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**The Free State Foundation's  
TENTH ANNUAL TELECOM POLICY  
CONFERENCE**

**“Connecting All of America:  
Advancing the Gigabit and 5G Future”**

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**“FINAL THOUGHTS AND LOOKING AHEAD:  
PERSPECTIVES FROM THREE OF FSF'S  
ACADEMIC ALL-STARS”**

**MODERATOR:**

**Theodore Bolema** – Senior Fellow, The Free State Foundation

**PARTICIPANTS:**

**Michelle Connolly** – Professor, Duke University, and a Member of FSF’s Board of Academic Advisors

**Daniel Lyons** – Associate Professor, Boston College Law School, and a Member of FSF’s Board of Academic Advisors

**Christopher Yoo** – Professor of Law, University of Pennsylvania Law School, and a Member of FSF’s Board of Academic Advisors

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\* This transcript has been edited for purposes of correcting obvious syntax, grammar, and punctuation errors, and eliminating redundancy in order to make it more easily readable. None of the meaning was changed in doing so.

## P R O C E E D I N G S

MR. MAY: This program is going to be moderated by Free State Foundation Senior Fellow Ted Bolema. And it's titled, "Final Thoughts and Looking Ahead: Perspectives from Three of FSF's Academic All-Stars."

When I first was thinking about this program and trying to figure out titles, putting them on paper, I had something like, for this program, "If I were FCC chairman instead of a professor, I would do such-and-such," or "These are my final thoughts."

And Ted, to his credit, reminded me that these three professors really have every bit as much prestige as any FCC commissioner or chairman, and that I should be careful not to minimize their accomplishments.

And so I immediately agreed and changed the program to "Final Thoughts and Looking Ahead: Perspectives from Three of FSF's Academic All-Stars." And I think we're in for a treat to hear from them. So I'm going to turn it over to Ted Bolema.

MR. BOLEMA: Well, thank you, Randy. This is

certainly a distinguished panel, and the title of it again is "Final Thoughts and Looking Ahead." So it's a fairly open-ended topic here.

Our speakers are welcome to comment or offer their wisdom on what they heard earlier in the day. Their detailed bios are in the program, so I'll just keep it short.

Ms. Michelle Connolly is an economist. Her degrees are from Yale, several of them, and she served not once but twice as Chief Economist at the Federal Communications Commission. She's currently Professor of the Practice of Economics at Duke University. And even though I'm from the University of Michigan, I was rooting for Duke on Sunday, both for the chance at a rematch and also because I didn't want to tread lightly around Randy this week.

Then also we have Daniel Lyons, who has his degrees from Harvard, including his J.D. He's an Associate Professor at Boston College Law School. He also has extensive legal experience at a major law firm in Los Angeles.

And Professor Christopher Yoo is also an attorney

with an undergrad degree from Harvard, an M.B.A. from UCLA, and a J.D. from Northwestern University. So we're covering quite a few of the major athletic conferences with Professor Yoo today. He also clerked for Justice Anthony Kennedy at the Supreme Court, and he is currently the John H. Chestnut Professor of Law, Communications, and Computer Information Science at the University of Pennsylvania Law School.

As Randy mentioned, they're all distinguished members of the Free State Board of Academic Advisors, and we're very appreciative of all the many contributions that they make there.

I'll proceed in the order that we have here, alphabetical order. If you'll hold it to about five minutes, then I'll ask a few questions, and maybe open it up to the audience.

MS. CONNOLLY: Thank you. My background is originally in macroeconomics, growth, and development. And I was thinking about everything we've been discussing today, and I thought it would be good to pull all the way back, to look at the forest in the sense that when we're looking at development and growth in an economy. What I

try to always teach my students is the role of institutions as primary in the creation of an environment in which the private sector can innovate and grow.

Without these institutions, the private sector can try and fail or will simply not try. And that's something that we have been hitting on all day in terms of telecommunications policy and the FCC in general. So with that in mind, I wanted to think about regulatory stability. And there are three aspects. One is in terms of legislation, another the current spectrum issues going on, and then the new Office of Economics and Analytics.

In terms of legislation, we've been talking about the need to address the issue of net neutrality or however you want to discuss it. And I do agree with many of the participants today, that this will keep getting moved around unless there is some action taken by Congress.

Importantly, someone earlier mentioned that economists in general have been very vocal advocates against the Title II regulation imposed by the *Open Internet Order*, and that is definitely true. But actually, a large part of that opposition, beyond the use of Title II and beyond the general conduct clause, was

specifically because of the issue of paid prioritization.

And that should not be forgotten. I don't want that to be swept under the rug simply because people are so happy to be getting rid of Title II regulation that they forget that paid prioritization is a very important thing about keeping this market free and allowing people to have services. People may want a certain quality of services and they may be willing to pay for it, and they should have that right to do that. And as an economist, this is about a market and this is about intervention in a market. And that should not be forgotten.

The second thing that is very clear: We're always talking about spectrum and the fact that it's a finite resource. So it would be useful to think forward about how we ease the repurposing of spectrum moving forward.

I'm sure that in 10 years we're going to be having the same conversation of "We need more spectrum. We need more spectrum." But it might be something worth looking at in the long term. How can our institutions think not only about purpose, where we allocate spectrum currently, but how do we make it so that it can be

repurposed without five-year delays or huge kidnapping ransom fees in the future so that we can move more effectively?

Then the last thing that I wanted to focus on is the announced creation of the Office of Economics and Analysis at the FCC, about which I am thrilled, absolutely thrilled that the current Commission is creating. I can also see why many people are skeptical about it.

When I've been thinking about this, I realized there are certain keys to doing this and doing this properly. And that is: How do we guarantee or at least maximize the chances that this office will be impartial, and will be respected and valued by both parties?

Because if it isn't, if it's seen as only justifying decisions that were made ahead of time, then no one will care what it says or does. If it's not respected by both political parties, then it's again going to be ignored.

So we want to make sure that the FCC has a very good intention here. It needs to be supported. And we want to make sure that even if something good is created, that in the next administration, people can't just say,

"Well, we don't like the answers you're giving us and we're going to ignore you and let you wither on the vine."

The key roles that I would see this office as needing to fulfill are to improve data collection in terms of the types of data they're collecting and improve how well that data is available to the public. Much of the FCC data is public, but as someone who has been trying to use that data, it can take you years to piece together all the pieces and to even find out what the true rules were for specific things.

By having open data, then whatever analysis is done is more likely to be accepted or considered because outsiders can, as much as possible, replicate what they want to do, and then they know that they're not being lied to. I think this notion of open data, to the extent possible, is key to giving credibility to this new office.

And part of that credibility is also saying economists aren't God. Everyone keeps talking about cost-benefit analysis, and I think that's absolutely right. We want to make sure that there's a high hurdle for new regulation. You have to prove first that you're doing no harm and that you are actually, hopefully, doing something

positive. So I do believe in this high hurdle.

But if there aren't real data out there or if your economists aren't very well trained in theory or empirical work, it's not possible to do a perfect cost-benefit analysis on every single topic. I think it's worth getting as far as we can, saying honestly what we can determine, what we do know, and also being honest about what things we can't make claims about simply because there may not be enough information.

And in such a situation, I think that the default should be, again, you have to prove a benefit before you should be able to change things.

MR. BOLEMA: Okay. Great. Thank you.

Professor Lyons?

MR. LYONS: Thanks. So Michelle points out that economists aren't gods. I think that's helpful --

MS. CONNOLLY: Well, except for me.

(Laughter.)

MR. LYONS: I don't need to issue that disclaimer because nobody's under any preconceived notions about lawyers.

So my comments are a little more mundane. I

think net neutrality is really sucking the oxygen out of the telecom space, and it has been for well over a decade. We just had a whole panel today on how we don't really want to talk about net neutrality anymore, and I think Christopher and I have had this conversation on two continents over the past 10 years.

That focus is really unfortunate, I think, because the effort that both sides are putting into this issue is all out of proportion with its importance. Ultimately the net neutrality debate boils down to two simple, frankly rather mundane questions.

One: Is antitrust law sufficient to deter broadband providers from anticompetitive conduct? And if not, two: Are additional rules likely to cause more harm than good to consumers and to innovation?

Everything else is just mostly rhetoric. And rhetoric is sometimes useful. It means that people other than academics are reading my work right now. And it helped me get tenure; that's helpful. But our collective energies are probably better spent on other issues in this space.

That having been said, I can't resist one

comment, which is that we seem to be moving toward consensus on a no blocking/no throttling rule. The public choice academic inside of me whispers just ever so softly that just because the existing players support a proposal, that doesn't necessarily mean it's the right answer.

The fact that existing players are on board with a proposal might mean that the proposal can serve to insulate incumbents from disruptive newcomers by limiting the potential planes of competition going forward.

So I was on a panel not long ago that was focused on the origins of common carriage and the public utility model. And one of the commentators said, "The whole point of common carriage was to make sure that as these new services are rolled out, that they're being made available to everybody and that nobody's being left behind." And I'd posit that that's where the FCC should spend big chunks of its attention going forward, as it sounds like Chairman Pai is.

There's a lot of interest in trying to find ways to bring broadband to the underserved. I'm partial to market-oriented solutions, and I think there's a lot of different potential avenues out there. I just want to hit

on two really quickly.

One is Lifeline reforms. I think a market-oriented solution to Lifeline would be finding ways to increase the purchasing power of low-income consumers to allow them to participate as close as possible to fully-fledged consumers in the telecom marketplace. This, I think, requires flexibility, and in that sense, I think the existing Lifeline reform proposal is a bit of a mixed bag.

I strongly approve of lifting restrictions on the services that you can get with Lifeline subsidiaries, like lifting the equipment requirement. But as I think Randy has suggested as well, I'm not a big fan of the proposed ban on resellers, and of the odd proposal that nobody's really talking about suggesting that maybe Lifeline providers need to prove that they're not turning a profit on the service. Both of these seem, from a market perspective, to be somewhat problematic in reducing rather than increasing the choices that we're making available to the Lifeline population.

And second on the issue of broadband buildout, I think it's important to identify those pockets of unserved

areas and figure out the most cost- efficient way to connect as many as possible with the limited amount of money that we have available. And in that sense, the reverse auction mechanism is a fantastic idea.

From a federalism perspective, I've been really intrigued by the waiver that the FCC extended recently to New York to go and distribute its CAF-II [Connecting America Fund Phase II] money itself rather than pursuant to the FCC. This makes a lot of sense to me.

I think in a lot of situations, state regulators have better local knowledge about why there are existing buildout gaps in particular regions within the state -- certainly more, I think, than the FCC. And I think they're in a better position to figure out how to allocate dollars most efficiently to solve those gaps.

So I wonder if the New York experiment, although it sort of comes out more or less by accident, winds up being a good model going forward to turn CAF into something like a block grant, where the FCC is administering money to the states and the states are responsible for how to get them to consumers through some type of reverse auction mechanism with FCC oversight to

make sure that the money is being spent efficiently.

MR. BOLEMA: Thank you. Professor Yoo?

MR. YOO: Thank you to Randy for inviting me. As Randy has sometimes commented, I believe he may be the first person who invited me to a D.C. event many, many years ago. And I owe a huge debt of thanks to him.

I also get to give my standard quip right now, which is the fact that my last name begins with Y means that I get to go last. Everyone perceives alphabetical order as being fair and neutral; it just goes to show that every sorting protocol has a systematic bias that affects it in a very particular way.

(Laughter.)

MR. YOO: And it's something that people like me are acutely aware of. So everything, whether it's best efforts or storms -- everything has some predictable effects.

So what's interesting to me is I'll take the time out here to talk about what we didn't talk about. And the funny thing is, I think there's a lot of things that didn't come up that may reflect the fact that we've been fighting these net neutrality issues so long, we tend to

focus on them in ways that don't actually reflect what's going on in the world.

I was talking with Tom Tauke earlier. We both testified at the FCC's en banc hearing in Cambridge following the Comcast BitTorrent matter. That was in February 2008, over 10 years ago, Tom, and so it's been a while we've been at this. And I've been predicting the end of network neutrality longer than I can remember.

I could be accused or described as writing the second article on network neutrality because after Tim Wu, who's credited with coining the term, which is a bit of an overstatement, but he did write the first one in print, they asked me to write a reply to him, and he wrote a response to my reply.

So that was one of the first if not the first academic engagement. So I'll take responsibility for getting the argument started. I will not take responsibility for having it go on as long as it has.

(Laughter.)

MR. YOO: But I worry that our discussions on network neutrality don't reflect the real concerns of the American people right now.

And if you look at what is of most importance to people out there right now is a different set of issues than the one we're talking about right now, and that in fact changes the political calculus in material ways.

Throughout the network neutrality debate, I have told large edge providers that there's nothing magic about being a network versus a service provider, and that in fact if you adopt a certain set of interventionist principles, it's just a matter of time before they'll be applied in different ways.

We see this in the \$2.7 billion proposed fine against Google for its search practices. We see it in their ongoing advertising and Android investigations. And I'll tell you, that's just the tip of the iceberg.

I had the privilege of being a nongovernmental advisor nominated by the Federal Trade Commission last week to the International Competition Network annual meeting in New Delhi. And for those of you who don't know, that is the annual gathering of antitrust enforcement officials where they all get together and they talk about practices.

It was a given in every conversation I had that

they're going after the large edge providers in a big sort of way. And so what struck me is how in some ways there's also opportunities in that.

There's a tendency sometimes when you see someone who you think of as rivals, like network providers think of their channel partners because you need healthy services and devices. But there's a tendency to watch them as you've fought battles and you see the battles involve someone else, to push back from the table and let them twist in the wind, I think there's an opportunity here.

I think that there's a consensus and a chance to work out political deals, and I keep thinking about how, say, the '76 Copyright Act was done. Someone all of a sudden needs something because of a Supreme Court decision, and the dynamics change.

And I hope that we have the sense to try to capitalize, at least explore the opportunities, because I've heard calls for legislation over and over again. And we know how the legislative process works. Unless every major part of the industry supports it, it's much easier to get to "No" than to "Yes."

So the hope is maybe there's some source of engagement here. It's not just this, but the general data protection regulation that is about to go into effect in a month and a half. In Europe, there are a lot of different things on the table. And I think that those kinds of things can be thought of as opportunities as well as costs.

The other thing that's kind of interesting is we've spent a lot of time talking about how to close the digital divide, and we spend most of the time talking about the supply side. And for those of you who don't know, I'm leading an initiative that's called One World Connected that's studying empirically ways to connect more people to the Internet globally.

There are a lot of areas of the U.S. that are underserved, and we're not just talking about Indian reservations, but counties. We're studying western Massachusetts, counties in Arkansas. There are a lot of places that have real challenges.

The two things that struck me about it is how the deployments that are working in a lot of these places that have some problems are very unorthodox. They looked very

different than the ones before. Many of them are fixed wireless deployments, sometimes WISPs where they're using unlicensed spectrum.

But David Cohen mentioned something that we just don't talk about enough at all, which is the demand side. There's a wonderful study done by two FCC staffers and by two people from Connected Nation in Kentucky that polled the one-third of the people who haven't bought broadband, and asked them, "What would it take?" Two-thirds of those people wouldn't take it even if it were free.

That tells you, if you build it, they won't come. It's not about availability -- you can make ubiquitous, cheap networks. There's another side of this policy which we're not discussing at all, and in fact, that's a huge part of the problem that I think we're talking about in a very incomplete way.

So we need to think about this much more flexibly and broadly and start to attend to things beyond what strictly falls in the purview of the FCC, and to start to think about other aspects of the problem.

And the last bit is a cautionary note. And I love the framing that Randy has given this, but I do think

that there's risk in all these words. So the word "gigabit" worries me. There's this whole series of articles coming out of Kansas City in the New York Times: "Now that we have Google fiber, who needs a gig?" And the answer, in every reasoned study I know is, "Nobody."

Now, I know this is not the message from marketers who want to sell equipment and all these different things. But the reality is, in a world where Netflix requires 8 megs for a stream and multi-party Skype conference calling takes 12 megs, you can maybe get to 50. Heroically, a multi-stream house, if you've got the most aggressive consumers, may need 100. A gig is just ridiculous. No one needs a gig.

But we've gotten in the trap of marketing the gig to everybody saying, "Oh, we can do this. We can do that work," it can be done. It's having an effect in the rural communities because when you talked to them about fixed wireless, they say, "Yes, but I can't get a gig." And you have to explain to them, "Well, but you don't need a gig."

But the hype has created a set of expectations. They've written checks we can't cash. And it's limiting the policy space, and it's easy to get caught up in this

in ways that aren't helpful. I have the same fear about 5G.

5G is sold as the next big thing for everything. People I know who are very candid will tell you the business models for 5G are tough. In many ways that's why we need the business flexibility to try to do things in a very different way, and to try to find new deployment models.

A lot of 5G is going to be machine to machine. And because it's machine to machine, a lot of it's going to be business to business. And so this is going to be a very, very different world that we're talking about.

And the reality is, I think Commissioner O'Rielly said it well: We don't know what the deployment model for 5G is. I will tell you in a small market, it is inherently unlikely, or it's going to be under a lot of pressure, for example, to be a rural solution because there's just not enough density to support it.

And so people who herald it as a rural solution, I've seen studies, including a presentation I saw by Milo Medin, who's the head of Google Fiber, who tried to deploy wireless to replace what they're doing. He says it won't

work. Now, that's one study. But it's a person who's highly motivated to try to find solutions, and he's looked at it and he said it's not going to work.

I actually think 5G is probably not going to be a full replacement for 4G in the sense that we're going to have macro cells as well as micro cells. It may not be even consumer-oriented; it may actually be business-oriented and service-oriented. It may be completely different.

But when I went to Mobile World Congress late last month, where everyone was talking about 5G as the next thing, you thought it was going to be like LTE is. And I think creating that set of expectations carries a lot of risks for this industry because if people think it's going to be the next big thing and it ends up being something very different, we may have oversold what we're doing and have to backtrack in ways that are going to hurt us in the policy space.

MR. BOLEMA: Thank you very much.

I'm going to direct questions to each of you. But if anyone would like to chime in afterwards, please do so. I'll start with Professor Lyons.

We've heard quite a bit from the other panels about the whole issue of federal preemption of state laws. Here's someone who's been in the arena and has testified on this. What do you say about the issue?

MR. LYONS: I have testified a few times; I've talked to legislators both in public and in private about what's going on in this space. There's a sense in which the groundswell of support coming up is demanding some type of a response. So there's a sense in which a lot of state legislatures feel like they're not in a position where they can do nothing.

On the other hand, I think the law pretty clearly puts them in a place where they can't do much, if anything at all. One bill came out of California, where they're going to adopt no blocking/no throttling/no paid prioritization, banning zero rating, perhaps. These things are dead on arrival, and I think it's not even a close question.

The Restoring Internet Freedom order is expressive of a language of preemption, and the case law is pretty clear that as long as the agency is on firm ground to preempt, and they are, that the supremacy clause

carries the day.

Is there any daylight at all for agencies to act? I think the difficult question was the one that Seth [Cooper] brought up earlier, which is, if you're looking just at a state executive order regarding the state's own purchasing of service for itself, where it's explicitly inside the market participant carveout of the dormant commerce clause, and it's not in any way attempting to influence third party contracts. It's only dealing with service to the state and not to any third-party entity.

Maybe that survives a dormant commerce clause analysis; I think it's a harder question. But I don't think we've seen that except maybe in the New York executive order, depending on you parse the language. Beyond that, I think almost all of these are, "If you're doing business with the state, then you have to offer net-neutral services to consumers in the state," and I think all of those are clearly preempted.

MR. BOLEMA: Okay. Thank you.

Professor Connolly, you spoke last year at the Free State Foundation conference, and one of your main takeaway points for us was that Chairman Pai is working to

clearly define what the proper regulatory role of the FCC is. A lot has happened in the last year. How is he doing?

MS. CONNOLLY: I've been very happy. This goes not just to Chairman Pai, but it's impressive to have commissioners who are coming into a situation where they are given a lot of flexibility and leeway, and they are saying, "No. It would be better if we had less."

And Commissioner O'Rielly was talking about it significantly, earlier, in terms of making sure that the FCC is not in a position where it's making regulatory grabs from other agencies or other segments of society generally. I think it's also important that we think about the institution within the FCC because truly, historically, we have observed that one person could run the show and make unilateral decisions and just push things through.

And that's not the way an agency should be. It should be an agency with technical expertise and with reasoned thought. So I applaud anyone who has power but who's trying to improve the institution that they're in so that the institution is good and that the institution

survives and leads to positive things, as opposed to just getting an institution to do what they want at that moment.

MR. BOLEMA: Okay. Thank you.

And Professor Yoo, you wrote a paper last year on the financial viability of municipal broadband systems, or lack of financial viability of municipal broadband systems. That's had a great impact on that discussion.

In reaching the digital divide, is there a role for those sort of programs? And also, how is the financial viability of municipal broadband systems affected by the different orders that have been coming down, like the *Restoring Internet Freedom* order?

MR. YOO: So what's interesting to me is we studied municipal fiber. We pulled the audited financial statements of every municipal fiber built in the U.S. because I wanted to see what the data actually said because there's a lot of hype.

For example, by the way, people always talk about Chattanooga. A punchline: They borrowed \$160 million. They make \$400,000 a year. You can do the math. That's a 400-year payback. And that's under the straight numbers,

and in fact, a lot of that's financed by borrowing from their electric power utility, and they had \$111 million in stimulus grants to finance it.

So there's a lot of hype. What I discovered was, first, as a matter of digital divide, of the 20 full case studies we had, 19 were overbuilds. Nineteen of them already had service. So this wasn't about the digital divide; it was about people who were unhappy with the service. There was one city who built new service.

And I can understand why they did that, but I don't think the numbers bear out very well. There are three places you could be. You could be making enough money to cover your capital costs, running in the black, and doing great. You could be running black but not making enough to pay off your capital costs. Or you could be running in the red.

Depending on how you measure it, 60 percent of them were running in the red. So they borrowed money, and they're going further and further into debt every year they operate. These organizations are in deep, deep trouble.

There's another group of about 20-30 percent

which are making money, so they're not shedding red ink but they're not on track to pay back. And there's a handful, like 10 percent or 20 percent, depending on how you measure it, that actually have a shot at breaking even.

And so the takeaway from this is actually that it's possible that it could be done. On the specific question you're asking, there's an interesting paper I saw where they actually looked at the rural numbers for fiber, and this shouldn't come as a surprise: Fiber is a lousy rural technology. The density isn't there; it's just not likely to be there.

What I found most gratifying is the positive response I got was not from the mayors who've already built, but it's from the mayors who hadn't built yet but were feeling irresistible pressure, often from their citizens, but often from their CIOs, who dream of running their own telcos, and they needed something to fight back with.

And to their credit, there are some cities that are fighting it. There's others who did something smart. Madison, Wisconsin, did a pilot instead of going with both

feet. The pilot is failing. And in fact, I got a call from a reporter that asked about it, and I'll tell you right now, the problem is not generally on the cost side.

The costs aren't great, but they manage that. It's on the revenue side because as anyone who's been in this business knows, especially if you're in an overbuilt situation, you're marketing the heck out of these things. You got to come up with a new advertising campaign all the time to chisel someone off who's already got service.

Guess what? Elected officials were not born to do that. They're not trained to do that. It's just not what's in their blood. But they think about operating a network. That's the easy part of being in this business, and they don't realize that.

And they also assume that the incumbent won't drop its price. Well, guess what? If a monopolist faces duopoly competition, any economist will tell you prices are going to go down. They don't take that into account.

A lot of models are oversold. Some of them are not even pro forma financials; they're pure marketing pitch. And they're put into the bond instruments, and

simply put, some of them really have no chance of succeeding at all. So is there room for fiber in rural buildout? No.

The thing that these cities who listen to me say is, "You have to give me an alternative. I have to do something." And that's where the creative search for solutions which go outside the normal way -- and what I'm finding when I talk to my friends at GSMA, you would normally think traditional carriers would be resistant to alternative solutions. They're actually encouraging it now, many of them across the world. Why?

Because if we don't find another solution, many of those providers are going to be under pressure from some authority: "Well, then, you have to solve it for us because you're the traditional carrier of last resort."

And we need good data around this to understand where those creative solutions need to go, but also where we stop and can allow traditional paid services to run where we can actually have sustainable, scalable models in the traditional mode to actually understand how to right-size this limited amount of universal service or other money that we need to do to solve problems which aren't

commercially viable.

MR. BOLEMA: I'll ask one more question and then I'll open it up if anyone else would like to ask a question. I'll direct it to Professor Connolly. At last year's conference you used a term that I hadn't heard before, which is the "waterbed effect."

And you're using that in the context of paid prioritization in particular. And you made a connection there between that and closing the digital divide, or how do we reach these rural areas that we've been talking about today. So can you explain how that works?

MS. CONNOLLY: The concept of the waterbed effect was within the context of no paid prioritization. Essentially, this amounts to a subsidy that is paid to certain types of content providers who want the quality of service but don't want to pay for paid prioritization.

And so if we think about a waterbed, if any of you in the 70s ever went on a waterbed, if you push down on one side, you're saying the price has to be lower here for something. Well, then it's going to go up somewhere else.

And so the idea was that in terms of the digital divide, the *Open Internet Order* of 2015, by creating this inability to charge for something, was inherently pushing up the price of the average service to the average consumer.

To the extent that we think that income is a large component of why people are not adopting, you're going to be exacerbating the digital divide when you have no paid prioritization.

MR. BOLEMA: Okay. Thank you.

MR. YOO: And that's the question I didn't answer for you. What does the *Open Internet Order* affect? That's exactly it. It may be that it raises prices. It may make it nonviable. By reducing the ability to raise revenue, you've raised the break-even number of consumers, you've made it harder for them to be viable, and you'll see fewer areas built out, -it's quite simple.

MR. BOLEMA: Okay. So I have a question over here. Do we have a microphone? If you could identify yourself and then ask your question.

QUESTION: Thank you. Brooks Harlow. I'm an attorney. This is for Professor Yoo, and it's kind of

more of a statement. But feel free to give me some feedback.

When you commented nobody needs one gig, I think back 20 years ago. I represented a Canadian telephone company, and we had dinner with them up in Alberta, so you might guess who it is. And they told me at that time the Canadian government had set the standard for Internet at 10 megs. And our jaws just dropped. We go, "What in the world are you going to do with 10 megs?" And we were living in the world of about a thousand dollars a month for a T1 line, which is a meg and a half. We had no idea what was coming.

So you might think ahead a little bit more. One gig, I don't know what we're going to use it for, but if somebody invents 3D television tomorrow, we might need a gig. So we just don't know what's coming, and I think it's good sometimes to future-proof your network and setting the sights a little higher than you think you really need sometimes helps you with that.

MR. YOO: There's a huge risk in it, and I'll give you two specific examples. One is in the late 90s, if my colleague, my friends at Verizon will forgive me,

Verizon did the first big fiber build. And they built about 18 million homes at the cost of what was originally supposed to be \$24 billion, and AT&T chose to do another round of VDSL, a similar number of homes, \$7 billion, less than third.

And the first thing that happened to Verizon is their bond rating agencies cut their bond rating. So now their cost of debt capital has gone up and the second thing that happened is they cut their stock price, so their cost of equity capital goes up. And that's not just on that venture; it's on every venture they do before.

They borrowed the money up front and they're paying interest on it from day zero. And now it's a race. If the revenue is coming fast, this is a great investment. If the revenue's coming slowly, this is a terrible investment. You could postpone it and instead invest it someplace else productively and make it work.

Now, to their credit, with LTE, AT&T did the same bet the other way and they succeeded. But these were real companies putting real investments on the table and taking their chances. So I give them all the credit in the world in investing in infrastructure.

That said, anyone who does this business knows that you can be so enamored of future-proofing the world that you end up losing your shirt because if you don't match the revenues with the costs, the numbers just don't lie. You will end up doing bad financially.

The other thing I hear -- we do have 3D TV. Remember? It existed and it failed. People aren't broadcasting it any more. Everyone's talking about 4K. I don't get it. We'll see. But there are many things that I don't get -- I never thought we'd look at video on a phone this size, either, but I was wrong about that. So we're not smart enough to figure this out.

The other example I'll give you is Japan. Japan, for reasons that are not great, has a great fiber network. Why? Because the Japanese government still owns one-third of their shares. They made them build it. All the private shareholders complained. They have separate financials. The private shareholders were right. They're never going to make money on it.

That said, it's built. Do they have those great apps? The chicken and the egg problem, classic problem. They have the chicken. There is no egg. There may be

someday, but not now. And so as it is, they've put billions of dollars in investment in a world where, certainly in Japan, they have huge infrastructure needs, and they're not available.

Anyone in the business knows, if I have to make an investment, if I can postpone it for three years, five years, I can make my business better and I can serve consumers better and hope to close that digital divide in different ways.

MR. LYONS: The last case I was on as a lawyer was Montana Power's bankruptcy. Montana Power was a sturdy old utility, upper Montana, and they decided they were going to take part in the big broadband buildout in the 90s. Laid dark fiber all over Montana, and then declared bankruptcy because they weren't making any money on it. Disaster for the folks in Montana.

MR. BOLEMA: Well, we're a bit over time here. So I'll apologize and say let's wind it up here. Thank you, everyone, for coming today, and thank you to our panel. I believe Randy has a few more words.

(Applause)

MR. MAY: Well, thanks to our panel again. A

true group of all-stars. I could have stuck with that title "if only I were chairman of the FCC" because we have some worthy candidates here. Thanks to Ted for moderating that.

So we're going to close now. I think it's always good to close with a discussion of waterbeds each year.

(Laughter.)

MR. MAY: And chicken and eggs -- I mean, that gives us something to think about and anticipate as we look towards next year's conference.

I want to thank all of you for being here. I just think it's been a terrific conference for our tenth annual conference. Each year I wonder whether we'll be able to top it again next year, but this has been a good one. And I especially want to thank our friends from C-SPAN for being here and covering the conference today. We appreciate that.

So with that, we'll close out the conference, and I'll say I'll see you again next year. Thank you.

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