55.6 Mbps per channel
  - Up to 8 channels downstream, 4 upstream
- Up to 122 Mbps upstream
- Cable telephony

Wireless solutions

- Necessary for areas of lower population density.
- Probably implies lower transmission speeds.
- Cf. the Australia NBN, which is seeking to cover 90-93% of its population with FTTH solutions, and the remainder with wireless or satellite at lower speed.

How much of the population to cover?

- There is no unique right answer.
- New Zealand: 75% of the population should be reached via FTTH.
- Australia: 90-93% FTTH.
- US: Shows that hitting the last percent with broadband can be extremely expensive.
- What percentage have a fixed phone today?
- Ultimately a political decision.