NH COMMISSION TO STUDY THE ENVIRONMENTAL AND HEALTH EFFECTS OF EVOLVING 5G TECHNOLOGY

Meeting held:
12/13/19
8:30-10:35am
LOB 202

Meeting called to order by Rep Abrami at 8:30 am.

In attendance: (10)
Rep. Patrick Abrami-speaker of the house appointee
Rep. Ken Wells- speaker of the house appointee
Kent Chamberlin-UNH-appointed by the chancellor
Denise Ricciardi-public-appointed by the governor
Michele Roberge-DHHS- Commissioner of DHHS appointee
Dr. Paul Heroux- Professor of Toxicology, McGill University- speaker of the house appointee
Rep. Gary Woods-speaker of the house appointee
Senator Jim Gray-president of the senate appointee
Carol Miller-NH Business & Economic Affairs Dept.
Senator Tom Sherman-president of the senate appointee

Not present: (4)
Frank MacMillan, Jr. MD-NH Medical Society Environmental Medicine
David Juvet-Business and Industry Association
Bethanne Cooley-CTIA , trade association for wireless industry and manufacturers
Brandon Garod-AG designee, Asst. AG Consumer Protection

Agenda:

I. Approval of minutes from 11-21-19:
Minutes were approved.

II. General Discussion:

Abrami: Recommendations will be based on general consensus.
Minority reports can be written by anyone if there is disagreement.
Focus: things that we can do as a state: from as simple as warnings…to ordinances.
There are things going on in our state right now. Dr. Sherman and I are cosponsors in smart meter bill allowing opt out without having to pay a fee to do so.

A. The electromagnetic spectrum discussion on terms such as: frequency, wave length, photon, electron volts, etc. and comparison from radio to Gamma. Frequency is the inverse of wave length.

B. Energy. Radio waves are the lowest electron volts. Gamma Rays are highest at 1.24MeV.Where is the break point? None of this is linear. Science says ionizing radiation which expels electrons from atoms or molecules, doesn't happen until UV rays. However, we have learned that it's actually doing damage below that. The question is: Is the science still out on damage beyond "heat", which is the FCC's standard? It seemed from one presentation that they looked at papers beyond heat so we still want the FCC to talk with us. I will see what we can do.

Sherman: We may be able to inspire them with a nudge from one of our Senators. I would be happy to do that.

Abrami: Kent, I took this from your presentation!

B. Photons: EMR can be represented by discrete packets of energy called Photons.

1. Increasing transmission power will increase the number of photons (although the energy in each photon remains constant).
2. The energy in each photon is proportional to the frequency of the transmission.
3. If the photon energy is great enough to detach electrons from atoms and molecules, it is referred to as ionizing radiation.
4. All the charts that I look at say that happens at UV level.

Wells: When you are ionizing radiation and you remove an electron, you are breaking a chemical bond but you can break a chemical bond at much lower energies. That's why we can see. This is also why humans can photo-synthesize vitamin D. They do it at energies much lower than UV.

Woods: Along those lines, we have to remember, and this is important. This is isolated episodes. However, biological systems work collectively. They diffuse their base energy around parts of a molecule. There is thermal activity already and sometimes can cause a disruption of a bond without anything occurring from anything external. We have to remember that these are terms that we are learning but they are for isolated singular entities. Some electrons are shared by biological systems and are a very different process. We have to go from a single item to a collective and that's a big jump. These are some of the experiments that Dr. Heroux is working with that tries to address that biologic collective entity.

Sherman: One factor…..Transmission power: If I remember correctly, people in industry were saying that each tower would be lower in power because there would be so many, is that correct? My question is: if you increase power, there are more photons but the energy in the photon is proportional to the frequency. So when you increase frequency to 5G but decrease transmission

power, you will have fewer photons but they will each be higher energy. What does that mean to us on the receiving end?

Wells: And the antenna is closer. As 5G single transmitter power density goes down but the number of them is much larger and they are much closer. It's like little Christmas tree lights around the room instead of just one bright one.

Sherman: Does that mean that the total amount of exposure will go up?

Wells: Yes.

Sherman: Because of the proximity of the antenna?

Wells: Yes.

Sherman: even though the power is down?

Wells: Yes.

Sherman: The photons will have more potency and you are closer to them.

Wells: They will have larger numbers. The total power of a 5G system has five orders of magnitude which is 100,000 times more intense than a 4G system!

Abrami: This is something we have to focus on. Kent, do you have something to add to that?

Chamberlin: No. I agree with what's being said.

Heroux: Basically with the beam forming you tend increase the directionality. It's more focused. With the old systems, they broadcast to a very wide area. So it's true that the new system 5G will be less power input into the antenna. But the beams will be much more focused and the cellphone will also have the ability. You are talking about very narrow beams that will be directed to you when you use the system so that means increased levels of radiation because of this concentration. The antenna is spending less power because it is not broadcasting everywhere.

Sherman: You just said something that I don't' think I put this together until now. When the cellphone is 5G capable, is the antenna putting out the same level of radiation?

Heroux: It's going to put out the same type of radiation. They are miniaturized antenna in a chip that is implanted inside the phone which you will hold so you will direct the beam to wherever it wants. You will have a more concentrated energy coming from your phone. The radiation pattern will be fundamentally different.

Sherman: So will it be 5G level radiation be coming out of your phone?

Heroux: Yes.

Abrami: Ken wants to talk about antennas after we get through this.

C. Specific Absorption Rate: power absorbed by mass of tissue=energy is absorbed by the human body when exposed to RF/EM field=Watts/kilogram. US cell phone standard is: 1.6Watts/kilogram or less.
D. IEEE/ICNIRP 209 standards are still the same basically what the FCC uses.

Dr. Swanson said that the FCC reviews biological standards as well, not just heat. We really need to speak with FCC on this.

Chamberlin: I thought my question to Dr. Swanson was pretty direct. I asked him which of the two approaches setting standards, did they use. One he described was on animal studies exposed to increasing radiation until their behavior changed, divide that by fifty and you come up with a standard. That was one way. He also said they relied on publications written but he didn't say which did they use? He said both but I don't feel like I got my question answered. If it's the behavior in animals, then that is a short term phenomena and does not address the concerns that we are looking at in this commission where people are going to be bathed in electromagnetic radiation 24x7. I am really unhappy with where we are, with finding out that piece of information.

Abrami: Dr. Heroux, I know you went back and forth with him on this and you were involved.

Heroux: Yes. The FCC cannot try to implement a national standard for radiation without claiming it is taking everything into account. Yet, they don't have biologists on their staff. They have a tradition of being a spectrum allocating agency which is very important for coordination in the country but they are not biologists. A better body to ask is the IEEE. Again, the IEEE is heavily influenced by engineering tradition and I would reinforce the argument of Dr. Woods. All of these things about physics are entirely true and entirely valid. What what we cannot forget are that biological systems, the fact that we think and we act are processes. These processes involve manipulations of electrical charges in our body. These processes fundamentally move electricity around in our body. Those are unstable processes that can be influenced by vanishingly small amounts of energy. Energy is an immensely valuable concept. But the complexities of biology have been underestimated by engineers eager to serve the public with applications and by the FCC eager to serve commerce.

Roberge: I asked Dr. Swanson a question related to the FCC standard as well. I thought I remembered a conversation about the standard being focused strictly on heating rather than other biological effects. That was my question with him, to understand are they strictly looking at effects of heat or are they looking at other biological effects? I am not clear on his answer. I am not clear if the standard evaluated other studies or just heat. I also thought it has been awhile since they set the standard.

Chamberlin: I would like to interpret what I heard him say. As long as you are below UV Ionizing radiation, the only factor is heating. There is a question about how much heating you can tolerate. That has been the industry mantra on radiation exposure for as long as I have been in the field. I believe that is what they are using as the criteria.

Abrami: That standard hasn't changed much over time, is my understanding.

Sherman: I apologize. I could not be here for that meeting. We are talking about human health effects. This bathing 24x7 is not just on the human environment. It's on the entire environment. Do any of you know if there are any studies on plants or animals and others exposed to this?

Chamberlin: Yes. There is a study that shows that tree and plant health near cell towers is degraded considerably. I have a paper that says that.

Ricciardi: There are many studies and a big study on the damage to bees. I did ask Dr. Swanson because he dismissed the fact that it harms bees. So I handed him the study. It has a huge impact on the environment.

Abrami: Let's pause on that one. There was a study done on bees using twelve hives. Half of the hives, they put cellphones in and in all six, they did not come back to the hive. They got confused and you wonder …why is that? It must have to do with their navigational system. I always thought they had sensors that pick up the Earth's magnetic field. All of a sudden we are going to cloud the Earth's natural magnetic field with man-made different frequencies.

Ricciardi: This one is the exposure of insects to radiofrequency electromagnetic fields from (2-120Ghz), published in Scientific Reports which is the first study to investigate into how insects including the Western Honey bee absorb the higher frequencies to be used in 4 and 5G. The simulation showed increases in absorbed power from 3% to 370% when insects were exposed. This could lead to changes in insect's behavior, physiology and morphology, over time. I did ask Dr. Swanson, can you confirm that these frequencies are safe for pollinators and what credentials he had to speak to this? I don't feel my question was answered at all.

Abrami: This is one I feel we need to follow up on. I found studies on bees at low levels that impacted the number of queen bees produced by 40% something like that, which is significant. Bees are our health, food, etc. It's navigation, which can also be biological. I don't want any of us to sound like alarmists. We want the facts to come out and we want to understand this. But on my list, I think bees and probably migrating birds as well are important.

Wells: there has been a lot of work on homing pigeons, migrating birds and bees. They also use iron to determine which orientation the EM field is. The effect is if you hit the frequency that will make that move, you will make that sense blurry or obliterate the usefulness. There haven't been a lot of studies determining what those frequencies are. However, if you confound the major pollinators, that puts all of plant life in jeopardy.

Abrami: yes…that's oxygen and food.

Woods: It's important for us to ferret out in these studies which include 5G because our charge is 5G. We know that that the photon energy is different. The comment that I heard him say was, how many G's do you need to study? We need to study 5G. As we go through this, we need to make sure studies include 5G. The energy is definitely different and we talked about that. Some of the studies do not include 5G.

Ricciardi: There is a recent study this year on 5G in France and Netherlands. They meaured the RF from small cells increased radio emissions from the base stations while decreasing the radio emission from the user. They found that in the area human sickness is well documented and has increased since it's been installed. This is all involuntary exposure hanging in front of people's homes. With your phones, you have the choice to turn off or not own. I have issues about choice and it's a privacy thing, too.

Abrami: The 1/R2 rule. Meaning the further away you are is a physics principle we need to talk about too.

Issues:

- Biological effects of non-ionizing radiation.
- We need to make sure these studies are not flawed.
- We need to find studies that are replicated.
- We need to understand the FCC approach to standard setting. Are biological effects included or not?
- Impact on navigation of bees, birds and other living things such as interference with Earth's magnetic field used for guidance (non-biological).
- Energy level from cell towers and small cells based upon distance. What other factors?
- Legislative activity, ordinances and the courts around the country and the world.
- RF Communication security. It's scary what's going on in China. Facial recognition, etc. Pretty soon you won't need any devices.
- Insurance Issues: why is it insurance companies won't insure this stuff?
- Smart meters on homes.
- Precautionary Principle. Dr. Sherman, I know you think this should apply here.
- Final report will have recommendations for future legislation or public health warnings based upon solid facts. We will come to a consensus. Anybody can write a minority report on any part they disagree with.

Sherman: One thing to consider is looking at all this frequency and power. Are we already beyond the safe level? Is 4G not safe? Is what's out there now unsafe even before 5G?

Abrami: well, we are not going to take people's cell phones. That's not going to happen. To industry, it means money. There are not definitive studies on 5G that there are not health effects. I asked Swanson that. Where are the studies that say 5G is going to be safe? Show us the definitive studies.

Ricciardi: I asked him, are you saying that 4 and 5G are not harmful? He said yes. To Dr. Sherman's comment about already being dangerous, your cell phones already have warnings buried in your phone to not put them close to your head or ear. People really don't know that. It is dangerous. We aren't going to get rid of phones. One solution we may want to consider a right to know law at the point of sale because people will still buy them but they may use them more carefully, just like cigarettes are still sold with a warning.

Sherman: That's my point. If this commission finds out that maybe we have crossed that threshold into what may be dangerous, I think transparency in sharing that knowledge is important. Also with 5G, one of the concerns is everyone will be exposed whether you own a phone or not. Are we already at that point with 4g whether you own a phone or not and is that exposure potentially toxic? That is something where we can at least raise the question.

Ricciardi: Very good.

Heroux: I have a number of comments. I have been in this business for a long time and I want to emphasize the importance of what has happening here and the influence that you are going to have. You are not the FCC. You are not the IEEE. You are not the Chinese government. But, you are a public body that has NO conflict of interest. You can claim that engineers have a conflict of interest because they are pushing products. You can claim that the FCC has a conflict of interest. This body apparently has none. It is looking at data and reality. The discussions that we are having today are incredibly rare. They are usually held in private between individuals. Although New Hampshire has limited power implementing laws and regulation, what you will recommend, will be heard. That can have tremendous influence on the future. I see that responsibility on the shoulders of this committee, as huge…. planet wide, in my opinion. First point!

The frequency range of 5G can be very wide because industry is very flexible in what it does. Some frequencies used in 5G are lower than some used in current systems. Some that have been allocated are much higher. As Tom Wheeler would say, if someone tells you that they know what 5G is, run the other way because not even industry, itself knows. So, we are forced to evaluate electromagnetic radiation as a whole.

About scientific studies: All scientific studies are flawed. You would have to have unlimited money and time to produce one that is not. The weakness of the overall process is that because you can criticize ANY study, a committee that has a philosophy, can get rid of studies it doesn't like. This is a reality that is inescapable. The philosophical attitude of the people assessing science is absolutely tantamount.

Another problem is that the reproducibility of experiments that you are familiar with in engineering or in science is higher than what you have in biology. This is because biological objects are inherently extremely variable. So when you impose the same standards of reproducibility on biology to those of engineering or science, it's extremely unproductive, in my opinion.

The physicists have to bear the guilt of the atomic bomb. I am sorry to say this but electrical engineering will have to bear the responsibility of 5G. In a sense, it's electrical engineering's atomic bomb. Probably the people who can attenuate and manage this are here.

III.Ken Wells: Presentation on 5G malign applications:

Culture of Safety:

It has been said in this room, that little research has been published on the hazard or the safety of these frequencies. I have been involved in hobby auto racing as a driver, pit crew and safety corner worker. I am used to cooperative safety culture that asks, what is the worst thing that could happen? Then you work together to make sure that is very unlikely or impossible. I don't see that 5g is progressing that way. I think we would be wise to take that same approach with high frequency radio frequency.

Is it possible for radio frequency to cause harm?

There is an RF weapon that's called "active denial system: that uses 3.25mm or 95 Ghz band of 5G. In testing, it was able to create a burning sensation in the people it was aimed at in a tenth of a second. It was able to create 1st and 2nd degree burns in less than a second. In one case a subject was hospitalized for two days. So, yes RF radiation can cause harm. From this military experiment, we have evidence that RF can cause pain and injury. I would like to explore what could happen if instead of a cooperative safety culture that I spoke about, that a maligned player either foreign or domestic wanted to pursue a nefarious use of this RF against a civilian population. In theory, could a 5G network of small cells, IOT and devices be weaponized? I think so. This is the worst thing that can happen scenario that we must render impossible.

Physical descriptors of RF. There are three major ones are used universally.

1. Photonic Energy that you can categorize in terms of frequency or wavelength.

2. The intensity of radiation: The brightness if you will. It expresses how much energy strikes an area in a given time.

3. Duration of exposure. The IEEE standard 95.12019 is substantial and you should look in to that document. The research in that describes a quantity called fluence which describes field strength times the time you are exposed to it. It implies that pulses of RF should be separated by a few tens of seconds to avoid damage. That is not currently incorporated in the standard but something I think we need to pay attention to.

Absorption: waves transmit energy from place to place. EMR interaction with matter is frequency dependent. It has three ways it shows that dependency. The first one is heating. Second, is quantum effects with sharp bands particular frequencies that are strongly absorbed by particular atoms and molecules. That is not so well studied.

Third, you have anisotropic effects. Those are not uniform in all directions. Those include things like polarized emission and absorption, tunneling, and we don't really understand the biological role very well. We know they are very important. We know that we can point to these in chlorophyll and DNA.

Membrane bound biological processes like photosynthesis, oxidative phosphorylation (respiration), reproductive fertilization and neurological processes are all things where we think these electronic reactions are happening. There is even some theory by Roger Penrose and others doing research that the human brain might even enlist what is not well understood called quantum entanglement. There could be a role of chaos theory. As Dr. Herox said, very small electrical fields are involved in these biological effects.

On page three, I took measurements from a cell tower. I happened to be hiking and got some readings of a 4G Verizon tower. Dr. Swanson told us that the amount of power was hard to pin down. The manufacturer said it was only about ten or twenty watts. I am not sure what we should believe. Since there is so much variation on it, we need to be able to put a large error safety bar on these values. I am most concerned about the layout of these small cell antennas which resemble a phased array.

A phased array is the way that modern radar picks its direction. Remember that old ones had oscillating antennas. A phased array nothing moves but you change the characteristics of the antenna in order to steer the beam. The hardware layout for small cell 5g antenna areas meets the requirements for a phased array about a hundred meters apart over an entire city. Once this antenna is built, a maligned operator using software could upload to the array to alter its function from the benign communications function to a high powered steerable array either to disrupt communications or to actually be used like this military device. Foster et al say in IEEE 95.1 “The use of multiple steerable beams from 5G base stations will introduce new issues for compliance assessment for future RF exposure risk” which I think is quite an understatement.

I don’t think that we or the FCC, can effectively regulate either operating frequencies or power levels of such an array because today’s equipment hardware characteristics are completely transformed by software. You need only to consider the VW “Dieselgate” cheat to see how software can be used to hide or reveal deeply embedded nefarious capabilities of hardware. Since regulation of wave parameters can’t be done with this array, the phased array deployment has to be blocked by controlling what kind of physical antenna can be built.

We could continue on our current path of allowing maligned foreign entities to sell us 5G equipment or even components that go inside these things. How hard would it be for a remote operator over the internet, to toggle the equipment from its benign communications into another role? This role may operate on another frequency for espionage and surveillance, or to increase the power as a weapon and deny us our Constitutional right for assembly. It would be easy if that maligned capability was built into the hardware that we purchase as a Trojan horse. There is once piece of good news in this. The atmosphere attenuates the signal fairly strongly.

There is a spectrum on the last page. In the mm band, there are really only a few windows. The military application picks the biggest of the three peaks between 1-10 mm at 3.75mm and those are also the same bands you want to use for communications. The Air Force began development of” Active Denial System” in 2000. It used 3.25mm (95Ghz) RF as a crowd-control device whose range was “greater than conventional small arms” (3km). In testing, it could cause “an instantaneous burning sensation” in .1 sec

exposure, along with first and second degree blistering burns on human subjects for exposures of less than 10 secs. One case required a two day hospitalization. It was tested as a 30MW mobile truck-mounted "area denial" system in Afghanistan in 2007. Could a malign player (foreign or domestic cyber-attacker) pursue a nefarious use of RFR against our civilian population? All of this suggests a couple of avenues we could consider.

Prevent the rollout of antenna array that can be used as a phased array. Transmitters should be built using MIL-SPEC US component suppliers, with the same degree of security and oversight used in other weapons systems. Do any citizens in the US ever worry about their constitutional rights, or oppression at the hands of their own government?

Abrami: We need to end here. We are going to have to follow up on your major points.

IV: Tim Schoechle PhD: National Institute for Science, Law and Public Policy presentation:

Schoechle: Computer and communications engineer for 45 years and on the faculty of the University of Colorado for a number of years prior. I'm speaking now for the National Institute of Science, Law and Public Policy think tank in Washington that writes on health and safety issues as well as telecommunications and energy issues.

The purpose of this paper is to give an overview of current technology and both the technology and the policy issues in telecommunication including internet, wired and wireless.

1934 the Telecom Act established the FCC which regulated broadcast radio and telephone service.

1986 The Bell Monopoly (AT&T) was broken up.

1996 Telecom Act revised the 1934 Act. Wired Communications were covered under Title II (common carrier), leaving the wireless and cable essentially unregulated.

1990-2010 Wireless rolled out 2nd and 3rd generation wireless.

What developed out of that was the reincarnation of the Bell Monopoly that began around 2000 which resulted in today's duopoly of Verizon and AT&T. This is not the Bell AT&T.

A major point here is: the massive cost subsidization of wireless by diversion of fiber to serving cellular network. One notable point is Verizon's abandonment of FIOS that it was marketing in 2000.

Abrami: You say there are two major players but what about T-Mobile?

Schoechle: Cable is the third player. It makes it more complicated because it's a wired service and wireless. It's really a trio-poly. The rest is much smaller.

Abrami: Talk about the flow of money and the diversion of subsidization. Are you talking about the charge on landlines that were supposed to be used for optical fiber infrastructure?

Schoechle: The "Book of Broken Promises" is a 600 page book that describes in detail how this diversion took place. The obligation was to upgrade wired infrastructure from the charges that ratepayer money for on the telephone bill. That money was charged against the wired and used for the wireless. It amounts to about 500 billion dollars. Basically, it made wireless look a lot more profitable than it would be otherwise.

The drivers: the need to cell more phones and now its 5G. It's about selling equipment. There has been a slowing on the sale of cellphones. The industry philosophy is planned obsolescence.

The new subsidy is YOUR public rights of way. It's a preemption of local property rights and rights of way that give telecom a grant by right to public property. Over twenty states have adopted legislation to take away the rights of localities which was inspired by if not written by the American Legislative Exchange Council (ALEC). It was written to take away control of states and localities of deciding on this equipment.

The FCC is a captured agency and presently chaired by a Verizon attorney, Chairman Agit Pai. It's not surprising that it serves their purpose.

Surveillance Capitalism: There has been a transformation in the past twenty years that began in 2000 to a surveillance business model. This is really important if you want to understand the telecommunications industry and particularly the IT industry.

It has gone from selling products and services to the new model of trading in personal data. The tail is wagging the dog. The data is more important than what the equipment does. This was developed by Google and refined in 2010. It has been adopted by Facebook, Microsoft, Amazon and now Verizon, AT&T and the entire IT industry. There is a book called "The Age of Surveillance Capitalism" by Shoshanna Zuboff of Harvard University. She has written a monumental piece that details how this occurred and the social implications. You have to understand this to understand why information technology is going where it is today. It is selling data, selling behavior and advertising primarily. It is also selling behavior modification, which has political implications as we know. Selling control of people is where this is headed.

Wireless devices and networks are complex and proprietary. I am going to compare wired and wireless. The wireless is unregulated. It has progressed rapidly. It is extremely complex and changes all the time. Wired networks that are copper or fiber are simple stable technologies and are open. What you have is essentially a generation of wireless technology which is designed primarily to gather data about you. Wired networks particularly optical fiber, are much more secure than wireless.

Some of the risks of the wireless industry:

- Loss of community rights, property rights and rights of way for private corporate gain.

-A loss of revenues that come out of that is essentially a forced subsidization of your community to wireless by giving them stuff they would have to pay for.

-If 5G was not subsidized through this form, it would not be feasible.

-The loss of community environmental regulation is a critical factor. There are a lot of environmental implications to this technology.

-Risk to personal privacy and corporate and government surveillance.

-Risk to public health and safety. Vast literature on this suppressed by industry or ignored by federal regulators.

-Damage to the environment birds, bees, insects, plants, animals, tree, etc. particularly mm waves.

-The FCC limits are obsolete and they have no health expertise and have swept this under the rug.

What can states do?

- Let's get fiber to everybody. Fiber should be the first priority. Fiber is a basic utility like sewer, water, roads, etc. Wireless is an "adjunct service". The fiber should be owned and controlled by the municipality. This should not be privatized. Fiber access is superior to wireless in every respect except mobility. The fed has no policy on this and local power companies and rural electric companies are stringing fiber optic. It offers speed, stability and better privacy, safety in weather events, reliability and it's cheaper.
- Internet access is a necessity to modern life. You can't operate government today without the people having access to the internet.
- Cellular wireless is an energy hog as well.
- Community fiber would reduce the need for cellular wireless.
- Enable community fiber.
- Integration of distributed energy. Fiber will be needed for solar/storage and the future of the electric grid.
- Enable local control of cellular wireless facilities: Initiative in Colorado is repealing ALEX laws passed in 2017 which preempts local legislation.
- California just enacted CCPA (California Consumer Privacy Act). Take a look at this.
- Health and safety studies of EMF need to be supported.
- Enforcement of Environmental Protection laws. The appellate court just overturned part of the FCC order on the basis of its failure to enforce NEPA, the Environmental Protection Act.
- Antitrust enforcement and divestiture. The last thing we should do is allow merger between T-Mobile and Sprint. Fifteen AG's from states have filed a separate lawsuit challenging this merger.

- Read ,"The Book of Broken Promises" and do something about it. There is a case proceeding in the 10th district in Washington, DC in January on this investigation.
- Support the Green New Deal: 1/ a distributive solar micro grid and 2/fiber smart grid and optical fiber nationwide.

FCC has abdicated its responsibility to public health and safety as have other regulatory agencies.

FAA has failed to regulate creating a debacle which could sink Boeing.

California PUC has failed to regulate PG&E, one of the country's largest utilities and is in bankruptcy largely due to the failure of regulators.

Another example of regulatory capture and the revolving door is now we have the FCC's failure to investigate cellphone radiation, safety and their obsolete radiation limits which flies in the face of the NIH Toxicology Program study that shows cellphones can cause cancer.

Abrami: You have reinforced many of the things we have been talking about in this commission. What do you know about what is going on in China and their 5G rollout?

Schoechle: I submitted a paper ," What is 5g and why do we care?" In it, it refers to China. It's a financial driver in China and part of a surveillance state. It takes surveillance capitalism and the capitalists are the government.

Abrami: So we should be concerned about the chips and things coming from China?

Schoechle: It's not just China. Korea is also a major manufacturer. They have become famous for LG, the television that are watches you. Those televisions are sending information to Google and Facebook and who knows where else on the internet. You don't even know that is happening.

Sherman: Is there somebody in the legislature in Colorado that you have been working with who has been translating some of the work you have been doing into legislation or bills?

Schoechle: The majority leader is on board with this. I wrote a 20 page report named "Reclaiming local control over cellular wireless facilities". I just sat down with a member of the House and went over that in great detail. We are looking for a sponsor for that bill. We are in recess right now. I can give you more detail on that if you want to follow up with me.

Sherman: That would be great. I am chair of Senate Health and Human Services. We try to not reinvent the wheel. If there is legislation enacted or in process that seems to be working through the system in Colorado that may be appropriate here in New Hampshire, we would like to take a look at that.

Schoechle: If you send me your contact information, I will try to facilitate that. The big focus in Colorado last session was major changes in energy policy. Electricity, oil and gas have been a major political debate in Colorado and we have made progress on that. Telecommunications will be in our next session.

Heroux: In your report in section 3.3.3 pg. 34, you say most of these sources never turn off and cannot be turned off. I believe you say this in context of IOT. Would you agree that the hardware switch on these devices would allow a person to eliminate radiation and eliminate transmission of information if the user wants to? Do you think it's feasible to implement or to legislate for such a device that would restore an individual's right to privacy and manage his radiation exposure?

Schoechle: That is a good question. The trend in the consumer electronics industry is to develop products that don't turn off. They look like they turn off and you think you turned it off but they are still on. This is a problem from an energy standpoint and from a data standpoint. I think what you are suggesting would be a good idea and we would have to look at how policy would influence the consumer electronics industry.

Heroux: You could design it that the switch is only disabling the transmission. You make it unable to send out data and you eliminate the radiation. You could also say that the fact that it is off, you do not disable the other functions of the device. It is a matter of engineering. We all depend on engineering. This type of switch could go a long way toward protecting privacy and making it possible for Electro-sensitive people to survive. How can this be imposed? Do we need IEEE to promote this? Do we need the Chinese government to promote this? How can this be achieved? You know industry well. If the goal is to restore that kind of power to the individual, what is the path to achieving this?

Schoechle: That is a wonderful question. I will have to think about that. It's not so simple. Particularly, with cloud data, the whole business model on these products is capturing that data. You are asking to change the business model for a whole industry. I agree with you completely. We will have to think that through very carefully but I think there is a path. Maybe the IEEE, but an organization called Consumer Technology Association (CTA) is more likely. I am on the cyber security committee and that would be a good focus for that. We are writing a new standard for consumer products. CTA2088. We also have an international committee that works on this. There is a concept of residential gateway for this as well. We could address it through standards and at least make that an option that people could buy.

Heroux: Since realizing that you are the best person probably anywhere to do this, I assume that we can count on your cooperation to further this idea perhaps in cooperation with the Committee in some form or other.

Schoechle: Absolutely yes!

Miller: I would like to explore your statement on enabling community fiber. You also said community fiber would reduce the need for cellular wireless. I am not sure I agree with that statement since we like to be mobile and fiber is not mobile. The other thing is why do you say community fiber owned and operated by municipalities?

Schoechle: Well, because for the municipality, there is a political process for governing it. If it is provided by a Century Link or Verizon, even if it's fiber, you don't have any control or assurances of net neutrality or if it will be equitably distributed in the community. You don't have that control. It's not something that should be privately controlled.

Miller: You go on to state that cooperative electric utility is a better model in some ways for smart grid which would be enabling fiber to the premise. That is not community controlled either. That's controlled by members through charter but not a community controlled network. So I am not sure what you mean, totally controlled by municipality? Or partnered with an electric coop to disperse fiber? Can you elaborate on that?

Schoechle: My first choice is municipal electricity and municipal fiber together. I consider the perfect model as Longmont, Colorado. They have done both of those. They have the most advanced fiber system in the country. That is preferred. But America is very diverse country. The rural electric associations are called coops. It is possible to go through the coops in a democratic way unlike a private corporation. They are like a Frankenstein monster, out of control and basically ungovernable.

We are looking at a new technology standard Ethernet cable Cat5 or Cat6 copper wire. This can carry data over short distances at the same speed as fiber. This can also deliver DC power. You can plug phones, computers to a USB connector throughout your home so you don't even have wireless in your home. That is coming… a USB connector standard USB3 type C something like that. This will be the new standard because this is the new internal wiring in cars will be gigabit ethernet.

Miller: This doesn't address mobile access. People want to be mobile.

Schoechle: I am saying it will lessen the dependence on mobile. Right now, if Verizon had their way, you would only have mobile access whether you want to be mobile or not. If you have fiber, you will have faster better service and when you are mobile, you have a mobile phone. I have a mobile phone and it's an old flip phone. If I want to do data, I use my laptop plugged in at home. I am not going to do that in a car driving around. People need the choice.

Sherman: I am not sure people would be quite so wedded to their phones if they were aware of the health impacts to themselves and the environment. If you were to take that new USB technology, would you be able to go to airplane mode on your phone and still have complete access to your phone? Would an on/off switch shut down antenna? Like an airplane mode for television or CPAP machine which is now wireless, as well? Would the concept of being able to shut down on all devices be what we are talking about?

Schoechle: Yes. It's analogous to airplane mode. Airplane mode is to prevent radiation for interference with aircraft systems. Right now many cell phones have a feature called wifi calling so you are not using cellular calling but using fiber access or whatever so you are not using cellular wireless network. Of course the cellular operators don't like that but all the phones now work that way. You could plug in your phone when you get in the house and turn off your cellular antenna and still have phone access.

Ricciardi: The town that I live in is entertaining fiber optics. We would have to put it on our ballot for the people to vote. I have two questions: I have heard different things. If we put fiber optic in, would that make it easier for 5G to come to our area? Would that give them a segway to attaching themselves?

Schoechle: That is a very good question. Many of my colleagues and I have arguments about this. Some say you are just going to enable 5G sites by putting in fiber. Well, that's why it needs to be democratically controlled by the people in the community.

Ricciardi: But my understanding is that the FCC can just allow them to come and put the 5G in. You won't have a say as a municipality. If that is the case, we would just be making it easier for them.

Schoechle: They can't make you use their fiber. The FCC ruling is just about siting, not the use of fiber.

Ricciardi: Oh, so it could help you keep 5G away.

Schoechle: The issue is not whether there will be fiber or not. The issue is who is going to own it and control it. That's the issue. If you put it in, you control it. If Verizon puts it in, they decide how it's used. That doesn't stop them from putting in 5G but they have to put in their own. They don't get their subsidy off of us.

Ricciardi: In the state of New Hampshire, our utilities are in the public right of way. There is a NH law that I have looked into. I have been looking into an ordinance for this. That is a factor in our state. It is a little difficult to overcome.

Schoechle: Yes. A lot of these laws were written that way and need to be revised. That's unfortunate. The goal should be Local Control.

Heroux: I have a comment about mobility. We need mobility. The cellphone industry has paid little attention to reducing exposure of users. There are some people who occupationally need to use the cellphone. They don't even have a choice. In other words, I recognize the right of people to accept EMR exposure if they want. However, there are people who do not have a choice to use the devices that are on the market. It is possible to reduce the exposure of a person by a factor of about a hundred if you make the proper engineering efforts to do so. You can have the exactly the same services you have now but your risk would be reduced a hundred fold by design of the antenna and software adjustments to the phone. There will be no loss of functionality however, an enormous loss of biological impact. Industry in the past has not done it. It needs to be told.

Schoechle: I agree completely. That is a very good point.

Abrami: Here's the issue. 5G is a concept that means something different to every one of the phone companies. They are all developing their own version of 5G which makes it hard to track. One thing for this commission will be a Health issue potentially and definitely a political issue is the deployment of these small cells at telephone pole heights in front of people's homes. That becomes a real intrusion. Regardless of what the science says, many people will say, I don't want that. We already know the

battles in our communities to put in a regular cellphone tower somewhere in the town, let alone a small cell in front of a home.

What is your view on that? We have engineers, doctors and toxicologists on this panel so we are having interesting conversations that really should be happening at the Federal level. What is going on in Colorado? Are there deployments of these small cell towers?

Schoechle: Well, yes. Verizon is rolling out in Denver. The issue has not come to Boulder yet. But the issue is what they have done with these ALEC laws and the FCC. They have lawyers that go around and tell city councils and county commissioners… oh…. you need to change your codes now to be in compliance with state and federal regulations. Our response is, let's change those. Of course that is a bigger hill to climb. People are getting up in arms because they are seeing the permitting of these small cells. Just the permitting has raised concern and communities are mobilizing around here. There are over a hundred cities around the country that have bonded together to sue the FCC. They have had some success. In November, there was a ruling in the 10th district. Industry wants to do this because 5G will need a shorter range. People don't realize that 4G and 5G will be bonded together. You cannot separate them. You will have both 4G and 5G. The new small cell sites being put in are 4G which will become 5G as well when they figure out what that's going to be. The technical standards aren't finished, the spectrum isn't allocated. 5G is an add- on to 4G which allows faster data transfer. It does not support voice communication. It doesn't support a lot of the things that your present cellular supports.

They talk about 5G for autonomous vehicles. I think that is a bunch of hype. There are safety issues that have not been addressed at all. It's marketing hype. The term 5G is a marketing term. It is not a technical term.

Sherman: My nephew is an engineer on the autonomous car, Waymo .They have no dependence on the internet. It is completely autonomous. So it's not just hype. It's a lie.

Schoechle: Right.

Abrami: Thank you for your time.

Schoechle: I would like to connect with the commenters. Thank you. I like the idea of technical standard approach to devices.

V. Next meeting: January 10 8:30-10:30 Devra Davis and Theodora Scarato

We are now going into Legislative Session. We need to do meetings on Monday or Friday. What about professors? Friday seems to work best.

VI. Meeting Adjourned at 10:35 am.