

**REMARKS OF  
COMMISSIONER JESSICA ROSENWORCEL  
GSMA: THE MOBILE 360 SERIES—NORTH AMERICA  
ATLANTA, GEORGIA  
SEPTEMBER 22, 2014**

Thank you for that kind introduction and thank you to GSMA for inviting me here to speak today. For the past several years I have had the opportunity to participate in the Mobile World Congress—GSMA’s annual global gathering in Barcelona. It’s always a fantastic event. Year-in and year-out, you bring the world’s wireless economy together and give us all a glimpse of the mobile future.

That future is big. I know, because I have the honor of serving as a Commissioner at the Federal Communications Commission. I have a front row seat at the wireless revolution. So I see every day how mobile services are remaking our civic and commercial life. And I spend every day thinking about how we can use our airwaves to grow the wireless economy and multiply opportunities for jobs, education, healthcare, and social engagement.

The United States now leads the world in 4G LTE wireless deployment. We are proud of that fact—but keenly aware that laurels are not, in fact, good resting places. So we have more work to do to keep the wireless economy growing, and more big auctions coming up. In fact, later this year we will hold an auction of 65 megahertz of prime spectral real estate. The following year we will hold the world’s first incentive auctions, reimagining the 600 MHz band.

So we are busy. There is a lot of work on the horizon. But before talking about what lies ahead, I want to talk about what has come before. I want to recall some major predictions about communications technology from the past.

Let’s start by going all the way back—to the telephone itself. In 1876, Alexander Graham Bell was struggling to find potential buyers for his new invention. Western Union seemed like a natural fit. But after hearing the pitch, William Orton—the President of Western Union—concluded that the device “has too many shortcomings to be seriously considered as a means of communications.” He went on to say “[t]he device is inherently of no value to us.” Needless to say, Western Union ended up using its fair share of telephones over the years.

Next, consider Popular Mechanics. In 1949 the March issue of the magazine focused on modern computers. It described a powerful calculator equipped with 18,000 vacuum tubes weighing 30 tons. But it assured its readers that miniaturization was coming to computing, predicting that in the future calculators may only have 1000 vacuum tubes and weigh just 1½ tons. To put that in perspective, you would need more than 10,000 units of the new iPhone 6 to weigh in at 1½ tons. And you wouldn’t find a single vacuum tube in the lot.

But predictions like this are not confined to the distant past. In the 1980’s AT&T asked McKinsey & Company to forecast how many cellular phones would be in use in the world by the year 2000. Their prediction? 900,000. That was a little shy of the more than 100 million

cellular phones in use worldwide by the turn of the millennium. And for the record, that number now exceeds 7.1 billion.

So what can we learn from this? Well, for starters, predicting communications technology is a dangerous business. Even smart people can get it wrong—really, really wrong. Technology is dynamic, evolves fast, and only a fool would predict with any certainty what the communications future holds.

But with that aside, I want to do it anyway. I want to offer my own predictions for the wireless industry. So here are five predictions for the next five years, five ideas for spectrum policy in 2020, five ideas to speed the road to 5G.

**First Prediction: Clearing more federal spectrum will be slow going unless we provide federal authorities with incentives to relocate.**

In the United States federal authorities have substantial spectrum assignments. That's because critical missions throughout the government are dependent on access to our airwaves. Federal authorities use their spectrum assignments to protect us from attack, with tools like precision guided munitions and early missile warning systems. They use them to manage our air traffic, enhance our crop productivity, and monitor our water supplies. They use them to protect us against forest fires, to predict weather patterns, and to warn us of climate events. These activities are essential to our economic security and national well-being.

But we cannot be blind to the great increases in commercial wireless demand. Commercial wireless activity has been a powerful force in our economy and we need to find spectrum for it to grow.

So we are on a hunt in Washington for new opportunities to fill the spectrum pipeline. We are looking for ways to take federal airwaves and repurpose them for commercial use. But our traditional three-step process—clearing federal users, relocating them, and re-auctioning the cleared spectrum for new use—is creaky. It's a slow way to go when the wireless world is moving fast.

That is why it is time for a federal spectrum policy that is based on carrots, not sticks. We need to develop a series of incentives to serve as the catalyst for freeing more federal spectrum for commercial use. We need to find ways to reward federal authorities for efficient use of their spectrum so that they see benefit in commercial reallocation rather than just loss.

That means that across the board, to fill the spectrum pipeline we need to provide federal users with incentives for efficient use of their airwaves. These incentives could be straightforward and financial—under which a certain portion of the revenue from the commercial auction of their previously held spectrum would be reserved for the federal entity releasing the spectrum. They also could involve revenue opportunities from leasing or shared access, including during a period of transition to cleared rights. As part of this effort, we should consider a valuation of all spectrum used by federal authorities to provide a consistent way to reward efficiency.

While we are at it, we should take a look at existing laws to see what other adjustments can make this process smoother. For instance, let's look at the Miscellaneous Receipts Act. It can prevent negotiation between federal agencies and winning bidders in wireless auctions. But if we made some changes, we could speed transition to commercial use by providing updated spectrum or equipment to federal authorities being relocated. That would be a future that's win-win.

**Second Prediction: We will need to look high and look low to find spectrum for next generation wireless networks.**

Today, the bulk of our wireless networks are built on spectrum ranging from 600 MHz to 3 GHz. This is the current sweet spot for mobile communications.

But the future could look different—very different. We are moving from networks designed for analog voice to networks designed for high-speed data. To keep up with escalating data demand, our next generation networks are going to have to do some heavy lifting. They will need to accommodate more traffic coming from more devices at higher data rates. At the same time, they will need to lower latency and conserve power to extend battery life. Well that sounds easy, right?

So how do we meet these demands? We need to think differently. We can no longer limit ourselves to frequencies in the traditional range. We need to look elsewhere. The only question is where.

First, I think we need to look low. We should explore if spectrum in the 400 MHz range can be repurposed for mobile broadband use. That will not come overnight, because this band is segmented into many small parts. These parts are a puzzle that does not fit back together easily. But if we can find a way to put even a few pieces together, we may be able to develop a new swath of airwaves prime for mobile broadband.

Second, I think we need to look high. Very, very high. Let's bust through our old 3 GHz ceiling. Let's take a look at spectrum all the way up in the 60 GHz range—and maybe all the way to 90 GHz. At these ranges, we can aggregate spectrum and allow data intensive applications to ride across hundreds of megahertz at a time.

But these stratospheric frequencies mean more than just wide channels. The physics here are different. That means real propagation challenges, but also new opportunities to think about 5G network topology. Because if you mix those wide channels with small cells packed close together, you can densify networks at low cost. Combine this with networks using lower-band spectrum and you can deliver service further into buildings and offer faster speeds than ever before, especially in areas with the greatest traffic demands.

To look low and look high like this will require thinking through some novel technical and policy issues. But if we get them right, we will have more resources to play with as we move to next generation networks.

### **Third Prediction: Spectrum use will become more efficient if we challenge ourselves.**

Spectrum is the consummate scarce resource. We are not making more. So if we continue to cram more wireless devices into our pockets and purses and more wireless services into our skies, we need to find new ways to promote spectrum efficiency. That means supporting technologies—from dynamic spectrum access to frequency agile radios to smart antenna systems—that make this possible.

Easier said than done. So I want to offer an idea building on the thoughts of a wireless legend, the father of the cell phone—Marty Cooper. I've had the privilege of sitting down with him and hearing his ideas about making our airwaves more efficient. I want to seize on one of them.

What if we issued a challenge in Washington? Think of it as Race to the Top, the Spectrum Edition. Imagine that we decided to reward the first person who finds a way to make spectrum use below 5 GHz 50 or 100 times more efficient over the next decade. The reward could be something simple—say 10 megahertz of spectrum suitable for mobile broadband.

This is no small prize. Because if the winner can find a way to use spectrum 50 or 100 times more efficiently, that 10 megahertz of spectrum could do the work of 500 to 1000 megahertz of spectrum using today's technology.

Think of the power of this kind of prize. We could all benefit from the winning idea when it is introduced at scale. But for that one winner, there will be any number of near misses. And we could see across the board, throughout the wireless economy, the multiplied benefit of all of these efforts together.

This contest could generate some real interest. I think it sounds cool. I will admit it is not something that the FCC can do on its own. But I think this is one of those big, bold, and strange ideas that is worth a look.

### **Fourth Prediction: We need more Wi-Fi.**

We talk a lot in Washington about the growing demands on our airwaves. Most of this talk is centered on licensed spectrum. But it is time to give unlicensed spectrum its due. That's because the spectrum that powers Wi-Fi and a slew of our daily activities is also getting more crowded.

Why does this matter? The unlicensed economy is a big part of economic growth. By some measures the impact of unlicensed spectrum is as much as \$140 billion annually. By any measure, that is a really, big number. But it's more than that, because the unlicensed economy is critical for Internet connectivity. Wi-Fi is an essential onramp to the Internet. And nearly one-half of wireless data connections in this country are now offloaded onto unlicensed spectrum. It may not be intuitive, but it means that unlicensed spectrum is essential for managing the flow of traffic on licensed airwaves.

So I think it's time to leave behind the tired notion that we face a choice between licensed and unlicensed airwaves. Because good spectrum policy requires both.

The best demonstration of this I have seen was earlier this year in Barcelona at the Mobile World Congress. I saw wireless technologies that amaze. Cars that warn you even before they break down. Wearables that monitor your health down to the microsecond. Systems that monitor crops and predict problems with livestock. These technologies do not rely on a single spectrum band to function. Instead, they overcome spectral and physical challenges by moving from frequency to frequency, sometimes on spectrum that is licensed and sometimes on spectrum that is unlicensed.

So if we want to do big things, we need to take page from this future. We should move beyond old dichotomies that pit licensed versus unlicensed spectrum. Because across the board we need to choose efficiency over inefficiency and speed over congestion—and we need to look at how more Wi-Fi can help us do it.

**Fifth Prediction: The government will do a better job of fostering innovation with an infusion of young engineers.**

Engineers are deployed throughout the government. At the FCC we have more than 250 of them. They are an integral part of our team, and their input is absolutely vital on spectrum policy.

But I think that across government it is time for a fresh infusion in our engineering ranks. Think of it as a new Americorps, an engineering corps that can modernize the work of government and open opportunities for innovation.

That's big. So let me start closer to home. Over the past several years, the FCC has been able to recruit talented, young legal professionals through an honors attorney program. In fact, one of the alumni of this program—David Goldman—works in my office and is just the kind of professional we want to recruit to public service.

I think the program that brought David to the FCC needs an engineering counterpart. So I think we should create an honors program for young engineers. It would bring new vigor to the ranks of our technical experts. By mixing young men—and women—with experienced engineers already on staff, the FCC could be better prepared to face the challenges of next-generation communications networks.

So there it is. Five ideas, five predictions for the next five years. I know they may not all work the way I have laid them out here. I've studied enough predictions on technology to realize talking about the future is a tough business. But I would bet on the future of wireless. And if we can work together and think now about what happens *after* the next set of auctions, we can ramp up opportunities for wireless innovation and speed the road to 5G services. That won't be simple or easy—but it's absolutely worth the effort.