SPECTRUM SHARING OUTLINE FOR CSMAC

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Both Government and non-government users depend heavily on spectrum for a wide variety of wireless devices and applications to provide communications, information and control of critical systems. Use by both government and non-government entities is increasing at a rapid pace.

Recognizing the potential for broadband access to enhance America's economic competitiveness and create jobs, on June 28, 2010 the President directed The Secretary of Commerce, working through the National Telecommunications and Information Administration (NTIA) to collaborate with the Federal Communications Commission (FCC) to make available a total of 500 MHz of Federal and nonfederal spectrum for broadband use. The wireless industry has expressed a strong need for spectrum below 3 GHz to meet the demand for mobile broadband services. Likewise, government users have requirements for spectrum below 3 GHz to meet mobile communications requirements. Given the need to satisfy both government and commercial requirements for suitable mobile spectrum, there must be a rationalization of spectrum use to migrate uses that can operate at higher frequencies out of spectrum below 3 GHz. There must also be efforts to maximize the efficient use of spectrum, including through sharing spectrum where feasible. While there may be limited sharing potential between dense commercial broadband deployments and government users, there may be opportunities for government users to share with non-government systems in order to clear spectrum for commercial broadband services.

Commercial Spectrum – The Importance of Exclusive Use

- The success of the commercial mobile wireless industry has been based on access to spectrum that is licensed on an "exclusive use" basis. Because the spectrum does not have to be shared with other licensees, this licensing model allows wireless companies to maximize the efficient use of the spectrum and provide higher quality, reliable services to the greatest number of customers. It also promotes increased investment in innovative wireless technologies because companies have incentives to get the most value and utility out of the spectrum they control.
- The FCC has previously determined that flexible exclusive use licensing arrangements have significant benefits that help to promote increased investment in and development of innovative wireless technologies and services. (See FCC's Spectrum Task Force Report, 2002).
- Spectrum allocated for use under a "commons" approach also creates significant consumer and economic benefit. However, the same spectrum cannot be made available

for both exclusive use and commons, as the use of spectrum for unlicensed use necessarily conflicts with the rights of an exclusive use licensee. Consequently, spectrum allocated under a commons model is best applied where exclusive use licensing isn't feasible, e.g., where spectrum must be shared with other uses.

- In identifying government spectrum for sharing, technical factors such as geographic limitations and allowable power levels must be considered. Economic considerations are also relevant, however, and we recognize that the best technical solutions might not produce economic incentives sufficient to achieve robust and widespread sharing. Thus, spectrum sharing discussions must also ensure that spectrum identified for sharing is viable for commercial and unlicensed users.

Federal / Non-Federal Spectrum Sharing Arrangements

- The potential for significant sharing of spectrum between federal and non-federal exclusive use commercial licensees on a long term basis is limited because the use of the spectrum by federal agencies will diminish the use of the spectrum for commercial purposes. This is why spectrum sought for commercial mobile services, e.g., 1755-1850 MHz, generally needs to be cleared of federal uses. There are exceptions to this general assumption.
    - Example 1: Geographic sharing may be possible, so long as the areas excluded from commercial access are very limited, e.g., small rural areas such as areas around remote military bases.
    - Example 2: Dynamic sharing on a temporal or spatial basis may also be workable, as long as the government's use of the spectrum is relatively low or occurs at times of the day when commercial traffic is relatively light.
- More extensive sharing, whether on a geographic, temporal, or spatial basis, may be feasible on an interim basis, e.g., as commercial networks are built out. Such an arrangement could facilitate a longer term transition of more costly or complex government systems, while allowing auction and use of the band by commercial systems on a near-term basis.
- Any sharing arrangements between federal systems and commercial mobile networks must, necessarily, be developed on a case-by-case basis, as the sharing conditions will be predicated on the technical and operating parameters of affected systems. There is no one size fits all approach that can be applied to all cases.
- Sharing arrangements must provide meaningful use of and access to the spectrum for the commercial system, including access to the major population centers where demand for

services is greatest. Sharing arrangements must also take into account the need for both commercial and government systems to evolve technology over time.

- Exclusion zones have the greatest impact on the new entrant's access to spectrum, although it may be the easiest way to share among otherwise incompatible uses while also preserving the ability of incumbent users to maintain and develop their uses. From the commercial mobile wireless perspective, it should be a mechanism of last resort unless the exclusion zones are sufficiently limited in size and acceptable geographic locations.
- In spectrum where significant continued operation of federal systems is required over the long term, sharing may be possible with unlicensed commercial applications or other non-exclusive licensing arrangements. However, in doing so, it should be understood that the arrangements may have impact on the value.

Recommendation for Developing Sharing Scenarios

- The commercial wireless carriers view is that NTIA's primary objective should be to fully clear federal spectrum for commercial use, where it is deemed feasible, because that creates the greatest commercial value.
- Where spectrum cannot be fully cleared, an analysis should be undertaken to determine what impact those federal systems that remain in the band would have on future commercial uses, and what sharing conditions are required to protect incumbent systems.
- The analysis should be conducted with the NTIA, the FCC, impacted government users and interested commercial parties working cooperatively to evaluate the impact and develop sharing mechanisms that maximize the efficient use of spectrum and minimize the impact on operations.
- Solutions should not be bound by traditional spectrum management approaches that relies on a strict hierarchy of users and which generally calls for new entrants to protect existing operations and where the incumbent is not required to take any action to facilitate sharing. Relying solely on the new entrant to develop a sharing arrangement is unlikely to result in the most efficient sharing arrangement. It is far more likely that the spectrum could be used and shared more efficiently if the impacted parties work cooperatively to exchange information about their respective operations and, as appropriate, develop mechanisms to facilitate dynamic sharing.
- This joint analysis, which must be undertaken on a case-by-case basis, should include consideration of system specific information for both incumbent and new entrant systems, including:

    1. Characteristics of incumbent and potential new entrant communication systems

a. System Characteristics Description (assuming non-classified for incumbents)
    i. Basic architecture of the radio system/link
    ii. Operating frequency, bandwidth, technology type, transmit power, antenna gains, operating performance (BER, FER, Availability, coverage).
    iii. Target limits on interference levels into their operating band/bandwidth
    iv. Out of band emissions into/from their equipment
    v. Spectrum mask, adjacent/co- channel interference profiles
    vi. Transmit power control characteristics
    vii. Area of operation/geographical information (terrain type, shadowing/fading conditions assumptions, street level, airborne, etc.)
    viii. Usage (how often, time of day, week of year, etc.); duration
    ix. System redundancy; alternate links
b. If two way, need information on the terminal/customer equipment transmission and receiver characteristics

2. Evaluate compatibility of federal systems with potential commercial applications – e.g., mobile broadband vs. backhaul, or fixed services vs. low bandwidth applications (e.g, telemetry, M2M).
    a. Evaluate candidate mobile broadband technologies against incumbent operational requirements (case-by-case basis).
        i. Evaluate limitations on coverage, time of use limitations, capacity and peak throughput;
        ii. Evaluate cost of developing technological solutions to accommodate incumbent needs and impact on commercial business model;
        iii. Evaluate impact to commercial device cost and performance due to constraints on operating requirements.
    b. Assess impact to overall value of spectrum for new entrant systems

Venue for Exchanging Information and Developing Sharing/Impact Analysis

- This analysis could best be accomplished through the establishment of a joint government-industry technical committee to address a specific opportunity.

- Establishment of a government-industry advisory does not have to be overly burdensome and can be created in a way that will protect sensitive information. The parties involved in the discussion can be limited to a focused group of experts and may even include non-disclosure agreements to protect sensitive information (although this would be insufficient to protect classified information) and to facilitate an exchange of information and ideas leading to a preferred solution for all parties.

- Any rules or final decisions would be subject to a fully open and public rulemaking process.