



Spectrum Policy: Just Do It!

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EXECUTIVE SUMMARY

The U.S. wireless industry is being held back by a shortage of spectrum—a problem driven in large part by rapidly increasing demand for mobile data. Consumers are already suffering the impact of spectrum shortages, and the situation is only likely to worsen as wireless data traffic grows. In this context, the White House, Congress, and the Federal Communications Commission (FCC) have all acknowledged the wireless spectrum crunch and have prioritized auctions to reallocate spectrum more efficiently. Yet three years after this goal was set in the National Broadband Plan, it is no closer to being achieved.

Resistance from broadcasters, who are being asked to give up valuable spectrum for considerably less government compensation than it might be worth, is partly responsible for this delay. There are also logistical challenges inherent in reassigning spectrum from one service to another. However, the FCC's misguided efforts to artificially create competition, manage business models, and pick winners and losers have also contributed to derailing the spectrum reallocation process.

In reality, there is no lack of competition in the wireless sector—a fact underscored by the FCC's own research, which points to falling voice, text and data revenues for wireless providers. The FCC doesn't have

to induce more competition by either setting aside spectrum for new entrants or handicapping the auction process so non-incumbents can acquire spectrum at an artificial discount. Doing so undermines the incentives for both incumbents and other potential entrants to develop new technologies that would enhance access to wireless.

To effect the best results, the FCC should avoid placing network neutrality conditions on one or more of the spectrum blocks due to be auctioned—not least because any such requirement is likely to draw legal action from incumbent carriers and further delay action. Moreover, the failure of 2009's Advanced Wireless Service auctions should have shown the FCC that network neutrality is a non-starter for service providers. No Internet service provider can support quality service without selectively applying special treatment to certain data applications, as they cross the network.

The FCC's misguided efforts have contributed to derailing the spectrum reallocation process.

The FCC should also decline to tilt spectrum auction rules in favor of particular technologies, such as Super WiFi, however superficially attractive they may appear. If the promise of the technology justifies the risk of investment, private capital will flow to enterprises that commit

to it. Government support for particular technologies risks subsidizing failures like M2Z, the Chevrolet Volt and Solyndra.

The wireless market does not need, nor should it have to endure, the FCC engaging in disruptive regulatory experiments; it needs it to get on with reallocating spectrum. The agency has the means and the resources to get the needed spectrum to consumers. It should just do it.

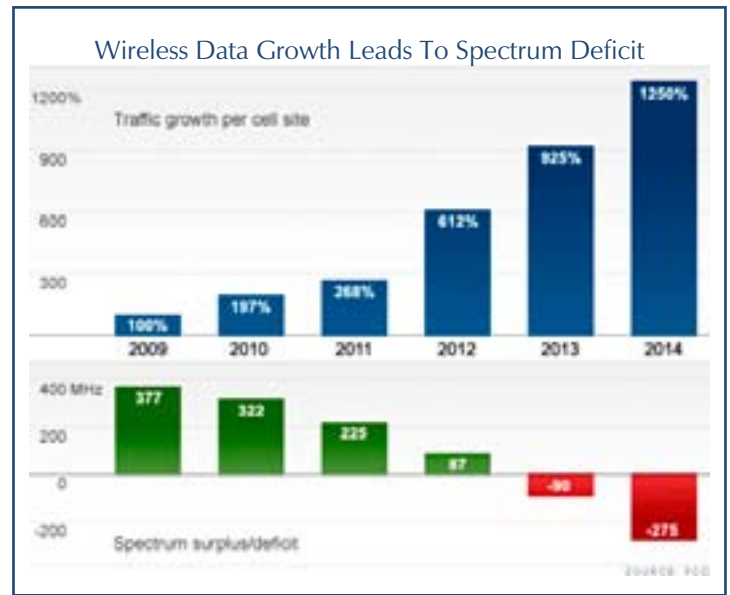
INTRODUCTION

A shortage of spectrum plagues the U.S. wireless industry. The main demand driver is the increase in use of wireless data to access the Internet. This has been enabled by increasingly functional smartphones such as the Apple iPhone and the Samsung Galaxy, as well as the iPad and other tablets. Wireless data applications that were once clunky, such as video, now work as well as they do on desktop PCs. Indeed, the entire functionality of the Internet now fits consumers' pockets, briefcases and backpacks.

Yet, while demand has risen dramatically, it has not been met with an increase in supply, with the result that the airwaves have become congested. A typical wireless radio channel can accommodate many simultaneous phone conversations. Once bandwidth-rich applications such as video are added, however, a single smartphone begins to use up more of the available radio channels within a local zone of wireless coverage, or cell. The iPhone, for instance, uses 24 times as much spectrum as a conventional cell phone, and the iPad uses 120 times as much, according to Julius Genachowski, former chairman of the Federal Communications Commission (FCC).¹ That's why calls drop and smartphone browsers can fail in the middle of a busy downtown (see sidebar on page 3).

Consumers have begun to notice. Some 77 percent of wireless phone users who use their phones for online access say slow download speeds affect the quality of their mobile applications, according to a survey from the Pew Internet and American Life Project. Of the same user group, 46 percent said they experienced slow download speeds at least once a week or more frequently.²

Global mobile data traffic is nearly doubling every year, and is expected to continue to do so through at least 2016.³ AT&T reports that wireless data traffic on its network has grown 20,000 percent since the iPhone



debuted in 2007.⁴

Wireless service providers have several options to address congestion issues. AT&T, Verizon, Sprint and T-Mobile have started upgrading their networks to the latest generation of wireless infrastructure, known as Long Term Evolution, or LTE. They can also "split" cells in existing systems, that is subdivide one zone of coverage into several smaller zones. Still, this is costly, as it requires additional radio equipment, lease of physical space for antenna and radio mounts, plus substantial system re-engineering to maximize efficiency and avoid interference. These costs end up being recouped through higher subscriber fees. Service providers have also begun imposing caps on data usage plans. Neither of these options endears service providers to users.

Consumers suffer because the government would be driving up the cost of spectrum.

Another way service providers can increase spectrum is through acquisition. The need for additional spectrum was the principal motive behind AT&T's attempt last year to purchase T-Mobile for \$39 billion. Despite its acknowledgment of the spectrum crunch, the FCC blocked the deal, arguing that it was anticompetitive.

As it is, even with cell-splitting and LTE build-out, FCC analysts believe spectrum availability could peak as early as 2014. That's why it's critical that the FCC move forward toward re-assigning spectrum in the fastest, most efficient way possible.

WHAT IS SPECTRUM AND HOW IS IT ALLOCATED IN THE U.S.?

Spectrum is defined as a block of radio frequencies. A principal job of the FCC from its creation in 1934 has been to assign the necessary spectrum for communications technology and services that use the airwaves. The usable radio spectrum, measured in hertz (Hz) ranges from 3 Hz to 300 gigahertz (GHz). While Hz (and MHz and GHz) denotes a radio frequency, it is also used to measure the size of frequency blocks. Commercial FM radio stations, for example, operate on frequencies between 88 to 108 MHz, therefore we would say FM radio occupies 20 MHz of spectrum.

Over time, the FCC has allocated wireless phone services a total of 368 MHz of spectrum in different blocks in the 700, 800, 1700, 1800, 1900 and 2100 MHz bands.⁸ Frequencies in these spectrum blocks have been divided up among the wireless service providers in each local market. While the first groups of wireless licenses were awarded via FCC set-asides and then adjudicated through an application process, since 1994, wireless licenses have been awarded by auction, with proceeds going to the U.S. Treasury.

To alleviate the spectrum crunch, the FCC plans to make an additional 300 MHz of spectrum available to the wireless industry. Television broadcasters currently occupy 120 MHz of this block. The remainder is either used or reserved for other land mobile applications, mostly by the U.S. government. For reasons described below, the process of transferring the spectrum is expected to take at least two to three years.

The spectrum transfer has not had an auspicious start. To begin with, while the FCC has the power to

assign spectrum, it is up to the National Telecommunications and Information Administration, an agency of the Department of Commerce, to identify unused or underused spectrum the government could vacate. The NTIA reported that 95 MHz of spectrum could be cleared in the desirable 1700 and 1800 MHz bands, but also warned that the 20 agencies that currently hold these frequencies consider a transition difficult and say it would cost \$18 billion. According to one policy analyst, the NTIA accepted this figure on faith and without further confirmation:⁹

But reading the report carefully, NTIA and the agencies seem more interested in appearing to support the White House goals than actually doing so. The report repeatedly downgrades its optimistic findings of the potential to clear nearly 100 MHz of essential spectrum by reminding readers of significant “challenges” that would need to be overcome. By the end, “challenge,” a word that appears 17 times in the report, starts to sound like code for something nearly impossible to achieve.¹⁰

Rather than push back, the White House, specifically the President’s Council of Advisors on Science and Technology (PCAST), took the NTIA report at face value. PCAST recommended that the FCC change its solutions approach and, instead of auctions, urge the wireless industry pursue “spectrum sharing,” a technology that would allow different types of mobile services to use the current bandwidth they have. For all his interest in novel technologies, even former FCC Chairman Julius Genachowski was skeptical about spectrum sharing’s potential in the next ten years and has emphasized that “our basic strategy has been to clear spectrum and reallocate it.”¹¹

Genachowski, however, faced headwinds from commissioners aligned with his own party. Commissioners Jessica Rosenworcel and Ajit Pai, two recent Obama appointees have both called for more investment in sharing technologies, and quickly.¹² With internecine battles looming in the FCC, there is a real danger of gridlock on reallocation of government spectrum.

Broadcasters present the second tangle, as they will have to be persuaded to give up a valuable asset for compensation considerably less than it might be worth. This comes in addition to the complicated logistics of re-assigning spectrum from one service to another. While the reallocation process falls within the FCC’s tradi-

SPECTRUM CRUNCH?

Each wireless cell has 10 MHz of spectrum per downlink. 1 MHz of spectrum can accommodate about 1.4 Mb/s of bandwidth. The average YouTube video download configured for wireless needs between 768 kb/s and 1.5 Mb/s. So in one cell, which these days can be as small as a one-square-block area, all you need are 15 users on YouTube—scattered in coffee shops, bars, offices and lofts—and you’ve exhausted the available channels. After that, any users entering the cell will have slow or timed out connections.

tional regulatory scope, its desire to inject itself into the transfer process as broker and middleman complicates matters further.

For one, the process will become more politicized, as broadcasters and wireless service providers lobby for favorable treatment. Second, the FCC has an interest in extracting a high price for the spectrum, and has the means though rulemaking to influence payment terms. Here, consumers suffer because the government would be driving up the cost of resources (in this case spectrum) higher than their actual market value. These higher costs end up reflected in service rates and divert funds from better uses, such as research and development.

Even before we discuss the costly conditions the FCC wants to attach to the auction process, we are confronted with a breakdown in government efficiency. The White House, Congress and the FCC all acknowledge the wireless spectrum crunch and have prioritized the transfer of more spectrum. Yet, more than three years after this goal was set in the National Broadband Plan, the country is no closer to achieving it.

CHANGES TO THE FCC APPROACH TO SPECTRUM ALLOCATION

As if federal bureaucracy itself had not already proved a millstone to progress on spectrum reallocation, the FCC also wants to attach stringent conditions to the auction of certain blocks. These conditions might require the applicant to commit to a specific type of wireless technology, or use a certain business or pricing model. The FCC has also sought to exclude incumbents from bidding for certain portions of spectrum, hoping to stimulate bids from smaller companies who lacked the financial resources of the incumbent service providers.¹³

Such granularity is unprecedented. In the past, the FCC evaluated applicants based on a standard set of merits. TV broadcasters, for example, were required to broadcast a signal at certain power output to cover a specific metropolitan area. The FCC did not demand that the licensee buy broadcast equipment exclusively from RCA, or set aside a license for an applicant who promised to use a novel picture-encoding standard that differed from common standards but caught the fancy of the FCC chairman. Nor did the FCC pre-emptively exclude applicants or bidders, nor reserve TV, radio

or wireless licenses for companies that agreed to use different business models. True, TV channels and radio frequencies are set aside for public non-profit broadcasting stations, but those carve-outs were authorized by Congress and were not done at FCC discretion.

Congress was initially divided on whether to give the FCC the discretion it wanted. A compromise was reached in February 2012 when the House and Senate reconciled separate bills authorizing the FCC to proceed with the spectrum auction, then passed a combined version as an amendment to the Middle Class Tax Relief and Job Creation Act of 2012 (commonly known as the payroll tax cut).¹⁴

By coddling competitors, the FCC killed them.

As enacted, the bill prohibits the FCC from excluding any companies from the auctions. The bill, however, does allow the FCC to write formal rules that set limits on how much spectrum one company can hold in a given market, and gives the Commission some leeway to set conditions for bidding.

The bill sets aside approximately \$1.75 billion for the FCC to compensate television stations that volunteer to give up their spot on the spectrum. The FCC, with some restrictions, can also move some stations around on the broadcast spectrum, allowing it to create larger blocks of contiguous spectrum. These stand to be more valuable than scattered pieces and thus should raise more money at auction.¹⁵

The legislation also provides for the allocation of small segments of spectrum, called “white space,” within the new block that currently serve as buffer zones separating the individual radio frequencies currently used to carry ultra-high frequency (UHF) TV channels. Former FCC Chairman Julius Genachowski made no secret of his plan to carve out this white space for unlicensed next-generation WiFi networks, particularly an untested technology called Super WiFi.¹⁶

GOING FORWARD

Now that the spectrum bill has passed, the ball is in the FCC’s court. Conventional wisdom was that it would take two years from the bill’s passage before any spectrum is ready for auction. The past year has seen little

movement, and the actual timetable will likely depend on how far the FCC chooses to deviate from its traditional role of impartial arbiter.

There are, nonetheless, good reasons why the FCC should refrain from setting conditions on bidders and move ahead with the spectrum auction as expeditiously as possible. For one, the FCC has historically functioned best when it operated as an impartial regulatory agency—a referee, not an advocate. A case in point was when TV transitioned from black and white to color. The FCC required broadcasters to make sure transmissions sent in color were still viewable on older black and white TVs, but it did not micromanage the process. The Commission did not make license renewals contingent on the equipment broadcasters chose to buy. The regulations, standards and guidelines applied equally to all companies in the segments it regulated. While the regulations could be cumbersome and were often unnecessary, broadcasters knew what compliance required and the associated costs were predictable.

The Commission’s experience with unbundled network elements is a warning that artificially constructed competition doesn’t work.

Conversely, problems tend to occur when the FCC steps out of its role as impartial regulator and applies rules arbitrarily. The Commission’s attempts to fine certain broadcasters for airing profanity, while giving others a pass, serve as a recent example. In *Pacifica v. FCC*, the Supreme Court held that the FCC could set rules against the use of certain words on the air. But the courts ultimately ruled that in order for this regulation to be constitutionally enforceable, it needed to be applied consistently across the board. The FCC could not decide that the broadcast of profanity in one context, say in an acclaimed film such as “Saving Private Ryan,” was permissible, but in another context, such as during a live awards show, a violation. At that point, as per the decision of the U.S. 2nd Circuit Court of Appeals when it overturned a fine against CBS in just such a case, the FCC broadcast regulations became “unconstitutionally vague.”¹⁷

Likewise, when it comes to the allocation of spectrum, consumers would be best served if the commission were to auction spectrum without attempting to craft elaborate conditions. Such conditions would slow

down the process, likely spurring a lengthy court review, without providing any guarantee of meeting policy goals. Specifically, the FCC should not:

- Attempt to artificially manage competition by creating rules that benefit specific entrants, for example through targeted spectrum discounts;
- Set rules that give advantages to applicants who promise to adhere to specific business models, such as no service contracts or “network neutrality.”
- Attempt to pick winners and losers by awarding spectrum preferentially to developers of experimental technology that has garnered little or no interest from the market.¹⁸

ARTIFICIALLY MANAGING COMPETITION

The FCC seems to have developed an obsession with managing telecommunications competition. Its rationale for opposing the AT&T/T-Mobile deal was its discomfort with there being fewer than four national wireless players in the U.S. market.

Recall also the Commission’s efforts in the 1990s to create wireline competition by forcing incumbents to share their network facilities with competitive local exchange carriers (CLECs). The FCC ordered incumbents to lease “unbundled network elements” at below-cost rates—essentially forcing incumbents to subsidize their competitors. At the time, the FCC had hoped that these arrangements would be temporary and that CLECs would ultimately build out their own facilities. But the reverse happened. With access to world-class network facilities for far less than it would have cost to build their own, CLECs didn’t bother to build at all. When the courts struck down these FCC rules, because they amounted to an improper seizure of property without due process, CLECs were unable to survive because they had become dependent on the FCC’s artificial cost structure. By coddling competitors, the FCC killed them.

Ironically, while these regulations were being contested, game-changing wireline competition emerged through creative applications of new platforms, especially voice over Internet Protocol (VoIP). Today, companies such as Skype offer computer-to-computer international video telephony for free. Yet the FCC was so focused on forcing a monopoly-oriented network

model—that is, circuit-switched telephony—into an ultimately unworkable “competitive” environment that it was completely blind-sided by VoIP.

The Commission’s experience with unbundled network elements is a warning that artificially constructed competition doesn’t work. Moreover, there is no drought of competition in wireless that needs addressing. The FCC’s own research confirms this. The FCC’s 2011 report on wireless competition reported that as of 2010, 89.6 percent of the population is served by five service providers in their local market. This represented an increase from 72.8 percent in 2009. Meanwhile, voice revenue per minute declined 9 percent from 2008 to 2009, continuing a downward trend that has lasted two decades. Price per text dropped for the fifth consecutive year, this time by 25 percent from the previous year, according to the report.¹⁹

The FCC report also spotlighted the declining cost of mobile broadband data service, which critics say service providers have been marking up to offset declines in voice revenues. “AT&T’s estimated price per megabyte (MB) for data traffic—calculated by dividing AT&T’s reported annual wireless data revenue by its reported mobile broadband traffic—has declined from \$1.21 in 2008 to \$0.35 in 2009 to \$0.17 in 2010.”²⁰

Given all this, the FCC doesn’t have to induce more competition by either setting aside spectrum for new entrants or handicapping the auction process so non-incumbents can acquire spectrum at an artificial discount. Indeed, such a discount undermines the incentives for both incumbents and other potential entrants to develop new technologies that would enhance access to wireless.

If we look at past patterns, additional competition for wireless services is likely to emerge. But like VoIP, it probably will spring from a completely new technological platform. The danger of spectrum set-asides and discounts is that as policy, they are predicated on the FCC knowing in advance how wireless services will be delivered in the future. But it cannot know this, since it does not have access to information that is in the minds of entrepreneurs even now contemplating the technologies of the future. The FCC will best enhance access to wireless services if it allows markets, not policy rulings, to direct innovation and investment. That can only happen if incumbents and entrants are able to buy spectrum in the market without undue interference from the FCC.

SETTING RULES THAT FAVOR SPECIFIC BUSINESS MODELS

The FCC has also sought to regulate the way service providers operate their networks. Former FCC Chairman Julius Genachowski made no secret of his support for the network neutrality doctrine, the concept that the network infrastructure should treat all data the same way as it crosses the network. While the Internet initially operated this way 20 years ago when traffic was largely text, in today’s environment, where Netflix, YouTube and other video services account for 46 percent of the Internet traffic during peak hours, service providers must manage data transmission to assure quality of service.²¹

If the promise of the technology justifies the risk of investment, private capital will flow to enterprises that commit to it.

After a year of debate, and ultimately faced with the reality of today’s service requirements, the FCC in December 2010 softened its original hard-line demand for neutrality on the wireline side and abandoned it completely for wireless. Yet many advocates of regulation were unhappy with the arrangement, and for Genachowski it was a reluctant compromise, as he made clear 13 months later at the 2012 Winter Consumer Electronics Show.²²

While the House bill on the spectrum auction originally included an amendment that would have barred the FCC from setting a network neutrality requirement or condition, that amendment was struck before the final bill passed. The lack of any specific language preventing it has led to speculation that the FCC may attempt to place a firmer network neutrality condition on one or more spectrum blocks that will be auctioned.

Any move in this direction would be detrimental. Verizon still has a suit pending on whether the FCC has the power to impose the limited network neutrality rules adopted in 2010. Any such requirement added to the new auction is likely to draw similar legal action from incumbent carriers, further delaying action.

On a practical level, the FCC already attempted to attach a network neutrality condition in the Advanced Wireless Service (AWS) auctions in 2009. That proved a failure when the incumbents sat out the round and no other bidder could afford even the minimum bid.

This should have confirmed for the FCC what network neutrality critics have been asserting for several years—that in the 21st century network neutrality is non-starter for service providers. No Internet service provider can support quality service without selectively applying special treatment to certain data applications, particularly video, as they cross the network.

PICKING WINNERS AND LOSERS

Another hurdle to efficient allocation of scarce spectrum is the FCC's fondness for favoring pet technologies. Genachowski's FCC voiced interest in using the next auction to set aside spectrum for a novel technology called Super WiFi, a radio technology that provides WiFi-like connections over longer distances, making it potentially applicable for rural areas (urban areas are still, from a radio standpoint, immensely crowded).

In this, Genachowski was following a pattern set by his Republican predecessor, Kevin Martin, who late in his tenure began championing a plan by M2Z Networks to roll out free wireless Internet nationwide. Martin wanted to set aside radio spectrum for M2Z, which claimed to have special technology that made nationwide free service achievable. M2Z even agreed to Martin's stipulation that the free Internet service filter content so as to be suitable for "teens and adolescents."

Martin's tenure ended before his vision could be realized, but M2Z remained on the FCC agenda until early this year, when FCC engineers determined conclusively that the company's technology caused massive interference problems with certain satellite services. Fortunately, this was discovered before M2Z had a chance to bid for spectrum at artificially low prices.

Yet rather than step back and evaluate the lessons from this experience, Genachowski doubled down on Martin's questionable policies. Coming on the heels of the M2Z debacle, the FCC's infatuation with Super WiFi is a perfect example of this.

Super WiFi may well have potential, but there are enough questions about it that the government should not be giving it regulatory advantages. According to an article in *Technology Review*:

...[W]hile there are 48 channels potentially available for long-range Super WiFi, zero or one channel will be available for long-range use in the places most

Americans live—so Super WiFi networks significantly bigger than today's home Wi-Fi networks won't be practical. In rural areas, the longer-range systems could prove a boon, although even there, most of the spectrum will still be off-limits.

The short-range devices will supplement existing WiFi systems, which can sometimes run out of capacity when lots of people in one vicinity try to use them. Super WiFi will benefit from using lower-frequency waves that travel farther and penetrate walls more easily, but those advantages will be reduced, if not completely offset, by the 40 milliwatt power limit. (Regular Wi-Fi can use up to 1 watt of power.)²³

In short, as intriguing as it sounds, Super WiFi may not be a workable solution to spectrum scarcity. This is why the government should be careful about tilting rules in favor of entrepreneurs and companies that embrace the technology. If the promise of the technology justifies the risk of investment, private capital will flow to enterprises that commit to it. When private capital is at risk, there is greater due diligence on an idea at the start, and stricter measurement against business performance standards when it comes to future funding. The motivations are profit and return.

Conversely, when the government chooses to "sponsor" a technology or business model, it is often because the marketplace tests are otherwise insurmountable. The trouble is, instead of investors making calculated decisions with their own money, the risk is socialized across the base of taxpayers. Two recent examples demonstrate the danger of this approach. First, there was the development of the Chevrolet Volt, a subcompact, all-electric car that the U.S. government subsidized as part of its bailout of General Motors. The car has proved a miserable failure in the marketplace, and according to one study, has cost taxpayers \$250,000 per Volt built (the car retailed at \$40,000).²⁴ Then there was Solyndra, which went bankrupt and defaulted on \$500 million of government-guaranteed loans when its much-vaunted solar energy technology turned out not to be viable.

The lesson here is that Super WiFi's commercial viability should be left to the market, with judgments about how much to risk and which technology to use being left to private investors, not taken by the government using taxpayers' dollars. The FCC runs the

risk of creating its own Volts and Solyndras if it persists in giving undue regulatory advantages to favored technologies and businesses.

CONCLUSION

Attempts by regulators to create competition, manage business models and pick winners and losers are generally counterproductive, imposing unnecessary costs on consumers and undermining innovation and economic development. They sidetrack the FCC from its critical mission to get spectrum allocated to where it's needed as quickly as possible, something former FCC Commissioner Julius Genachowski himself admitted was a priority.

U.S. consumers deserve better. The technological means for quality wireless broadband services is here today. Methods to improve on it are in the pipeline. The FCC's role is to facilitate this as fast as possible. That means moving forward with a fair, open spectrum auction that permits all qualified bidders an opportunity to acquire the spectrum resources they need.

Competition is robust in the wireless sector; attempting to "manage" it through set-asides, subsidies and conditions will only slow the process of allocating spectrum efficiently, providing a broken crutch to companies that might not otherwise succeed in the private equity market, while directing resources away from innovation that might actually be viable.

In short, the market does not need the FCC's disruptive regulatory experiments. The agency has the means and the resources to get the needed spectrum to consumers. It should just do it.

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