of spectrum users in the bands below 512 beginning in 1991 with the refarming issue. They started out with very aggressive deadlines at which all new systems had to achieve certain spectral efficiency standards and then after a certain amount of time existing system. They gave up on that and went to this market based approach that I hear expounded so freely here today. And it doesn't work.

With respect to governmental entities, when you go into your budget director, if you say I need to buy more spectral efficient equipment to improve operations, he'll say what are you using now? Keep using it.

If you say the FCC passed a rule and by 2012 I have to have this, then you get the money allocated in the budget. So I'd just like to throw that out.

MS. FARQUHAR: Let me go back to my original question with respect to the lack of clarity or definition in the rules themselves, if that's the issue or is the lack of enforcement perhaps by the FCC with respect to enforcing such rules that exist right now? Which is it, I guess, is part of the question. And let me ask a side or secondary question with respect to can the spectrum

users or licensees themselves even in an unlicensed environment do more to enforce these rules or administer these rules and are there models out there right now where that's going on.

Let me ask Steve Stroh that question in particular. How are the etiquettes working in the unlicensed community and what lack of definition might there be right now? Or is there, do you believe a lack of definition?

MR. STROH: The etiquettes, such as they are, work very well. It's basically does it function or not?

I'd like to touch on one point. The gentleman from Ager said that everything would be great if everybody would adopt the 802.11 standard. And that guts out the most innovative part of the license exempt spectrum that different technologies can compete on an equal basis, and whichever one is more applicable to the use is better.

802.11(b) is a wonderful standard for internal local area networks. It's a lousy standard for wide area networks. There are many other systems for example, the frequency hopping spread spectrum that's used by a number of vendors. OFDM is another one. All of those uses are

evolving in 2.4 already. They're being used. They are in daily use. The market is sorting out or is performing the function of an etiquette that if it works, they use it. If it doesn't work, they stop using it and go buy a different set of technologies or a different set from a different vender, change their operations. So it is working.

MS. FARQUHAR: Larry, can you answer that question from the perspective of the public safety community and others -- the product licensing realm in particular the private wireless realm. They have to do a lot of self policing. Does that work as a model or not as much when you have shared environments?

MR. MILLER: Well, self-policing works well. Unfortunately, it's a lot more personality dominated than technology. We have cases all over the country where if you have counties where the sheriffs like each other, they can sheriff. They don't, seriously, they don't.

MR. HAZLETT: Can you give us a map of which county is which?

(Laughter.)

Which ones to stay out of?

MR. MILLER: Actually, it isn't quite

that easy. So essentially, we try to look at it as we assign, as we recommend frequencies for licensees we try to do them on a technical basis. And that works pretty good, 85, 90 percent of the time. But there are times when things we think we won't work do and things we think will work won't, simply based on the incompabilities of the personalities involved.

MS. FARQUHAR: Let me see if there are questions from the audience.

David Reed?

MR. REED: Just a quick comment because it was mentioned before by Martin and sort of is implicit in the question you asked Steve. I've been personally tracking down and researching every story I've seen about 802.11 congestion. These so-called pileups and I'm convinced, based on that research, that most of those stories are of the hypothetical nature that various people who have no experience in the field are positing that this will happen.

In very, very high density areas it's possible to have a problem briefly. You discover that two radios next to each other are tuned to the same channel. But the nature of that particular

technology, which is not the same as a wide area network technology is that you can resolve that very quickly because it's not very far away whatever interferer there is, whether it's a microwave oven or whatever. And certainly we don't need the FCC or even a micro market to solve that problem -- a market infrequency. We just need people to either spend a little bit more money or spend some time, which is a lot more effective way to do that.

I would be very interested and I'm really honest about this, I'd collect anything that would demonstrate that so-called meltdown that's talked about in the press. But I'm afraid actually that that's another example in the way public policy debates are carried out which is that people can claim they're something without somebody proving the negative. That doesn't happen. So I wouldn't make any policy based on the stories we heard in the press about meltdowns in unlicensed spectrum.

MR. LONGMAN: Wayne Longman, spectrum user of unlicensed devices. Well, if there's not a problem in the meltdown, why not issue licenses to the manufacturers? On the rare events there are

problems, we have someone to take responsibility for them. Thank you.

MR. WYE: That actually reminds me of something that came up a while back when we were talking about part of the problem in the unlicensed maybe is that they're kind of different competing uses. You know, not just 802.11 but there's cordless phones, there's baby monitors, and there's this, that and the other thing. It kind of generated a question in my mind which is well, does that mean that we need to have separate unlicensed band for different kinds of services? And I thought, okay we're starting to move back towards a license system. And I think this maybe goes back to Wayne's point and my memory is a little foggy on this since I left the Bureau. But we also I think had this thing in part 90 called license by rule where there is a rule part that governs some of the stuff. But each individual, you know, device is not necessary licensed and there is not a central controlling party.

Like in my case, my company kind of controls that spectrum through our bay stations, if you will. So this is a question maybe for the rest of the panel. You know, it says Part 90 and

license by rule get to what Wayne was just saying. Is that another element of the models that we need to be considering?

MR. HAZLETT: Yes. The suggestion is an excellent one and the question. This is exactly what would, of course, spontaneously emerge if a cheap spectrum policy were pursued and something like overlay rights, the Pressler plan or some other rendition were to be instituted, you would have, in fact, the Microsofts, the Intels, the Ciscos, your manufacturers, smaller, larger, all sizes. Actually, looking at this you would also have consortia develop in addition to manufacturer groups.

You could well, and again in a cheap spectrum environment, because lots of rights, lots of flexibility, lots of competition, you would, in fact, get that kind of entry, that kind of coordination, that kind of competition and experimentation between rival approaches to optimizing any particular band.

MR. CALABRESE: If there is a meltdown with unlicensed, it will only be because of failure of policy and I think that's true for a couple of different reasons. One is, you know, the whole

idea of the tragedy of the commons is a misnomer. It's what you -- there's many successful commons including the internet, but what there is sometimes is a tragedy of unregulated access. In other words, where there are not some rules promulgated such as the open internet protocols that David Reed helped develop for the internet that will kind of help self-regulate within the commons. So we may need those kinds of rules Jennifer mentioned, for example.

Many of the commenters suggested that for this channelized WiFi technology, we may need a new park that's dedicated for wireless broadband networking and that's fine. But the second is, you know, fallacy about it, you know, I think is also have this other technology that's coming on with cognitive radio and dynamic sharing, which means that if there really is, you know even if we open up a new park for today's technology and then that gets "congested", even despite protocols and etiquettes, then eventually what we should do is put out many more underlay rights for the new cognitive radio and ultra-wide band sort of technologies that can dynamically share.

And the first place we ought to look to

do that is the broadcast bands, you know, is to open that up to these new technologies as they come along to fill that white space.

As David made a point earlier that even though you might see congestion on the AD 3.5 megahertz and the ISM band, if you opened up these other huge parts of the spectrum that are just lying fallow to smart radio devices that can find the openings, that can fill the white space, there's almost no chance that there would be congestion.

MR. FURTH: Let me ask a question though going back to Michele's original question, I guess, about interference rights. But specifically focusing on the licensed model, because presumably when you're dealing with unlicensed spectrum you don't need to define interference because everybody has to accept it, whatever it is. But in the licensed model, there's been a lot of talk in prior panels about this concept that you were talking about that, first of all, interference rights aren't well defined and that one of the things this leads kind of fuzzy is the ability of these opportunistic technologies to hop in and out of licensed spectrum.

I guess I want to put that question out. Is it really a question of the rights not being well defined so that it is simply a question of writing a clearer rule? Or is it that they are well defined but they put the rights in the wrong place so that those technologies are blocked? And if you want to allow or encourage that type of opportunistic technology to flourish in licensed bands, what's the rule that you write in order to make that happen?

MR. KURTIS: Again, from my myopic point of view, I think the Commission got it right on cellular when they said users of adjacent spectrum and the same frequency band coordinate the usage and do it in a way and expand their systems so that they don't block the growth of the neighbor. I think one of the unfortunate oversights in PCS is that they did not keep the requirement that you coordinate in the same frequency band with your adjacent neighbor. And as a result I know from the rural carrier, we're having a lot more problems of interference cropping up unknown, unexpected overnight having to go down and hunt it down as opposed to a cellular model where there's an advance coordination process

that's supposed to take place. The carriers that honor that to my knowledge, the FCC has had very few interference cases come to them from adjacent CMRS operators.

MR. HAZLETT: Well, I'm not a lawyer but I play one on TV, so let me say that the rights as far as the market place are concerned, the rights are not well defined at all. If you want to take it from the legal standpoint, the rights are very well defined. The FCC regulates all the rights. Nobody owns the spectrum, and you have to come to the FCC for permission for any reallocation. So that's what fuzzes this all up. I mean to refer to exclusive use spectrum under today's regulatory model, there are examples where there's more flexibility than in others, PCS, for example, versus cellular or broadcasting.

But the current model, of course, does not have full flexibility, and so when you introduce a new technology on top of the, and I almost said obsolete technologies, let's call them existing technologies, like software-defined radio and you want to hop from one band to another, well obviously you're going to run in, frontally, run into the block allocation system because you can't

allocate around that without stopping at the FCC for 10 or 20 years each hop. Now that's probably too costly and prohibitive, and that's why don't see it in the marketplace.

Now to say then that the FCC solution is to override, decentralize decision making amongst all the different bands and then to impose that kind of shared usage is to make exactly the same mistake with a new technology. What you want to do is decentralize all that decision making, hand the rights to existing or new players that can, in fact, then in a flexible environment invite in on a negotiated basis all that kind of new traffic and then make those delicate trade-offs between some new system of software-defined radio, in some perhaps ultra-wide band tradition or whatever the trade-offs are in addition to you know standard commercial technologies being used today on a decentralized and competitive basis to hit the optimum, not to try to centrally plan this outcome.

MR. GATTUSO: I'd like to try to disagree with Tom, although really I'm going to make a different point but it was fun to say that I was going to disagree.

(Laughter.)

But something that Tom say triggered that which is I think Tom you said that at some point the rights are established, the FCC holds the right. But I think in another sense there's something very fundamental that at least when I was listening to the interference panel seemed very unsettled. And that is what exactly does an FCC license grant the licensee? And it seems like there's two possibilities and both have been in effect. One is the right to transmit in a certain area of certain power. We have possible parameters. Is it the right to transmit or is it the right to provide a service or a right to be free from interference?

And, of course, the second question raises all those issues about well how do you measure interference and how much does interference have to do with the receiver and it's been proposed even that you could define a right as the right to transmit with a cheap receiver and then take it from there. But it seems to me that that essential dichotomy exists in all sorts of situations and it's the basis for a lot of the spectrum questions that are pending.

I think the 800 megahertz issues that

we've heard discussed and those say well, one person said I have the right to do this. I have the right to send out the power. The other person might say not only can I send out the power, but you can't interfere with me. And then there's no clear direction, there's no clear answer and I think the Commission is left having to sort these out time after time.

MR. FURTH: I think one clarification in that is, you know, at least in the statute it's harmful interference. So what the license gives you is the right to provide, license to provide a service and to be free from harmful interference. And so if in moving toward flexibility we eliminate the service portion, I'm wondering in some ways to throw this up because I'm the lawyer, not the engineer, so I really don't know the answer. But I'm wondering if we can't just define this bundle of license rights primarily with respect you know, you obviously have things like know what frequency what you're talking about in the geographic scope, but if we can't define the license primarily with respect to the interference that you're protected from and then that's the license which means that all other users who can share that band without

harmfully interfering with you are -- as Tom was suggesting are invited in because there seems to be no reason given when you go back to the sort of the legal and constitutional values that underpin the Communications Act, there's no reason to squelch communication, particularly among citizens who are using these smart radios on a peer-to-peer basis if there's no harmful interference. And I think that definition of harmful not only has to be found,but then has to evolve over time with technology.

We need to actually move on here because we're running short on time and we've got a lot of ground to cover. I think we could inevitably discuss this for the rest of the day and a long time to come. But I would like to move on a little bit to talk about a couple things in prior discussion and in the comments the sort of uses of spectrum that people have tended to talk about as perhaps being exceptions to whatever general model or models we might want to apply, for example, to commercial uses of spectrum.

One of these is obviously public safety uses. And I'd also like to have an opportunity for the panel to come back to the question that I know Dave Siddal raised this morning and Michael has talked

about here which is the issue of whether we should have different regimes for rural spectrum versus urban spectrum or perhaps more accurately spectrum that is more congested and less congested since in rural areas clearly you do not have a congestion problem.

So I'd like to talk first about public safety and maybe come back to what Martin talked about initially which is a distinction that was made in your report between commercial uses of spectrum and sort of public uses of spectrum that would have to be approached under a different model and ask you to talk about that a little. And then ask the panel to perhaps address whether we'd need to sort of single out public safety and those types of uses and apply different model and if so what would it be.

DR. CAVE: It is certainly true as I indicated in the outset that the report which I wrote identified in essence two regimes with some kind of linking condition created by the opportunity of public service spectrum uses leasing over the boundary. I guess the reason as I've indicated that was incorporated was that I just didn't feel that we were ready yet to move to a

regime in which there was wholesale competition. But that's certainly the regime that I hope we will move to over a period of 5 or 10 or 15 years.

I was discussing this yesterday with another bunch of people here in the FCC and somebody suggested that in proposing this that I was rather like Gorbachev in trying to reform the Soviet economy. This halfway house was a measure that would inevitably fail and that some radical person like Tommy here for example will come in and elbow the proposal out of the way with a more radical approach. But as far as I'm concerned, as far as Europe is concerned, my estimation of the possibilities there, it's just not practical to move to a system where there isn't some kind of reservation of spectrum for public purposes.

But that, as I've indicated, should be accompanied by some kind of incentive for economy and its use so you don't get the problem which we have in our Ministry of Defense, for example, were inquiries reveal that they don't even know whether they're using the spectrum that they've got or indeed probably don't even know what they've been allocated. And that kind of situation is very serious.

MR. HAZLETT: Yes. Just on that point, was there any consideration of an approach within the set aside approach, so you have some allocations for public safety, but you go from there not to sort of the current top down regime but you have, in essence, requests for proposals and competitive bidding by private or public organizations to, in fact, provide those services and you know make bids for use of the spectrum at the same time. This would get to finding the spectrum that's not being used, getting much better public safety communications system and introducing competition. You know, it's government contracting is what it's is. Was there any consideration of that?

DR. CAVE: We already have some of that and it might be useful just to describe the arrangements we have in the U.K. for the provision of communications services for the emergency services. The U.K. government has let a contract to an operator and assigned the spectrum that it considers is necessary to provide that service. And that service is then provided uniformally to our fire, police, and ambulance services. So we have to some extent taken on board the notion of

outsourcing communication services. But it's been done in a way that has involved really vertical integration between the service provider and the band manager of the spectrum. And clearly those two functions could actually be separated. You could have an emergency services spectrum band manager which would then treat with various emergency services in order to provide whatever their needs were. I think that might be quite a useful halfway house, as Tom has suggested.

MR. FURTH: Then maybe I should put the question more generally to the panel is this halfway house approach or some kind of halfway house approach for public safety something that's appropriate for us to consider?

Larry, do you want to talk about it?

MR. MILLER: I think it is and I'd like to point out something. The Nevada Department of Transportation, about eight years ago, decided they want to be able aid statewide trunk 800 megahertz system, but they didn't have the financial resources to do it. So the manager there very innovatively contacted some county agencies, the Federal Energy Commission and several other governmental entities. They formed a partnership

with -- utilities also, the telephone company and the electric company there in Nevada.

They had to go through the waiver process with the FCC and a lot of other administrative applications and requests. But they were able to get away where they build a system that they use that's shared by utilities, it's shared by federal agencies, by the UNLV. I think there's about a dozen diverse governmental entities using this shared system and what it did it resulted in an economy of scale where they can share the cost of the hill tops by their subscriber units. So it worked out real well.

I think that's an approach that a lot of states are looking toward now. Homeland security is a big item now and I'm working on that application right now for the State of South Dakota where they're doing the same. They're building a state-wide combined shipment which requires waivers, it requires industrial radio service frequencies and land transportation, etcetera, just to get enough spectrum to meet the technical requirements to make the trunking system work.

So I think there is some options. Block allocations are good for certain things, but

when you get to a large, wide geographic area, usually you have to go outside the block to get the sufficient amount of spectrum. So I think that is something we should look at, is innovative approaches towards licensing these public safety systems.

MR. FURTH: Other comments?

MR. WYE: I never want to make the public safety community mad at me, so without getting to whether or not there needs to be set aside spectrum or whatever you want to call it, I think there is at least two issues I would mention. One is that there's a perception problem here. Having talked about this with some folks over the last couple days, not just in my company but other places, people keep saying you know, they have to buy police cars. They have to buy fire trucks. They have to buy the gas that powers those vehicles.

I don't understand, my wife said that, I don't understand why they don't have to buy the fuel that powers the radios. And so whether or not you agree or disagree is something that must be set aside. There's at least a perception problem that there is some kind of a disparity here that I don't

think anybody disagrees that public safety is a vitally important part of this nation. Certainly the services that we all want -- I want the police to show up at my house if I have a burglar or if there's a fire, I want the fire engine to show up. But there's an issue there were some people just kind of scratch their head and I just don't get it.

Secondly, just to return to I think the point Professor Cave made which is probably the most important one and we've seen this in the 800 megahertz proceeding that's going on now, is that regardless kind of what else is going on, there have to be some mechanisms in place to improve the efficiency of the radios and the equipment that the public safety community is using. We've run into problems time and time again, and now I'm kind of speaking in my past life when I worked for Michele and the Bureau where I kind of did some public safety stuff for awhile.

We run into this problem time and time again where the equipment is old. It's antiquated. It's extremely inefficient and the problem largely has been funding. I think we all recognize that and certainly the budget cycles are weird and I

appreciate Larry's comment which we heard before which is I can't just run into my city manager every five minutes and say I need to buy new radios. But when the FCC tells me I have to, then I have a reason to come up with. So two things. Perception problem and how do we improve the efficiencies of the public safety radios.

MR. FURTH: Joe?

MR. GATTUSO: I think it's important to recognize that public safety spectrum users really are a public service or non-profit. Obviously, I'm thinking about the federal government incumbents. The operation, the incentives, everything about a nonprofit or noncommercial service affects the incentives, effects their operation and one cannot blindly apply a solution that works in the commercial context to the noncommercial context, because if you do that you will very quickly see the disparities. Certainly, we see this a lot when evaluating the relative value of a federal government or public safety user spectrum versus another and it wouldn't be fair to say, for example, well, you haven't brought in $300 million this year. Obviously, you're not important.

There are other measures that may or

may not be measurable. They might not be quantifiable. And yet, fundamentally we do have to look at efficiency. We do have to look at incentives. And certainly, in a discussion such as this with respects to rights, remember that rights can work both ways. That one type of right that doesn't seem to be clearly defined is what rights do incumbent noncommercial operators have today and, in fact, how could you use the existing rights to encourage those operators to be more efficient?

I think it's important that we break out of the us versus them dichotomy and just a matter of breaking down which spectrum blocks we're going after to how can you change, how can you use the different incentives that these operators have to end up with more efficiency.

MR. FURTH: How would you change those rules? If you could make that decision, how would you do it?

MR. GATTUSO: One thing would be to at least explore, and I think the answers are not clear, explore how you can define the rights that are held by the noncommercial operator and then see how you might give the incentives for that operator to use those rights or to give away those rights or

to know that if the party needed spectrum in the future, that those rights could be acquired through a mechanism other than having to go through a long politicized process.

MR. FURTH: Jennifer.

MS. WARREN: Just a slight variant. I guess public safety clearly, at least in my mind, should not have to -- should be viewed as a public service and not be treated as other licensed services for purposes of access and spectrum. I think even among what I would call nonpublic safety licensed services that they can't be expected to compete with each other either for access to spectrum, whether it's the BLIT licensees and the CMRS. There's no ability

-- it's apples and oranges. It's not apples and apples.

So when you're looking at licensing regimes, you've got to distinguish between the types of users because otherwise you're going to have a very distorted outcome with perhaps those who can pay the most but not necessarily those who will put it a use that's a very valid use.

And then obviously, there's the satellite spectrum which is separate and apart,