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1220 L Street, N.W., Suite 600

Washington, D.C. 20005-4018

(202) 628-4888

hrc@concentric.net

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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Commission Meeting Room
FCC Building
445 12th Street, S.W.
Washington, D.C.

Wednesday
May 19, 2004

The parties met, pursuant to notice.

BEFORE: HONORABLE MICHAEL POWELL
Chairman

APPEARANCES:

P R O C E E D I N G S

(9:35 a.m.)

MS. SEIDEL: Good morning. I'm Cathy Seidel and I'm the Deputy Chief of the Wireless Bureau. I'd like to welcome you all to the Commission's Boardband Forum. Today's forum will focus on three critical issues relating to broadband wireless services. Specifically, we'll talk a little bit about what wireless broadband is, what wireless broadband will be and, perhaps, most importantly, what wireless broadband should be. We've brought together business, technology and government leaders in what is sure to be an open, informative and lively discussion.

As outline in the agenda, today's forum will be comprised of four panels, each of which will be moderated by one of our commissioners, each of whom has graciously agreed to be a part of this effort. These panels will explore technological development, consumer demand, barriers to further success and expectations for the future.

To ensure a healthy discussion, we have set aside time for questions from the audience at the end of each panel discussion. In addition to the panels, we will be setting up demonstration rooms from noon to 5:00 p.m. so that everyone can view some of the key

technological developments in the wireless broadband space.

With the recent creation of the Broadband Division within the Wireless Telecommunications Bureau, under the able leadership of Joel Taubenblatt, the Commission's vision of wireless broadband continues to develop and sharpen. We believe that this forum today will support and help inform the work of the division and outline options for the Commission that will have a positive impact on long-term wireless broadband development.

This point will be brought home later today by the Wireless Bureau's Chief, John Muleta, who will fight his own unique perspective of the wireless marketplace and the strives the Bureau is making to promote wireless broadband.

As many of you are aware, conducting a forum such as this requires a heavy amount of behind-the-scenes work. I'd like to thank the work of staff in the Wireless Telecommunications Bureau as well as the Office of Engineering and Technology for the detailed work that was done to make this forum a reality. Specifically, I'd like to thank Chelsea Fallon, who's probably running around here somewhere, who has really been the primary organizer for today's

event and really has gone above and beyond the call of duty to make today's event a meaningful experience for each of its participants.

Before we get started with our panel discussions, Chairman Michael Powell has agreed to kick off today's events by discussing his vision for wireless broadband. As you know, Chairman Powell has consistently championed wireless technology and innovative broadband services in particular as a means to achieve ubiquitous and affordable telecommunication services nationwide. As chairman of the FCC, he truly has his finger on the pulse of wireless broadband and is singularly positioned to help ensure the continued development of wireless broadband for the benefit of individuals, commercial entities, public safety entities and the community and beyond. So, without further ado, please join me in welcoming Chairman Powell.

(Applause.)

CHAIRMAN POWELL: Thank you, Cathy. That was a great introduction. She's not press agent. Very nicely done.

I want to the opportunity today to welcome all of you here to the FCC for this very important forum on broadband and, particularly, the promise that

wireless holds for bringing the great benefits of broadband to all Americans. It seemed to me, walking in here today, I don't need any more graphic representation of broadband than looking at our narrow band security system to get people into this room. So that's our own graphic representation of the value that we're here to talk about today.

We have been talking about, as a community, broadband for years now. The recognition of the internet, the recognition of the promise that it holds for America and world citizens everywhere, but, as we move into this year, we really begin to see the intensifying recognition at all levels of government the promise that broadband holds for any nation that hopes to remain competitive and globally significant in the world of the information age and the world of the future. And that recognition is punctuated by our leaders increasingly setting out ambitious goals for this nation to reach.

The President of the United States recently talked about wanting broadband availability to all Americans by 2007, a truly bold and ambitious goal that's going to be difficult to meet, but we're able to meet. But it only will be met by the use of every possible tool in our broadband tool kit to get there.

And it will be critical that wireless a major role in our ability to provide these benefits to the American consumer.

This is, as we often say, the central communication policy objective of the era. It's more than talk now and it's time for action and these forums are unique and important way to bring together critical communities to identify issues, to develop solutions and highlight important questions for government as it develops a spectrum policy that's respectful and efficient and productive for the broadband goals that we hope to achieve.

It is becoming more clearly focused what the benefits to a nation are of a constructive broadband policy and a broadband success. The American consumer we have a simple goal. We want to be able to provide this critical plug into an information appliance in an information age to every single American no matter where that American chooses to set up their family and live and to do so at affordable rates so that it is something that is for all of us regardless of our sociodemographic class. That issue has always proven to be difficult and sometimes impenetrable using the technologies of the past. For a hundred years, we have hauled copper wire over a mountain and through

rivers and through valleys and over poles to try to reach this objective using a single technology. But that's what holds so much promise as we move into the future. We're able to use other technologies that will make that challenge more addressable.

A satellite cares very little about those demographic difference. Wireless can bridge distances that wire line functions can't. Wireless has unique opportunities for interactivity and mobility that other technologies don't. So, as we begin to sort of put this together for consumers, we see wireless as a critical component to that. I think, also, we begin to recognize anybody who cares about the economic well-being of their nation has begun to see the critical value of investing in broadband infrastructure and information technologies.

The United States has been able to steadily increase its global and its economic productivity almost exclusively because of its continuing willingness to invest in information technologies. Indeed, last year the United States had extraordinary productivity growth at the end of the year attributable directly to our investments in internet and information technologies of the '90s. If the United States is going to maintain its ability grow

its economy, I think the continued proliferation of broadband technologies with wireless playing a critical part are key to that solution.

Productivity and growth are what we are about to make our generation better for our children and that's how daunting and important that task will be. And safety and security, as we all have come to be aware, in the post-911 world, we understand that we're vulnerable. We're not blessed as much we once were by geography. We can't take for granted the safety and security that we've come to enjoy in our generation and we understand that as an economy moves into an information age, its dependence, its vital dependence on critical information infrastructure becomes deepened and, as it becomes deepened, indeed, we become both benefitted but more vulnerable to problems in that network.

We have a historic opportunity as we engineer networks for next great era of communications to be cognizant of the need for safety and security at the front end of the engineering problem. It's important to be thinking about first responders and public safety now not later. It's important to be talking about how to secure networks and encrypt them and protect them from those who would rather do you

harm or gain access to information inappropriately. It's important to have that up front.

To often, I think, in public policy, we often are working on those things on the back end of a deployment or we're bolting them on at the end. Let's be cognizant of them at the front end for the good of our citizens.

Wireless, again, as I have said, is vital. And I'll put it this way, to me and in my mind, one of the great ways to achieve the benefits that we're talking about is we can't rest on any single technology. I will give anyone a platform who has a broadband platform, who has the possibility, the opportunity, the entrepreneurial spirit to bring it to the market and bring it to deploy it to consumers. This is not an agenda just for a phone company, just for a cable company, just for a big wireless company. It's also a form for entrepreneurs and innovators and radical creators of new goods and services. And it's the Commission's mission to try to drive any platform that can deliver these services and deliver them effectively.

For 100 years, if I were to characterize the great regulatory difficulty, it's because we always had one wire. We had one wire to the home and because

of that one wire you had enormous difficulties of monopoly control, bottle-neck facilities, the pricing of those facilities, how to get that one wire to every home in the United States. We have a historic opportunity here to not repeat that world. We have the opportunity for not one. We're clearly going to have two, DSL and KL modem are well on their well, but the holy grail is when you get to three. Magical things happen in competitive markets when there are three. Magical things happen when there is real choice and pressures for innovation. And we are looking. We want your poster up here for the third great access and, indeed, the fourth or fifth for the American consumer. And we all know that wireless rest somewhere there in that solution to bring that competitive world and take pressure off the regulatory environment for upgrading the market benefits that that dynamic can produce and we're already beginning to see it.

I don't need to catalog for this community the explosive growth in everything from Wi-Fi technologies to wireless internet service provision that is popping up in rural America, particularly, all over the country. We're beginning to see greater uses of wireless mobile broadband products such as EVDO

coming into the marketplace. This is not science fiction anymore. These are true commercial applications that are rapidly spreading throughout the marketplace. But, more exciting, there are a number of dramatic wireless technologies on the way. We see creative uses OFDM, wideband CDMA, wi-max, ultra wideband, products that just a few years ago technologies very few had every heard of now beginning to work its way through the commercial system and beginning to produce real products for consumers. So the future is exciting, innovative and bright and we look forward to wireless as part of that solution.

The FCC has recognized for years now that spectrum is vital to realizing this vision and that it had to have a bolder, more enlightened national spectrum policy. And, from Day 1, we have been working very, very hard to change the traditional command and control approach that is not respective of innovation, not respective of the need to move spectrum to its highest and best uses and to work really, really hard to provide a spectrum policy that's much more facilitating of more platforms, more broadband platform, more innovation, more choice, more flexibility. Put simply, our view is that more spectrum more flexibility and more innovation will

equal more broadband and a brighter information landscape and that's the core of our policy.

Just to mention a few of the big items that we've looked at and are looking at, Advanced Wireless Services, just last year the Commission allocated an additional 9 megahertz that can be used for Advanced Wireless Services, MDS and ITFS will begin working very, very hard to develop new rules that will provide less complicated and more flexible structures for MDS, ITFS band. We expect to release these rules sometime this summer.

The 70, 80, 90 gigahertz bands, the Commission has established innovative framework for allowing commercial use of spectrum in those bands. 24 gigahertz, the auction of spectrum license and the 24 gigahertz band that can be used to provide a range of fixed broadband services is going to begin on July 28th. We have promoted the use of secondary markets for people to have more commercial flexibility in obtaining spectrum and allocating spectrum.

In our world of important order, we're working on specific solutions for rural America. We've promoted more unlicensed spectrum and recently, in particular, in the 5 gigahertz band and we're working very aggressively on new technologies like

smart radio that will provide really new and creative technological solutions to spectrum scarcity and can open up more possibilities.

So the bottom line is all the raw material is there. The recognition is there. The understanding of its importance has begun to gel. Now all there is the easy part of actually making it happen and that's what this forum is one small part of to bring the stakeholders together who know how to make it happen and to leave this room better than we found it this morning and, hopefully, in a few years, we'll be looking back quite proudly of our accomplishments, knowing that we put the country and the world on a better, more competitive footing and a world that our children will enjoy for many years to come and I'm excited to be a part of it, excited to have you here and want to thank you for your service. Thank you very much.

(Applause.)

MS. SEIDEL: Thank you, Chairman Powell.

In a moment, we'll get underway with our first panel and I'd like to invite the first panelist to come on ahead and take a seat here. And, while you do that, I'll mention just a couple of housekeeping items.

First of all, and, perhaps, most importantly, there is an overflow room which is in TWC488 and I think there are signs outside that point you in that direction for folks that may be standing or may not have a seat.

The format for the panels today is that the moderator will give each panelist five minutes to introduce themselves and their company or organization that they represent. Following the introductions, there will be an informal, moderator-led question and answer session for approximately 30 minutes. Following that, the floor will be opened up for 10 to 15 minutes of questions from the audience and there are speakers placed throughout the room for that purpose.

With that, I'd like to welcome Commissioner Abernathy and our first set of panelists. Thank you.

COMMISSIONER ABERNATHY: Thank you very much. As the Chairman spoke so eloquently this morning, this is an opportunity for us to learn even more about wireless broadband services, what's going out there, what technology is doing and what we should be doing better. But, first, I want to thank everyone for attending today's forum, both the speakers and the

folks in the audience. It's just another mechanism for us to try and figure out how we regulate a technology that's head and shoulders above how fast the government can act.

So what we're trying to do is get a handle on that and understand where we can add value, where we would simply be standing in the way and we should step back. This first panel on wireless broadband technology, it serves as a baseline for all of our further discussions that we will be having throughout today's forum and this is because technology and consumer demand, not regulatory policies, should be what drives the marketplace. And I'm excited about the innovative technologies that are appearing in the market. I'm hopeful that we can craft a regulatory framework, continue to work on a regulatory framework that will incent further development and deployment of broadband wireless services to American consumers.

So far, what we've been able to do, as outlined by the Chairman, is we've embraced broadband wireless by making additional unlicensed spectrum available for unlicensed devices, allowing more flexibility for licenses and the types of services that they can provide, initiating a proceeding to create rules for broadband over powerline and

examining rules that would allow more efficient use of the spectrum resource. These are our first steps.

What I'm hoping for today is to hear more from our panelists about their views on where the technology for wireless broadband is taking us, what consumers expect, what they want that they don't know that they want, and already wireless broadband services is changing our lives by providing services such as mobile access to medical information by emergency personnel, any time, any place access to data services and improved communications for public safety. So we're already seeing significant, dramatic changes in how we live our lives as a result of broadband wireless services.

So, with that, I thought I'd go ahead and introduce each of our panelists and provide them with a few minutes to tell us more about themselves, what they're working on, why they've been involved in this area and then we'll move on to a question and answer session.

So I think down at the very end we have Pierre de Vries of Microsoft. He's the CTO, Chief Technology Officer. They've created this great microsoft home that I've seen and we'd love to hear a little bit more about your background and what you're

up to.

MR. de VRIES: Commissioner Abernathy, thank you very much.

Good morning ladies and gentlemen. It's always an interesting question, what's a software company doing here in our communications environment? And the vision that we have, the dream that we have is for affordable connected computing for everybody. And you can see the computing part is something where we would like to contribute by providing a platform, by providing applications, but it's not something that we can do on our own by any means.

We work with people who provide the equipment, the hardware. People who provide other services. People who actually provide the connectivity and we're very excited by the prospects of wireless. It's a way of providing connectivity as the Chairman said. It's another choice that people will have and there have been a lot of investments and a lot developments in this area, broadly speaking, in three places. The technology keeps improving. The technologies like OFDM, the improvement in online sites connectivity for consumer wireless broadband. It has been very impressive to observe over the last 10 years.

The companies keep investing. There are people who are entrepreneurs who start new companies. They get funded by people who want to create new businesses and that is continuing and exciting. And the third thing is that the regulators, the FCC, is moving aggressively to create the environment for this and I'd like to thank the Commission for inviting us and for setting up this conversation.

Those three things that I mentioned are, I think, the golden triangle of new innovation, the three things that one has to get right. You have to get the technology right. You have to get the business right and you have to get the policy framework right and we need to see investment and progress in all of those.

Microsoft's investments are mainly in the technology space where we're working to create support in our operating systems and applications that run on top of that use broadband connectivity and make sure that customers can use new technologies that are emerging. We're also investing time and effort in standards organizations because it's very important to create the environment and the low cost through doing standards.

If I think about what the future is like for

this space, it doesn't feel to me as if we've nailed it yet. In a way, we wouldn't be here today if we'd nailed broadband, but we're moving in a spiral. We keep improving. When I think about what really remains to be done, I'm guided by the entrepreneurs that I've spoken to and the business models that I've seen. And, when I think about consumer wireless broadband, there seems to be three things that really drive the models. The first is the customer's premise equipment, the cost of the customer's premises equipment. The second is the subscriber acquisition cost and the third is the cost of spectrum.

Now, if we think about the customer premises equipment, the cost keeps coming down thanks to Moore's Law and the innovation and the invention by people who are building things.

Subscriber acquisition cost is a tricky one because that depends on a variety of factors. How do you get your marketing out? If you send out a flyer, do you advertise in the city? And you get leads, can you actually provide service to everybody who picks up the phone and says, yeah, I want this service? That actually touches on coverage and range. And another factor in subscriber acquisition cost is, do you need to have a truck go to the house and install an outside

antenna. That adds about $250. Again, that's a coverage question and that's why spectrum is an important part of this.

I don't want to pre-judge the conversation we're going to have later. We only get a five-minute head start before the hounds get released, but I think some of the issues that are important in my mind for spectrum is that we need a mix of spectrum in order to bootstrap these businesses. There needs to be spectrum at 2.5, 3.5. But there also needs to be spectrum below 2.5 gigahertz in order for companies to get going.

Below 2.5 gigahertz is code. It's code for 700 and, therefore, there needs to be progress -- and there's a lot of work going on in this building and in many other places about accelerating the transition, the broadcast spectrum and allowing agile use of radios in that spectrum. What will we do with that spectrum? I think it's good to have a mix of licensed and unlicensed usages for a variety of reasons.

And, also, last but not least, to make sure that we have global alignments. The FCC and the NTIA of industry did an amazing job in the last couple of years with ultra wideband and with the 5 gigahertz allocation to ensure that the U.S. remains the leader

in these technologies. But one can only do that with a colonization of business, technology and policy and that's what I look to this group to contribute to. Thank you.

COMMISSIONER ABERNATHY: Thank you very much.

Next we have Guy Kelnhofer, who is the CEO of NextNet Wireless and this is a company that is an industry leader in broadband wireless access. Thank you for joining us and we look forward to hearing from you.

MR. KELNHOFER: Thank you, Commissioner Abernathy.

I'd like to thank John Muleta from the Wireless Bureau for the invite to speak before you today.

Let me talk about our vision. Imagine getting on a plane in Montreal, Canada and getting off a plane in Rio de Janeiro and having an device that fits inside your briefcase that allows you instantaneous voice and data communications, including video streaming, voice over IP and ASL and DSL speeds and better? That's here today. That is our vision. That's we've created. Imagine like Mr. de Vries said, the need to -- to eliminate the need for a truck roll,

the need for software in your computer, the need for multiple visits from the cable guy. It's here today.

We've spent four years developing this technology. We've been selected three times for national employment, including Canada, Mexico and Brazil. As Chairman Powell said today, the vision for this technology is the ability to deliver very secure communications at very high speed. Imagine driving 150 kilometers per hour in your car and being able to download multiple sessions over the internet. We're doing that today.

This gives us the ability to completely change the economics for public safety 180 degrees. As Chairman Powell indicated, after the changes of post-911 that's a preeminent that broadband wireless technology find its nitch within the security applications. We have the ability to change the economics today. We're going from uniband public safety to broadband public safety. The ability to deliver to police over 9 percent of the dollars in an actual solution and still spending that money for software for spoofing compression, TCP application spoofing and everything that is required by now.

One of the challenges we face as an industry, first and foremost, is the MPRM that sits

before the Commission today and the speedy resolution for that MPRM. We all are hopeful that the result will relieve enough channel bandwidth to still be able to deliver broadband services regardless of modulation techniques we might use, whether that be 4 quam, 16 quam or 64 quam. If the pipe becomes too narrow, the benefits of broadband are lost. So that is one of the important things that we need to really focus on today as far as what happens in the imperium.

The second and more important thing is movement with the major spectrum holders. As we've said, we've managed to be selected now for both Canada and Brazil. And what's happened in the U.S. has been a very unique situation where, instead of waiting for the 600-pound gorillas to move, there's been a ground swell of small communities, rural communities that are interested in deploying broadband and they're interested in doing it over a licensed spectrum because of the problems associated with unlicensed spectrum with the noise floor, interference -- potential interference coming on line.

These communities are struggling to keep their economies strong, to keep their economies vibrant. They're struggling with issues like depopulation. We're deployed in six cities today

across Iowa. Iowa has suffered from depopulation. Iowa is looking for any solution to keep their economies vibrant and strong. We see the same things in New Mexico, in Michigan, in Minnesota, in Texas, in Arizona, in other states where it applied today. All communities are looking for a solution. They're looking for leadership. They're looking for a way to keep their population stable and grow. And, for that, they need access to the internet. They need alternative solutions other than what are available out there today.

Finally, as we move forward, there's the issue of standards. We believe very strongly in the standards process and we believe that's one of the ways in terms of Moore's Law and the economy of skill will be able to drive pricing down within the marketplace. From that standpoint, we have driven very, very closely to follow the Wimax standard and ensure we are going to be interoperable now and in the future and we stack up very closely today in that.

You can pass the 802.16 or 802.20. We're nearly there. We're OFDM. Our air link is TTD. Our capacity is 12 megabytes over the air. We have the ability now, which is a separate standard from 16, which is actually 20. So we think standardization is

important. We think that's another key driver in this space and we think it's imperative that all of the vendors drive towards interoperability in the future. Thank you very much.

COMMISSIONER ABERNATHY: Thank you very much and thanks for coming.

Next we'll hear from Margaret LaBrecque and the Wimax forum. She's chair of the Regulatory Taskforce. And, in response to some of the concerns just expressed by Kelnhofer, she's been working on interoperability in standards. So, Margaret, welcome.

MS. LaBRECQUE: Thank you, Kathleen.

Well, from the perspective of Intel, broadband access is without question the number one driver of demand for our primary product, which is microprocessors. Therefore, it's very natural for us to be interested in broadband wireless access, broadband access in general.

Certain business are based upon value manufacturing. It costs Intel upwards of $40 million to create a single generation of a single chip. The availability of cost effective production to manufacturers of broadband wireless access systems has been a huge issue in this industry. We believe it's been the primary -- one of the primary issues holding

this industry back. If we do some simply math -- although it may cost Intel $40 million to develop and market a chip, if you're developing your own chip, you may be able to do it for 15 or $20 million if you can only use it yourself void of a global standard in place.

If you sell 200,000 units of your product in a year, which for this industry, which has been driven by innovative companies, such as the ones here today, $200,000, historically, would have been a good unit run for a year. Divide $20 million by 200,000 and you've just added $100 to your cost of your system. You know that by the time this system ends up in the consumers hands, typically, it's a two to three X increase in price. So you just added 250 to $300 to the price the consumed system, meaning you have lost the chance for explosive growth in this industry.

What's necessary for Intel to be involved in this market is a global standard and we see that in IEEE 802.16. Some of you may be familiar with the IEEE. If you're not, some of our favorite technology, internet, is 802.3. Wi-Fi is 802.11. So, we feel that the IEEE is a very credible, global standards body to back this effort. But a standard itself doesn't buy you much because any vendor can say

they're compliant to the standard and without a body like the Wimax Forum to actually certify that they are compliant, it won't be a benefit for service providers of the operators actually deploying this equipment.

The key litmus test for compliance to the standard is that you are actually able to interoperate with another vendor's equipment. What that means for the service provider is that they can mix and match equipment within their network from different vendors. When you know that there's ability to mix and match standards based technology is what made the PC industry take off. It's what made the internet take off. It's what made Wi-Fi take off and it's what will make Wimax take off.

I'm pleased to say that the Wimax Forum has over 100 vendors today, 100 members today, which about 40 are system manufacturers. These manufacturers ship well over 90 percent of all broadband wireless access equipment that's shipped today, of course, this is pre-standard broadband wireless access equipment. They have deployments in over 130 countries. So it's my belief that we have the question, the momentum for building the forum to take this industry to the next level.

As we know, anyone involved in hi tech knows

that it's globally competitive and it's really not possible to survive unless you can compete on all the relevant vectors and one of those key vectors is the availability of spectrum, good spectrum. Not all spectrum is equal. The U.S. has been a progressive leader in the area of license exempt spectrum and, of course, this is why Wi-Fi is so successful today.

Wimax operates in both licensed and licensed exempt spectrum. And, therefore, not only are the efforts that have happened to gain more access to license exempt spectrum very beneficial for us, but, also, the efforts to gain access to more licensed spectrum for broadband wireless access, especially, in lower frequency bands, this is a huge benefit. As an example, 700 megahertz, you may need 1/10th the number of base stations that you would require at, say, 2.5 gigahertz. This is a huge cost advantage.

If you're going to really roll this broadband wireless access out globally in a cost effective manner, we must have access to good spectrum. Thank you.

COMMISSIONER ABERNATHY: Thank you very much, Margaret.

And now we will turn to Brian Markwalter from the Consumer Electronics Association. He's

Senior Director of Technology and Standards, which we've been talking about and he's been working in many different inter-industry venues on behalf of CEA. Thanks for coming today. We look forward to hearing what you have to say.

MR. MARKWALTER: Thank you.

Well, I'm happy to be here on behalf of Consumer Electronics Association. Our mission is very simple. We promote growth to the consumer technology industry and, as a result of that, we've grown phenomenally, actually. We have now more than 1500 corporate members that represent every aspect of consumer technology -- audio, video. And the things that are important in this area, both wireless or wire line communications, information technology, home networking and our company's also sold every part of the food chain of the consumer technology cycle, the design, development, manufacturing, retail, service, and installers. We have virtually every part of it.

It's a $90 billion industry in the U.S. and we produce and sponsor the International CEA. I'm sure many of you have been to it. It's quite a sight to see and the Commissioner's been there. It's a very interesting invent. It's eye candy for those who enjoy this kind of stuff. But, more importantly, the

profits that are made from that show are funded back into work to grow the industry, to fund things like training, technology and standards, advocacy work and policy work. So, CEA has had a long history of working with the FCC in many bureaus and departments. We work with OHE, with Wireless Telecommunications, with your Consumer and Government Affairs and Strategic Planning and Policy bureaus. So this is familiar territory for us. I suspect somebody is over here every week or so dealing with various issues.

Now CEA, in terms of what we do outside of pure regulatory work and interaction with the FCC, we conduct training. We might get to that later on, perhaps, in questions. I'm not sure we've touched on that subject just yet. We also, somewhat in response to the increased activity of the FCC, I suppose, in dealing with spectrum issues, we created a spectrum policy taskforce under our Government Affair Council that we use to develop our industry position by talking to member companies and we have since last year added a technical to advise them so that our filings can have both a technical and a policy component to them because these are very complex issues we're getting into now, especially, was we try to maximize use of spectrum.

We are, and I'm actually very happy, so far all three speakers have mentioned a pro-standard stance. We're actually an ANSI accredited standards organization. I suspect the only one on the sessions today. So we develop standards. Now we are not a primary developer of wireless standards. Certainly, OET is imminent in that area in lands and man technology and others in other areas.

But one of the things we do is take those standards and then apply them in consumer technology. In fact, we have a program going on now in one of our groups that -- it's kind of a two-phase program where we're looking at how to compare the various wireless land technologies against the needs of the consumer electronics industry. So it's more of an analysis and measurement approach.

These technologies are developed and standards are created through a complex, sometimes difficult, process. But what's interesting, seeing how well they work, particularly, for things like video applications. You'll probably notice we do a pretty good job of IT applications, but we haven't really addressed all the consumers connectivity problems just yet.

We also, I think, if you look at our

industry and how things are done, and this certainly aligns, I think, with what Pierre and Margaret said. Our industry is on a constant search for these winners and it's an expensive process for one and one that they undertake in search of ongoing products to introduce into the market. But what you'll see is that, typically, new technologies emerge as separate devices as you would notice with wireless land cards. And then you get some integration in the platform as we've now seen with laptops where it's integrated into the platform. And then, ultimately, you get some what I would call cross-over integration where you get, for example, cell phones and Wi-Fi being integrated together and that's an interesting phenomenon and one we see repeated.

Now that does tell us certain things about how we need to think in a regulatory sense. One is that it's increasingly important for us to consider global aspects. I think this is a point made before that you have to sell a lot of things and markets are global now, so we need to think about whether these technologies can be deployed worldwide. It's very important to be able to recoup the cost of the technology and semiconductor development.

There are many failures and, for the most

part, we don't hear a lot about the failures and the companies try a lot of different things before they get the winners. And, actually, the FCC has done a fantastic job of creating fertile ground for that experimentation. The unlicensed devices are allowed to operate on a non-interference basis and the work that's gone on recently is very commendable. It's kept us very busy, but it's great for us to see the attempts to really open up spectrum and make it available for consumer technology devices. Thank you.

COMMISSIONER ABERNATHY: Thank you very much.

Now our last speaker is David Reeder from Airspan Networks. He's the Vice President of Sales and he does broadband wireless access equipment. It's a key part of this entire puzzle. We can have all the research. We can have all the spectrum. We can have lots of equipment on the shelves and then it can just sit there. So the next piece is, how do you bring it to the consumer and how do you make it an integral part of their daily lives? So thank you very much, David.

MR. REEDER: Thank you, Commissioner.

I appreciate the opportunity to be here, of course. Airspan Networks is a global supplier of

broadband wireless access equipment. We started in 1992, '93, predominantly dealing in the international markets because, again, the spectrum question. We have the majority of our products deployed in the 3 and 1/2 gigahertz internationally with some large national deployments, mainly, being in the rural markets again, fitting the need where broadband is not met today in places like Ireland and New Zealand and Asia Pacific and Africa.

We are excited to see our entire industry grow rather significantly over the last few years. As a public company, we're certainly watching and waiting for the explosive growth opportunities and I think we're starting to see that now. You know, projections for our company are to be over 100 percent increase in sales from last year. So we're very pleased to see this growth in our industry now.

The challenge for our company has been, as we've been focusing on international markets, is how and when to break into the U.S. market? The challenge of available license spectrum for broadband wireless access, fixed wireless access has been one that we've been working on and I applaud the FCC's efforts in a couple of key areas. It's really helped us start to break into U.S. One is the secondary market for

spectrum, allowing other folks to get a hold of that spectrum and use it in the areas that they want. The other idea is to use or lose it so we don't have people just squatting on spectrum. That's really initiated a lot of the efforts that we've been working on deploying equipment into.

So the challenges that -- if I agree with all the comments that have been said here and I don't want to repeat. If I bottom line it for myself, in our company, I see that, again, CPE cost and the spectrum to work are the issues that we're dealing with today as far as seeing this explosive growth.

We were very pleased to see the 700 megahertz license go to market and we took a very aggressive stance in getting products to market very, very quickly. And I would say right now that's the largest driver from a product technology spectrum perspective that Airspan has in the U.S. right now.

The challenges that we run into when we start talking with operators about deploying broadband wireless access are the balance between available spectrum, unlicensed spectrum, say, in the 5.8 gigahertz where there's lots of good spectrum to use. The challenge is being that the spectrum lends itself very much to a line-of-site application. So the

desire to use some lower than 1 gigahertz, 900 megahertz, for example, is very, very high. We see a tremendous desire to use that spectrum. We also see a tremendous amount of interference when we try to start to deploy in that spectrum. So the 700 megahertz really kind of excites us and there is the issues of licensed spectrum which the target market for Airspan, historically, has been the telephone companies, the traditional ILECS and the CLECS and R box, both here, domestically, and around the globe. And the challenge, of course, in the unlicensed space is can I guarantee a long-term service in that unlicensed space and what protection do I have and the challenge that there are unknowns in terms of going forward and investing in that infrastructure is hard for these guys to swallow.

So the idea of opening up more spectrum in the 700 megahertz band, just from a pure physics point of view, lends itself, again, very well to very large footprint and also non-line-of-site. Yes, non-line-of-site can be done in the higher frequencies, but, as we've already discussed, the challenges increase rather dramatically.

So, anyway, Airspan is pleased to participate in this discussion. We're members of the

Wimax Forum. We're very much pro-standard. So, Glen, you can add us to that list of yours that you've got going. And we see that moving towards 802.16, both the D and E standards, the fixed and the mobile standards and the Wimax Forum kind of pushing that to market, we'll call it, not just be a technology standard, but also pushing them to market, helps solve that CPE cost issue and does help drive kind of the spectrum problem in terms of -- I think the 802.16 body chose a very robust technology platform, the OFDM platform that Guy mentioned, to get as many technologies in the non-line-of-site environment as possible. And, clearly, we're not going to see the real explosive growth until we see very low cost CPE that's in a non-line-of-site environment as Pierre mentioned as well.

The truck roll is certainly doable and we're working with lots of companies that are deploying that model today. But, in order to get to the millions of subscribers per network as opposed to tens of thousands or hundreds of thousands as we have today, I think those are some of the challenges that we still have to work through.

COMMISSIONER ABERNATHY: Great. That gives us a bit of a background of what folks seem to be

talking about today. It sounds like, if I were to sum this up a little bit, more spectrum. Although, I've never heard any demand for less spectrum. So, just understand, that's terribly original, but more spectrum and it sounds like both licensed and unlicensed, interoperability, meaning global standardization, mix and match equipment with the recognition that we really are talking about a global market, particularly, when we're trying to drive down the prices of the equipment so that it's available to more people, both urban and rural.

And then, finally, the cost of the equipment, the CPE. How do you get the scale and scope and how do you drive the technology in such a way that you still recover all of the research costs, but then you bring it down to a point where you can really bring it out to large groups of users globally?

And I guess the first question I'd pose to all of you is, how do we technologically -- we've been trying to crack this nut for a while and it sounds like we've jumped some hurdles recently. It sounds like the equipment is new and we resolved some of the problems where there was an off-the-shelf equipment for some of the first users. And we saw three years ago a number of folks headed down this path, a number

of them went under. There didn't appear to be the robustness. The equipment didn't appear to be there. What's happened over the last two to three years that's made the difference? Where are we when it comes to the technology, the viability of the technology and the reliability of it that's really changed, it appears to me, maybe over the couple of years? And I throw that open to anyone.

MR. KELNHOFER: I'm going to try to answer that. What do carriers want, and I believe David was addressing some of those issues. But, if we're talking about ILECS or even CLECS, why has the technology changed? It's absolutely mandatory if you're going to get this out into a large consumer market, whether that be Soho or even medium enterprise. But you have to be able to deliver a non-line-of-site solution.

So what's the first key thing that changed in technology? The actual ability to deliver true, non-line-of-site, no truck roll, as I said earlier. This is really ILECS major carriers want to see. They want to eliminate truck roll. Well, it's gone today. The need to have direct line-of-site, hence, the need to put an antenna on the subscriber premise. Well, that's gone today. That's also gone.

Secondly, the ability to deliver fixed service, but the ability to deliver nomadic portability. The ability to take a device not yet embedded in the computer, but, hopefully, in the future, as Margaret was speaking to, that would become reality. But today, they actually take your device and put it in your car, put it in your briefcase, get in a plane, fly to another city if that service is available. As I often remind my team, you can't tie your cable modem to your car and down the road at 175 kilometers per hour. But you certainly can do that with the technology that's available today.

So, from that perspective, I think those are really the key features that have changed the landscape. Thank you.

COMMISSIONER ABERNATHY: Margaret, maybe you can add to the discussion. This idea of moving seamlessly, are we there yet? Can we, in fact, move from, say, a Wi-Fi network to wide area cellular network or wireless to a wire land platform. I had heard years ago, 10 years ago there is a vision of a smug phone that would naturally seek out the lowest cost reading and, if satellite was your only available technology, it would go satellite. But, if it could go cellular, it would seek out cellular or land line.

Are we there yet and how fast are moving in that direction?

MS. LaBRECQUE: Well, I would say that we're not there yet, but the efforts are in place to take us there. And, actually, they've been in place for the last several years. Intel and other companies have been working to create a seamless infrastructure between Wi-Fi and 3G, seamless hand-off, a common way to authenticate users. We've been doing it through a number of global standard bodies, including the ITU and the ITEF.

Now, when we talk about Wimax, the 3G, often we're talking about what's known as the air interface, which in the seven-layer network model, OSI model, that's layers 2 and below. What we're talking about when we're talking about a seamless roaming infrastructure is abstracting layers 3 and above so that any air interface, whether it's Wi-Fi, Wimax, 3G, can bolt into a common infrastructure from roaming and hand-off.

Now, locally, we saw this work between Wi-Fi and 3G about three years ago. So we're on the way. And it's our expectation that we will be able to bolt Wimax into that same infrastructure. We certainly wouldn't want a service provider who, perhaps, is a 3G

service provider for mobile voice and wants to add a Wimax network for high-speed data, assuming you really want them to have to have two billing systems. So I would say that we're a few years off, but we're headed in that direction.

COMMISSIONER ABERNATHY: Okay. Thank you.

Well, then that leads to the next question, I think, for Peter and probably Brian and I think you brought this up, is we'll have this very smart, very useful equipment and then it won't work. So what do we do about the training or the ability to take this into mass market deployment to folks who don't have the ability to take classes on how to use it or how to fix it or how to make it work? And how do you develop it in such a way that it becomes as friendly as, say, a wireless phone that still today a lot of people just use for voice because they haven't quite cracked the nut about all the other services. And, yet, you want them to want these other services. You want them to start using all these other applications, but we need it to work.

MR. de VRIES: Yes. I'll leave the training comments to Brian. I think, in terms of the user experience, the catch phrase that I hear amongst my company is it just works. That's what we have to get

to. It's actually very hard to demo when it just works because there's nothing to see. And so I think the reason why we're talking about this is we're not there yet. I think there's been a lot of work, and, again, 802.11 and Wi-Fi has been a good test bed for us. If you flip open your laptop these days, it's a lot easier to just associate with the hot spot.

There's work being done between service providers and software providers and hardware people around how you can associate automatically with the service provider of your choice. So those things, ultimately, for the consumer, need to be part of a invisible experience.

The other question, though, I think is, in terms of "it just works" I think it touches on the range of devices you mentioned or the uses you mentioned, Commissioner, was it the diversity that is going to be important here. One of the questions -- people say, well, what's going happen with all these standards? The great thing about standards is that there are so many of them.

(Laughter.)

MR. de VRIES: And I don't think that's going to change because, increasingly, as we become more sophisticated, we're trying to solve more and

more problems for customers of a whole variety of sorts. But, at the same time, the requirements, in terms of the spectrum, are diverse, too. And I think what you may be hearing, at least, on this panel is that we need a diversity of solutions. 700 is good. It's not the only thing that's required. A higher frequency spectrum is good, too, for consumers because that's what you need to get capacity. If you want to provide really high band width service, you need high frequencies. But, in the same way that the cellular companies, when they started years ago, started in lower frequencies with a few towers serving a few people and then moved to smaller cells, higher frequencies. We need to do the same things in order to provide affordable connected computing to everybody.

MR. MARKWALTER: Nobody seems to be taking up training here. And we've, I guess, just out of need, and this has come up, both in discussions, particularly, about HDTV and why people don't understand it and what's happening to adoption. But we see it in every part of our industry. And CEA ended up creating online training, a facility called CE Know How.com and it's targeted our retailers to help train sales people to be able to explain the

things they sell. Manufacturers make a valiant attempt at providing training materials into the retail channel, but it's not sufficient in many cases and the staff in some retail environments -- you know, there's a lot of turnover. There's nothing new about it and the products in technologies are just tremendously complicated. You can't talk about the things that make it all work and the consumer doesn't want to know about it either.

We also do things related to what we call take-home rating programs to help identify how ready this mainly in the installer and information technology home networking kind of market, but how ready the home is to accept broadband and IT services. But, you know, we're sometimes our own worse enemy in this process of searching for winners. We go through a lot and we may be a little bit of a victim of Moore's Law in this case. We can do many, many things in these platforms and very small device now and we search around and some companies get it right.

And one of the interesting parts is that manufacturers tend to reserve that area for themselves and for their differentiation. We're full of contradictions in our industry where we want standards so that we can get enough volume to make the

semi-connector and deployment sheet, but we want to be able to differentiate on what's left, which is typically useability and user interface. So it's never easy and we have a lot to do on training and useability. I think our industry works hard at it and it actually getting better at trying to cooperate on the useability aspects of it.

MR. REEDER: Just a couple of quick comments on that.

COMMISSIONER ABERNATHY: Sure.

MR. REEDER: As manufacturers, we use forums such as the Wireless Communication Association where they bring operators and vendors together to discuss these kind of forums and these type of issues. And, clearly, as a manufacturer you have to get your hands dirty. You have to be involved in the deployments over very large scale networks with tens of thousands of subscribers to understand what those issues are in terms of, okay, when this shows up in one's home, how do they turn it on, plug it, use it? And so, the push back from us I think very good. The communications that we're getting back from the operators saying this is what we need. We need your help to get there. We're working on our part on the manufacturing side to do that as well.

COMMISSIONER ABERNATHY: That's great. And this then leads me to believe, based on everything you're saying, we're working on standards. We're working on equipment. We're getting spectrum out there, yet, we continue read that, according to various studies, that the U.S. is ranked relatively low compared to other countries when it comes to certain measures of international broadband availability.

David, I know that you mentioned you've gone into other countries and have only recently entered the U.S. market, too. So how are we doing? Are we really behind or are the measures just different for the U.S. as compared to other countries? And, if we are behind, what more can we do short of making it free to everyone. Short of that, what more can we do?

David, why don't you start with that and then I'd be happy to have anyone else jump in.

MR. REEDER: Sure. I mentioned we've been kind of waiting to get in the U.S. market until about a year and a half ago and some of the challenges were spectrum. Some were technology. The U.S. market for us, when we look globally, is so very unique in terms of the customers. The networks need to be very particular. They need to be very stable. We're

dealing in networks in locations in Africa, for example, where there is not existing service at all. So the quality of service or the need to have very low priced communications to match DSL offering isn't there. So we're bringing the very first communications into some of these markets and the demand and the appetite, frankly, for broadband is rather overwhelming in those locations.

And so what we see in the U.S. is that the rural markets are Airspan's focus for the U.S. The rural markets also have this demand. I mean, Guy talked about the issues in Iowa, for example, that his company and their deployments are helping to address. But we see the demand in those areas is very high. But we also see that the expectations are very high in terms of what type of service they get and how it matches up with maybe some other competitive offerings.

The economics here in the U.S. are very unique as well compared to many other places in the world in that, truck roll installation labor is extremely high. It other places it's extremely low. And, in fact, some operators prefer to roll a truck because they get to go touch the customer and they get involved there and it's really -- it doesn't add a

whole lot their total subscriber addition cost. But, in the U.S. market, it's different from that perspective as well.

What we're focusing on to help address this problem is clearly through -- I don't want to beat this drum too much, but, clearly, through the standards process and seeing our products interoperate with companies like NextNet and others that we can drive cost down and we can see very flexible networks.

The other thing that we see is, from a network perspective, people are choosing one frequency and deploying there. They're taking platforms that operate in multiple frequencies and using that flexibility as much as possible. So now that we have technology that can help address some of those problems, I think we're starting to see that improve. But, again, we still have these nuances of DSL prices jumping between 30 and $50 a month and the challenge to deploy a fresh network from the ground up is hard to address in those kind of markets.

COMMISSIONER ABERNATHY: Can you talk a little bit about some of the price plans that you've seen globally as compared to what -- we know what it is here in the U.S.

MR. REEDER: Well, it's hard to say. We

have some markets in Japan, for example, where they're offering pretty close to a megabyte per second service, close to a T1 service for around $30 a month. And we've heard that there's government initiatives in some countries to even subsidize the cost of these networks to get things rolling. So we, as vendors, are taking advantage of some of that and helping us get to market and get some of our scale and get access to large networks. But we see that -- it varies rather significantly.

COMMISSIONER ABERNATHY: Would anyone else like to comment a little bit about the U.S. versus deployment in other countries?

MR. de VRIES: A few observations from conversations that I've had. One of them is that, as David pointed out, the U.S. has some geographic and demographic peculiarities. Although, in other ways it's similar to rural deployments everywhere. It doesn't surprise that others have come into the market, narrowing the U.S., once we have 700 megahertz to operate. And, to your point, Commissioner, nobody ever wants less spectrum.

If you offered me a trade between 10 megahertz at 700 versus a gigahertz at 60 gigahertz, guess what I'd take? And so it's a question of what

the appropriate spectrum is. The other points, which I think, perhaps, relates to this and it will be interesting to hear what other companies have seen, is the cost of back haul is sometimes an issue in rural areas. That's something where wireless helps, too. Now you can see that you have a combination of, let's say, 5.8 unlicensed to back haul with 700 licensed of four of the last mile is also something that will help kick start this market.

COMMISSIONER ABERNATHY: Great. Thanks.

Anyone else want to chime in before we leave this.

MR. KELNHOFER: I think that David covered it very well. I mean, we're also deployed in a lot of the same markets that Airspan is also in. I would say this, there has been a lot of discussion -- obviously, there's been a great deal of effort in the U.S. to create a national broadband policy. In some respects, I think we are a little bit behind other parts of the world, including places that are even less developed than we are.

I've actually, and I think David can confirm this, I mean, we have been, as I said, selected for national employment now three times. And, on a comparable scale, if you don't get GDP, just any

demographic factors you want to look at, obviously, the U.S. is somewhat ahead in both Mexico and Brazil. But both of them seem really driving the national policy at a faster rate than we are here and that's not a criticism. I mean, we have a lot of challenges and, as Pierre said, we also have some very big peculiarities based on our overall geographic size and so forth.

I think that the most important thing for us is, again, access to spectrum. And I have very strong concerns about unlicensed spectrum. We specifically don't play there and Airspan doesn't play there either. And, if you talk to people who have been in the industry a long time and you really understand -- and really are RF junkies, so to speak, the issues with having unlicensed spectrum permeate more problems than they really create good service to the consumer. It's like having no rules on the highway.

COMMISSIONER ABERNATHY: Although, what we've heard is that there are parts of the unlicensed uses that have clearly added value and that they can be a piece of the solution, but maybe not the only solution. And you're saying that you never see it as a valuable way to allocate spectrum for the U.S. or, given your business plan, you prefer license?

MR. KELNHOFER: Well, no. You're right. Must be careful about generalizations. If you talk about Wi-Fi or 802, that's a real success one, but you're talking about a rather small sale radius. And, if you try to expand that sale radius, then you're really not delivering the non-line-of-site anymore. If you're using 5.7 and 5.8 for back haul as part of your solution to lower your back haul cost, that's an excellent choice. If you're talking about going up about 5.7 or 5.8 or anything really above 3.5 and try to play a non-line-site solution over a wide area, over a man, then you're talking about some pretty severe economic penalties and some pretty severe lost characteristics at that frequency range.

COMMISSIONER ABERNATHY: Okay.

MR. REEDER: Can I just make one other comment here?

COMMISSIONER ABERNATHY: Sure.

MR. REEDER: We are seeing very successful unlicensed networks being deployed, too, as well. So I agree, clearly, the operators always prefer licensed spectrum if they can it and if they can get at the right price. But the good news is that we're seeing, again, a variety of frequencies used, whether it's unlicensed for back haul or even, say, unlicensed for

data applications and use your licensed spectrum for that higher, sensitive communications like voice applications or security applications. I don't want to, certainly, short change the hundreds of networks out there deployed in the unlicensed band.

COMMISSIONER ABERNATHY: Okay.

MR. de VRIES: I'd like to echo that comment because it seems to us as if unlicensed can be an interesting lever. It allows people who are trying to deploy to operate in both licensed and unlicensed, obviously, the trade off that you have is that in unlicensed you have interference protection, but no more barriers to entry. On the other hand, if you go licensed, you have much better protection, but you have to fork out up front for the spectrum. And so, again, the mix of the regimes seems to us to be very useful.

It's interesting that people who are actually offering a service in license can use unlicensed as well as anybody and probably better. Now there is the issue that Guy raised about interference. And I think that one looks at the rules that we have and will continue to have in 2.4 and in 5 and so on, there are issues with interference. There are activities going on in various standards

organizations, industry organizations, looking at coexistence between various different systems that are operating in unlicensed bans.

And, if we're looking at low frequency uses, let's say 700 with unlicensed, it's going to be necessary to have spectrum rules showing etiquettes, for example, that allows systems to coexist without prejudging what the technology is that people want to build and implement.

COMMISSIONER ABERNATHY: Well, that's the perfect opportunity to segue into some of the challenges on the standards front. But, before I move in that direction, I wanted to see if there's anyone from the audience who'd like to ask some questions of our panelist?

Please go over to a microphone. I think this is being streamed.

AUDIENCE MEMBER: Thank you, Commissioner Abernathy. Thank you, panelists.

The first thing I want to do is take just a second to thank all of the panelists on behalf of my colleagues on the executive committee of IEEE 802 for the wonderful pitch for our standards that they've made here today and the value that they provide.

I also wanted to just mention that we're

looking at a new standard related to the IMRM that the Commission just adopted last Thursday for the sharing in the T.V. band, using cognitive technologies for regional area networks. And the question that I have is sort of twofold.

One is, you know, there's mention of the interference issues if you're operating in the unlicensed mode and that, to me, sort of begs the question of what about the concept of some unlicensed spectrum for certain uses that doesn't become a food fight, as it were, amongst all sorts of different applications and still reduces the cost of entry for people that want to provide broadband services?

So I'd just like to kind throw that one out for comment from the panelists in terms of whether unlicensed with some limited set of applications permitted in that spectrum, encouraging standards for interoperability and coexistence. Would that be a better play in the view of the panelists for some of these applications?

COMMISSIONER ABERNATHY: Margaret?

MS. LaBRECQUE: Well, recently, in the Wimax Forum, we've gone around the globe speaking with regulators and some of them like to use the term "light licensing" to refer to, I believe, what the

gentleman has brought out. And where there is a strategic need, say, to deploy broadband access in low population density areas, rural areas, if that's really a strategic objective for the regulator, then this might justify this form of light licensing.

MR. MARKWALTER: I'd like to comment. We've looked at that. We looked very carefully at a lot of the activities coming out your spectrum taskforce here at the FCC and, in our mind, it's way hard to prejudge applications and even technologies. Hardly anybody gets it right the first time and that's what's been so economically productive about unlicensed is that it's brutally efficient at searching for the best users and best technologies.

So we are -- I guess, the way we've put it is that if there are rules that are necessary to get access to spectrum that we otherwise would not have gotten because you need to protect some existing services, that makes sense. And, beyond that, it's difficult to see that it's helpful to try to guess what applications are going to be winners.

And, to be honest, there's not been that much of a tragedy of commons, I think. I think we're still somewhat self-healing because as uses go up, people can pour money back into the technology and

more efficient protocols and more efficient implementations. So we're a little bit hesitate to prejudge and say there need to be certain rules to allow use of spectrum.

MR. de VRIES: The uh --

COMMISSIONER ABERNATHY: Go ahead. You want to go ahead and walk up to the microphone while Pierre's speaking? Good.

MR. de VRIES: The regulators, I think, are most effective when they focus on ends and not means. And the FCC, this Commission, I think, has been very cognizant of the fact that the requirement is to look at what the outcomes are rather than specifying the way in which the outcome is achieved. So, when there's a suggestion of saying, well, we need to have particular services optimized for unlicensed or license exempt, I get a bit nervous because it begins to smack a bit of command and control to me.

However, I can see a case that one could say there's a category or a set of things which, at this moment, we believe is important. So, for example, let's say wireless, two-way data services, which doesn't prejudge the kind of service. But, it can well, let's say, well, if we're going to have these wireless, two-way data services at low power where

there's not a lot of spectrum and it will propagate, what are the kinds of rules that one needs.

I believe that one can actually get to an outcome which is light enough to allow innovation, but strong enough to actually give users of the technology some guarantee of a liability.

COMMISSIONER ABERNATHY: Yes, sir.

MR. KLANSI: Good morning. I'm Andy Klansi. I want to shift gears for a second and ask about training. One of the things I've noticed in this Commission is the lack of some representation from universities and academia. And, speaking about training, I can remember back a few years ago the adage that, in the cellular industry, they had difficulty because no one knew RF. And I think the comment was there was no formal training in RF in any colleges in North America or very few. I think there were a couple of college in Canada.

So what do you say on the panel about bringing the technology forth, but also bringing the academics and bringing the universities in to train people. Train people in the truck rolls. Train people on how to use spectrum. I mean, how many people -- I'll just ask about training. How many people's VCRs and DVDs still flash 12:00? Think about

for a second. Now that's a technology that we all have and use, but we use it.

But, taking it further, what's going on, on the university side, to train, to teach the technology and to then drive the technology forward?

MR. KELNHOFER: I can tell you some of the things that we're trying to do. I mean, we've actually instituted them. You're right. There's a bit of a dearth in terms of good universities turning out topnotch RF engineers. You'd be surprised. They're not the better known schools that are actually today turning out the best RF engineers.

Network engineers, no disrespect to the software people, but network engineers are more prevalent. I'll just leave it at that.

One of the things that we're doing -- I want to answer your question -- at least, one part of your question in terms of how do you track good talent is we actually initiated a scholarship program with one of the universities. And what we specifically do is we call it a Grow Your Own Program. What we specifically do is we go out and we look for talent, usually in the junior year, and we offer them a scholarship, plus an internship over the summer that is actually sufficiently, not only to pay their

tuition and books, but to give them a bit of extra funds so they can focus completely on their engineering program. And that goal is that we nurture them into our organization and into our specific needs. And, at the end of that, I've always said, yes, as far as taking a job. So that's what we doing, at least, in that respect.

MR. REEDER: I know there's several programs. The University of Colorado, for example, has a very good telecommunications program. Virginia Tech, as well, I believe. So I know there are some programs there. I can speak a little more directly of the University of Colorado. I'm a graduate of the Masters Telecom program several years ago and I know the challenge has been placing graduates into telecom companies. I mean, the last few years has been rather tough, so they are focused, I think. I think there needs to be more dialogue with industry, saying, here's where we're -- the direction we're headed and make sure the programs are oriented towards that and not necessarily just catching up.

COMMISSIONER ABERNATHY: Okay. Why don't we take one more question from the audience.

AUDIENCE MEMBER: Steve Stroud. I'm curious, Mr. Kelnhofer, that there's been a number of

metropolitan area deployments, entire zones of unlicensed wireless and entire cities are spending their budgets wiring their cities as an economic development measure and, yet, they're choosing to use license exempt spectrum.

My observation is largely they're doing that because they can't get licensed spectrum. They can't get access to licensed spectrum. It's yet another license spectrum. It's yet another "Mother, may I" with "would you please deploy in our area." And, well, we'll get to it when we can when decide you're an important enough market just like the cable companies and the telephone companies have done.

So they're choosing to take their destiny into their own hands because they can with licensed exempts. They don't have to get permission. They can go and do. I'd like to get the panel's impressions on that.

MS. LaBRECQUE: I wanted to comment earlier that, in fact, I think the U.S. has been a leader in speaking with system manufacturers, the overwhelming majority of equipment license of sound is in the U.S. I don't know the exact number. I've seen one of the leading wireless ISPs in the audience here and probably others. But I know that there were over 2500

wireless ISPs in the U.S. serving over 6000 markets. So, in theirs, we believe that getting the portable cell phones to all is extremely important to expressing growth and getting it into this laptop is the next step after that.

I spoken with retailers who have said to, you know, Margaret, we deploy satellite dishes all day long -- you know, the outdoor subscriber station is not a problem for us. And what you're telling me, in addition, is that it's more expensive. It increases their revenue. I mean, that's not a benefit for the consumer but for the retailer and they can charge more on a monthly basis because the outdoor subscriber station will get better, in general, then an indoor subscriber station and that's why it can be used for a business back haul, for example, back haul enterprise of a thousand users or an entire area full of hot spots.

So, I guess, to Steve's comment, I would say I believe it viable for deploying broadband access. And I believe this fulfills our vision of ways of being able to be anywhere and to get connectivity.

MR. REEDER: A quick comment. Somewhere around 80 percent of our revenue in the U.S. this last year was in the license exempt band space and we also

have examples outside the U.S. In the 2.4 gigahertz band we have network deployed of about 30,000 subscribers in an urban deployment all in the unlicensed band, so it can work.

COMMISSIONER ABERNATHY: I'm going to go ahead. We're going to have to bring this to a close. I want to thank all of our panelist as well as all the people in the audience for participating. And, more specifically, I want to thank Joe Muleta and his team in the Wireless Bureau for putting together this forum. For those of you who have ever tried to assemble folks for something like this, it's a huge task. It requires a lot of flexibility. It turned out great and I want to thank them and all of you.

(Applause.)

MS. SEIDEL: Thank you, Commissioner Abernathy and thanks to each of our panelists for such an interesting discussion and also just for taking the time to be here with us today. We know you are all very busy, so thank you.

We have time now for about a 10-minute break if everyone would just be back in their seats at 11:15 that would great and we'll start with our second panel. So thanks to everyone.

(Recess.)

MS. SEIDEL: We're begin with our second panel.

I'd like to introduce Commissioner Jonathan Adelstein, who will be moderating the panel and I would like to welcome each of our second panelists. Thanks.

COMMISSIONER ADELSTEIN: Thanks. I hate to interrupt all the great networking going on up there. That's probably more valuable. There was a great buzz in this room. We have, obviously, hit upon an issue of huge important by recognizing the turnout that we have here and the level of interest and the great participation that we had in the first panel. So thank you all for coming to participate. This is great and thank you for the introduction.

We have an outstanding list of panelists there today that are going to tell us about these business strategies for getting this wireless broadband going. It's a real exciting panel I think.

I think accelerating deployment of broadband services has been a real focus of this Commission and certainly a focus of mine since I got here. I personally believe that broadband services had the potential to transform people's lives, to transform communities and there's such a huge difference,

especially, in rural areas, but in all parts of the country to provide an alternative and competition. And we're seeing just the tip of the iceberg in the explosion of services that's going to be revolutionizing how we look at broadband, I think, based on what we're learning here today and we're hearing some great stories.

The Commission is going to do its best to extent these wireless technologies, both licensed and unlicensed to Americans, whether they live in urban areas or rural areas. We want to get as much information flowing over the airwaves, as much data flowing over the airwaves as possible. I think that's our mission here at the FCC.

What a really diverse group of panelists, but one thing that they have in common is that they've been successful in deploying wireless broadband networks, at least, they've found a successful strategy for offering wireless broadband. So let's learn what lead to their success, maybe what some of the pitfalls might be along the way and we also want to hear from the panelists on the current state of wireless broadband and what they see in the future for both licensed and unlicensed to our wireless broadband services.

So I'm going to first introduce the panelists. We're going to give you each about five minutes to give your prospective on the wireless broadband industry. And, after the final presentation, we'll open the floor to questions. I can read off some questions now, but I want to encourage everybody to really get involved and to get a good dialogue going and also have a dialogue amongst the panelists themselves.

So I will introduce everybody randomly and we'll start from that end with your presentations. But I'll start introducing from this end, Mike Anderson, who's Chairman of the Part 15.org, Licensed Exempt Internet Service Providers Organization. Mr. Anderson also serves as the Chief Information Officer for Prime Directive Quick Link, PDQ Link, and is responsible for overseeing all wireless technologies deployments for the West. Mr. Anderson is also the finder of the Wireless Internet Service Providers Conference or WISPCO.

Paul Berriman is the Senior Vice President of Strategy and Marketing of PCCW, Ltd., one of Asia's leading integrated communications companies. He leads teams of experts who perform an important role in the strategic direction and product technology of the

company. Most recently, he lead the fix and wireless broadband projects in Hong Kong and in the U.K.

Our next panelist is from Nextel Communications, Atish Gude. Mr. Gude is Vice President of Strategic Planning and Corporation Strategy for Nextel Communications. He's responsible for developing strategy and access for Nextel's overall strategic and competitive positioning. Prior to joining Nextel, he was Senior Manager at the Rice Consulting Telecommunication Strategy Practice.

Next we have Doug Sobieski from XO Communications. Mr. Sobieski is Vice President of Broadband Wireless Service at XO Communications. He oversees the commercialization of the company's fixed broadband wireless services and filing successful trials in early 2004 in southern California. XO has initiated plans to rent out these services nationwide.

We have Bill Stone with us from Verizon Wireless. He's the Executive Director of the Network Strategy for Verizon Wireless. Bill is responsible for advanced technology planning, including the deployment of the company's third generation data and voice networks. Under his guidance, Verizon Wireless conducted several broadband wireless technology evaluations, including NDDA technology trials which

have culminated wireland service right here in Washington, D.C. as well as in San Diego.

We have Richard Wong here from Openwave. Mr. Wong is General Manager of Openwave, which is the leading independent provider of software products and services for the communications industry, including wireless operators, broadband providers and device manufacturers worldwide. Mr. Wong leads the business direction and management of the messaging and applications team at Openwave. And we're glad to have such a great group of panelists here. Maybe we'll start down there and, if you could give us that over for five minutes, we'd appreciate it.

MR. WONG: Good afternoon or good morning, I guess it is still. My name is Rich Wong. I'm responsible for a software company called Openwave where we sell almost exclusively to the service provider community. So we have people like Verizon wireless, PCCW as customers. So we come out here, not as much as a service providers, but as one that services almost substantially a majority of the wireline and wireless players.

At a personal level, before coming to Openwave, I actually did work at a company called Kodak Communications that many of you know was one of

the larger independent DSL companies. So I have some experience in the broadband world, at least, from the wireline experience.

Just in terms of some opening comments around the state of wireless broadband, I would say that we're in the very early stages of the secular growth of wireless broadband, both from a Wi-Fi, Wimax arena as well as 1X in the case of Verizon and Spring as well as people like Cingular or T-Mobile renting out GPRS.

For those of you that have studied the broadband industry for a while, I would analyze it to the broadband DSL industry probably in the 1997, 1997 timeframe. If you think about that timeframe, most of you -- there were a few of you back then who had broadband access. You knew they were very rich because you had a T-1 line or probably had a medium to slowish ISDN model at the time or you were one of the people first discovering the internet for AOL or Prodigy.

And so I would submit to you that the state of the industry today in wireless broadband is in that similar state. You have some regions around the world who have still actually broad scale access to this. San Diego, for example, has, through 3G, launched

right now. And you have people like T-Mobile and Starbuck's and Red Carpet Clubs around the country having Wi-Fi capable. So I think there's a lot of growth in the market over the coming few years and I think we're just at the early stages in that.

The primary limiter to growth, in my opinion, of at least the 3G services and folks like Bill and Atish have a better view than I do, is about what are the real applications running on wide area 3-G networks. Is it photo-messaging? Is it video-messaging? What are the types of services? That is the question that is yet to be answered.

COMMISSIONER ADELSTEIN: Thank you.

Bill?

MR. STONE: Thank you, Commissioner Adelstein. I am Bill Stone. Commissioner Adelstein already gave you the background. I'm with Verizon Wireless Service Provider. The largest service provider here in the U.S. market, currently, providing service to roughly 40 million customers.

I started in the industry back in 1988. I have held positions in network engineering, operations, system performance. Currently, I hold a position in our headquarters organization responsible for long-term technology planning. Let me just start

out by saying that from my perspective, the existing policy for CMRS, the flexible, exclusive use licensed policy is one of the drivers -- there's been a lot of talk about a license today. I'm certainly not saying that unlicensed doesn't have its place, but the certainty associated with licensed spectrum is one of the key components driving wireless broadband and certainly driving Verizon Wireless.

We've had great success. You can't argue with the success that the CRMS industry has had today. Currently, in the U.S. market, we're serving over 125 million customers. We're generating tremendous value. An economic study done by Hazlet & Spitsor indicates that the CRMS industry is generating over $80 billion in consumer surplus annually. So the existing policy works. I think that's a key message and it's one of the key drivers and one of the reasons why Verizon Wireless is moving into to wireless broadband.

In addition, the existing policy provides an economic incentive for us to use our spectrum very efficiently. We have to pay for spectrum at auction. We're incented to put it to very efficient use. If you look at the CMRS industry, historically, depending on what study you reference, spectrum efficiency over the last 10 to 15 years has increased on the order of

1300 percent. I actually read a CTI report right before I came up here that indicates that since 1990, on a per megahertz, per square kilometer basis, the CRMS industry has increased by 70 times the number of customers we're providing service to today. So we are making very efficient use of our spectrum and we are incented to do so.

In addition, new technology investment or the opportunity to raise capital -- that's one of the keys here, to raise capital and the certainty with licensed spectrum enables us to go to the capital markets and raise the capital we need to move forward with significant investments in new technology that enable new services to meet customer demand. So existing policy enable us to react to the demand in the marketplace and the key linkage here is that it enables us to raise the funding we need to move forward with wireless broadband technology, which brings me to EVDO.

Verizon Wireless, as Richard pointed out earlier, offer 3G service today in San Diego and Washington, D.C. I encourage you to stop by the demonstration room, check it out. We offer service across a large geographic area in both Washington and San Diego. We have committed to a significant

investment over the next two years, around a billion dollars. Actually, we've committed to exactly a billion dollars to propagate EVDO technology. We market it under the service name Broadband Access to many more markets across the country.

I'll tell you more about EVDO when the panel gets started, but suffice it to say the existing policy that Commissioner Adelstein and the FCC has used to date works, allocate spectrum, allocated for licensed, unlicensed, both. I'm here to represent the licensed community today as you can tell, auction it and get out of the way and let the market drive technology deployment. Thank you.

COMMISSIONER ADELSTEIN: Thank you, Bill.

Mr. Sobieski?

MR. SOBIESKI: Thank you. XO is a national local exchange carrier. As part of that, we're also the largest LNDS or fixed wireless spectrum holder in the United States. We have over 100 licenses that cover more than 170 million people. The licenses average about a gigahertz a spectrum. So we have a lot of spectrum. Those licenses are deployed in 75 FCC defined marked places, which would include 95 percent of the top 30 markets in the United States.

Those license are complimented by the other

assets XO brings to the table. We have approximately 37 metropolitan markets with fiber line services, both voice and data services as well as robust inner-city network that provides IP and TTM services.

Deployment of IP enabled broadband wireless its key to our future. So what are strategies? Providing IP enabled wireless services to provide a wide range of data services that leverage our assets, provide competition for the last mile to solve the low speed restrictions where cooper line services are only available, to partner with carriers to maximize the consumer value and to partner with manufacturers to expand the product set available in the spectrum band.

We've had some successful trials. What feedback we're getting from them? The consumer really like the fact that it is true broadband service. The quality has exceeded their expectations. The deployment intervals have met or exceeded their expectations and we've seen strong market demand for the pricing points we've set in mark places. What do we see out there? We still see competitive services creating downward price for convention services. We see that IP enabled access networks are facilitating new services that are creating new values in the marketplace.

What have we learned? Build it and they will come, obviously, did not work. Vendor investments and dependencies are not sustainable. We need to provide the marketplace incentives for manufacturers to create technology in this spectrum and we encourage use of standards as a way of encouraging a wide range of manufacturers to be involved.

I think we need to look at the paradigm in which manufacturers and service providers work with each other. We need to figure out how to make us both share in the risk and reward of rolling out these kind of technologies in the spectrum. We believe that the public interest is best served by partnering and the spectrum we've seen only provides marginal opportunities.

What do you think we have to do on a going forward basis? I think we need to form a vision within the industry and in the regulatory bodies that LNDS is a tremendous opportunity for future IP-based platforms. We have to make it so that we can line up our spectrum with our operating units. So that would allow us to exchange spectrum between licenses to leverage the assets each of the licensees bring to the table.

We need to have access to SUF funds in the rural areas. We cover a tremendous amount of the rural areas. Wireless is viable alternative to those areas. We need to have the same access other wireline carriers are provided and we need to ensure that we have regulations associated with the wireless environment that are similar to that of the broadband network providers. Thank you.

COMMISSIONER ADELSTEIN: Well, thank you very much. Atish?

MR. GUDE: Thank you, Commissioner Adelstein.

First of all, let me thank you for the opportunity to be here to learn from and contribute to this great forum because I think this is a starting point of a discovery process related to broadband in general and, specifically, wireless.

My name is Atish Gude and I am the Vice President of Strategic Planning at Nextel. Let me start out by talking a little bit about Nextel. A lot of people think that Nextel started on the basis of a fundamental technology that we called "push-to-talk." Let me put forth a slightly different suggestion that what Nextel really tried to do was to understand and serve a specific customer need years ago in the

dispatch community. And, as that customer grew to interconnect services, we offered interconnect with direct-connect, push-to-talk services and that's fundamentally what Nextel has been built on to really serve a customer need.

I think that's important because, after considerable research and planning, earlier this we launched a wireless broadband service trial in Raleigh/Durham, North Carolina for two primary reasons. The first reason was, obviously, to evaluate this OFDM technology provided to us by a company called Carion, evaluate the technology. But the more important reason is, is the second, which is we really wanted to understand customer demand, customer usage, usage and behavior. And the reason for that is to develop a well-thought-out, go-to-market model that would help bring these kinds of new services to the market.

So we're on a discovery process. This service is aimed at, not only business users, but also individual purchase decision-makers, home users, people who want to use the service on the road, and we are learning a tremendous amount already, but would not suggest that we're at the end of that learning process.

A couple of things that I would like to suggest from our learning process. The usual hypothesis or question we had was, wireless broadband, what's the value proposition. And, so far, what we are finding is that that value proposition is not tremendously different than the value proposition that wireless, cellular brought to the market with respect to wireland. Our customers there are telling us that what they value -- one of the first things that they value is the ability to be freed from a specific desktop, freed from time and place. That concept of mobility rings very well in taking internet access away from the desktop.

The second value proposition is, again, not unlike what cellular voice services brought to the market with respect to wireland and that is the concept of having access to where a wireland has not, could not or, perhaps, even will not build out to. And then, again, that issue is related to fundamentally being connected.

And the third value proposition that we are recognizing, based on the questions that are customers are starting to ask us, is the proposition of enhanced services, new services that would go hand-in-hand with broadband and that brings us to a fundamental

conclusion, or the start of one, that I think many people recognizes is that broadband is just a highway. It's a highway for voice, video and data services period. Wireless is just a mode of transport.

Now one of the hypothesis that we are starting to develop, based on what our customers are telling us is that there is a requirement for voice. There's a requirement of video. There's a requirement for data and all of the cellular type of services that go hand-in-hand with wireless service. But, in the same context that wireless and wireland coexist today in a business as well as in a home, we are starting to build some thinking that would suggest, while intermodule competition, wireless broadband and wireland broadband may exist, at some point, the higher order of value proposition is intermodule services and wireless broadband just provides a highway for a lot of services and applications.

I think we still have a lot of research to do, but that is a very interesting concept that we are starting to learn from, from our customers and, hopefully, this forum will, perhaps, start to discuss those kinds of issues of intermodule services rather than just talk about the intermodule competition. Thank you.

COMMISSIONER ADELSTEIN: Thanks a lot. Paul Berriman?

MR. BERRIMAN: Good morning and thank you, Commissioner.

I guess I'm more interested in the U.S. at the moment. I'm just here because John asked as an old friend if I'd come and tell you how we're finding it as a new operator overseas.

PCCW is the incumbent fixed operator in Hong Kong. We currently have about 3 million telephone lines. Because of the small topology of Hong Kong, we can deliver a 6 megabytes broadband and EDSL to about 91 percent of the lines in Hong Kong. So we've been able to really experiment with what can be done with demands are for broadband when its a variable and in sort of dimensions. We did all of that for about $35 U.S. dollars amongst customers.

The whole thing is a very competitive market. We have five, six mobile operators, about 15 of these various fixed operators and they are leaving with our market share. So what we've been doing in Hong Kong is defend the market there and we have some innovative broadband T.V. services and are the leading ISP in Hong Kong. So we've had to leave out of Hong Kong to grow. And, obviously, we didn't have any

facilities in the environment in any other places, so we believe that broadband wireless is ranging for growth for us.

About two years ago we started playing around with the technologies and we found that the site prototype technologies will rapidly starting to mature, so we started to look for spectrum around the world and, in that respect, we were looking for licensed spectrum. I don't think we need to invest or available to invest in unlicensed network unless it's spectrum networks, apart from the hotspots that we have to provide in Hong Kong. Now we have about 250 hotspots.

So we found the new support regulatory environment, the transparent regulatory environment, the legal environment and such were most opportune for us was a 3.4 gigahertz license in the U.K. Now we recognize that 3.4 is at the upper limit of the non-minus site spectrum, but, at least, in this particular situation, it's a very clean spectrum and we were able to, I think, catch the market with its trousers down. We got the national license for $14 million U.S. in total for about 40 megahertz a spectrum. So, in that respect it was good.

But the main driver is, in fact, as we

looked around the world, we were looking for penetration of broadband and the U.K. is a very good example where you have 55 percent of household with dial-up internet or access, but less than 10 percent with broadband access and, even then, the government there has tried to make it look better by allowing ADSL and 512 to be classed a broadband, which we don't, given our situation, we see that and the competition is pretty poor in reacting to broadband in the U.K. So we saw that made it vastly for the fact that we were going to have to put in a lot more cell sites than you would do at 700 megahertz, for instance.

We decided that our major proposition was to go hit ADSL head on with an online of site proposition. So, once we got the license, we were given approval to get out there and do a soft launch in the Thames area of the U.K. and covering about 400,000 houses.

In terms of the technology, as I said, we've been looking at various types of technology, but we're still not satisfied that we have the standards that we need to warrant how we go forward international roll out, so we're still treading cautiously. We've actually put in a few different technologies at this

point in time. We use IP wireless to get started. But, in our RFPs for international roll out, we're planning more to providing where we are successful with the initial launch. We really see some migration capabilities in what we may move towards a standard and Intel is one of the investors in PPC data and we will continue to have dialogues about Wimax with them is one potential.

So that's really all on the technology, but one of things that is for sure, for that standard, so we'll have to get out there and do something now and we'll go forward with these two technologies and, hopefully, we launched -- in about 300,000 homes. The whole cost is about $40 million for that. We launched about three weeks ago now and the results have been pretty good.

In order to facility the fast roll out, we've used all of our network facilities in Hong Kong, so the billing systems, the customer care systems, the web platforms, they're all based in Hong Kong to give us another roll out and we've been using companies such as ATM Crown Castle for the line-of-site acquisition, which is very much the critical path of the whole project.

And, in terms of selling, we're selling to

full-party retailers, call centers and online internet service. I think that's 70 percent of all broadband in the U.K. sold to the internet. The customer proposition is broadband-to-go and there is some relatively new work. Some of the propositions that we offer a customer -- the modem is delivered in 24 hours. I think over the internet or, if not, bought in the shop and they can be installed in three minutes. It's portable within the home. It doesn't need a phone line. We give them a one-month free trial and it's good value for many of the 512 cable service we offer as 18 pounds, which is about $30 and we think that's about 2 pounds than BT's offering and at 28 pounds, roughly, a l megabyte service, which is about $50. So we're really are not hitting the other side. Because of the 3.4 megahertz, we've had to design the cell size at about 2 kilometers in radius to get the coverage that we want so that we can penetrate at least one more into the whole.

We targeted to prove in our initial roll out of about 10 percent of unit additions in the covered market area to the broadband market and, in the first few weeks, we began to see that we were exceeding that several times over. So we're very confident that very shortly the board will be giving us approval to move

towards a national network order -- roll out.

And, to quote Pierre, it just works. What we're finding from the feedback the number of new members that we've served, at least 95 percent of them were actually online activations within their receipt. So we were very confident that our predictive tool, which looks at the current area versus the address of the inquiring potential customer is giving a high degree of accuracy, so that's been a great relief for us. And the feedbacks have been quite good. There are lot of bulletin boards and message boards on the internet of some people you can imagine they're quite technical geeks or whatever and the reports on the performance has been pretty good.

Assuming we do get the approval from our board, we'll begin looking to roll out to about -- I don't know, 75 percent of the population in two years is our target if we can meet all of the initial performance indicators that we've been looking for. That's about it really and with the major problems that I would say we've had has not been so much spectrum. We got it relatively easily and, besides acquisition and planning approvals have been a major difficulty and don't think that should be underestimated. I think that will become, if a

problem in the U.S., it will become a growing problem from what we've seen in the U.K., local councils, local groups objecting to the town. This potential threat of wireless.

And, also, we have to rely, to a large extent, on the incumbent provider for the back haul capacity from the base stations and that has not been good. I think it's been more corruption rather than conspiracy, but it hasn't been a good experience. That's for sure. So we're now looking for the alternatives to provide some ways of mitigating that risk. Thank you.

COMMISSIONER ADELSTEIN: Well, thank you, David. There's a lot we can learn from that experience.

Now from the unlicensed perspective, we have Mike Anderson from PART-15.ORG.

MR. ANDERSON: Thank you, Commissioner.

My name is Mike Anderson. I'm also here wearing two hats, I think, today. I think is license exempt wireless internet service provider and just outside of Chicago we have 28 POTs, WIPOTs we call them, wireless internet point of presence. Out of the 28, I think we pay rent on 2. The rest of them we either bought our services in exchange for water tower

space or rooftop space to mount our antennas and stuff.

We cover about 900 square miles. We have a little less than 900 subscribers, customers. We have 12 hotspots. Most of our hotspots, we chose early on not to go the way of charging individual users to use the hotspot technology. We more elected to either use that hotspot as an advertising point so when somebody walks in, they open up their laptop, they try and surf. They have to go to the login page and that's where our advertisement is because we're in a small community, rural America, so it seems to work as a good advertising promotion for us very inexpensively.

The other hotspots we have, the person who owns the location is the one who pays for the hotspot technology. Many of the small rural places that the license exempt guys are going after are the restaurants, businesses, things like that and those owners, the landlords of the property as a utility. It's something to get. They needed to help the customers come in and buy their food, beer and wine and stuff like that, so they've just thrown the cost of the broadband in with the cost of electricity and gas and the other normal utility bills.

PDQ Link offers services to hospitals and

courthouses and everything broadband is needed for -- realtors, fire departments, police departments. We have ambulances that have IP video cameras now in them. So the hospital can actually watch the EMT doing their thing in the back of the ambulance on the way to the hospital -- sheriffs departments. A lot of people are jumping on the licensed exempt. It's very inexpensive to be a licensed exempt WISP. You can become a WISP for less than $5000, which creates its own problems by being so cheap as far as technologies go because a lot of people in the old days that were in the good old networking guys now turn to the new wireless side of things and they're not really RF familiar and that causes self-interference issues actually along with interference with other WISPS. But, for the most part, it's working out extremely well.

Just to make a quick comment, I'll put on my other hat of Part 15 here. There are actually over 8000 licensed exempt WISPS in the United States actively providing service. PDQ Link is 35 miles outside of Chicago. If I look out my front door, I'm in suburban Illinois. If I look out my back door, there's cornfields, so I'm in rural Illinois. So we cover both. We didn't try to get into the major

metropolitan areas, numerous issues, line-of-site, everything else that's associated with the tall buildings and the massive amounts of movement and people but that's where all the bandwidth is. If you go downtown Chicago, you can buy dark fiber for $50 a meg, but I'm 40 miles out in the boonie, so it cost me $600 a meg. So how do we overcome that. So I do have some licensed spectrum. I don't own it. I rent it from a person providing me the back haul, but I can now buy 250, $350 a meg bandwidth instead of that normal hard wired $600 a meg. That's working out excellent. We have, like I say, 28 WIPOTs. Most of our customers are providing voice over IP services and packet 8 and things like that, very happy with the performance of even the Wi-Fi 2.5 customers that we have.

Out of the 28 towers, I just want to make a note -- out of the 28 towers, not two of them have the same exact equipment on them. This tower over here might have a 900 megahertz solution and a 5.2 gig back haul. This one over here will have a Wi-Fi solution for the customer access and a 5.7 back haul or this old tower over here might not have any Wi-Fi on it because of the noise flow in that area because maybe in that area I'm competing with 15 other WISPS.

Just an antidote, the other day I was driving home from one our POTs and there's a program out there called NextNumber. I don't know if many of you know of it. It searches out access points in the Wi-Fi arena. And, in that four miles it took me to drive this one straight road in my service area, using NextNumber, we picked up 111 access points and this rural America gang. It's not like downtown. I would have expected that leaving the City of Chicago, not out in rural Illinois. Enough about PDQ Link.

Part 15 is the licensed exempt wireless internet service providers organization. We have hundreds of members from across the world actually, major manufacturers, the Motorolas, the Airspans and many of the manufacturers that are producing the licensed exempt equipment. We saw the need for the education and to going from the hard wire to the RAF side. We host a conference called WISP Com. It's the wireless internet service providers conference. It's kind of different than a normal conference. It's not your typical conference. It's more of an education type thing. If the speaker says their company name more than three times, we kind of beat up on them. It's not really there for marketing type things.

Again, there's over 8000 WISPS in the U.S.

Most of them are providing support for rural and suburban America. The advantages for licensed exempt -- low cost for the spectrum. The disadvantages -- you're going to deal with interference issues. Most of the interference issues can be worked out, though. Most WISPS that want to cooperate know there's only so much room in the sandbox and we all need to get along or none of us are going to go very far. So, so far, even with the massive growths -- back in '98 when I started the transition from dial-up to wireless, the Wi-Fi card that you can buy for $39 at Best Buy now cost me $167 back then. But the prices keep going down, so more and more people are getting into wireless. It creates it own problem, but it's not overcomeable. That's not a word.

Anyway, I'd rather get to the questions and answers because I think that's more important than me rambling.

COMMISSIONER ADELSTEIN: Well, thank you.

I'd actually like to follow-up on that. You're kind of outnumbered here by the licensed operators. You're an unlicensed person, but I wanted to talk a little bit about the relationship between the two, about what impact services and technologies that operate in the license bands are having on the

deployment of wireless broadband in general. I'm kind of curious of what you think. Anyone who wants to respond is welcome to jump in here, whether or not these services are complimentary or are they really substitutes for one other? Or are there strategies for integrating Wi-Fi with wide area wireless networks and what types of integration strategies are working? Do you think we'll ever see sort of a greater seamless integration between them?

MR. WONG: It doesn't do either. Since we serve both. The classic example of that is T-Mobile. T-Mobile is probably the largest to my knowledge of the commercial lifetime provider. They have all the Starbuck's and they have a lot of red carpet clubs and admiral clubs as well. So they obviously are a 2 and 1/2, 3G GPLS provider as well, which is GS exempt technology. So we do both.

In terms of integration, I would say to you that it's not the transport level for the integration to occur. In most of these cases, the operators have a better view than I do, perhaps, but it's about billing and customer care integration that's sort of job one. And job two, in my personal opinion, is the applications integration. You have the same whether it's an e-mail account, or photomessaging account or

whatever it is, to work equally well whether you're sitting at the Starbuck/s or plugged into your Fiji card at home. So I think it's billing and applications and I think they're fully complimentary.

MR. STONE: Actually, I'll try mainly to say I agree with everything Richard said, especially, the last couple of points about services and applications being transparent across access technologies -- billing, et cetera. We all, in fact, in the CMRS domain, working in industry standards and moving towards standards that will enable us to evolve our network infrastructure to support multiple access technologies. So that is a movement or a process that's underway in standards as we speak.

In addition to that, I will say that I believe that the success that we've seen with Wi-Fi, especially, in the residential and enterprise domain, not so much in the hotspot domain, but that remains to be seen. T-Mobile is a good example. But, especially, in the -- Michael pointed out the number of residential access points he could pick up. I can give you an antidote in my neighborhood that there's at least six of my neighbors that have it. And, as a matter of fact, as an RF engineer, I've already coordinated frequency radios amongst us and I should

charge a fee for that, but haven't gotten to that just yet.

(Laughter.)

MR. STONE: But the point is, is that's wetting the appetite for broadband wireless on a larger scale. One of the things that we found in our broadband trials, similar to Atish, was that the customers want coverage, ease of use and coverage, which is very similar to the wireless services we provide today. You turn on your phone. It works. That's another quote that came up today. It just works. That consistently is the feedback we're getting. So, if we're going to move in this direction of integrating access technologies or allowing these services to work across multiple access technologies, I think the key to success is that it's got to be easy to use.

MR. GUDE: Bill, I think that, you know, one of the things -- at some point in time I'd like to sit next to the Verizon people. I think we'd find more things in common.

(Laughter.)

MR. GUDE: I think that we have learned in this industry of licensed spectrum users is that quality is essential for our customer adoption and

interference is a significant barrier to that quality. We have been very close to this interference issue. So most of us wireless carriers, I think, feel very comfortable in a world of delivering quality, delivering services that customers value in a world of licensed spectrum, but that doesn't mean that unlicensed spectrum cannot coexist. We're already seeing it in the 802.11 world. And, as technology moves forward, the link between unlicensed and licensed will become clear because of a point that I was trying to stress earlier is that we will be in a world -- we will likely live in a world of services that will be increasingly more converged and networks that will be increasingly more converged.

802. 11 provides a great bridging environment between wireless and wireline. I mean, it's taught us that. We also have, I think, overcome the hurdle of multi-mode, multi-band. There are devices that exist in those realms. But IP and SIP are two protocols that get us a lot closer to integration of technologies such that we're not that far away from integrated billing, integrated customer care because of those protocols. I wouldn't say that we're there today. But, in that sense, we're probably very close to a world where licensed and unlicensed

can coexist together and probably customers will require that.

MR. SOBIESKI: Today, most of our partners are operating in the other bands. Our value proposition we're bringing to the table is that we have a high capacity, ubiquitous IP connection to the PSTN. That's what we provide. LNDS provides that and we provide it to the wireless users. Right now, it's mostly the transport layer. I think that an important step is that, as the technologies and the standards evolve, is more of that transparency, because transport only provides -- can only go so far before you're going to see the kinds of application space that's really going to be available in the future. That information has to be transported more than just at the protocol level. So I see wideband spectrum availability being used as an aggregation network today, in the future. I say let's learn from what we learned in the wireless environment. We started out with very expensive, very few base stations. We're now to quarter miles basing on those mobile technologies. The higher frequencies play very well in small, dense coverage areas.

So I see the whole industry evolving. I see every one of those service groups will continue down

their path. I think there is a path in which everybody can provide mobility services across spectrums, so that the user can benefit with a high flow of application space available to them.

MR. BERRIMAN: I'd like to concur with everything that's been said. I think it's overview is interference risk and investment risk. 802.11 is really a world network. It's in the hotspot. It's not providing less line. It's providing less yard and I think, in Hong Kong, more broadband customers, we have taken care of getting Wi-Fi hotspots into the coffee shops, et cetera. And it's interesting. I think about our way back into mobile. We sold our mobile business a few years ago. On our way back, we've been dealing with handsets where a person is locked into his home and at this point, which is Wi-Fi compatible.

In that situation, we don't have a problem with unlicensed spectrum. We think it's good. But I think for us to go investing the last mile solutions, using unlicensed, then I think we'd have a problem. So it's really has to do with investment risk and interference risks.

MR. ANDERSON: Just a quick note, I'd just like to clarify, I guess. A lot of people think

unlicensed means 802.11 and there's so many other things in the unlicensed that are not 802.11 that are working very successfully to overcome the interference issues that the people are concerned with. For example, we have 57 and 58 radios that can detect another frequency being used in that range of changes and bypass it to continue providing the service. So there are many other license exempt bands out there that we are using because of the interference issue. So I just wanted to make it clear that most people think Wi-Fi 802.11 is license exempt. Well, it is, but there are so many other things out there as well.

MR. BERRIMAN: Can I come back on that? Well, I think the only problem I've got with that is the fact that what can work now? It works now but you don't know what's going to come along in the future. We've seen an influx in Hong Kong with devices from Korea that allow you to connect your T.V. in the bedroom from your DVD player in the living room and it uses the 2.5 license spectrum. You turn it on. You get a good picture in the bedroom, but your Wi-Fi has just died and it what comes on afterwards, not whether you can make it work now that is the issue with unlicensed versus a future risk.

MR. ANDERSON: True. Maybe unlicensed is a

temporary solution because it's here now and until the Nextels and everybody else comes to north rural Illinois, I have to do something or I'm just -- can I say SOL?

(Laughter.)

COMMISSIONER ADELSTEIN: Now, in terms of business strategies we're here to talk about. I'm from a rural state, South Dakota, and I think about the fact that we led the way. I used to be so proud that we had this company out there and I want to reflect on some tragedies as well as the benefits. We had a company called Morning Mobile Services that was using EVDO just like Verizon, only they did before Verizon in the small markets. I used to say we love the rain in South Dakota because we had through first in Sioux Falls. Actually, our biggest community and they were targeting these mid-size communities like Sioux Falls and Duluth, Minnesota.

They went bankrupt and they're out of business and they've shut down service. So I kind of wanted to think about, in terms of business strategies, what you've learned from their experience. Were they too early? Was this something that really doesn't work in less populated markets? What are the most important factors for the plain services? Is it

consumer demand or is it network quality because, certainly, they had a good quality service? Is it the type of service? EVDO seems like a wonderful technology. Or was it about price and educating the consumer? What is it that works? What can we learn from that experience? Anybody who wants to reflect on that. Obviously, Verizon go first. It's used the same technology.

MR. STONE: I think, in this case, you really have to start with the business case and network quality, absolutely, is very important. We've learned that through the years and we focus a lot of time and energy and investment on providing a high quality network. But, in addition to network quality, you need customers. I mean, you need revenues to offset the costs of operating the network and the capital to build out the network.

And what we've found with experience that works is you target the metropolitan areas first. You go where the enterprise customers are located. You go whether there's the highest concentration of consumers and, as you ramp up volume and ramp up skill, you can drive down the operating cost. The cost to deploy goes down. The device cost goes down and you prorogate outward from the metropolitan areas. That's

the formula that's worked over and over again with Verizon Wireless.

We started with analog technology way back when and started in the metropolitan areas, propagated outward. Did the same thing with our digital deployment in the mid-'90s. Most recently, our 1-X technology we started in the metropolitan areas. And, all of the above, is now in 100 percent of our cell sites. So we're starting over again with EVDO. I expect it to go the exact same way and, all the while, we continue to add base stations as well. So, in addition to starting with new technology and building outward, we continue to expand coverage by investing in most base stations as well.

MR. WONG: I would say, God bless capitalism, basically. The entire history of telecommunication has never said go after stuff and sometimes they break out and make it happen and sometimes they don't. And, since the Telecom Act of '96, whether it's Kodak, Rhythms, at home, Arsenio, you know, every single one of those companies has had its ups and downs and some of them have survived and some of them haven't and that's healthy. That's good. That's what capitalism is about is trying those different experiences. So, actually, I view that as a

very healthy thing that there are people that go out there that are mavericks that experiment and not all of them are going to make it.

The second point I think I'd make is I believe there are some things and it turns that EVDO technology, I think, is one of those things where it just take a greater set of deep pockets to resource to make it happen. It is just a very expensive process as well as technology challenges to go after it and I think that it was probably a little bit ahead of its time in terms of the handsets and the technology really wasn't there to be deployed at that scale, but those are necessarily bad things. I think experimentation is a healthy thing for the industry and for, frankly, our economy in my opinion.

COMMISSIONER ADELSTEIN: Is it sort of a bad sign for future deployment in rural areas? I mean, is it going to be the last place to get this kind of service because of the small scale?

MR. BERRIMAN: Can I speak from experience? At the moment, one could believe the technology is available. We're not driven by technologies. We're driven by the fact that it's a non-line-of-site proposition. So there's all different technologies available. But one of the common things is that, to

make it work, we've got to work with current projected prices of that equipment at infrastructure costs will allow you to be viable with something like 79,000 households per cell.

Right now, I'm sure as you were saying, Bill, the cost will come down, the standards, with everything else, and then you can start to look out to the more rural areas. But I mentioned you're going to try to do 75 percent of the households within two years. Doing 25 percent, we might never do this twice because it's so spread out and, unless we move to a line-of-site technology to do it, I can't see us doing it unless the prices come down in the infrastructure.

MR. SOBIESKI: The driver in all of these CP equipment -- I mean, we need to get CP equipment used in all these bands. The cost to the service provider in the few hundred dollar range, not the thousands or thousands of dollars or 10s of thousands dollar range. As long as that equipment is at that kind of price point, you're going to still have to service only selected market segments, either geographical or customer bases. So the only way you're going to get that is to kind of economy to scale for mass production that you're seeing in the unlicensed band because people perceive the spectrum availability

opens up the marketplace.

Our position is we're trying to change the paradigm and say that even licensed space can be available through partnership arrangements to create that kind of access to the marketplace that will allow people to produce equipment in that spectrum that gives you that same kind of price point from a purchase perspective. So it's a different paradigm and we understand that.

COMMISSIONER ADELSTEIN: One more question I just I'd like to touch on quickly before we open it up is really is constantly here at the FCC we hear about working on and contemplating the future of voice-over internet protocol and the thing that raises this issue for me is, when do you think we'll see mobile phone become commercially available? Is that a peculiar application here for wireless broadband and would these device be able to roam, you think, between Wi-Fi hotspots and some of the networks?

MR. GUDE: Let me see if I can just start off with that. Voice-over IP, I think everybody understands there are three kinds of voice-over IP. There's voice-over IP in the back haul technology and there's been a lot of progress made in that area. There's voice-over IP vantage style and then there's

voice-over IP on the air link between some tower and a mobile phone and, perhaps, there's other definitions as well.

We don't see voice-over IP as something that we take a very long period of time to develop. We think that it is relatively close on the horizon. But I don't want to start from the technology first. I really want to go back to the customer demand issue and talk about a conceptual state of mind that people always refer to as convergence. In a world of convergence, we need to talk about network convergence. You can talk service convergence. You can talk about a lot of different kinds of convergence, but what broadband allows us to do is to take all of those service within voice, media or data and put them over the same access medium.

So the importance of VOIP is that, number one, it allows for enhanced services to be brought to consumers. And, depending how you look at it, it also lowers the cost of broadband entry. Let me give you an example. If you have a customer who is a landline -- an example, if you have a customer who is paying for DSL access at $35 and they're paying $50 for local and LD service, they're paying about $85.

If that customer happens to buy broadband

and then starts to go vantage like, unlimited local and LDs are only $35. So you're now at $70 total. That savings of $15 or $20 effectively lowered the cost of broadband. So voice-over IP is a very interesting opportunity. It is an application. It's also a means of communication and then you can extend this to a wireless, but, at the end of the day, what we think is that voice-over IP is an application that really brings a lot of utility to customers in enhancing the value proposition.

MR. BERRIMAN: I was just going to say I think it depends on what your business model is. If you're looking to do lower cost long distance, then voice-over IP there is a market for that. If you have a fixed network, like we have in Hong Kong, we have so many voice lines already, we're not going to replace voice with voice for new additional revenue.

So, with that end of the spectrum, in the U.K., for our next generation of modem we'll have a built-in voice-over IP software with the intention of having that capability because it suits us, having an IP stream as our access mode to have voice-over IP as the means of doing. So, in Hong Kong, we have voice-under IP as well voice-over IP where we have an IP stream as our main access.

MR. STONE: Adding to what Atish said, and I agree with everything, especially, the consumer demand piece. Just a couple of other comments. I think I'm a little more bearish on timing, certainly, I see the potential, the incentive for a wireless provider, the exist CMRS providers to move forward with voice-over IP. However, you do need to keep in mind that today, as we've talked about a lot, our customers demand high quality service. We, the service providers, are incented to provide service in a very efficient manner.

And today, voice-over IP, does not accomplish either of those things or I should say differently. The CDMA circuit switched or the circuit switched voice call model, in general, has a very rich set of features. It's well optimized and operates very, very efficiently.

So the up side in the near term is the enhanced services, but we also need to catch up -- voice-over IP over wireless needs to catch up with circuited switched voice in terms of efficiency and the set of feature