

Some parties suggested that the FCC should extend flexibility as far as letting private parties develop interference standards, with the FCC functioning in the role of mediator.<sup>72</sup> Other panelists indicated, however, that many carriers may prefer that the Commission establish more universal standards so that more equipment is manufactured under those criteria.<sup>73</sup> Certain panelists also stated that as new technologies such as SDR evolve, there should be less need for a fixed standard because it will be easier to adjust to technology changes through software, as opposed to having to redesign hardware.<sup>74</sup>

Various parties indicated that a purely flexible market-oriented approach may not be appropriate for public safety and other critical infrastructure users. They contended that market-based sharing regimes might pose problems for such entities, which are required to meet strict regulations with absolute reliability." They also asserted that it may be more beneficial for these entities to operate their own systems in order to comfortably be assured of meeting these standards. It was pointed out many times that a pure market mechanism disadvantages those providing public services. While the highest and best commercial uses may adequately be measured in market terms, several commenters asserted that the market fails to value public services appropriately.<sup>76</sup> These public goods include public safety communications systems (police, fire, rescue, disaster coordination, etc.), and less visible uses such as radio astronomy." Specific use allocations may still be necessary in these cases, although no more spectrum than necessary should be devoted to such regulated use. Such dedicated spectrum needs may be reduced if public service providers are allowed to lease part of their requirements on an as-needed basis. Public safety is discussed in more detail below.

Another situation in which the market fails to take important considerations into account is when domestic spectrum uses must be compatible with international uses, either for technical reasons, or in order to conform to international agreements. A number of commenters pointed out the importance of respecting those demands.<sup>78</sup> Much of the discussion was in the context of developing global satellite systems, and the solution was generally assumed to be an arrangement of special allocations. But in keeping with the general interest in more flexibility, the Commission should also explore an approach in which spectrum would be made available for satellite, terrestrial, or combined use at the option of the user.

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<sup>72</sup> See, e.g., Ericsson Inc. (Ericsson) Comments at 5-6.

<sup>73</sup> See, e.g., Statement of Michael Kurtis at the *Public Workshop on Spectrum Rights and Responsibilities*; Peha Comments at 4.

<sup>74</sup> Statement of Ray Pickholtz at the *Public Workshop of Interference Protection* at 124. See also Old Colorado Communications Comments at 3-4; License Exempt Alliance Comments at 5.

<sup>75</sup> See, e.g., New York State Office for Technology Comments at 11; Private Radio Commenters Reply Comments at 3-4.

<sup>76</sup> See, e.g., Statements of Jennifer Warren and Joe Gatusso at the *Public Workshop on Spectrum Rights and Responsibilities*; AT&T Wireless Comments at 8-9; NPR Comments at 4-12.

<sup>77</sup> See, e.g., NPR Comments at 4-12; Barnaby Rickett Comments at 2; Nickolaus Leggett Comments at 5-6.

<sup>78</sup> See, e.g., SIA Comments at 7; Hughes Network Systems Comments at 10-14; New York State Office for Technology Comments at 11-12; Motorola Comments at 25-26.

*Conclusions/recommendations* The Working Group generally agrees with commenters and workshop participants that, within "basic" parameters, spectrum users should be given maximum possible flexibility to:

- Choose the services they provide on their spectrum;
- Determine the technology that is most appropriate for providing those services; and
- Transfer, subdivide, or lease their spectrum rights.

In addition:

- Rules generally should be written so as to permit anything not expressly prohibited; and
- Exceptions to flexible rights licensing models should permit command-and-control restrictions only where absolutely necessary and involving the least amount of spectrum needed to accomplish public interest goals.

## **B. Regulatory Certainty**

While participants were vocal about their desire for more flexible rights, they were equally interested in firmness and clarity in the rules they are required to follow.<sup>79</sup> Discussions at times seemed paradoxical, with commenters apparently requesting both more definite and more flexible rules, but an overarching principle eventually emerged: providers of wireless services want clear rules governing their interactions with the FCC and other spectrum users, but the freedom to operate as they please within those boundaries. In other words, they want certainty of access to a clearly specified bundle of spectrum use rights with firmly defined limits on how much interference they have to accept and can produce, but flexibility in their operations within those parameters.

As in the discussions about flexibility, the commenters requesting more certainty were not always talking about exactly the same types of certainty. While most agreed that the Commission's rules are not sufficiently clear, the examples they provided varied greatly. Some pointed out that rights which are not exhaustively defined create "grey areas" that can lead to conflict. With site-based licenses, for example, the question of who should have access to the white space surrounding a licensed site is often a source of dissension. Others argued for more clarity in the rules on the grounds that equipment manufacturers do not know what sort of equipment to build if service rules are not clearly defined.

Advocates of the exclusive use model argued that instability in the usage rights of licensees discourages investment, and further contended that "exclusive" rights are not meaningful when the Commission, after licensing, can tell a licensee that a new service may operate on the same frequencies, through overlay or underlay licensing. Thus, they maintained that the rules should explicitly prohibit other users from interfering with incumbent systems.<sup>80</sup> Proponents of commons-like approaches disagreed with the

<sup>79</sup> See generally Sprint Comments at 4; Statement of Steve Sharkey at the *Public Workshop on Spectrum Rights and Responsibilities*.

<sup>80</sup> See, e.g., AT&T Wireless Comments at 14-15; Sprint Reply Comments at 7-8.

proposition that exclusive rights are necessary to investment, pointing out that uncertainty can inspire innovation and the development of such devices as frequency agile radios<sup>81</sup>

The suggestions that received the most attention were those dealing with interference rights, which many parties asserted are important to define. Specific suggestions dealt with different aspects of interference, among them the need to clarify the definition of "harmful interference" currently used by the Commission; how to delineate the maximum level of "noise" that licensees must accept; and the rules on how to resolve issues that arise when an incumbent's service is impaired by a new user operating within its rights.<sup>82</sup> Several participants noted that the need to consider these points is well illustrated by Nextel's conversion of SMR service to a cellular-type service, an unintended consequence of which was interference with adjacent public safety licensees.<sup>83</sup> If the rights of the new service had been defined more clearly at the outset, the problems may have been avoided. In general, prospectively defining these rights is useful for avoiding subsequent problems with incumbents, but unfortunately that is not always possible. Transitional issues are discussed below.

Commenters frequently pointed out a need for more objective measures of interference.<sup>84</sup> Defining measures and setting them at an appropriate level will require the Commission to have a better grasp of the science involved prior to making rules, and to anticipate better the consequences of different uses. This means that more engineers should be involved in the rulemaking process.

Based on the many comments received and heard, the following basic spectrum rights parameters must be clearly defined for both licensed and unlicensed uses:

1. Authorized frequency and bandwidth;
2. Geographic scope of right to operate;
3. Maximum RF output, both in-band and out-of-band; and
4. Interference protection, i.e. maximum level of noise/interference that spectrum user must accept from other RF sources.

Parties often cited broadband PCS as an example of how flexible service and technical rules can coexist with clearly defined spectrum rights and responsibilities.<sup>85</sup> In that regime, geographic licenses for a particular frequency and bandwidth carry a

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<sup>81</sup> See, e.g., Statements of Bruce Fott and David Reed at the *Public Workshop on Spectrum Rights and Responsibilities*.

<sup>82</sup> See, e.g., Statements of Victor Tawil and Peter Pitsch at the *Public Workshop on Spectrum Rights and Responsibilities*; Part 15 Organization Comments at 5; CTTA Comments at iii, 12.

<sup>83</sup> See, e.g., Statement of Steve Sharkey at the *Public Workshop on Spectrum Rights and Responsibilities*; Coleman Bazon (Bazon) Comments at 2-3.

<sup>84</sup> See, e.g., Statements of Andrew Clegg and Nancy Jesuale at the *Public Workshop on Interference Protection*.

<sup>85</sup> See, e.g., Sprint Comments at 13; Statement of Dwayne Hendricks at the *Unlicensed Spectrum and Experimental Licenses Public Workshop*, held at the Commission on August 1, 2002.

<sup>86</sup> See Statements of David Siddall and Michael Kurtis at the *Public Workshop on Spectrum Rights and Responsibilities*; Sprint Comments at 2-3.

construction requirement and a renewal expectancy, which give licensees the certainty they need to make major investments while still giving the Commission the ability to reclaim the spectrum if the licensee acts improperly. The PCS rules include maximum output levels at the geographic and spectrum borders of each licensed spectrum block, so that each licensee knows in advance the maximum output that it can produce and is required to accept from co-channel and adjacent channel PCS licensees. This approach also provides a clear common framework from which adjacent and co-channel licensees can negotiate alternative consensual arrangements. Some suggested that this approach can work for almost any technology.

The issue of enforcement also arose in connection with the clarification of rights, with various panelists arguing that the **FCC** must do a better job of enforcing licensee rights or else the licensee really does not have those rights.<sup>87</sup> Indeed, the point was made repeatedly that the success of any rights regime depends on the enforcement of the rights. It was suggested that the **FCC** needs a plan to speed up the resolution of interference complaints, and that better enforcement could be achieved by increasing technical expertise at the Commission.<sup>88</sup>

*Conclusions/recommendations.* In sum, the Working Group generally agrees that with regard to regulatory certainty:

- Rights should be clearly and exhaustively defined;
- Basic parameters to be determined are frequency, bandwidth and geographic scope, and how much interference a licensee is allowed to impose on others and how much he must accept; and
- Once identified and assigned, rights should be protected through adequate enforcement efforts, and should not easily be modified.

### **C. Interference Standards**

Issues concerning interference were among the most widely discussed by commenters and by participants in the Public Workshop. The specifics of appropriate types of interference parameters and interference protection schemes, and appropriate levels of desired and undesired signals and how to best measure them, are discussed elsewhere in the reports of other Working Groups. Here we discuss the impact of various approaches on licensee rights and responsibilities.

The most common theme expressed was that as services proliferate and more people try to do more things with spectrum in the future, the most fundamental spectrum management problems will likely relate to interference. As discussed above, it was noted that too often the interference caused to adjacent channel licensees is not factored in when a new service is authorized. Another concern expressed was the preclusive effect of many licensees/operations in the absence of predefined protections for future spectrum users.

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<sup>87</sup> See, e.g., Statements of Victor Tawil and David Wye at the *Public Workshop on Spectrum Rights and Responsibilities*; Bazon Comments at 2.

<sup>88</sup> See, e.g., Bazon Comments at 2-3.

Several parties also pointed out that the Commission's most difficult, controversial, and unsatisfactorily resolved cases have resulted from situations in which the extent of an incumbent's spectrum rights and interference rights, and its limitation on impacting other bands or users, were *not* clearly understood by the incumbent, by a new service provider, and even by the Commission.

Several parties argued that the current definition of interference is too vague and subjective, while others preferred to retain the flexibility of interpretation that it allows. Various parties stressed the need for regulatory certainty, both in terms of what kinds of signals they would be permitted to transmit, within their bands and into other bands, and what kinds of undesired signals they should plan to tolerate as worst case from in-band operations (e.g., "underlay") and out-of-band operations.<sup>89</sup> To achieve this certainty, they maintain, requires some objective technical standards that are concretely measurable and predictable.

Participants that remarked on this issue generally suggested that the Commission should take into account frequency/bandwidth, power, co-channel and adjacent channel operations, out-of-band emissions, background noise, and perhaps geographic location and scope. A few parties insisted that the Commission must field test its assumptions when determining interference consequences of its technical determination.<sup>90</sup>

Despite a desire for certainty regarding the operating environment that they could create and in which they would be required to perform, parties also expressed a compelling desire for flexibility. There was some discussion of whether licensees' permissible operations should be defined in terms of "inputs" – permissible tower height and transmission power – or in terms of "outputs" – how much signal strength results on particular frequencies at particular locations. Parameters based on the latter considerations would provide licensees with greater flexibility in determining their system architecture to meet customer density, geographic location and scope, and cost considerations, while maintaining what should be the Commission's most basic regulatory concern: the extent to which they impact the service of other licensees and operations.

Any setting of such standards, of course, reduces the Commission's flexibility in responding to changing technology and changing customer and public needs. Nonetheless, the degree of certainty that can be provided for both incumbent licensees and potential new entrants and the increased opportunity for new entrants and services outweigh this concern. This concern is further diminished if the Commission undertakes

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<sup>89</sup> See, e.g., American Radio Relay League Comments at 10; Private Radio Commenters Comments at 15-19; Hughes Comments at 10.

<sup>90</sup> See, e.g., Telecommunications Industry Association (TIA) Comments at 6; Information Technology Industry Council Comments at 9; CTIA Comments at iii, 12; Bazon Comments at 2; AT&T Wireless Comments at 14; Consumer Electronics Association at 6-7.

<sup>91</sup> See, e.g., CTIA Comments.

periodic review of its technical parameters, as further discussed below in the section regarding license terms and terms limits on rules.

Various panelists agreed that it is critical to distinguish interference from competition. Several complained that incumbent licensees claim that a new service will cause "interference" when their primary concern is direct or indirect competition provided by the new entrant. One participant specifically remarked that regardless of whether the standard is "harmful interference" or "meaningful interference," the analysis will depend on one's point of view, *i.e.*, whether one is an incumbent or a new entrant. New entrants often complain that incumbents have no incentive to produce robust systems that are less affected by potential interference and, in fact, have a disincentive to do so if the Commission continues to protect legacy equipment that is not designed to operate in a spectrally efficient manner.

At least one party proposed that the Commission let the courts determine what constitutes harmful interference when parties have a conflict.<sup>92</sup> However, the more objective standards for determining interference that we expect to develop would appear to obviate the basis for such a proposal.

One idea that participants raised was that the Commission define the amount of interference that a user can create and must accept, and let industry set standards within those parameters. Participants also suggested that the Commission should allow the private sector to develop interference standards and present them to the FCC, which would then be responsible for enforcement. The Commission has often been guided by or given deference to industry-developed standards, and will continue to do so when the participants reasonably represent all affected and potentially affected interests. Sometimes, however, industry groups may not adequately account for the interests of other affected entities, such as those developing new technologies and nascent providers of future services.

While there also was some call for receiver standards, these proposals appeared to result primarily from concerns about the vulnerability of many receivers designed by incumbent licensees in the context of our current interference rules. We believe that if the interference environment in which receivers must operate is adequately specified in advance, licensees and receiver manufacturers would face strong economic incentives to design equipment that will not be susceptible to potential interference. In most cases it is best left to licensees and equipment designers and manufacturers to determine how best to design equipment to operate in this environment, and to make the various economic evaluations and trade-offs involved in such determinations. The Commission should carefully consider, however, whether it might be appropriate to mandate receiver performance for consumer goods whose design and manufacture are not controlled by a licensee.

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<sup>92</sup> See David Rhodes Comments at 4

*Conclusions/recommendations* Given these considerations, the Working Group concludes and recommends as follows:

- The current definitions and rules for controlling interference do not always provide licensees with adequate notice regarding possible changes to the electromagnetic environment in which they may be required to operate in the future;
- Inadequately defined interference rights can lead to extensive adversarial contests regarding the rights of incumbents when new service are proposed;
- If the Commission determines to specify the maximum level of undesired signal to which licensees will be subjected, licensees and equipment manufacturers can design systems that will provide for additional future uses by other users of the same spectrum and of adjacent spectrum;
- Interference standards based on outputs provide desired flexibility while protecting the reasonable expectations of licensed and authorized service providers and the public; and
- While there may be some situations in which it would be appropriate for the Commission to establish receiver performance requirements, in most cases licensees and manufacturers should retain that responsibility, assuming that they know in advance what their expected interference environment will be.

#### **D. Secondary Market Arrangements and Commission-Granted Easements**

Coincidentally and Public Workshop participants suggested that the Commission needs to look for ways to improve access to licensed spectrum by new entrants, and that technological advances using devices such as frequency-agile radios have increased the potential for spectrum to accommodate multiple non-interfering uses.<sup>93</sup> Many strongly advocated that the Commission move forward with its pending proceeding on secondary markets.<sup>94</sup>

Coincidentally generally suggested two alternative approaches to facilitate access. Many advocated expanded use of a variety of market arrangements, including secondary markets involving the lease of spectrum usage rights.<sup>95</sup> Under this approach, licensees would hold the rights associated with determining which potential entrants could have access to the spectrum and under what conditions. Others advocated allowing open access on a non-interfering basis through expanded use of easements.<sup>96</sup> In the latter case, the Commission, and not the licensee, would establish conditions for user access to the spectrum. There was significant disagreement among coincidentally on how to balance

<sup>93</sup> See, e.g., Statements of David Farber at the *Public Workshop on Spectrum Rights and Responsibilities* at 61, 77.

<sup>94</sup> See, e.g., Sprint Comments at 9; Cantor Fitzgerald Comments at 3; AT&T Wireless Comments at 12; Winstar Comments at 3. See generally *Promoting Efficient Use Of Spectrum Through Elimination of Barriers to the Development of Secondary Markets*, WT Docket No. 00-230, *Notice of Proposed Rulemaking*, 15 FCC Red 24203 (2000).

<sup>95</sup> See Sprint Comments at 9; AT&T Wireless Comments at 12; Winstar Comments at 3.

<sup>96</sup> See Statement of David Reed at the *Public Workshop on Spectrum Efficiency* at 60; Statements of Gerald Faulhaber at the *Public Workshop on Spectrum Efficiency* at 144, 222.

these approaches. However, it should be noted that the **two** approaches are not necessarily mutually exclusive, and in fact could both be applied to the same block of spectrum.

Proponents of secondary market arrangements asserted that the market can solve these types of access problems if licensees have flexibility and exclusive rights.<sup>97</sup> Incumbents could determine, through privately negotiated agreements, how other parties could use some fraction of the spectrum bandwidth or some portion of the geographic area covered by the license for some period of time, which could be for a few seconds or minutes or for years. Many secondary markets proponents were also skeptical of the easement approach, arguing that (1) “non-interfering” operation tends to work better in theory than in practice, and (2) even where spectrum is otherwise not being used by the licensee, creating easements for third party access without the licensee’s consent could lead to squatter’s rights problems.<sup>98</sup> Several commenters also were particularly adamant that the Commission not grant any easement rights that would affect exclusive use licenses that had already been granted by the Commission, contending that incumbent licensees have already built out their systems and made other technical decisions in reliance on there being no easement rights to third parties that could possibly create harmful interference.<sup>99</sup>

Proponents of easements asserted that the market would not facilitate, and might even inhibit, access by the very technology that is revolutionizing efficient spectrum use, i.e., smart, frequency-agile devices. They pointed out that the Commission currently allows unlicensed Part 15 low power devices including ultra wide band (UWB) devices to operate in certain portions of the spectrum in which incumbent licensees operate without the users of those devices obtaining permission from the licensee. The FCC could also allow “opportunistic” devices to search across licensed spectrum and then to operate in licensed but unused spectrum without permission of the licensee, as long as those devices did not cause interference to incumbent licensees and instantly ceased transmitting whenever a licensee wished to use the spectrum. Easement proponents contended that exclusive rights holders will look for ways to block access by such devices to protect their investment, and that the only way to open spectrum to new uses is to vastly expand the use of the easement model from its currently limited form. They also contended that new technology is sufficiently sophisticated to overcome concerns regarding interference.<sup>100</sup>

The Working Group believes that there is room to expand our use of *both* market arrangements such as secondary markets and the easements models. The Commission has already taken steps to initiate and expand secondary markets, but this model has so far been applied on a limited basis only. This is partly due to statutory issues, but also results from usage rights in existing spectrum not being well-defined (as discussed in

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<sup>97</sup> See generally Cantor Fitzgerald Comments at 3-4.

<sup>98</sup> See, e.g., Statement of Peter Putsch at the *Public Workshop on Spectrum Rights and Responsibilities* at 68-69.

<sup>99</sup> See, e.g., AT&T Wireless Comments at 14; Sprint Comments at 4.

<sup>100</sup> See, e.g., Hypra Comments at 4.

prior sections). Allowing a variety of market arrangements so that licensees would be able to authorize others to make use of unused portions of their licensed spectrum could lead to substantially greater access to and use of the spectrum. The Commission has used an easement approach in cases such as UWB, but this is still a very limited application compared to the kind of easement access that some commenters advocate. Both low power underlay easement rights operating below the noise temperature and easement rights that would allow the use of non-interfering opportunistic devices in some situations could be expanded.

New technology has transformed the access issue by making certain types of access possible that were not technologically feasible in the past. We must therefore develop access models that take the potential of this new technology into account. We agree with commenters that the secondary markets model and the easements model each offer certain distinct advantages as well as disadvantages, but conclude that neither model should be adopted to the exclusion of the other.

*Secondary markets model.* The secondary markets model takes advantage of the flexibility and adaptability of the market to solve access problems. Because licensees have economic incentives to use spectrum in ways that will yield the highest return to them, they will often find it advantageous to allow others to use unused portions of their spectrum if they are adequately compensated. Because licensees have a strong incentive to obtain the highest possible return on all their "assets" including their spectrum, we do not agree with those who contend that making an exclusive licensee the access "gatekeeper" (i.e., requiring potential spectrum users to obtain licensee consent) will inhibit access by new technology. In fact, exclusive licensees will often wish to encourage and even develop new technologies in order to provide new services, serve more customers, etc.

If the rights afforded to licensees are sufficiently well-defined and flexible, and the secondary market mechanism is fast and efficient with low transactions costs, licensees will have ample incentive to negotiate with potential secondary users for access. As long as the transaction costs of those negotiations are not too high, then many licensees will find it in their self interest to allow access by secondary users. It is also important to realize that a secondary markets approach doesn't necessarily need to rely on individual negotiations with each licensee: band managers and other intermediaries such as clearinghouses can facilitate transactions. Thus, even if many individual transactions are necessary in order for secondary markets to work, organizations are likely to develop to handle those transactions just as American Society of Composers, Authors and Publishers (ASCAP) and Broadcast Music, Inc. (BMI) were developed to handle the negotiations between holders of copyrighted music and the thousands of radio stations and other organizations wishing to play that music. On the other hand, there may be instances where secondary markets work less well, such as in cases in which they impose such significant transaction costs on parties that negotiations will not occur. In that case, an easements model may be appropriate.

*Easements model.* By definition, the easements model appears to allow for highly efficient and low-cost access to spectrum, since a government agency establishes overall rules and protocols under which any user would be allowed access to the spectrum. Negotiations with individual licensees is not required. As a number of coinventors suggested, the easements model bears greater consideration than in the past because the increased sophistication of technology allows for the possibility of enhanced spectrum use by third parties on a non-interfering basis with the licensee.<sup>101</sup> While it is true that potential interference problems between licensees and easement users may arise in an easement model, presumably those problems can be resolved through technical protocols and coordination. Moreover, the concern about overcrowding and the tragedy of the commons is greatly reduced when easements are applied to high frequencies and the power levels in devices are limited so that potentially interfering signals only travel relatively short distances and thus the number of potentially interfering devices is limited.

At the same time, however, the easement model inherently limits the flexibility afforded to the licensee to some degree, and relies on government to define the scope of the easement. For example, currently all Part 15 devices are limited to very low power levels in order to minimize the possibility of interference. If opportunistic devices are to be authorized in the future, there will have to be regulations or protocols to ensure that they listen before they transmit and that they do not transmit when to do so would cause interference to an incumbent licensee. In addition, there is the concern that once unlicensed entities begin to operate in an easement and then later create interference to the incumbent licensee, it may be difficult legally or politically to shut down those unlicensed operations. Thus the potential for squatters is another potential downside of the easement model that must be addressed.

*Balancing the two approaches.* In seeking to balance the two approaches, we generally conclude that rights of licensed incumbent users should be limited to some extent to create "easements" for non-interfering uses below a defined interference temperature. There may also be some limited situations in which it would be desirable to establish easements for higher power opportunistic devices, but only in circumstances where the transaction costs associated with negotiating with incumbents for access to the spectrum would otherwise be unreasonable.

To the extent that efficient market mechanisms can be developed that would allow market arrangements at reasonable transaction costs, however, then they should be left under the control of incumbent licensees. That would be true of both individually negotiated secondary market uses and opportunistic uses of licensed spectrum. Opportunistic uses of spectrum may become feasible (especially by using technical solutions such as agile-frequency-hopping radios, software defined radios and adaptive antennas) at reasonable transaction costs. If such uses become feasible either through direct negotiations with incumbents or perhaps through royalty or rent mechanisms administered by private asset managers or clearinghouses, the right of access should

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<sup>101</sup> See, e.g., Statements of Jennifer Warren and David Wyc, respectively, at the *Public Workshop on Spectrum Rights and Responsibilities* at 253, 255.

remain within the control of the licensed user rather than be the subject of an FCC dedicated and mandated easement.

Using this balanced approach, certain technologies should probably be allowed access to spectrum "holes" primarily on a secondary markets basis, while others may be more amenable to access via easements. The easement model appears particularly suitable for underlay technologies that operate at very low power (i.e., below the "interference temperature"<sup>102</sup>), provided that the technical boundaries of the easement are well-defined.

*Conclusions/recommendations.* In order to evaluate the options involving secondary markets and easements, the Working Group recommends to the Spectrum Policy Task Force that the Commission obtain more information from the public (e.g., through an NOI) on:

- Developing further analysis to distinguish those situations in which government granted easements may be appropriate compared to situations in which various secondary market arrangements between licensees and other users are appropriate; and
- Analyzing the ability of new technologies (smart frequency-agile radios, software defined radios, adaptive antennas, spread spectrum etc.) to operate, even at higher power levels, without causing harmful interference.

Other actions that the Working Group recommends include the following Commission actions:

- Move forward with the existing "Secondary Markets" proceeding;"
- Address underlay/easement rights in transition bands on a going-forward basis;
- In new allocations and assignments, consider including low power easements or underlay rights based on the "interference temperature" concept;
- Clearly define access rights for opportunistic devices, whether based on secondary market uses, easements, or a combination of the two.

## **E. License Terms and Term Limits on Rules**

Participants in the Public Workshop, as well as parties that commented on the Public Notice, provided input regarding how long spectrum license terms should be, as well as whether it would be useful to set some sort of term limits on Commission rules so that rules would automatically be revisited periodically. A few parties suggested various alternatives for providing periodic modifications in our technical rules in order to demand increasing spectrum efficiency from licensees as technology advances."

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<sup>102</sup> "Interference temperature" measures the RF power available at the receiving antenna per unit bandwidth and is a measure of the "noise" in a particular band and location.

<sup>103</sup> *Promoting Efficient Use Of Spectrum Through Elimination of Barriers to the Development of Secondary Markets*, WT Docket No. 00-230, *Notice of Proposed Rulemaking*, 15 FCC Rcd 24203 (2000).

<sup>104</sup> See, e.g., New America Foundation et al. Comments at 14, Consumer Federation of America Comments at 30-31

License terms in various services differ. For instance, the term of wireless telecommunications licenses is generally ten years, while broadcast licenses have a term of eight years and CARS licenses are awarded for a maximum of five years. Satellite licenses have in the past generally been awarded for ten years, but in February of this year the Commission adopted rules allowing it to issue such licenses with 15-year license terms.

The practice of adopting individual rules with predetermined sunset dates has long been used by the Commission in cases where it finds that a rule would outlive its usefulness if allowed to remain indefinitely. Under the Telecommunications Act of 1996, the Commission is also required to determine in every even-numbered year whether any regulation is no longer necessary in the public interest as the result of meaningful economic competition between service providers, and to modify or repeal such regulation. The Commission has undertaken numerous proceedings to streamline its rules pursuant to this requirement.

With respect to license term, certain public interest organizations argued that the FCC should, in keeping with the fact that the airwaves are a public asset owned collectively by all Americans, establish relatively short license terms. They argued that the Commission should not lengthen license terms or otherwise undermine the government's ability to reorder spectrum rights and responsibilities as technologies and social needs change. Incumbent licensees, on the other hand, argued in this and other fora that consistency and certainty are necessary to warrant significant investment, and most seemed to assume that the current level of license renewal expectancy would remain an integral part of our licensing scheme.

Commenting on the idea of term limits or sunsets for Commission rules, one panelist said that different bands would require different term limits and that it is impossible to determine what they should be (that is, how quickly technology will change in each band), so the Commission is better off with rules of infinite duration but a reservation of power to intervene in the event of a market failure.

We believe that a predictable and structured format and timetable for implementing rule changes that will periodically increase the efficiency of spectrum usage is imperative. At this point, it is not apparent that it matters whether such changes are implemented as a function of periodic license renewal considerations or as a function of periodic service rules review. What does matter is that the timing of such potential changes is both reasonable and predictable, and that the extent of change within any period of years is limited in some manner.

One proposal made at the Public Workshop was that all licenses should be subject to a re-evaluation period that enables the Commission to prevent old technologies from occupying spectrum in virtual perpetuity, but is scheduled sufficiently into the future that it does not threaten the stability of licensees' business plans. We continue to believe that a level of certainty regarding one's ability to continue to occupy spectrum at particular

locations, at least for some foreseeable period, is an essential prerequisite to investment, particularly in services requiring significant infrastructure installation and lead time. A periodic adjustment of operating parameters or requirements, however, need not deter investment if limited to predictable and reasonable outlines. While potentially disruptive, periodic revision of operating parameters and protections is a necessary means to continue to mine the spectrum with increasing efficiency as technology develops, to the extent such efforts are economically viable. Any such assessment would include, of course, an assessment of the economic/societal value of the new or increased service capability being accommodated versus the costs to incumbent licensees and to the public. This applies to "commons" spectrum and exclusively used spectrum, including casements, with respect to both internal operations and effects on geographic and spectral neighbors.

Any evaluation of such periodic adjustments should be on a predictable schedule, and any implementation of resulting new rules should be on a schedule that is predetermined by rule. For instance, no change in technical parameters, such as an increase in noise floor or in emission masks or in edge of territory field strength, could be introduced in a particular service until at least three years after a determination is made to implement such a change. While some new technologies may develop suddenly, and could sometimes be delayed by a guaranteed transition period, the uncertain cost of this risk is outweighed by the need to provide some level of certainty to develop and implement known technologies and services. We do not propose that the timetable should be the same for all services and spectrum bands, but can vary with both service provider and customer investment requirements, apparent public expectations, and anticipated speed of technological development. This is one way in which to ensure continued innovation and continually increasing efficiency in the use of spectrum.

*Conclusions/recommendations.* In sum, the Working Group proposes:

- A periodic adjustment in technical requirements is imperative in order to continue to make increasing use of spectrum; and
- Such adjustments must be predictable in both time and scope (although it is probably not significant whether such adjustments are effectuated in the context of service rules or periodic license renewals).

#### **IV. Other Considerations**

While significant debate exists over the merits of the exclusive use model versus the commons model, as noted above, the command-and-control approach may be more appropriate for some allocations and services, such as those having elements that may be given too little weight in the market. Examples include satellite, public safety, spectrum shared with the federal government, broadcast, and rural services. Moreover, each service has distinct reasons why it may be more appropriately dealt with in a command-and-control framework.

For example, satellite services require significant negotiations over spectrum that must be harmonized across many countries. Significant transaction costs accompany

these efforts, and it may not be economically feasible to pursue alternative spectrum bands. Most notably, the benefits of such harmonized spectrum accrue to spectrum users and society as a whole, not just to satellite services, while the costs are incurred by satellite services alone. This type of public benefit with a cost concentrated on one party or industry appears to be a classic market failure problem that can be addressed via certain regulatory interventions, such as government-mandated spectrum allocations.

Public safety, which *uses* spectrum as an input, is another commonly cited example of a service that may be given too little weight in the market. In this case, however, the potential problem may be distinct from that associated with satellite services. As opposed to satellite services, which may need particular bands of spectrum set aside for global harmonization, it may be possible to address concerns related to *public safety* with less intrusive regulation, including some market-oriented policies.

Other spectrum allocation decisions have traditionally reflected considerations that may not be fully accommodated in an exclusively market-based approach. For example, a significant amount of spectrum is allocated to (and shared between) both Federal Government and non-Federal Government users. In addition, broadcasters traditionally have faced a set of rules that represent their unique history and services. Similarly, rural interests have unique needs that may be costly to meet, and there is strong support for public policy that will address these needs. Similarly, radio astronomy has particular spectrum needs and can provide important *but very long-term* benefits which market mechanisms may not fully reflect.

#### **A. international Considerations**

A number of parties stressed that the United States should make a better effort to harmonize its spectrum management policies and allocations with those of the rest of the world, when possible.<sup>105</sup> According to these commenters, to the extent domestic policies and allocations complement international decisions, U.S. consumers and businesses will reap important benefits such as more international roaming and better economies of scale with regard to equipment manufacturing. Commenters also pointed out that while the satellite, maritime, aeronautical, public safety and radio astronomy services have long required and benefited from extensive international coordination, terrestrial services like third generation wireless and radio local area network (e.g., WiFi) services are also becoming increasingly ubiquitous requiring the same level of international coordination.<sup>106</sup>

The commenters explained that the United States needs to eliminate any credibility concerns that are raised when it advocates for an international allocation only

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<sup>105</sup> See, e.g., CTIA Comments at 15-16; Association of American Railroads Comments at 25; SIA Comments at 20; Information Technology Industry Council at 5; AT&T Wireless Comments at 20; Nokia Comments at 4; Motorola Comments at 25-26.

<sup>106</sup> See, e.g., Wireless Ethernet Compatibility Alliance Comments at 5-7.

to later allocate the same spectrum for different uses domestically.<sup>107</sup> Various parties asserted that the United States should formulate more effective and forward-looking international positions to take to the International Telecommunication Union's (ITU) World Radiocommunication Conferences (WRC) through the regional Organization of American States (OAS) telecommunications process administered by CITEL.<sup>108</sup> It was suggested that the Commission make it a priority to advocate for an increase in the speed and efficiency of the ITU spectrum decision-making process.<sup>109</sup> It was also suggested that the United States appoint a professional WRC ambassador to provide continuity of expertise between and for WRCs.<sup>110</sup>

Other parties commented on the importance of the Commission considering how spectrum-based services are affected by spectrum use models. It was stated, for example, that the Commission should take account of the effect that interference caused by licensees offering newly flexible services would have on existing crossborder interference agreements with Canada and Mexico.<sup>111</sup> Commenters asserted that a broader regional perspective on spectrum management by the Commission could speed deployment of services to U.S. consumers by resolving crossborder coordination and regional policy issues earlier.<sup>112</sup>

*Conclusions/recommendations.* International considerations must be taken into account in two ways:

- First, because regional and world-wide harmonization of band use can have significant advantages both in terms of truly ubiquitous services and economies of scale, in developing domestic spectrum policies and allocations, the Commission should always carefully consider the potential impact on international objectives.
- Second, U.S. consumers could benefit from improved spectrum management coordination with our regional neighbors, especially Canada and Mexico.

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<sup>107</sup> See, e.g., Statement of Jennifer Warren at the *Public Workshop on Spectrum Rights and Responsibilities* at 243.

<sup>108</sup> See, e.g., ArrayComm Comments at 6-8; Sky Tower Comments at 11 (identifying backward-looking preparatory process for international meetings and claiming that "new technologies are often shut-out altogether or compromises are reached causing a proposal for a new technology to be considered on less desirable frequencies, of limited bandwidth, and/or with severe interference criteria that make deployment of the new technology much more difficult").

<sup>109</sup> See SIA Comments at 19; Winstar Comments at 4.

<sup>110</sup> See CTIA Comments at 15-16.

<sup>111</sup> See, e.g., Dominion Comments at 9; New York State Office of Technology Comments at 11-12.

<sup>112</sup> See, e.g., Longman Comments at 27; Winstar Comments at 4; New York State Office of Technology Comments at 11-12.

## B. Public Safety

The Working Group sought information regarding what spectrum use models the Commission should use to ensure the provision of public safety services and other public service uses of spectrum.

A number of commenters and participants in Public Workshop who addressed this issue opposed applying an exclusive use model to public safety.<sup>113</sup> Although they recognized the need to encourage efficiency on the part of public safety providers, many agreed that it is not appropriate to make them compete for spectrum against entities that measure spectrum value monetarily. These parties agreed that there is a fundamental difference between commercial systems and public safety systems, which have different funding mechanisms, are inherently slow-moving and budget-constrained, and need very reliable communications rather than cutting-edge equipment. In addition, they cited public safety's need for longer equipment cycles (e.g., 25-year cycles). For these and other reasons, they indicated that a commercial model has limited applicability to public safety.<sup>114</sup> One participant also added that making state and local government users acquire spectrum in the marketplace would in effect impose a federal tax on such entities. The principal concern expressed by government and public safety spectrum users was that they not be required to compete with commercial users for spectrum.<sup>115</sup> Some of the same concerns were expressed with respect to non-public safety licensees whose operations nonetheless impact public safety, such as critical infrastructure industries (e.g., electric utilities).<sup>116</sup>

Not all commenters or participants in the Public Workshop thought, however, that it is necessarily a bad idea to require government entities to compete with commercial entities for spectrum. Marlin Cave, the one non-American who participated in the August 9 Public Workshop, stated that he had recently recommended different regimes for public safety and non-public safety entities in Great Britain, but only because he did not think his audience was ready yet for competition between government and commercial entities. He indicated that he hopes to move to such a competitive regime in 10 to 15 years.<sup>117</sup> Another panelist advocated spectrum fees for state and local governments, saying that such fees would encourage efficiency and that governments will not spend the money for more efficient equipment unless they are compelled to do so by the FCC.<sup>118</sup>

When asked whether public safety and other public service uses of spectrum can be combined with commercial uses through sharing or other mechanisms, certain commenters indicated that such a combination is not advisable, again stressing the

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<sup>113</sup> See, e.g., David Staelin Comments at 1; Longman Comments at 14.

<sup>114</sup> See, e.g., APCO Comments at 3; Marsalis Comments at 5.

<sup>115</sup> See American Association of Railroads Comments at 21-22; BellSouth Comments at 1-2.

<sup>116</sup> See, e.g., American Petroleum Institute (API) Comments at 13; Exelon Comments at 3.

<sup>117</sup> See *Public Workshop on Spectrum Rights and Responsibilities*.

<sup>118</sup> See *Public Workshop on Spectrum Rights and Responsibilities*.

different needs of public safety and commercial entities.<sup>119</sup> Parties with a particular interest in public safety also stated that the Commission should not try to set uniform interference standards across all bands because of public safety services' inability to tolerate interference.<sup>120</sup> Certain parties suggested that the FCC consider segregating public safety bands (and related rules) from other bands.<sup>121</sup> One commenter proposed the relocation of public safety to its own contiguous spectrum and that this relocation be paid for by auctioning licenses for current public safety spectrum at 400, 500, and 800 MHz.<sup>122</sup>

One panelist advocated allowing unlicensed users to operate in bands used by public safety at the end of a 10-year grace period.<sup>123</sup> He and at least one other panelist noted that some public safety entities are moving to commercial spectrum (for example, operating in the 2.4 GHz band) because that is where the newer, cheaper equipment is. Nonetheless, other panelists opposed allowing unlicensed underlays on public safety channels because of the potentially dire consequences of interference with public safety operations.<sup>124</sup>

One panelist noted that public safety agencies are becoming more innovative through creative licensing schemes, such as forming partnerships between state and local agencies and utilities and federal agencies. By sharing costs and spectrum with others, public safety entities are able to obtain more technologically advanced radio systems than they could afford on their own.<sup>125</sup>

#### *Conclusions/recommendations.*

- Spectrum that is currently set aside for public safety and critical infrastructure use should remain so. Going forward, the Commission should set aside no more additional spectrum than is necessary to achieve goals related to public safety and critical infrastructure services.
- There is considerable potential for market-oriented policies to help rather than burden public safety, and that would allow for more efficient use of spectrum to meet both public safety and commercial spectrum needs. The Commission should explore mechanisms for meeting public safety needs other than simply through dedication of spectrum on a command-and-control basis.
- Public safety users should have flexibility to lease spectrum capacity that is available during low-use periods to commercial users with a "take-back" mechanism when public safety use increases. Public safety use of spectrum typically is highly variable, with periods of low traffic and occasional usage

<sup>119</sup> See, e.g., Private Radio Commenters Comments at 3; New York State Office of Technology Comments at 9-11.

<sup>120</sup> See, e.g., TIA Comments at 6; MAP/NAF Reply Comments at 7.

<sup>121</sup> See, e.g., CTIA Comments at 13-15; Bergen County Comments at 6-7.

<sup>122</sup> See Bergen County Comments at 6-7.

<sup>123</sup> See *Public Workshop on Spectrum Rights and Responsibilities*.

<sup>124</sup> See *Public Workshop on Spectrum Rights and Responsibilities*.

<sup>125</sup> See United Telecom Council (UTC) Comments at 4-5; Proxim Comments at 5 ("Market-oriented spectrum policies do not mean 'taking away' from government or public safety spectrum users. Rather this approach means giving such entities flexibility to monetize such assets as they best see fit to achieve their missions.").

that "spike" during certain times of the day or week during emergencies. Accordingly, there is benefit to be gained from permitting public safety entities to lease some of their spectrum capacity to commercial users during low-use periods under an arrangement whereby the spectrum can be reclaimed immediately when needed for public safety use. The potential for this type of shared use will increase as smart transmitters and receivers are developed that can be shut down immediately upon command.

- For major regional or national emergencies, additional public safety spectrum needs potentially could be addressed through enhanced easement rights to non-public safety spectrum. In extraordinary national or regional emergencies (e.g., terrorist attack, major natural disaster), public safety may require access to spectrum resources significantly beyond the amount of spectrum required to handle their normal emergency workload. Because of the extraordinary nature of these events, permanent dedication of spectrum to public safety to meet these contingencies is likely to be highly inefficient. An alternative would be to address these needs through an "easement" mechanism that would enable public safety users to operate on non-public safety spectrum in such extraordinary emergencies, but to revert to operations on public safety spectrum when the emergency subsided.

### C. Spectrum Allocated for Government Use (or Shared with Non-Governmental Uses)

Federal users of spectrum, like public safety users, need spectrum to provide many critical services such as national defense. By law, NTIA and the FCC share responsibility for management of the spectrum, with NTIA responsible for spectrum allocated for government operations and the FCC responsible for spectrum allocated for non-government operations. As government and non-government needs and concerns are often quite different, this separation provides an appropriate expertise and advocacy.

A few participants argued, however, that long-range planning has been impeded by the split in responsibilities between the FCC and NTIA. They claimed that the bifurcated management process results in the absence of a comprehensive national spectrum policy, a dearth of spectrum for numerous services that in turn drives up the cost of spectrum at auction, and inadequate harmonization of spectrum use with other parts of the world. Some commenters specifically argued for better coordination with NTIA and the removal of barriers between government and non-government spectrum.<sup>126</sup> Several participants noted a loss of efficiency and the slowness to react that results from this shared responsibility. They pointed out significant sources of conflict that arise from operations in adjacent bands exclusively allotted to Federal and non-Federal use, where spurious or harmonic emissions impact adjacent bands, and from operations in shared bands.

There are various policy options that potentially could address these problems. For instance, non-Federal users could be required to share frequencies with each other

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<sup>126</sup> See, e.g., Longman Comments at 25-26 and Reply Comments at 4; Nokia Comments at 2-3

instead of with non-Federal users, and more non-Federal users to share spectrum with each other rather than with Federal users. Conflict would also be reduced if there was less interleaving between Federal and non-Federal allocations. This would reduce the occasions requiring coordination and agreement between the agencies. However, only a modest level of improvement could be so achieved. The reason for the development of extensive blocks of shared spectrum is the complementary nature of many Federal and non-Federal uses, in location, architecture, and nature of use. The greatest efficiency may come from accommodating complementary services wherever possible.

Significantly, the FCC and NTIA should coordinate, to the extent possible, the policy prerogatives resulting from this Task Force, particularly as regards interference, licensee rights and responsibilities, and periodic reassessments of efficiency, and adopt them to the fullest extent possible. The effects of any FCC actions in these regards will be severely limited if non-Federal users are hamstrung by legacy rules that are overly protective, in light of new technology, of shared and adjacent channel Federal users. For instance, a FCC policy of requiring periodic increases in equipment capability such as transmission innocuousness or receiver selectivity or discrimination will be significantly diminished if Federal users in spectrum that is impacted by non-Federal users are not migrating to similarly enhanced equipment. The Commission and NTIA should work together to minimize the indirect, as well as the direct, impact of inefficient Federal uses on non-Federal uses and the citizenry at large, and to adopt those principles and policies that they agree will lead to increasing efficiency of use of the spectrum while preserving other significant Federal interests of security and reliability. Where there is a divergence of financial incentives or means, improved relocation/compensation legislation and rules should be adopted to facilitate migration of Federal users to new spectrum or to new equipment where economically justified.

The Commission should also explore whether certain secondary market mechanisms can promote efficiency by Federal users of spectrum. For instance, such mechanisms could give the Federal government the right to lease to commercial users while maintaining priority in use. Significantly, technology has advanced to provide the option of strict priorities of service and high degrees of security and reliability, thus greatly enhancing the utility of non-Federal spectrum for many Federal uses. To the extent such arrangements are utilized, the Federal government might be able to enjoy significant cost savings, both direct and indirect, by reducing the amount of spectrum encumbered to only that used in space, time, and specific frequency. Additionally, such Federal uses would necessarily keep pace with advancements in technology.

*Conclusions/recommendations.* The Working Group recommends to the Spectrum Policy Task Force that the Commission work closely with NTIA to consider the following issues:

- Whether the amount of spectrum shared between the Federal Government and Non-Federal users can be reduced and whether there could be increased coordination with respect to interference, spectrum rights and responsibilities, and periodic reassessment of spectrum use.

- Whether Federal users should be allowed to engage in secondary market transactions with non-Federal users, perhaps while retaining priority in access.
- How to improve coordination in adopting technical standards and policies for both Federal and non-Federal spectrum and services.
- Whether to create a third-party board of scientific experts that can be consulted to arbitrate, on either a binding or non-binding basis, conflicts that arise from a disagreement in engineering opinions that cannot be resolved to the mutual satisfaction of both agencies.

#### D. Broadcast Services

The Commission has traditionally allocated spectrum specifically for broadcast use, based on statutory public interest considerations and the free over-the-air nature of broadcast service. Many commenters argued that these characteristics distinguish broadcasting from other market-based uses of spectrum, and that the Commission should therefore continue to dedicate some spectrum specifically for broadcast use on a command-and-control basis.<sup>127</sup> One commenter analogized the setting aside of spectrum for public service use by broadcasters to setting aside space for public parks, libraries, museums, and other public facilities and institutions.<sup>128</sup> Another commenter stressed the importance of setting aside spectrum for non-commercial educational broadcasting, noting that “[s]ince 1952, Congress . . . has consistently supported the policy goal of a reserved space in the spectrum for noncommercial educational purposes through federal financing and access to multiple distribution platforms.”<sup>129</sup>

Other parties, however, contended that the continued dedication of spectrum for broadcasting, and particularly for commercial broadcasting, is increasingly anachronistic as the public gains access to alternative sources of programming and information from cable television, satellite services, the Internet, and other outlets.<sup>130</sup> These parties argued that the original rationale for command-and-control regulation of broadcasting, which is based on spectrum scarcity, is undermined by the proliferation of digital technology that has vastly increased the actual and potential efficiency of spectrum use to meet consumer needs.

The Working Group concludes that for the time being, there are valid reasons to continue applying the “command-and-control” model to existing broadcast spectrum, although there are also alternatives that should be considered for introducing greater flexibility into broadcast spectrum regulation in the short term, and transitioning away from the command-and-control model, with limited exceptions, over the long term.

<sup>127</sup> See generally NAB/MSTV Joint Comments; SBE Comments; APTS Comments; NPR Comments.

<sup>128</sup> See NPR Comments.

<sup>129</sup> See APTS Comments at 4 n. 11 (citing Educational Television Facilities Act of 1962, Public Broadcasting Act of 1967, Public Telecommunications Act of 1978, Public Telecommunications Act of 1992, Cable Television Consumer Protection Act of 1992, Telecommunications Act of 1996, and Satellite Home Viewer Improvement Act of 1999).

<sup>130</sup> See, e.g., Public Workshop on Spectrum Rights and Responsibilities.

Broadcasting has consistently been a central focus of Congress and the Communications Act, which regulates broadcast content and behavior by placing certain public interest obligations on broadcast licensees. These include requirements that broadcasters provide "reasonable access" to candidates for federal elective office and afford "equal opportunities" to candidates for any public office,<sup>131</sup> children's educational programming requirements,<sup>132</sup> restrictions on airing of indecent programming,<sup>133</sup> and provisions relating to the rating of video programming,<sup>134</sup> equal employment opportunities rules,<sup>135</sup> and other "behavioral" rules that mandate accountability.<sup>136</sup> While not exhaustive, this list demonstrates that "content-and-control" regulation of broadcasting has a significant statutory basis.

In addition to the statutory public interest obligations on broadcasters, there are other characteristics of broadcasting that potentially affect broadcast spectrum policy considerations.<sup>137</sup> Broadcast service is traditionally not subscriber-based – it is a "universal" service that is widely accessible to the general public.<sup>138</sup> In addition, localism and diversity of ownership are two important public interest objectives that have been associated with broadcasting to a greater degree than other spectrum uses.<sup>139</sup> Finally, the broadcaster's relative lack of control over its signal reception equipment is another component that differentiates broadcast from its wireless counterparts.<sup>140</sup> In cellular or PCS systems, for example, licensees have the ability to replace or modify the equipment used by their customers, whereas in broadcasting, consumers and third party manufacturers play the primary role in the replacement of receivers. This affects the rapidity with which technological advances in equipment can be introduced into the marketplace and assimilated by consumers – a factor that has affected the pace of the DTV transition.

The transition of broadcast to a digital world, which is already under way, should help to alleviate concerns regarding inefficient and inflexible use of broadcast spectrum. As broadcasters convert to digital, some broadcast spectrum can be recovered for reallocation and reassignment to more flexible uses, as in the case of the 700 MHz band. The Commission has also allowed for some flexible use of broadcast spectrum,<sup>141</sup> and

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<sup>131</sup> See 47 U.S.C. § 312(a)(7), 47 C.F.R. § 73.1944 (reasonable access); 47 U.S.C. § 315, 47 C.F.R. § 73.1941 (equal opportunities).

<sup>132</sup> 47 U.S.C. § 303(b), 47 C.F.R. §§ 73.671, 73.673, 73.3526.

<sup>133</sup> 18 U.S.C. § 1464, 47 U.S.C. § 303, 47 C.F.R. § 73.3999.

<sup>134</sup> 47 U.S.C. § 303(w).

<sup>135</sup> 47 C.F.R. § 73.2080.

<sup>136</sup> 47 C.F.R. § 73.4280.

<sup>137</sup> See generally NAB/MSTV Joint Comments; APTS Comments; NPR Comments; SBE Comments.

<sup>138</sup> But see 47 C.F.R. §§ 73.641-73.644.

<sup>139</sup> See NPR Comments.

<sup>140</sup> See Statement of Victor Tawil at the Public Workshop on Spectrum Rights and Responsibilities at 90-94.

<sup>141</sup> Broadcast spectrum can be used for ancillary or supplementary services that do not interfere with the primary broadcast signal, e.g., through use or leasing of the vertical blanking interval to provide telecommunications services. See 47 C.F.R. § 73.646. In the digital context, broadcasters may provide ancillary and supplementary services such as subscription television programming, computer software distribution, data transmission, teletext, interactive services, and audio signals so long as such services do

should consider additional ways to allow greater flexibility consistent with broadcasters continuing to meet their core public interest responsibilities. In addition, the Commission should consider whether it is feasible to make "white space" in the broadcast bands available for other uses.

Over the longer term, the Commission should periodically reevaluate its broadcast spectrum policies to determine whether they remain necessary to accomplish the public interest objectives they are intended to promote. In particular, such reevaluation should consider the extent to which the public interest benefits provided by dedication of spectrum to broadcasting under a command-and-control regime can be provided through the application of more flexible, market-oriented spectrum policies. It is likely that there will be a continued need to set aside some spectrum for non-market based broadcast uses, such as non-commercial and educational broadcasting. But assuming that technological advances continue to occur and that scarcity of access to spectrum resources decreases, it is equally likely that the continued application of command-and-control policies to commercial broadcasting can be substantially relaxed, or may not be needed at all, to ensure the public availability of the information and programming provided by commercial broadcasting outlets.

#### *Conclusions/recommendations*

- For the time being, broadcast spectrum should continue to be subject to the command-and-control model due to the public interest obligations placed on broadcasters and the free over-the-air nature of broadcast service.
- The ongoing transition to digital television, upon completion, will allow for more efficient and flexible use of broadcast spectrum. The Commission has allowed for some flexible use of broadcast spectrum and, over time, should continue to consider ways to increase flexibility and encourage additional introduction of efficient technology for broadcasting.

#### **E Rural vs. Urban Areas**

The Working Group addressed the issue of whether the Commission's approach to spectrum management should vary in different portions of the spectrum, in different geographic areas, or for different types of uses. Many commenters focused considerable discussion on the issue of rural areas, where spectrum is almost uniformly uncongested even in the most heavily used bands below 3 GHz.<sup>142</sup> Although some parties indicated that the Commission should not adopt different spectrum allocation and assignment policies for different portions of the spectrum or different geographic regions, there is some support in the record for applying different rules to spectrum usage in urban and

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not interfere with the required provision of free over-the-air programming. See In the matter of Advanced Television Systems and Their Impact upon the Existing Television Broadcast Service, *Fifth Report and Order*, 12 FCC Red 12810 (1997) at ¶ 29 (citations omitted). See also 47 U.S.C. § 336.

<sup>142</sup> See, e.g., AT&T Wireless Comments; Blooston, Mordkofsky, Dickens, Duffy & Prendergast (Blooston) Comments; RTG Comments; Cantor Fitzgerald Comments; Internet Technology Consultants Comments; Longman Comments; Schafer Comments; Midcoast Internet Solutions Comments; NTCA Comments; Rural Cellular Association (RCA) Comments; Williams Comments; Matanuska Telephone Association Comments; Leggett Comments; Part-15 Organization Comments; Michener Comments.

rural areas, and it was generally recognized that the economic and technical considerations in rural areas can be different than in urban areas."<sup>143</sup>

*Access to spectrum* Many advocates for rural interests asserted that rural carriers have difficulty gaining access to rural spectrum, even though it is not scarce. Specifically, rural carriers indicated that the Commission's tendency to adopt large geographic service areas that include both urban and rural areas prevents rural carriers from competing at auction for an entire license area."<sup>144</sup> In addition, rural carriers contended that the Commission's partitioning and disaggregation rules do not benefit rural providers because they must incur significant transaction costs by negotiating access to rural spectrum with multiple large carriers that may opt to retain such spectrum for future use. It was further stated that impediments to secondary markets arrangements that would enable providers to gain access to spectrum, and the Commission's build-out rules, which require coverage on a population basis, result in hoarding of rural spectrum and contribute to build-out only in urban areas.<sup>145</sup>

*Interference and other technical considerations.* Commenters also discussed whether there should be different interference standards for rural and urban areas. Certain parties advocated different permissible power levels for rural areas on the theory that where there is less congestion, higher permissible power levels would allow for fuller usage of spectrum.<sup>146</sup> Others objected to this idea, arguing that having different rural and urban regions is impractical because it is not a simple matter to define urban versus rural, as many areas fall somewhere in between and problems may arise when formerly rural areas undergo development."<sup>147</sup> Thus, there was a difference of opinion as to whether different technical rules for rural areas are feasible or desirable. For instance, one participant in the Public Workshop indicated that unusual rural conditions have been dealt with satisfactorily through the waiver process,<sup>148</sup> and another thought that it will be possible in the future for transmitters to determine if they are operating in a rural or urban area and adjust power accordingly."<sup>149</sup>

*Conclusions/Recommendations.* The Working Group recommends to the Spectrum Policy Task Force as follows:

- The Commission should explore the option of taking different approaches with regard to rural and urban spectrum, while recognizing, that the distinction between high- and low-congestion areas does not necessarily

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<sup>143</sup> See generally Blooston Comments; RTG Comments; RCA Comments; NTCA Comments.

<sup>144</sup> See, e.g., Blooston Comments at 4-5; RTG Comments at 3-6; NTCA Comments at 4; RCA Comments at 4; Matanuska Comments at 3.

<sup>145</sup> See, e.g., Blooston Comments at 5-6; RTG Comments at 6-8; NTCA Comments at 3, 6; RCA Comments at 5; Matanuska Comments at 3-4.

<sup>146</sup> See, e.g., ITC Comments at 1; Longman Comments at 12-13; Schafer Comments at 4-5; Williams Comments at 1; Part 15-Organization Comments at 6; Michener Comments at 1.

<sup>147</sup> See, e.g., AT&T Wireless Comments at 11-12; Leggett Comments at 5.

<sup>148</sup> See Statement of Larry Miller at the Public Workshop on Spectrum Rights and Responsibilities.

<sup>149</sup> See Statement of Steve Stroh at the Public Workshop on Spectrum Rights and Responsibilities.

require non-uniform rules where the rules do not artificially cause spectrum congestion or constrain the use of uncongested spectrum

- When licensing by geographic area, the Commission should explore using licensing areas that distinguish between rural and urban areas, so that rural bidders can bid directly for rural spectrum without having to bid against entities seeking urban spectrum; it should note, however, that new, rural licensing areas may not be the optimal solution for all bands because it would significantly increase the number of overall licenses and drive up the administrative and transaction costs of aggregation.
- To improve rural providers' ability to gain access to spectrum, the Commission should promote the development of an efficient and flexible secondary markets regime that, in addition to partitioning, facilitates the leasing of spectrum usage rights in rural areas
- The Commission should consider expanding "easements" on licensed spectrum (as discussed above) in rural areas to allow access, on a non-interference basis, by other spectrum users.
- In general, interference and other technical rules should be calibrated to situations where spectrum is likely to be in the greatest demand and the most congested, *i.e.* urban areas. Thus, the rights of spectrum users to emit RF energy and the obligation to accept interference from others should be set at levels suitable for such areas, as this will increase spectrum efficiency.
- While interference rules should not necessarily prevent licensees from operating at higher power on a non-interference basis in less congested areas, licensees should not have expanded interference protection rights or reduced obligations to avoid interference under the rules. Thus, if two spectrum users come into conflict in an otherwise uncongested area, the "default" rules would prevail and be the basis for any negotiations between them.
- The Commission should explore setting technical rules for unlicensed spectrum that allow for higher-power operation in less populated areas, as power limits may be less necessary in low-population areas where fewer devices operate and interference is less likely.

## V. Transition

As discussed above, this report recommends that the Commission move towards assigning flexible usage rights in spectrum within its jurisdiction, whether under an exclusive rights or a commons model. However, the practical reality is that most spectrum within the Commission's jurisdiction is already occupied by incumbent spectrum users. Moreover, most of these incumbents are governed by legacy command-and-control regulations that substantially limit allowable uses of the spectrum. Therefore, successful implementation of the recommendations in this report requires the Commission to consider how to migrate away from these restrictive legacy licensing regimes to more flexible rights models that create opportunities for new, more efficient and beneficial uses. Specifically, the Commission must determine which bands should be transitioned to expanded flexible rights models and how the transition should be accomplished.

Several parties discussed methods that the Commission might employ to determine which bands should be transitioned to more flexible rights models. Certain parties indicated that the Commission should inventory spectrum needs on a regular basis to forecast demand, and that it should work to identify inefficiently used spectrum.<sup>150</sup> As discussed above, several parties made the point that there is a large amount of significantly underutilized spectrum.<sup>151</sup> Some parties suggested setting up an independent review commission to find blocks of inefficiently used spectrum (e.g., a mechanism similar to the Base Realignment and Closure Commission process as a means of facilitating reallocation decisions and overcoming any political difficulties), or drawing upon independent consulting firms or technical advisory committees to develop technical analyses for reallocation decisions.<sup>152</sup> Some commenters suggested that the Commission should develop a rigorous cost-benefit analysis to be completed with any reallocation decision, examining both technical and financial ramifications.<sup>153</sup> And, as discussed above, several commenters suggested that special considerations should be given when determining whether and how to transition certain bands of spectrum, such as those used for public safety or broadcasting, to an expanded flexible rights model.

There also was considerable discussion about whether the Commission should reallocate and assign the underutilized legacy spectrum to new licensees or, instead, simply expand the rights of incumbents to use the spectrum in more flexible ways. Several commenters proposed that the Commission reallocate and reassign underutilized spectrum to more flexible use through an auction process.<sup>154</sup> These commenters objected to granting expanded flexibility to incumbents on the grounds that such a course would serve to prop up faltering businesses and might give incumbents, most of whom did not obtain their spectrum through auction, an inequitable windfall. For instance, some incumbent wireless service licensees objected to granting other incumbent licensees the flexibility to provide commercial mobile services even though they had not competed at auction.<sup>155</sup> These commenters claimed that this policy would create less of an incentive for them to invest in their networks. In addition, several commenters contended that a substantial grant of flexibility was equivalent to assigning a new license, and that the Commission is required to make such new licenses available through a competitive bidding process.<sup>156</sup>

Other commenters, however, contended that granting expanded rights to incumbents would be the best means of transitioning spectrum to the most efficient uses, maintaining that the benefits to be reaped from allowing spectrum to be put to its highest and best use immediately – in the form of new services and spectral efficiency – would

<sup>150</sup> See, e.g., Motorola Comments at 2-4.

<sup>151</sup> See, e.g., Cantor Fitzgerald Comments at 3.

<sup>152</sup> See, e.g., CTIA Comments at 3-10.

<sup>153</sup> See, e.g., CTIA Comments at 3-6.

<sup>154</sup> See, e.g., AT&T Wireless Comments at 8.

<sup>155</sup> See, e.g., CTIA Comments at 6-9.

<sup>156</sup> See, e.g., New America Foundation et al. Comments at 11-14, AT&T Wireless Comments at 5-8; CTIA Comments.