BEFORE THE FEDERAL COMMUNICATIONS COMMISSION

In the matter of	)	
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Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands	)	WT Docket 02-353; FCC 02-305
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Facilitating the Provision of Spectrum-Based Services to Rural Areas	)	WT Docket 02-381; FCC 02-325
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Comments of Fred R. Goldstein, Ionary Consulting

In adopting these Notices, the Commission is presented with a historic opportunity to apply its spectrum licensing authority in a manner that at once fosters both innovation and economy. In keeping with the Commission's overall goal of maximizing the value of spectrum, the 1710/2110 MHz bands can be simultaneously used for two compelling, yet complementary, purposes. The primary users of this spectrum are likely to be advanced mobile wireless services, such as so-called "3G". But demand for this service is greatest in urban areas; bandwidth requirements for mobility are necessarily smaller in sparsely-populated and thinly-traveled reasons. Thus it is suggested herein that a portion of this band be reserved in outlying rural areas for advanced Wireless Local Loop (WLL) applications.

The suggested basic framework is to divide these 90 MHz into seven to nine channel-pairs, each 5 to 6 ½ MHz wide in each direction, to allow these to be auctioned in blocks of one to three to CMRS or other operators, but with at least one channel-pair reserved or "carved out" in rural areas. These reserved channels would be made available without competitive bidding to eligible local exchange carriers, for whom these would become, over time, a substitute for some level of existing high-cost support. The LECs would use these for both voice and advanced data services in places where wired local loop is inefficient. This spectrum would potentially become an advanced replacement for BETRS.

Previous Commission policies with regard to wireless services and wireline universal service have been, in general, made in isolation from each other. Wireless licensing has thus been primarily focused on mobility, and on high-volume urban/suburban applications, while wireline/PSTN service providers have been unable to make significant use of wireless technology in order to solve the problems of rural subscribers and the carriers who serve them. The current

proceeding affords an opportunity to demonstrate the success of the Commission's reorganization and a new-found willingness to work across Bureau boundaries in order to solve a problem.

CMRS licenses and bidding credits

The Commission's efforts to improve mobile coverage in rural areas are laudable. Its suggestion that bidding credits might be granted to rural carriers is appropriate for the provision of mobility-based radiotelephony services, but is not sufficient for high-cost wireline substitution.

Bidding credits may be a useful tool in encouraging development of mobile-wireless services in some areas. But true WLL is a substitute for high-cost fixed wireline outside plant facilities, in all other ways operated as a wireline service. WLL providers as envisioned herein are Title II LECs, not CMRS.

The Advanced Wireless Service (AWS) frequencies are unlikely to see heavy use in rural areas that are not already served by 800 MHz Cellular and 1900 MHz PCS service. Shared use of these frequencies for WLL is unlikely to have a significant negative impact on mobile service.

Channelization

The most obvious primary use of this new AWS spectrum is for third-generation wireless mobile telecommunications systems (3G). While such systems have been licensed in Europe and elsewhere, their market acceptance has been limited, and the technology is only slowly coming to market. Current wireless operators are upgrading their licenses to "2.5G" systems that are compatible with existing spectrum allocations. Some, but not all, 3G operations will however require new spectrum.

A case can be made for dividing the 45 MHz bands into either 5.0, 5.625 or 6.5 allocation blocks, which, if uniformly applied, would result in nine, eight, or seven respectively. PCS already offers 5 MHz wide channels; the question is really whether Advanced Wireless Services fit the same mold.

There are of course two major competing technologies that share the "3G" label and international standards[1]. CDMA2000 is designed to be upward-compatible from existing CDMA systems, and to fit within existing PCS spectrum allocations, with their 5 MHz blocks. Narrowband CDMA

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[1] While China has adopted its own, third 3G technology, TD-SCDMA, it has been of little interest to the rest of the world. Its success in China, however, may lead others to examine its unique features.

fits within 1.5 MHz channels, whether used for voice or for data in the 1X RTT format. Wideband CDMA (W-CDMA) may be more appropriate as an upward migration path for existing GSM operators. Its chipping rate is slightly higher than CDMA2000s. Its nominal specification is for signals at 2.5 MHz from the carrier to be 35 dB below carrier level. However, W-CDMA has been slow to roll out, and whether it is actually suitable for a 5 MHz channelization is slightly uncertain. This implies that there may be significant demand from some TDMA and GSM operators for new W-CDMA-compatible spectrum with a slightly wider channel.

Given a 45 MHz allocation in each direction, an equal division into seven 6-1/2 MHz channels would be appropriate for both CDMA2000 and W-CDMA users. It would provide conservative room for a W-CDMA channel, or would also provide simultaneous room for a "3X" CDMA2000 and "1X" narrowband CDMA carrier. It would thus appear technically reasonable to divide the total bandwidth three ways, allocating two or three such channels to each licensee. Thus auctions could be held for 26 MHz or 39 MHz, allowing three licensees per market. However, a more granular division with some 13 MHz allocations is also possible, and would allow a larger number of existing carriers to avail themselves of new spectrum for advanced services.

A 6 ½ MHz channel would also be the minimum for DOCSIS-based WLL systems, which are designed for 6 MHz CATV channels, and have a nominal 6.4 MHz bandwidth. Such systems are however asymmetric, with narrower upstream channels. This could be less than ideal for providing rural telephone service, which is a symmetric application, but may be useful for consumer data, a "wireless cable modem".

An eight-way channelization, into 5.625 MHz channels, is also plausible; this should also suffice for W-CDMA, at the cost perhaps some minor inefficiency in CDMA2000, since an additional 1X channel could not be simultaneously accommodated. This would however be wide enough for the proposed WLL application.

A nine-way channelization, into 5 MHz channels, would support CDMA2000, and support W-CDMA with a bit less certainty. This provides the largest number of blocks, of course, and could support four licensees, three with two channels, the third with three (i.e.; 20, 20, 20 and 30 MHz allocations). The rural WLL carve-out could thus be taken from the largest block while only reducing its bandwidth by one third.

Rural wireless local loop

Current policy for providing basic local exchange telephone service in rural areas has focused on subsidy mechanisms, with wireless local loop being used only in extreme cases. Local exchange service providers are in general encouraged to provide wireline service to virtually all subscribers, no matter what the cost, with the tab being picked up by the larger nationwide pool of callers. This encourages inefficiency. More insidiously, the revenue requirements imposed by this method lead to rate pressures, such as very high switched access rates, and to the use of arbitrary intraLATA and intrastate toll rates as a source of implicit and explicit subsidies. Dependence upon intraLATA toll, in turn, leads to regulatory friction. Conflicts arise over topics such as Virtual NXX for ISPs, area-wide calling for CMRS carriers, and affordable local calling for communities split between exchange areas. An ideal solution would be one that, over the long term, reduces the need for subsidies while improving service levels. Wireless local loop based on broadband technology (such as CDMA) may finally make this possible.

Current Part 22 services such as Rural Radiotelephone Service and Basic Exchange Telephone Radio Systems (BETRS) provide a limited alternative for very-high-cost subscribers who are within radio range of a base station. These are based on older technology; BETRS, while based on digital transmission, has difficulty even supporting fax modem speeds of 14.4 kbit/sec, let alone providing Internet access at acceptable rates. Available spectrum is also quite limited. The cost is also kept high by the use of narrowband channelization, which requires new transmitting equipment for every few new subscribers, and by its relatively small market size, which limits economies of scale.

While CMRS wireless mobile systems are theoretically capable of providing fixed service, the economics and engineering of a fixed wireless (WLL) system are dissimilar from CMRS. Mobility requires a stronger signal, both because its target mobile units are subject to constant Rayleigh fading, and because the mobile units have omnidirectional antennas. Wireless local loop base stations can thus cover a larger radius, by using directional gain antennas and, if necessary, higher-powered transmitters, at the subscriber sites. Additional range can be gained in some cases by using elevated antennas. This longer range is critical in low-density rural areas. Longer-range systems also have more subscribers per cell, providing necessary economy of scale. In contrast, CMRS providers generally build out networks starting at the densest locations, and typically do not provide mobile service in most BETRS-eligible areas. CMRS providers usually also have different pricing models, which are appropriate for mobility, but would not be widely accepted as a substitute for basic local service.

Advanced Exchange Radio Telephone Service

In response to this need, I suggest the creation of an Advanced Exchange Radio Telephone Service (AERTS), most likely within Part 22. This service will, as part of this proceeding, be allocated paired channels (e.g., 6.5 MHz in each direction if that is the channelization) in each of the 1710 and 2110 MHz bands. These allocations will only exist in rural locations where a local exchange carrier is eligible to use BETRS, or currently receives high-cost support, or demonstrates using some other test of the Commission's choice that its cost of providing loops to a significant portion of its subscribers is substantially above national norms. These 10 to 13 MHz could be part of a 30 to 39 MHz wide license allocation, creating in effect a "carve-out" of rural areas from a license that serves a larger geographic region. It is axiomatic that the mobile subscriber density will be lower in rural than urban areas, so that the actual value of this additional spectrum to a CMRS licensee should be de minimis. The auction value of a 26 or 39 MHz license would thus be barely impacted by carving out such partial exceptions in very-low-density rural areas.

The geographic scope of AERTS licenses would, like BETRS, be very specific, not regional. It would typically correspond to the low-density rural portions of a local exchange carrier's service area. Eligible LECs in adjacent areas would be permitted to share transmission facilities that serve territories of both, or could choose to coordinate their systems to minimize interference. Because directional subscriber antennas can be used and because of the superior interference-rejecting capability of CDMA technology, it is likely that the same frequencies can be reused in adjacent service areas without unacceptable interference.

Rural carriers who receive this spectrum would, in exchange, be expected to eventually reduce their dependency upon subsidies. Their current high-cost-support status would be held harmless for a sufficient period of time to begin a buildout, perhaps two to three years. After that, the peak level of subsidy payment for new lines would be reduced, although participating LECs would be allowed to complete the capitalization of existing lines.

Incumbent LECs are the Eligible Telecommunications Carriers who are recipients of the vast majority of these current subsidies, and thus they should have first option for these AERTS licenses. However, if an incumbent LEC opted to not accept this license and the concomitant future reduction in subsidies, then the spectrum should be offered to alternate carriers, to use for the same purpose. One possibility is for eligible LECs in adjacent or nearby areas to be given an option, followed by offering it to any other company (ILEC, CLEC or CMRS) willing to offer service in the same area.

CMRS licensees should not be prohibited from deploying networks with the technical parameters of AERTS, so that a CMRS auctioned licensee could, if it chose, use similar technology to provide fixed service within its service areas, urban or rural. However, this alone should not be considered to be adequate buildout for mobile service.

Advanced Exchange Radiotelephone Service would support both voice and broadband data. 3G technologies are theoretically rated to provide over one megabit per second data bursts to fixed stations, although a peak speed in the 384-512 kbit/second range may be more realistic. From my experience working with ISPs and DSL providers, the bandwidth of a CDMA2000 or W-CDMA carrier would be sufficient to support dozens of "high speed data" subscribers, because average usage is a small fraction of the peak rate. Voice telephony can be prioritized in order to maintain a high quality of service, including support for modems.

By adopting this plan, the Commission addresses several problems, with little harmful impact to existing or other prospective licensees. Fixed wireless offers the best potential to economically bridge the "digital divide" in low-density rural areas without costly subsidies; the new 3G spectrum offers a promising place for it.

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