Wireless Broadband Access Task Force – GN Docket No 04-163

These comments are from David R Hughes, owner operator (for the past 20 Years) of Old Colorado City Communications, which has been a Wireless ISP in Colorado Springs for 8 years, and have been a remote-office user of Unlicensed Wireless for the past 10 years, and a professional designer and installer of Wireless communications in rural as well as urban areas since the first generation of Part 15 radios emerged in the market place about 1990, after the first report and order of 1984.

I also have been the recipient of 5 separate National Science Foundation grants totally over $2 million through my small company (I being the Principal Investigator) since 1995 from the Networking Division of the NSF, and have a pending $1.7 million grant from the Biological Sciences Division which will run through 2008. These have required me to research the value of, and model wireless technologies for (1) Rural Education (2) connecting up the University system of Ulanbattaar, Mongolia (3) Environmental and Biological Scientists in the Rain Forests of Puerto Rico, on the lakes of Northern Wisconsin, Central Alaska, and the Chesapeake Bay Islands of Virginia. The pending grant will extend that to the importance of wireless mesh networking which will have great significance for future Biological as well as Environmental Science, in particular under the NEON – National Ecological Observatory Network – which Congress is funding, and which seeks to link vital scientific data (not the least of which are dangerous chemicals or agents released by terrorists) right from the Sensors in the field, to the entire Internetwork. The ONLY way that can be done is wirelessly. Coupled with satellites where there is no terrestrial Internet port within 50 miles.

1. As one of the earliest (1980) advocates and practitioners of extending personal, school, business, and governments networking across rural America, where incumbent switched circuit telephone companies have repeatedly failed to extend either digital or broadband communications, including the Internet at tolerable rates, to the 25% of the US population (72 million) which occupies 97% of the rural land area of the US (US Census figures – 75% occupy only 3% of the land – dense urban areas) – I found that unlicensed wireless, for all its severe limitations in both power and frequencies permitted – was, and WILL continue to be for the foreseeable future the ONLY affordable broadband communications to all Americans wherever they live or

work. Even though the 1996 Telecommunications Act mandated that 'broadband' should be 'ubiquitous' (to every citizen) across the United States, traditional wired solutions have failed to deliver, even when subsidized by the Universal Service Fund, on that promise and goal.

2. While it has taken policy makers, including those at the FCC, 20 years since its first report and order on permitting spread spectrum unlicensed general wireless communication to wake up to the great potential of digital wireless, there are some signs that the Commission is at last moving in the right direction. Of course there are legions of nay-sayers who may know a lot about technical digital broadband wireless but don't have a clue of the public benefits which can flow, and are needed if it is to reach everyone 'from sea to shining sea.' Yes there is a great need for not only more spectrum than currently allocated, but both progressive polices and supporting technologies are needed to manage that growth, minimize unnecessary interference, and encourage the greatest amount of radio innovations and FCC rules to support them. Several of these policies are:

    a. A dynamic differentiation between dense Urban and sparse Rural areas within which different power and spectrum rules can apply. Almost all FCC unlicensed device rules are written and enforced, both in the radio certification and by users, for urban situations with dense population 'worst case' situations. That is dumb, particularly with the amount of automated GIS information about every square inch of the United States it is not necessary.

    b. To support the above policy change, the FCC must permit, which it does not now, certification of innovative 'cognitive radios' whose software and feed-back from the electromagnetic spectrum and by knowing – by GPS and other means – where it is, and what spectrum is being used – 'adjust' itself to the minimum power required to maintain a robust connection, and even, in future radios, the ability to change the frequencies it uses. Dynamic rather than static radios.

    c. To further support the 'cognitive radios coupled with GPS/GIS data' there is no reason that the FCC 'rules' for location specific frequencies, spreading techniques, and power levels could not be embedded in the radio devices as a data base which could automatically limit the radio's power and frequency range to that permitted by FCC rules!

e. If the above measures were not only permitted, but encouraged in the most pro-active way to technology firms, research laboratories, and university RF researchers, there would be, where this is not now a hard coded, but dynamic marriage between FCC Policies, Rules, and RF technology! My NSF colleague, Dewayne Hendricks, now a member of the FCC Telecom Advisory Committed – TAC- and I proposed that in the April 1998 Scientific American fully 6 years ago. The technology IS here now.

3. Rural Versus Urban

. The fashioning of FCC rules for Rural Use of unlicensed wireless, including permitted Antenna gain above the power rating of the radio, is abysmally behind the power curve and reality of Rural needs. It is a testimony to the creative, advance technology skills of companies who have brought out radios, in SPITE of, not because of FCC rules, that I can go 25 miles at T-1 speed, clean line of sight between two 802.11b radios between 2.4 and 2.483ghz while standing on my head to keep the system within FCC rules. A MAJOR problem is that the current wireless rules for unlicensed are only in the 902-928Mhz, 2.4-2.483 and the 5.2 to 5.7Ghz ranges which cannot BE other than line of sight, for the simple physics problem that the higher the frequency the less penetration of walls, or trees is possible for any given amount of radiated power. There is then:

a. A need for more spectrum for forms of spread spectrum radio in much LOWER frequency ranges than the 900Mhz up. At least down in the 400Mhz range please! This would not only aid field environmental science, and help reach farm and ranch houses in forested areas, but also permit location tracking of livestock on open ranges from longer distances than can be done now.
b. Higher power limits in rural areas above the 4 watts (36dbm) EIRP now permitted. Again, if linked to location rules, that can be accommodated. I have NEVER encountered, in Central Alaska, 50 miles from the nearest human habitat, a Polar Bear with a PDA complaining that I am interfering with him! (and in my next grant I AM being requested to instrument Arctic Squirrels north of the Arctic Squirrel who hibernate beneath the surface, and link their bodily functions to the Internet, real time! I can't do that now, within the power/frequency rules.

4. There is a great FCC Policy wireless blind spot when it comes to the support of American Education and Public Libraries with Wireless. The FCC, in spite of formal NPRM filings, appearances before Commissioners and their Staffs, and advocacy by MANY wireless-knowledgeable persons, promulgated a rule during the Hundt FCC period, implementing the School/Library Internet Fund, that was incredible stupid. It has cost rate payers who are compelled to contribute to the Universal Service Fund, Billions of dollars already, denied schools, teachers AND large numbers of the 55 million K-12 access to the Internet, and just about totally have left behind large fractions of remote and smaller of the 16,000 School Districts and 15,000 public Libraries. Reason?
    a. The FCC rule PROHIBITED schools and libraries from using the School Library Funds to BUY and OWN their own wireless systems. And thus 'link' their various buildings to each other (and only 2,000 of the 16,000 School Districts have all their students in one building) AND the nearest upstream Internet Service Provider, OR to students, teachers, or administrators AT HOME inside the boundaries of the school district – which average no more than 7-10 miles across (which could be easily in broadband wireless range of the school if the rules were right)
    b. Instead the schools can ONLY retain the SERVICES of Internet Providers – meaning in 99% of ALL cases a Telephone Company with wired T-1s to EACH school separately. At whatever the traffic will bear. One school district in Colorado Springs, before the USF fund was established, at considerable sacrifice to local taxpayers, connected up all 25 school buildings wirelessly, for a one time – and thus 10 year - $600,000, while US West wanted $2.8 million over the same period.
    c. Instead the FCC, undoubtedly lobbied hard by the Incumbent Telcos, into whose $2.4 Billion EACH year pockets that rate-payer money has gone, rather than go into the School's own growing communications technology equipment one a ONE TIME basis, with no need to retain services except for the 'Internet' and NOT the local loop broadband services.
    d. The last time I checked, the demand for the School Library fund is running $5 billion a year, while the supply has never been authorized over $2.4 billion. So LOTS of schools and Libraries

still don't have affordable Internet in spite of all the Press Conference crowing about how the USF connected up almost every school. But the telcos sure are crowing, all the way to the $2 billion bank.

e. As a consequence of this very bad FCC rule done as much out of comparative unlicensed versus telco wired economic ignorance, the schools have had little incentive or accumulated wireless expertise, not to speak of radios, to take the next big obvious step in US K-12 education – extend broadband wireless to EVERY student and teacher at home from their antenna equipped school buildings so they can (1) do their homework online whether or not their parents have dial up connections (2) learn the 'collaborative' culture of the Internet and (3) be far more prepared for the Information Economy and continued distance learning, they will all be graduating into and (4) smart school boards will NOT still try to build hugely costly school buildings with an 8:00AM hot seat for every student every day, but start using wireless, connectivity to the schools and libraries and the Internet to permit from 20 to 40% of their students NOT to 'go' to that anachronism of the Industrial Age, the 'school room' for their education. The 'net' can be the classroom, but the students have to be connected. Unlicensed wireless at low enough frequencies (400mhz at least, or on unused broadcast radio or television spectrum) and sufficient power to punch through walls and trees and enable Non Line of Sight technologies to get better – is needed.

f. There is STILL time for the FCC to REVERSE that stupid decision and start letting schools buy wireless devices from USF funds.

5. There is a fallacious assumption embedded in FCC policy thinking that assumes all unlicensed wireless uses is by 'consumers' rather than 'producers' of content and services. There is a need for more spectrum, and permitted power for many, and smaller, and especially rural and small town Wireless ISPs to be able to serve more customers AND link 'upline' wirelessly at least at DS3 (45mbps) rates to more distant wired access points.

So, FCC Wireless Broadband Access Task Force, from one who has more wheat field and mountain level experience with more unlicensed radios doing more things to get connectivity than I'll bet anyone who posts in this

Docket solicitation, and who has deployed Wireless connectivity to the net from Mongolia to rural Wales, and most recently to the Sherpa village and schools in 13,000 foot Namche, Nepal on the slopes of Mount Everest, I urge you JUST DO IT!

Urgently Submitted

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