BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON D.C. 20544

Spectrum Policy Task Force Seeks Public Comment on Issues Related to FCC Spectrum Policies	ET Docket No. 02-135

COMMENTS OF WAYNE LONGMAN

SUMMARY

The spectrum policy objectives of the commission should be wholly examined for both market and conventional assignment and allocation methods, and for new and old technologies, since all will continue to co-exist. The examination should keep in mind alternative techniques to improve spectrum efficiency, in order to avoid a narrowly-viewed evaluation of the methods.

One alternative is a hypothetical Flexible Allocation model that allocates bands according to their spectral characteristics, which eliminates political boundaries between bands. This should dramatically reduce regulator intervention for the introduction of new applications, and allow all users greater access to more spectrum. Further flexibility is given by allowing these bands to overlap, with the effective allocation boundaries moving in response to the spectrum actually used by the adjacent services. This

automatically links supply of spectrum to demand. This approach is made more feasible by the re-tunable radio technologies available today.

Compensation to the public would be higher than by license fees or by auctions over time by an appropriately levied annual Spectrum Rent related to revenue, on all spectrum users. The disadvantages of capital depletion under auctions are avoided, and a long-term revenue stream is created that reflects actual user demand. Rents would discourage marginal users, and declining rents in a band would indicate it should be considered for a more valuable use.

Auctions for spectrum are not free markets, so those theoretical benefits are diminished or lost, and give rise to disbenefits. Issues such as untoward government influence, rigid use, cost-inefficiencies, best use of the spectrum, transparent processes, and greater use of non-spectrum or other more appropriate radio alternatives, remain to varying degrees or are made worse under market approaches. Market approaches may also result in warehousing, fragmented domestic use of the spectrum and less alignment of spectrum with the rest of the world.

Other techniques such as licensing by contract bids, "type of use" allocations in place of "type of user", and ancillary services may yield more efficient spectrum product and process results. Geographic block licensing can lead to fewer systems and warehousing. Incumbent compensation is cost-inefficient and contrary to public interest, as it bestows an unearned reward for obsolete equipment and delays new services. An alternative to compensation that is successfully used in Canada is a phase-out period.

Accurate and public record-keeping of frequency assignments is required for sound decision making when new allocation alternatives are explored, and if there is more sharing between government and non-government users. Public safety and some

other government needs may be satisfied in bands shared by commercial users, or by commercial systems.

Unlicensed devices inherently mean there is no licensing database for judging actual demand or resolving cases of harmful interference. Licenses might be granted to manufacturers who might report sales in each area, and also assume responsibility for resolution of harmful interference. Rather than risk harmful interference to licensed systems from an unlicensed technology that may proliferate, the latter should have exclusive bands.

The resolution of harmful interference is a case-by-case engineering issue, based on today's flexible definition of harmful interference. Quantification of harmful interference will hinder this process. Over-specifying service or system characteristics also leads to rigidity. However, there should be a means to ensure bands are used by spectrum-efficient equipment, by requiring minimum spectral efficiencies in bits/sec/Hz.

U.S. domestic spectrum policies are dragging our use of the spectrum away from the rest of the world, limiting markets, and making change more difficult. Efforts should be made to halt and reverse this trend. One method is erasing the government/non-government barriers; another is to try to broaden ITU spectrum allocations through generic radio services.

The ITU satellite coordination process is flawed and encourages paper systems. Domestic terrestrial microwave radio coordination is successful as it is based on commercial coordination, rather than a government-driven process. Removing the ITU process is likely impossible, but it may be possible for satellite operators to pre-coordinate their systems directly with each other using ITU criteria. This should reduce the number of paper systems, and delays.

Radio is the domain of scientists, engineers, technicians and radio operators, not economists. Although market-based approaches have provided some short-term gain in terms of process, they not proved their ability to deliver the best product, or maximize the long term efficiency of the spectrum. The current market approach experiments should continue, but not expanded. There are a number of improvements that can and should be made to non-market approaches, which will apply to most services for any foreseeable future.

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The following comments are respectfully offered by Wayne Longman, currently retired after several years of operational management of VHF air traffic control and navigational aid frequencies; over a decade as an advisor on spectrum policy, both roles in the Canadian government, and several years in spectrum regulatory affairs in Washington D.C. on behalf of Teledesic LLC. The views are offered as a detached but interested observer, with no working relationship with any former employer or other interested party.

INTRODUCTION

The Commission's apparent objectives in this proceeding are unquestionably laudable, including, inter alia, greater efficiency in the assignment and allocation of frequencies, better ability to respond to change, de-politicizing the allocation process, compensation to the public for the use of a public resource, interference protection, and accommodation of government and other special spectrum users. Except for special users, the Commission wishes the outcome of

this current proceeding to result in a more global application of new or improved market based (best and highest value use) spectrum policies.

One pressing issue is how to introduce new technologies into spectrum that is already heavily used. Conventional systems will continue to exist, so the issue becomes the integration and growing of the equally important old and new within finite spectrum.

In order to identify improvements to the assignment and allocation processes, it is necessary to examine allocation alternatives in the light of the Commission's objectives. Perforce, the comparative examination must be qualitative since the criteria as presented are subjective. Rather than simply compare Traditional and Market Allocation processes, a third, hypothetical approach nicknamed "Flexible Allocation" is described in Annex 1. This conceptual approach bases allocation on the identification of bands by spectrum signature, without identification of "political" or application boundaries. This would enable entry of new types of radio systems with minimal regulatory intervention. The concept as described includes flexible band boundaries that match actual local use. The addition of this third model is an attempt to identify an ideal or idealistic allocation process for the new environment and to provide a better perspective on the other two. A tabular comparison of models is shown in Annex 2.

Compensation for the use of this public resource would better serve business, government, the public and the consumer if a tax were levied on a fixed percentage of the system revenue. This will be an exact and relative indicator of the actual and current value of the spectrum. This Spectrum Rent would be non-regressive, and avoid the depletion of capital, higher user costs, and slower rollout. It would more accurately reflect the true utility of the service to the public. The spectrum rent for non-revenue spectrum users should reflect that of

revenue operators so all bands have an associated value. Payment of spectrum rent by government users may require the use of forgivable debts until it is incorporated into budgets. Rent would discourage marginal uses; low or declining spectrum rent in a block would indicate it is time to find a more valuable use.

These concepts are introduced to ensure the proceeding keeps in mind there may be other alternatives.

MARKET ORIENTED POLICIES

"Economists agree... that market forces ...result(s)...in efficient allocation..."[1] This sweeping statement may be incontestable from an economist's viewpoint, but is this a real world efficiency or only in the theoretical framework in which they work? If the market provides this, by theory or definition, then the most efficient valuation (highest value use) and distribution of any item by any other distributive means is inarguably inefficient. Nonetheless, few economists propose a free market approach. Most proposals require the market be constrained from being a free market, or applying to all of the radio spectrum. This is an admission that true market approaches are imperfect for radio spectrum.

A true market is an ongoing process where the "invisible hand" reflects a multitude of individual decisions that people make to reflect their best interest in the prevailing environment. One-off auctions of blocks of spectrum are too limited to allow market forces prevail within that spectrum. Markets may maximize certain benefits for direct participants. This does not mean that their actions will maximize the benefit of derivative participants. The incentive to pass on market economies, if any, is less than the incentive and purchased freedom to establish market oligopolies and maximize profit.

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[1] H. Hallikainen, Int. J. Comm. Law and Policy, Iss. 5, 2000. See Comment of Harold Hallikainen 06/07/02

For spectrum, a more realistic market determination of value is the value of spectrum-based applications versus non-spectrum based applications to the consumer of the service. This choice and direction of capital can apply, for example, between fixed service microwave systems and fiber optics, wired and wireless LANS, and would likely apply between over-the-air broadcasting and cable if not for regulatory intervention. It also applies to mobile operations, as we see customers move their long distance traffic from the landline telephone system to cellular because of lower rates - and the reverse can and will occur.

Spectrum auctions distort competition between radio and non-radio services, since it constitutes an unevenly applied tax. It distorts competition between radio services when the spectrum value varies significantly between auctions. Lower auction costs subsidize the new entrant, and higher auction results burden the new entrant. High bids on new spectrum by earlier entrants serve to preclude new entrants and preserve monopolies.

Conspicuously, the greatest popularity of auctions is among economists and politicians. It is not generally popular among those who actually implement radio systems. Some have no option but to go along when government fails to apply other means to pry spectrum from legacy users. Before further embracing market-allocation as the ideal solution, we should be certain that it will work in the long term to satisfy the needs of those participants who do not find it attractive.

Winston Churchill reported: "It has been said that democracy is the worst form of government except all the others that have been tried." The current governmental administrative process for spectrum allocation is democracy in action compared to auctions. This "traditional" process that has evolved over many years, allows all parties to compete on an equal and open basis. In the international forum of the ITU, spectrum allocation is subject to one nation, one-

vote secret ballots. In contrast, a market approach based on the concept that the best use is that for which the most money is paid is inherently elitist and anti-democratic, with or without aggregation limits or set-asides. Both processes have been and will be subject to narrow political influence.

The value of a lump-sum payment to the Treasury for the use of spectrum deserves close examination. This expenditure is a current cost that will affect profitability for a long time. The recovery of this expenditure of capital through user fees will carry significant mark-ups to finance interest and to provide a return on investment. It will adversely affect service to the consumer as it significantly reduces the capital pool available for construction, which will limit or slow the rollout, quality and cost of service. An auction that the government considers highly successful may be the least successful to the consumer. The consumer will receive much less service and pay much more for it than he or she would for systems that are competitive, equally capitalized, and do not have a massive front-end capital load. For business, the substantial increase in fixed cost reduces or eliminates profit, making new capital more difficult or impossible to find. These costs work themselves throughout the economy, making it a hidden and inflationary tax on all taxpayers and a burden on domestic productivity.

To prove the efficacy of auctions, the Commission could grant one parcel free, and auction the remainder of a block. According to supporters of auctions, the owner of the free block will rollout his service slower and at a higher cost because he has less invested than the others, and is less incentivized.

The uneven results from auctions indicate that there is no intrinsic value to the spectrum, so the level of compensation for the use of a public resource is not related to any absolute utility. It is quite possible that auctions better indicate the general temperature of the capital market than

the value of the auctioned spectrum. The past successes, per se, may not be possible in the new capital market environment.

Spectrum rent income is continuous, and can be applied to all spectrum (without auctions). It can easily exceed any auction value of spectrum that may not come into the public market for decades for further contribution to the Treasury, particularly if secondary markets are employed.

Proposals for secondary markets are, in part, to create a more realistic spectrum market. Secondary markets will encourage warehousing, as first auction entrants can assemble more spectrum resource than needed, with an eye on later re-sale of an even more scarce resource. If secondary markets are explored it is essential that the same rules apply as for the primary market. If not, the use of that spectrum will degenerate into a hodge-podge of uses that will be incompatible with each other and impossible to reconcile in the future.

The concept of "automatic" selection of the best use or highest value use of the spectrum by market forces is not a given. Current market models do not do an "automatic" selection between different types of users of the spectrum since the auction process is limited to potential users within a specific type of use. We do not see broadcasters and would-be 3G operators bidding against each other for the same spectrum.

Economists and economic theory do not design, build, operate or use radio systems. Engineering design results are concrete and measurable by business, who purchase it or not. Business lives and dies providing service to their customers. Customers find acceptable service or move on. No general economic theory can reflect these individual and case-by-case legitimate needs.

Market approaches favor high value commercial enterprises over all others; are potentially anti-competitive and are not democratic. They fail to reflect the actual value of the spectrum, contain a flawed taxation model, and impede the cost and roll-out of service. They may very well result in very inflexible use of the spectrum because of implied or actual property rights. The application of secondary markets will deprive the public of ongoing revenues for public spectrum, will encourage warehousing, and can result in a hodgepodge of uses.

Patches to the market process may mitigate some of these effects, but will only further distort the justification of market-based approaches. Spectrum is not like corn or pork bellies; it is not portable or growing in supply in response to demand[2]. There is no ongoing trade and exchange of spectrum to ensure the current value of the product rather aperiodic one-off confrontations between competitors for unique and limited blocks.

The spectrum is in trouble as more and more systems are added to a finite resource. This creates difficulties such as; integration of new technologies, the assembly of new blocks of spectrum for new applications, and the upgrade or transition of old systems out of the spectrum or into other parts of it. The increasing impacts of globalization and the increase in the number of players further complicate deliberation, decisions and change. Market approaches do not inherently solve these problems. The same issues will arise in a market paradigm, but will be more difficult to solve because the government will have sold part of their responsibility and authority.

Responses to the questions in the Public Notice are offered from the perspective of the forgoing discussion.

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[2] An excess of spectrum cannot be shipped to a location experiencing a shortage. Although increased spectrum efficiencies can put more users into a block, the boundaries of the block or adjacent blocks are not moved.

MARKET-ORIENTED ALLOCATION AND ASSIGNMENT POLICIES

To be clear, allocation is the grouping of frequencies into bands to serve a specific purpose, with different bands serving different purposes, and assignment is the distribution of those frequencies to users at specific locations to provide the specific service. Market-oriented policies have been used since 1994 for assignment, but not for allocation. The nature of the questions makes distinction between these sometimes difficult, so the responses may sometimes apply more to one process than the other.

1. *What specific policy and rule changes are needed to migrate from current spectrum allocations to more market-oriented allocations?*

The objective is better stated as market-responsive solutions, rather than market-oriented, as experience so far indicates the latter focuses on process rather than quality of product. The result must provide the public with better service, rather than facilitate government processes. Market responsive solutions should provide a streamlined administrative distributive process that minimizes delay and costs.

It may be interesting to consider the replacement of license applications by construction bids. Applying contract practices to implement competitive 3G for example, would ensure fast and cost-effective rollout. The Commission would specify the scope of the "projects" and select the winners by bid assessment techniques. Actual contracts and performance penalties could form the essence of the license. To avoid burdening the Commission staff, and eliminate political interference the selection could be contracted out if properly structured. This would require detailed, objective and quantifiable deliverables, which would differentiate the process from beauty contests.

Frequency allocation selection is a far different issue, as it is trying to select between apples and oranges, as opposed to frequency assignment, which is between apples or between oranges. In general, the traditional allocation process has enough compromise room to result in win-win solutions, which is essential to maintain the principle that one group does not have inherently greater right to the spectrum than another. Market approaches create win-lose situations unless there is significant government intervention, which negates the benefit. Both traditional and market allocation processes risk the strictures of inflexibility imposed by fixed and highly defined allocations.

2. *Should current, restrictive service and operating rules applicable in many bands be changed to provide licensees with greater flexibility? If so, in which bands and how?*

The existing system is not totally inflexible. For example, an ancillary use (the provision of a service that would normally require a different allocation, when it is an integral part of the allocated service) of radio spectrum, has been going on for decades, and is recognized domestically and internationally. By definition, the ancillary service cannot be used in the absence of the primary allocated service. Rules that prevent harmful interference between users must be maintained for such uses.

Under the traditional process most bands are allocated to more than one service, providing flexibility in time, place and use. Shared allocations usually have a strong technical base, something that could be lost under market-driven schemes.

a. Should incumbent users be given flexibility within their existing spectrum?

To the extent that a different use causes no more interference to others in the band than the original use, and that use does not distort the original use of the band, any band can benefit

from such a change. It is not possible to identify the need for specific technical or policy restrictions until the use is proposed, and it would be counterproductive to pre-determine every possible restriction.

b. *Should "site" licenses (e.g., broadcasting, private land mobile) be converted to geographic area licenses? If so, how should such licenses be defined (e.g., by power limits at geographic and frequency boundaries)?*

Geographic licenses will in some cases encourage warehousing of spectrum. The referenced radio systems by their nature are already geographic licenses, since service is provided over a generally specific area. The question appears more to ask whether licenses should be franchises rather than facility implementation. In cases where a large number of stations, which otherwise require licensing, must be established to provide service (e.g. land mobile) a geographic license is appropriate. The risk is that where there are coverage gaps spectrum will be unused and unavailable for another party who would provide coverage. If service to the public rather than administrative ease is the primary objective then geographic areas should be tailored to match actual service coverage, not possible service. More users can occupy a given area if they are shoehorned in through site-by-site coordination.

c. *How should spectrum not currently licensed by geographic areas be assigned or re-assigned, e.g., by auctioning Commission-defined "overlays" or by other means?*

Site-by-site licensing fosters competition for spectrum among users, resulting in higher spectral efficiency than occurs where an operator need only address his own needs, which will normally be to minimize his costs by deploying less spectrally efficient systems, and less or no coverage in less lucrative areas. To ensure real competition and consumer choice, the

Commission might consider 3G "super blocks" where more than one operator using the same technology competes for service within the same block. A consumer could freely roam between the operators, based on cost, features or coverage, which will drive operator behavior accordingly.

d. What are the relative efficiencies and inefficiencies of different licensing models?

See Table at Annex 2 for an evaluation of licensing for three models (Traditional, Market and Flexible).

Licensing efficiency should be measured by time, cost and quality of the process and product. The licensing process is a short-term activity (a few weeks, months or years) compared to the product that is likely to have a life of decades. In the short term, auctioning may be administratively efficient in licensing, but it may be inefficient in the long term. In the long-term, it increases the cost of service by the amount of the auction plus the cost of money, and it potentially defers the rollout of service by the same amount. It also establishes barriers to competition in less-lucrative portions of the service area, which less-well financed applicants may otherwise serve. Comparative licensing is time-consuming, but it can be cost-efficient in the end, providing more, better and cheaper service.

e. How would the interference rights of incumbents and new licensees be redefined under flexibility?

The current ability to declare incumbents "secondary" is adequate for a change in use. The licensees could maintain their same relative rights under flexibility if the old and new uses are technically homogenous.

f. What, if anything, should the Commission do to facilitate efficient restructuring of spectrum held by new licensees and incumbents, i.e., reduce transactions costs, avoid strategic holdouts, and create greater certainty about costs?

The allocation process re-structures spectrum. It is now a drawn-out, but democratic "beauty contest" that involves all players including international. This is in contrast to licensing (assignment) actions that are in the sole purview of the Commission. Auctions would be even less democratic in allocation actions than they are in licensing.

As discussed below under Question 17, incumbent compensation should be severely limited.

3. Should spectrum policy be different in different portions of the spectrum or in different geographic areas?

Spectrum policy should be related to product, which is the public benefit of spectrum, rather than to process. Rural areas have different product requirements and will profit from some differences in the use by the urban areas.

a. For instance, should the more congested region of the spectrum (i.e., that below 3 GHz) be governed by different policies than the less congested portions of the spectrum? Should different licensing concepts be applied to upper millimeter wave spectrum where propagation characteristics limit the range and small wavelengths enable very narrow beams?

Policies should be similar for similar products in all frequency bands. The differences in frequency ranges are technically exploitable by users who should not be constrained in choice

of band through policy, unless it is clear that industry will not or cannot make an obvious choice itself. Users will naturally migrate to higher bands in relief of congestion when it is appropriate.

b. Should spectrum policies vary by geographic area according to the relative level of spectrum congestion or use? For instance, should the rules be different in urban areas where spectrum is generally in high demand, than in rural areas where the demand for spectrum is typically low, or in the transition areas – where spectrum demand is somewhere between high and low demand regions?

Relaxed technical criteria are appropriate in areas with little or no spectrum congestion, as is the use of an alternative primary frequency allocation to a service that is not required in urban areas. The shared allocations should be coordinable in the boundary areas. Otherwise, gaps of spectrum use will occur which can reduce service to both urban and rural users

c. How can spectrum use, congestion and demand be accurately measured and predicted?

Spectrum congestion can be measured empirically by determining how many frequency assignments can be still made in the area. If the frequency manager determines that the band will only accept a relatively small number of additional assignments, it is congested; if many, it is uncongested. This requires accurate and available databases, which seems to be a problem for the FCC and band managers. Spectrum rent would be a strong incentive for all parties to closely track assignments. Market approaches may render these determinations impossible if the licensees have full and independent control of their spectrum.

4. Are there circumstances under which adopting more market-oriented allocation and assignment policies would affect other important Commission objectives?

For example, could the optimal provision of radio services to or by public safety and public service entities be helped or hindered by more market-oriented spectrum policies? Are there specific market failures that would produce such adverse affects, and what should the Commission do to address these market failures?

A great deal of care is needed in applying market principles to spectrum, as the spectrum is constrained and shaped by non-market forces. Non-market forces include new applications, rapidly changing technology, changing customer expectations of service or quality, and since radio is international by nature, a global difference in the way spectrum is used. Auctioned bands will suffer the same fossilization as those defined by current practices, and may be more difficult to correct.

Public safety users may benefit by foregoing independent radio systems, and relying on less expensive and more modern commercial services. Radio system design in terms of reliability and priority of access can be the same for both. Annex 3 shows how more spectrum can be available for all parties by the elimination of administrative band boundaries.

5. *Should more spectrum be set aside for operating unlicensed devices? Should the kinds of permissible unlicensed operations be expanded? What changes, if any, should be made to the rules to accomplish this? Because of the commons aspects of unlicensed use, is there concern that, as congestion rises, spectrum may not be put to its highest valued use? If so, what policies might be considered to anticipate this problem?*

Unlicensed devices by definition means there is no accurate determination of number or location. Determination of congestion becomes anecdotal, even though it may be theoretically

calculable. A band loaded with a new unlicensed technology such as spread spectrum may be a more hostile interference environment than a band full of coordinated conventional technologies.

Interference is potentially irresolvable unless the licensed system voluntarily changes frequency band (an unintended exception to the FCC relocation rules?) Unlicensed devices may be a case in point that the highest value use is not that auctioned at the highest cost, since some new applications (UWB) are not auctioned.

This suggests that some new technologies may require their own spectrum in order to protect conventional systems, and to ensure the new technology growth is not unnecessarily constrained.

6. How can the Commission better facilitate the experimentation, innovation and development of new spectrum-based technologies and services through, for example, changes in its experimental licensing rules, increased use of developmental authorizations or promoting demonstration projects?

More flexible allocations could minimize or eliminate the need for exceptions for such trials.

INTERFERENCE PROTECTION

7. Are new definitions of "interference" and "harmful interference" needed? If so, how should these terms be defined?

The current definition of harmful interference has been vitally useful for some time. There has always been a desire by some to quantify harmful interference. This should be rejected as it now serves the indispensable function of laying out the qualitative factors constituting harmful interference, against which engineers can calculate and quantatively agree if a specific case requires remedy. A quantified pre-definition will result in an inflexible number and

discourage practical compromise and innovation. There are other interference definitions available for quantification. "Does a tree falling in the forest make any noise if no one is there to hear it?" In radio, there is no harmful interference if it is not detected, but it goes further - there is none if the recipient ignores it, or agrees to ignore it. A quantified definition would cause more disputes than it would resolve.

8. *What is the impact, if any, of increased flexibility on how harmful interference should be defined and understood?*

The present definition provides unlimited flexibility. Quantification leads to rigidity and can stifle innovation, since it is invariably derived from current technology

9. *Are more explicit protections from harmful interference of incumbent users required?*

Protections are established by defining for example, maximum radiated power levels, against which designers will determine the worst interference environment, and act accordingly. Incumbent users should not be subject to increased levels of interference, unless it is explicitly agreed. Otherwise, this would be a retroactive change to their system design.

10. *Does defining power limits (in-band and at service area boundaries) and coordination procedures in the Commission's rules provide sufficient control over interference as new uses are introduced by licensees? What other regulatory measures are needed, if any?*

The most efficient use of the spectrum will always arise when the specific characteristics of a specific radio station and locale are taken into account, and another station can be fitted into that environment. Geographic definition of power levels independent of actual stations, e.g. X miles from the center of a metropolitan area, is not a technical solution but a process solution.

The definition of a franchise area risks restraint of service when the service provider slows rollout once the highest profit customers are reached.

The U.S. and many others strongly opposed planning of the FSS bands in the ITU, because as since demonstrated, the planning did not reflect the actual deployment needs of real systems. The ITU FSS planning included service boundaries, power and protection limits.

11. Does defining power limits and other measures in the Commission's rules designed to protect against harmful interference affect innovation?

Power limits, antenna characteristics and similar parameters serve to define a predictable inter-service and intra-service sharing environment. Relief has been be found by specifying tighter parameters as congestion increases. Innovative services frequently require a review of parameters to ensure they are afforded protection, and not creating new problems. Innovation is accommodated by specifying new limits when appropriate so the incumbent users can predict the new interference environment.

12. As technology advances, should what the Commission defines as unacceptable or "harmful" interference correspondingly change in the future? How should rights and obligations of spectrum users be defined to facilitate such changes as well as innovation?

The re-definition of interference levels is an ongoing process driven by technological change. The levels should not be allowed to drive innovation. If the Commission wishes to allow a new technology, the new interference environment must be designed for the specific technologies. Abandoning this process creates an unpredictable technical, operational and business environment that investors will avoid and customers reject.

The technical function of the regulator is to help avoid or resolve harmful interference. If there was no such thing as harmful interference then the only regulatory function required is that of gatekeeper, and that for a limited number of administrative purposes. It is possible to transfer the technical function to the user, but the regulator must maintain technical oversight to prevent exploitive or anti-competitive use of the spectrum. In the case of unlicensed devices, the transfer cannot be to the end user if this regulatory connection is broken. This suggests that suppliers should hold a blanket radio license for unlicensed devices, and be charged with resolving harmful interference (and a spectrum rent).

13. If the Commission adopts new policies to address interference, should the rights of new spectrum users be defined differently from those of the present incumbents? If yes, how?

Many frequency bands are built upon detailed frequency coordination where careful balances would be upset by a change in policy regarding the rights of old and new players. It would be better to clear incumbent users than create a conflicted environment.

14. Should the Commission consider developing receiver standards or guidelines for each radio service that would be used in judging harmful interference? For example, should such standards or guidelines aim to protect receivers that meet or exceed the standards or guidelines, but allow users to use less robust receivers at their own risk? If so,

a. What criteria should be considered in drafting these standards/guidelines?

b. How should the Commission consider protecting legacy receivers?

c. Should these standards/guidelines differ among the various radio services

Standards can stifle or at least delay innovation. Standards eventually become the lowest common denominator. Standards should not simplify the process at the expense of the product. The Commission should only intervene when it is clear the lack of quality of receivers in a band is causing gross inefficiencies in spectrum use. History indicates this has not been the case in the past - it was clear that huge improvements were possible in the use of TV spectrum in the 1970's, but the FCC failed to take action. In a competitive market, users will reject receivers of inferior performance, given the opportunity.

15. In lieu of, or to complement, technical rules related to interference, are there processes that the Commission could consider that would allow private parties to more expeditiously resolve interference issues and disputes, for example, through negotiated agreements, mediation, arbitration or case-by-case adjudication?

The process of resolving interference disputes is known as frequency coordination. Frequency coordination seldom fails when objective technical criteria specific to the case are employed. The Commission may wish to more formally recognize the availability of frequency coordination houses, and apply them to more services.

16. Some parties assert that the Commission should adopt rules for interference that are based on economics, and not purely technical, in nature. They argue that efficient interference management should involve an economic balancing between the parties using the spectrum. Would greater use of these types of alternatives lead to more certain and expeditious resolution of interference issues?

Interference is an integral part of a radio system design, and is carefully engineered to ensure a valuable product. Engineers already resolve significant economic trade-offs in station and system design. Economic theory better applies to aggregates of activity than to an individual

event. Although some may consider that the market can automatically take interference into account, actual interference is invariably a case-by-case event. To apply economic balances would be like saying that one need not seek help for a case of typhoid since so few now die of typhoid. If the intent is to allow financial settlement of interference, this is now possible through private (frequency coordination) agreement.

SPECTRAL EFFICIENCY

17. What mechanisms or policies might be considered as a means of promoting a proper level of spectral efficiency either through regulatory mandates or economic incentives? Are there mechanisms that other countries use that should be applied in the United States as well?

The microwave radio bands are a good example of cooperation between operators to make efficient use of the spectrum. However, older less spectrally efficient equipments (particularly those owned by municipal, state or federal agencies) are allowed to continue to operate despite a recognized shortage of spectrum. Spectrum should be periodically reviewed to see if the upgrade of equipment would resolve impending problems, something that is difficult for the group of operators to do themselves. The incentive would be to remove interference protection in a number of years for equipment not meeting acceptable spectrum efficiency (bits/second/Hertz). Since digital systems can be more susceptible to interference than older analog systems, a re-frequencying exercise may be required. This can apply to other services. The benchmarking of spectrum efficiency in different bands by the Commission would help drive users to more efficient equipment and designs

Canada employs a "5 and 2 year rule", which means that after public consultation determines a need for a change in spectrum, the incumbents remain in place for at least five