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REGULATION AND LICENSING OF LOW-EARTH-ORBIT SATELLITES

Ted Stevens†

I. INTRODUCTION

Imagine riding the train to Ho Chi Minh city on your way to negotiate the final details of a complex licensing agreement. Before you arrive, you prepare for the meeting by accessing a database back in your Manhattan office with your notebook computer. Or imagine calling your San Francisco office from a kiosk outside the Kremlin with your cellular telephone. Out of the innovative developments in radiocommunication technology, a race has emerged to provide global data and voice services utilizing networks of low orbiting satellites.¹ Low-earth-orbit (LEO) satellite systems² will provide "cellular-like mobile services to users anywhere, position location services, search and rescue communications, disaster management communications, environmental monitoring, paging services, facsimile transmission services, cargo tracking, and industrial monitoring and control."³ Po-

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1. See e.g., In the Matter of Amendment of Section 2.106 of the Commission's Rules to Allocate the 1610-1625.5 MHz and the 2483.5-2500 MHz Bands for Use by Mobile-Satellite Service, Including Non-geostationary Satellites, Notice of Proposed Rule Making and Tentative Decision, ET Docket No. 92-98, 7 F.C.C.R. 6414 (released Sept. 4, 1992; adopted Aug. 5, 1992) [hereinafter Large LEO Satellite TD].

2. The FCC defines "low-earth-orbiting satellite systems" as "any system that is not operating in geostationary orbit. This includes systems operating in lower-altitude orbits, medium-altitude orbits, and highly elliptical orbits." In the Matter of Amendment of the Commission's Rule to Establish and Policies to Mobile Satellite Service in the 1610-1626.5/2483.5-2500 MHz Frequency Bands, Notice of Proposed Rulemaking, CC Docket No. 92-166, 1994 FCC LEXIS 744 n.6 (released Feb. 18, 1994; adopted Jan. 19, 1994) available in LEXIS, FEDCOM library, FCC file [hereinafter Large LEO Satellite NPRM].

Generally, LEO satellites orbit the earth at distances of 1000 to 2000 kilometers. See e.g., In the Matter of Amendment of Section 2.106 of the Commissions Rules to Allocate Spectrum to the Fixed-Satellite Service and the Mobile-Satellite Service for Low-Earth-Orbit Satellites, Notice of Proposed Rule Making and Tentative Decision, ET Docket No. 91-280, 6 F.C.C.R. 5932, ¶ 3 (released Oct. 18, 1991; adopted Sept. 26, 1991) [hereinafter Small LEO Satellite NPRM]; In the Matter of Amendment of Section 2.106 of the Commissions Rules to Allocate Spectrum to the Fixed-Satellite Service and the Mobile-Satellite Service for Low-Earth-Orbit Satellites, Report and Order, 8 F.C.C.R. 1812, ¶ 2 (released Feb. 5, 1993; adopted Jan. 14, 1993) available in LEXIS, FEDCOM library, FCC file [hereinafter Small LEO Satellite R&O].

3. Large LEO Satellite NPRM, *supra* note 2, ¶ 2.

tentially a multi-billion dollar industry, these new services are expected to stimulate economic growth, create employment opportunities in the United States and abroad, and provide global telecommunications to underdeveloped areas of the world "that have previously been grossly underserved."⁴

This comment examines the licensing process evolving out of the dynamic interaction between the Federal Communications Commission (FCC) and the private companies planning to commercialize LEO satellite technology. The second section briefly outlines the major international and domestic regulatory programs that allocate and assign the radio frequency spectrum for LEO satellite systems. The third section analyzes and compares the methods currently used by the FCC to assign the frequency spectrum and to distribute licenses to LEO satellite applicants: comparative hearings, negotiated rulemaking, lotteries, pioneer's preferences, and competitive bidding.

II. REGULATION AND LICENSING OF LEO SATELLITES

A. Background

For more than twenty years, commercial satellite technology has thrived under the FCC's permissive regulatory supervision.⁵ Commercial enterprises have focused their efforts primarily on the development of global telecommunication networks utilizing geostationary satellites.⁶ These satellites require two resources: the radio frequency spectrum⁷ and the geostationary orbit.⁸

4. *Id.* ¶¶ 2-3.

5. See Pamela L. Meredith & Francesca O. Schroeder, *Privately-Owned Commercial Telecommunications Satellites: Licensing and Regulation by the Federal Communications Commission*, 27 CAL. W. L. REV. 107-108 (1990). In contrast, satellite activities in other countries with satellite capabilities are government-owned monopolies. *Id.* at 108.

6. MILTON L. SMITH, INTERNATIONAL REGULATION OF SATELLITE COMMUNICATION 1 (1990); see also Paula K. Speck, Comment, *Competition in International Satellite Telecommunications: Alternative Avenues*, 20 TEX. INT'L L. J. 517, 520-21 (1985).

7. The radio frequency spectrum is defined as that part of the electromagnetic spectrum between zero and 3,000 Gigahertz. Geneva Radio Regulations, Dec. 6, 1979, S. TREATY DOC. 21, 97th Cong., 2d Sess., art. 1 (1980) [hereinafter Radio Regulations]. Hertz is the unit of frequency. One hertz is one cycle per second of any electromagnetic wave. Every telecommunication signal operates within a range of radio frequencies measured in hertz, which is called its bandwidth. JOHN R. PIERCE, SIGNALS: THE TELEPHONE AND BEYOND 28-34 (1981).

8. SMITH, *supra* note 6, at 5. A satellite is called geostationary when its period of revolution is approximately equal to that of the earth. By placing the satellite in orbit above the equator at an altitude of approximately 36,000 kilometers, known as the GSO, the satellite appears stationary relative to a point on the earth. The beam from a satellite in the GSO can cover almost one third of the earth, therefore a system of three geostationary satellites can provide a global telecommunications network. *Id.* at 5-6.

Proponents of LEO satellite systems claim that these systems will have technical and economic advantages over systems using geostationary satellites.⁹ Although the commercial success of these LEO satellite systems remains speculative at this point,¹⁰ the technical feasibility of low orbiting satellites has already been demonstrated by several government-owned LEO satellites, used for military and scientific purposes.¹¹ LEO satellites are lighter, less expensive to launch and require less operating power than geostationary satellites.¹² In addition, LEO satellites can receive communications from smaller and weaker earth transmitters since the satellites are closer to the earth.¹³ Although LEO satellites are in constant motion relative to a fixed point on the earth, continuous service can be provided by overlapping satellite orbits; as one satellite passes out of range, another appears over the horizon.¹⁴ The main disadvantage of using LEO satellites in a telecommunications network seems to be that their operating lifetimes are about half those of geostationary satellites, due to the stronger effects of gravity on low orbiting satellites.¹⁵

The FCC recognizes two types of LEO satellites: "small LEO satellites," which operate below 1 gigahertz (GHz),¹⁶ and "large LEO satellites," which require portions of the radio frequency above 1 GHz.¹⁷ Three companies have developed plans for small LEO satel-

9. Edmund L. Andrews, *Wireless Phones: Different Visions*, N.Y. TIMES, Aug. 26, 1992, at D5.

10. Proponents of LEO satellite systems have experienced difficulties in raising financing because some potential investors are said to have been deterred by the profusion of regulatory and political delays. *LEO Faces Plethora of Financial Obstacles*, 12 COMM. DAILY, Nov. 10, 1992, at 5.

11. See Small LEO Satellite NPRM, *supra* note 2, ¶ 2. Much of the new LEO satellite technology was developed out of research originally funded for U.S. defense systems. See *EC Officials Concerned With Pace of U.S. LEO Satellite Industry*, 12 COMM. DAILY, Sept. 28, 1992, at 4 [hereinafter *Officials Concerned*]. The scope of this comment will be limited to the recently proposed privately-owned LEO satellite systems.

12. Andrews, *supra* note 9. To launch a LEO satellite costs approximately one-twentieth of what it costs to launch an average geostationary satellite. Small LEO satellite NPRM, *supra* note 2, ¶ 9.

13. Andrews, *supra* note 9.

14. *Id.*

15. Small LEO satellite NPRM, *supra* note 2, at ¶ 9.

16. *Id.* n.1. Small LEO satellites will use about 4 MHz of bandwidth, operating in the range of spectrum known as VHF/UHF (very high frequency and ultra high frequency). *Id.*

Recently, the FCC has begun to refer to small LEOS as Non-Voice, Non-Geostationary (NVNG) Mobile-Satellites. See In the Matter of Amendment of the Commission's Rules to Establish Rules and Policies Pertaining to a Non-Voice, Non-Geostationary Mobile-Satellite Service, Report and Order, CC Docket No. 92-76, 1993 FCC LEXIS 5734, available in LEXIS, FEDCOM library, FCC file (released Nov. 16, 1993; adopted Oct. 21, 1993) [hereinafter NVNG R&O].

17. Small LEO Satellite NPRM, *supra* note 2, n.1. Large LEO satellites will use more than 16 MHz in the frequency range above 1 GHz.

lite systems operating from 2 to 24 satellites to provide data messaging and position determination services, such as locating lost hikers and tracking the location of cars, trucks and ships.¹⁸ Five companies have envisioned rival networks consisting of 12 to 66 large LEO satellites to link up mobile telephones and laptop computers.¹⁹ These large LEO satellite networks will enable customers to make and receive calls from anywhere, even where current conventional cellular telephone service is unavailable.²⁰

These innovative proposals have presented the FCC with difficult and complex regulatory issues. Although the radio frequency bands to be used by LEO satellites have already been allocated internationally by the International Telecommunications Union²¹ and domestically by the FCC,²² each system must also receive a specific frequency assignment from the FCC.²³ Assigning specific frequencies is a complex matter because the radio frequency spectrum is already congested, and the users of the spectrum have competing interests.²⁴ The major hurdle in frequency assignment by the FCC is that the proponents of LEO satellite systems have developed competing and potentially incompatible technologies to transmit communication signals.²⁵ Because the number of FCC license applicants has apparently exceeded the number of existing frequency allocations, these technical conflicts among competing systems may force some companies to alter or abandon their current designs for LEO satellite systems.²⁶ Finally, in addition to receiving frequency assignments, each proponent must pe-

18. *Id.* ¶¶ 2-6. For a general description of these small LEO satellite system proposals, see *infra* appendix A.

19. In the Matter of Amendment of Section 2.106 of the Commission's Rules to Allocate the 1610-1626.5 MHz and the 2483.5-2500 MHz Bands for Use by the Mobile-Satellite Service, Including Non-geostationary Satellites, Report and Order, ET Docket No. 92-98, 1994 FCC LEXIS 150, ¶ 4 (released Jan. 12, 1994; adopted Dec. 13, 1993) available in LEXIS, FEDCOM library, FCC file [hereinafter Large LEO Satellite R&O]. For a general discussion of these large LEO satellite proposals, see *infra* appendix A.

20. Large LEO Satellite TD, *supra* note 1, ¶ 5.

21. See *infra* part II. The international allocation of radio frequencies to communication services is decided by the International Telecommunications Union, a special agency of the United Nations. DAVID M. LIEVE, INTERNATIONAL TELECOMMUNICATIONS AND INTERNATIONAL LAW: THE REGULATION OF THE RADIO SPECTRUM 1, 19-20 (1970).

22. See *infra* part II. The FCC is responsible for the assignment and national allocation of frequency bands to specific stations. 47 U.S.C. §§ 303(c) and 153(k) (1988).

23. 47 U.S.C. §§ 303(e) and 153(k) (1988).

24. LIEVE, *supra* note 21, 18-19.

25. See *infra* appendix B for a brief overview of these competing modulation-access techniques.

26. Karen Lynch, *U.S. Seeks Foothold in the Sky*, COMM. WK., June 1, 1992, at 1A.

tion the FCC for a license to construct, launch and operate a proposed satellite.²⁷

B. Regulation of the Radio Frequency Spectrum

The proposed LEO satellite systems are subject to the international and domestic regulations covering the use of the radio frequency spectrum, which has been declared a "limited natural resource."²⁸ In contrast to other natural resources such as minerals, water, and fossil fuels, the frequency spectrum is used rather than consumed.²⁹ As the global use of the radio frequency spectrum has expanded, international and national regulatory institutions have become necessary to ensure that the spectrum is equitably apportioned and to avoid harmful interference among competing users.³⁰

1. International Allocation of the Radio Frequency Spectrum

Allocation of the radio frequency spectrum is a function of the International Telecommunications Union (ITU), which is a specialized agency of the United Nations.³¹ The ITU Convention³² created the ITU as an entity, defined its organization, and enunciated its purposes and membership rules.³³ Over 165 countries are members of the ITU, demonstrating universal recognition of the need for international cooperation in the use of the radio frequency spectrum.³⁴ To avoid "harmful interference"³⁵ among the radio stations of different countries and to foster international cooperation, the ITU allocates the radio frequency spectrum and requires the registration of frequency

27. See *infra* part II.C. After LEO satellite systems receive spectrum assignments and licenses from the FCC, each proponent must still negotiate licensing agreements with foreign countries. *ITU's Tarjanne Tells Satel Conseil Fiber Will Be Networks' Medium of Choice*, 12 COMM. DAILY, Sept. 30, 1992, at 3. The scope of this comment is limited to domestic licensing issues.

28. International Telecommunication Convention, Nov. 6, 1982, S. TREATY DOC. NO. 6, 99th Cong., 1st Sess. (1985) [hereinafter Convention].

29. LIEVE, *supra* note 21, at 15-16.

30. *Id.*

31. *Id.* at 19.

32. Convention, *supra* note 28.

33. *Id.*

34. SMITH, *supra* note 6, at 36-37 n.2. For an historical analysis of the function and organization of the ITU, see LIEVE, *supra* note 21.

35. Defined as "any emission, radiation or induction which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with the Radio Regulations." Radio Regulations, *supra* note 7, art. 48.

assignments by each member country.³⁶ These international allocations are contained in the Radio Regulations,³⁷ which are created or revised at periodic special meetings of delegates from ITU member countries.³⁸

The most important of these meetings is the World Administrative Radio Conference (WARC).³⁹ At WARC-92, the most recent conference, which concluded on March 3, 1992, the American delegation proposed frequency allocations for small and large LEO satellites.⁴⁰ After initial opposition from the European delegates,⁴¹ the American delegation was successful and new frequencies were allocated to mobile satellite services, including low orbiting satellites.⁴²

2. National Assignment of the Radio Frequency Spectrum: The Authority of the FCC

Although the international allocation of radio spectrum frequencies is accomplished by the creation or revision of the Radio Regulations at a WARC, "the Board does not distribute frequencies or withhold frequencies from ITU members."⁴³ The assignment of specific frequencies to specific services is left to national regulatory entities.⁴⁴ In the United States, the FCC has maintained an extremely permissive policy toward private telecommunications satellites.⁴⁵ New rules are created and existing rules are amended in response to

36. SMITH, *supra* note 6, at 23.

37. Radio Regulations, *supra* note 7.

38. SMITH, *supra* note 6, at 23-25.

39. Speck, *supra* note 6, at 523. For a detailed discussion of previous conferences, see LEIVE, *supra* note 21, at 40-81 and SMITH, *supra* note 6, at 57-183.

40. U.S. Congress, Office of Technology Assessment, *The 1992 World Administrative Radio Conference: Issues for U.S. International Spectrum Policy - Background Paper*, OTA-BP-TCT-76, 122-131 (1991) [hereinafter OTA]. The new allocations for small LEO satellites are: 137-138 MHz downlink (space to earth), 148-149.9 MHz uplink (earth to space), and 400.15-401 MHz downlink bands. *Id.* at 124. The new allocations for mobile satellites, including LEO satellites, are 1610-126.5 MHz uplink and 2438.5-2500 MHz downlink bands. *Id.* at 126. The American proposal was based on petitions originally filed to the FCC in late 1990. Large LEO Satellite TD, *supra* note 1, ¶ 4.

41. The Europeans opposed the allocation because Europe is already adequately covered with terrestrial systems that are government-owned. The new services to be provided by LEOs could undermine these existing terrestrial systems. *Tug of WARC*, *ECONOMIST*, Mar. 7, 1992, at 89.

42. International Telecommunication Union, (WARC-92), Final Acts of the World Administrative Radio Conference, Malaga-Torremolinos (1992) cited in Large LEO Satellite NPRM, *supra* note 2, n.15.

43. LEIVE, *supra* note 21, at 20.

44. *Id.*

45. Meredith & Schroeder, *supra* note 5, at 113.

proposals submitted by private companies hoping to develop innovative technology.⁴⁶

The FCC's regulatory authority for the assignment of radio frequencies for commercial satellites stems from the Communications Act of 1934⁴⁷ and the Communications Satellite Act of 1962.⁴⁸ Under these acts and implementing regulations,⁴⁹ the FCC is authorized to allocate and assign specific frequencies that have been allotted internationally at a WARC.⁵⁰

The FCC's rulemaking procedure for assigning frequencies consists of several "notice-and-comment" periods.⁵¹ First, private companies may petition the FCC for an "issuance, amendment or repeal of a rule or regulation."⁵² Once a petition is filed, the FCC will release a "Public Notice" to inform interested parties of the petition.⁵³ Comments in support of or in opposition to the petition may be filed up to thirty days after the Public Notice has been issued.⁵⁴ Replies may be filed up to 15 days after the comments have been filed.⁵⁵ "If the [FCC] determines that the petition discloses sufficient reasons in support of the action requested,"⁵⁶ a "Notice of Proposed Rulemaking" will be issued in the Federal Register to notify potentially interested parties of the rulemaking⁵⁷ and set time limits for comments and reply comments to be submitted in opposition or support of the proposed rulemaking.⁵⁸ After consideration of the comments and replies, the FCC will issue a final decision in the form of a "Report and Order."⁵⁹

It often takes several years for a Report and Order to be issued on a proposed rulemaking. For example, in late 1990, several LEO satel-

46. *Id.*

47. 47 U.S.C. §§ 151-613 (1988).

48. 47 U.S.C. § 701 (1988).

49. 47 C.F.R. pts. 0-19, 21-25 (1993).

50. 47 U.S.C. § 303(c) (1988).

51. There are two types of rulemaking authorized by the Administrative Procedure Act, 5 U.S.C. § 533 (1988): informal and formal. *Phillips Petroleum v. FPC*, 475 F.2d 842, 851 (10th Cir. 1973), *cert. denied*, 414 U.S. 1146 (1974). "Informal rulemaking—commonly called notice-and-comment—rulemaking is the normal type." BERNARD SCHWARTZ, *ADMINISTRATIVE LAW* 199 (3d ed. 1991). Formal rulemaking is an exception requiring that agency rules be "preceded by a 'trial-type' hearing." *Id.* The FCC's comparative hearing process is an example of formal rulemaking. *See* discussion *infra* part III.A.

52. 47 C.F.R. § 1.401(a) (1993).

53. *Id.* § 1.403.

54. *Id.* § 1.405(a).

55. *Id.* § 1.405(b).

56. *Id.* § 1.407.

57. *Id.* § 1.412.

58. *Id.* § 1.415. The FCC may extend the rulemaking by issuing a second Notice of Proposed Rulemaking before issuing a decision. *Id.* § 1.421.

59. *See id.* § 1.415.

lite proponents petitioned for a rulemaking to allocate the domestic use of the frequency spectrum to LEO satellites.⁶⁰ The FCC finally adopted its Report and Order finalizing the frequency allocation in late December 1993.⁶¹

C. FCC Licensing Requirements for Satellites

Even after the threshold issues of frequency allocation and assignment have been decided, each LEO satellite system must comply with FCC licensing requirements.⁶² Private companies must submit written applications to the FCC requesting permission to construct,⁶³ launch and operate a satellite.⁶⁴ To obtain an operating license, an applicant must submit information concerning the character and citizenship of the applicant,⁶⁵ and the financial ability of the applicant to construct, launch and operate the proposed satellite system.⁶⁶ The applicant must also demonstrate the technical feasibility of the proposed system.⁶⁷

The FCC's mandate is to "encourage the provision of new technologies and services to the public."⁶⁸ The FCC follows a "public interest" standard when determining whether an applicant has met the appropriate satellite licensing criteria.⁶⁹ In making a determination of whether to grant a license, the FCC must also evaluate the "convenience and necessity" of the proposed new service.⁷⁰ From the begin-

60. Large LEO Satellite NPRM, *supra* note 2.

61. Large LEO Satellite R&O, *supra* note 19.

62. Private satellite activities are permitted under international law. The United States is a party to the United Nations Outer Space treaty regarding the exploration and use of outer space. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, T.I.A.S. No. 6347, 610 U.N.T.S. 205. State parties to the treaty are required under Article VI to authorize and provide continuing supervision of the activities of non-governmental entities in outer space. *Id.*

In accordance with this international obligation, the FCC has been authorized to require licenses for privately-owned radiocommunication satellites. 47 U.S.C. § 301 (1988) ("No person shall use or operate any apparatus for the transmission of energy or communications . . . except . . . with a license that has been granted under the provisions of this chapter.")

63. 47 U.S.C. § 319(a) (1988). The FCC has ruled that satellites are within the statutory definition of "station" defined in 47 U.S.C. § 153(k). *See* Report and Order, 22 F.C.C. 2d 86, app. C, at 129.

64. 47 U.S.C. §§ 308 and 153(cc)-(ee) (1988).

65. 47 U.S.C. § 308(b)(1988). Under § 310(b), a license may not be granted if more than one-fifth of the shareholders of the applicant company are foreigners or if the applicant corporation is controlled by foreigners, or if more than one-fourth of the directors are foreigners.

66. 47 U.S.C. § 308 (1988).

67. *Id.*

68. 47 U.S.C. § 157(a) (1988).

69. 47 U.S.C. § 309(a) (1988).

70. *Id.*

ning of the commercialization of space technology, the FCC has maintained that its policy of promoting competition in the private sector and imposing minimal technical design standards furthers the public interest.⁷¹

III. LICENSE DISTRIBUTION BY THE FCC: COMPARATIVE HEARINGS, NEGOTIATED RULEMAKING, LOTTERIES, PIONEER'S PREFERENCE, AND COMPETITIVE BIDDING RULES

Until recently, the FCC used two methods to distribute licenses among mutually exclusive applications: comparative hearings and lotteries.⁷² Responding to the concerns of private companies that the FCC's existing licensing rules discouraged innovation, in 1991 the FCC determined that certain applicants requesting spectrum allocation rule changes and licenses were entitled to a licensing preference or "pioneer's preference."⁷³ In August 1993, Congress amended the Communications Act of 1934, giving the FCC the authority to assign licenses by competitive bidding when mutually exclusive applications are filed.⁷⁴ As a result, the FCC has initiated a review of its licensing rules to consider whether to amend or repeal its pioneer's preference rules.⁷⁵

A. Comparative Hearings

Until 1982, the FCC exclusively selected among competing applicants for a license by holding administrative hearings to evaluate their proposals under comparative criteria;⁷⁶ although the FCC may grant licenses without a hearing, if the FCC determines that "the public interest, convenience, or necessity would be served" by the grant. However, if the FCC does not grant a license, applicants still have the right to a hearing before their applications are denied.⁷⁷ Comparative

71. Meredith & Schroeder, *supra* note 5, at 114.

72. In the Matter of Review of the Pioneer's Preference Rules, FCC Notice of Proposed Rule Making, ET Docket 93-266, 8 F.C.C.R. 7692, ¶ 5 (released Oct. 21, 1993; adopted Oct. 21, 1993), available in LEXIS, FEDCOM library, FCC file [hereinafter Review].

73. 47 C.F.R. §§ 1.401-403, 5.202 (1993). See In the Matter of Establishment of Procedures to Provide a Preference to Applicants Proposing an Allocation for New Services, Report and Order, GEN Docket No. 90-217, 6 F.C.C.R. 3488 (released May 13, 1991; adopted April 9, 1991) [hereinafter Pioneer's Preference].

74. Omnibus Budget Reconciliation Act of 1993, Pub. L. 103-66, Title VI, § 6002, 107 Stat. 387, (to be codified at 47 U.S.C. § 309(j)(11)). This authority to use competitive bidding will expire September 30, 1998. *Id.*

75. Review, *supra* note 72, ¶ 1.

76. In the Matter of Amendment of the Commission's Rules to Establish New Personal Communications Services, Notice of Proposed Rule Making and Tentative Decision, 7 F.C.C.R. 5676, app. D (released Aug. 14, 1992; adopted July 16, 1992) [hereinafter PCS Rules].

77. 47 U.S.C. § 309(e) (1988).

hearings date from 1945, when the Supreme Court in *Ashbacker Radio Corp. v. F.C.C.*⁷⁸ held that the Communications Act requires that all mutually exclusive license applications are entitled to comparative consideration.⁷⁹ Because Congress granted license applicants a right to a hearing before their applications were denied, to grant a license to one applicant "without a hearing to both deprives the loser of the opportunity which Congress chose to give him."⁸⁰

Comparative hearings have several major problems as a licensing process; for one, they tend to be expensive and time-consuming.⁸¹ Existing licensees have an incentive to use the hearings as a means to delay competitors' entry into the field.⁸² In addition, the FCC has had considerable difficulty in determining comparative criteria.⁸³ Finally, since certain licenses are transferable, "the ultimate licensee may not be the party that the [FCC] deemed most worthy."⁸⁴

B. *Negotiated Rulemaking*

Under the Negotiated Rulemaking Act of 1990 (NRA)⁸⁵ and the Federal Advisory Committee Act⁸⁶ the FCC has the authority to establish advisory committees to negotiate regulations defining the technical rules that will apply to frequency allocations.⁸⁷ These advisory committees include representatives of the interested parties that may be significantly affected by the outcome of proposed rules to allocate frequency spectrum.⁸⁸ The stated goal of an advisory committee is to develop regulations based on a "consensus on the language or substance of the appropriate rules."⁸⁹

Negotiated rulemaking attempts to encourage negotiations, in a less adversarial setting than comparative hearings, by developing regulations "that will facilitate the shared use of the spectrum by the maximum number of . . . providers."⁹⁰ Negotiated rulemaking was created

78. 326 U.S. 327 (1945).

79. *Id.*

80. *Id.* at 333.

81. PCS Rules, *supra* note 76, app. D.

82. *Id.* Significantly, the FCC allows interested parties to petition the FCC to deny an application for a license filed by another party. *See* 47 U.S.C. § 309(d) (1988).

83. PCS Rules, *supra* note 76.

84. *Id.*

85. 5 U.S.C. §§ 581-50 (1993).

86. 5 U.S.C. app. § 1 (1993).

87. *See* FCC Asks for Comments Regarding the Establishment of an Advisory Committee to Negotiate Proposed Regulations, Public Notice, CC Docket No. 92-166, 7 F.C.C.R. 5241, ¶ 1 (Released Aug. 7, 1992), [hereinafter Negotiated Rulemaking].

88. *Id.*

89. *Id.* at ¶ 3.

90. *Id.*

to allow "greater public participation than 'Notice-and-Comment Rulemaking'" and to reduce the "likelihood of litigation after a rule has been promulgated."⁹¹ The FCC concluded that the proposed allocation of frequency spectrum to small and large LEO satellites met the criteria for negotiated rulemaking.⁹²

While other governmental agencies have experience with negotiated rulemaking, particularly the Environmental Protection Agency and Occupational Safety and Health Administration,⁹³ the small and large LEO satellite system rulemaking committees were the FCC's first experience with negotiated rulemaking.⁹⁴ Based on the results of these two committees, it appears that negotiated rulemaking will play an important role in the FCC licensing process because of the highly technical issues involved in licensing these new technologies.

Three major criticisms have been levelled at negotiated rulemaking in general: (1) the process often fails to reach a consensus opinion; (2) the parties may refuse to negotiate in good faith; and (3) the process may deprive non-mainstream interest groups of an equal opportunity to influence policy due to weaker bargaining positions.⁹⁵

However, the FCC stated that in the event the advisory committee could not reach a consensus opinion, the majority and minority reports would be incorporated into the FCC's Notice-and-Comment Rulemaking.⁹⁶ This policy allows private parties a greater influence

91. Marshall J. Breger, *Defining Administrative Law*, 60 GEO. WASH. L. REV. 268, 276 (1991) (reviewing PETER L. STRAUS, *AN INTRODUCTION TO ADMINISTRATIVE JUSTICE IN THE UNITED STATES* (1989)). But an advisory committee's report is only a proposed rule; the report must still receive the FCC's imprimatur through the notice-and-comment rulemaking process. Peter M. Shane, *Symposium: The New Public Law: Structure, Relationship, Ideology, or, How Would We Know A "New Public Law" If We Saw It?*, 89 MICH. L. REV. 837, 844 n.26 (1991).

92. Negotiated Rulemaking, *supra* note 87, ¶ 5. Before adopting negotiated rulemaking to develop new regulations, the FCC must consider whether the following factors have been met: (1) there is a need for a rule; (2) a limited number of interests have been identified that will be significantly affected by the rule; (3) there is a reasonable likelihood that a committee can be convened with a balanced representation of persons who can adequately represent those interests and the parties are willing to negotiate in good faith to reach a consensus on the proposed rules; (4) there is a reasonable likelihood that a committee can reach a consensus within a fixed period of time; (5) the negotiated rulemaking will not cause an unreasonable delay in the issue of notice and the new rules; (6) the agency has adequate resources to commit to the committee; and (7) the agency commits to using the consensus of the committee as the basis for rules proposed by the agency. *Id.* ¶ 4 (citing NRA § 3, 5 U.S.C. § 583(a)).

93. See, e.g., Thomas O. McGarity, *Some Thoughts on "Deossifying" the Rulemaking Process*, 41 DUKE L. J. 1385, 1439 (1992).

94. The FCC created separate advisory committees for the small LEO satellite and the large LEO satellite proponents. See *FCC Begins Negotiated Rulemaking For "Global" Cellular Systems*, 15 SATELLITE WK., Jan. 11, 1993, available in LEXIS, NEXIS library, CURRNT file.

95. McGarity, *supra* note 93, at 1439-40; Melanie J. Rowland, *Bargaining for Life: Protecting Biodiversity Through Mediated Agreements*, 22 ENVTL. L. 503, 526-27 (1992).

96. Negotiated Rulemaking, *supra* note 87, ¶ 3.

on the FCC's rulemaking decisions. Since only the proponents have the necessary technical expertise to evaluate the feasibility of the various LEO satellite systems, negotiated rulemaking offers an effective and fair method for the FCC to become adequately informed about the technical complexities at the least public expense and in the shortest time frame. Negotiated rulemaking also gives the parties increased access to the licensing process. When the number of interested and potentially affected parties is small enough to be manageable,⁹⁷ the negotiated rulemaking process can equalize representation and participation by all the parties, regardless of the financial resources and political influence of each party.

While there is a possibility that the FCC might show intransigence at the proposed changes, in fact the FCC has showed flexibility and a desire to work with the LEO satellite system applicants in the first negotiated rulemaking committees.⁹⁸ This flexibility reflects the aggressive position repeatedly taken by the FCC in support of the introduction of LEO satellite services in the United States.⁹⁹

Negotiated rulemaking has also been criticized as a political tool, used solely to create the impression of citizen power while, in reality, it is nothing more than an attempt by the agency to increase the public acceptance of the government's decision.¹⁰⁰ However, the results from the FCC's first negotiated rulemaking committees suggest that this procedure will allow greater participation by private and governmental spectrum users in assisting the FCC in the development of new rules.¹⁰¹

The most difficult regulatory issue concerning LEO satellites is the technical debate over which modulation technology is best suited to allow the maximum number of users to share the limited frequency spectrum.¹⁰² In other settings, negotiated rulemaking has frequently failed to marshal a consensus when incompatible groups holding rigid

97. The FCC limited both rulemaking advisory committees to between twelve and twenty-five participants. Negotiated Rulemaking, *supra* note 87, ¶ 10.

98. For example, the FCC allowed a party to participate on the small LEO satellite rulemaking committee even though the FCC had denied its license application as untimely. *Little-LEO Negotiated Rulemaking Committee Adjourns*, 12 COMM. DAILY, Sept. 22, 1992, at 4 [hereinafter *Committee Adjourns*].

99. See, e.g., NVNG R&O, *supra* note 16 (concurring statement by Commissioner Barrett).

100. Rowland, *supra* note 95, at 526. This criticism seems especially relevant to environmental negotiations where the parties may hold strong, uncompromising views, and where the agency may attempt to legitimize an unpopular decision.

101. See Negotiated Rulemaking, *supra* note 87, ¶¶ 1-3.

102. See, e.g., *id.* ¶ 6; *Committee Adjourns*, *supra* note 98. See also discussion of modulation technologies *infra* appendix B.

positions were brought together for negotiations.¹⁰³ Similarly, negotiated rulemaking for LEO satellite systems has only enjoyed limited success, hampered by the apparent unwillingness of some of the parties to compromise on their modulation technology.¹⁰⁴ On other issues, the small LEO satellite negotiated rulemaking was relatively successful in streamlining the rulemaking process.¹⁰⁵ Although, the large LEO satellite rulemaking ended without a consensus opinion,¹⁰⁶ the FCC recently issued a Notice of Proposed Rulemaking combining the majority and minority opinions reached by the advisory committee.¹⁰⁷

C. Lotteries

In 1982, Congress authorized the FCC to award licenses by random selection.¹⁰⁸ Lotteries have been described as examples of "pure procedural justice."¹⁰⁹ This concept has been defined as "when there is no independent criterion for the right result: instead there is a correct or fair procedure such that the outcome is likewise correct or fair, whatever it is, provided that the procedure has been properly fol-

103. McGarity, *supra* note 93, at 1439. For any negotiation to be successful, the parties must be prepared to negotiate in good faith. Some parties may refuse to participate in good faith, believing that their interests may be better served by more traditional rulemaking, legislation, or litigation. A necessary party may also refuse to participate as a tactic of delay or obstruction. To continue negotiated rulemaking under this last circumstance, the agency must convince such a party that only through participation can the reticent party influence the outcome. See Philip J. Harter, *Negotiating Regulations: A Cure for Malaise*, 71 *Geo. L.J.* 1, 73-74 (1982) (Harter's influential proposal was the catalyst in negotiated rulemaking techniques).

104. *Committee Adjourns*, *supra* note 98.

105. See Report of the Below 1 GHz LEO Negotiated Rulemaking Committee, CC Docket NO. 92-76 (Sept 16, 1992), cited in Small LEO Satellite R&O, *supra* note 2, n.11. The small LEO satellite negotiated rulemaking meetings were held between August and September 1992. See "Cake's Eaten Up" Laced Charges Little LEO Applicants are Carving Spectrum Into 3 Pieces, 12 *COMM. DAILY*, Aug. 1992. Committee members included four license applicants (VITA, Starsys, Orbcomm, and Leosat), and other existing and prospective users of the adjacent frequency bands, including NASA, the Air Force, Army, Navy, NTIA, and NOAA. *Id.*

106. Large LEO Satellite NPRM, *supra* note 2, ¶ 9. The large LEO satellite negotiated rulemaking committee was held between January and April 1993. *Id.* ¶ 8. The sixteen members of the committee were included representatives of pending license applicants and other users of adjacent frequency bands. *Id.* "The Committee members included representatives from AMSC, Ellipsat, Motorola, Constellation, TRW, LQSS, the Commission, the Federal Aviation Administration (FAA), the Committee on Radio Frequencies (CORF), the National Aeronautics and Space Administration (NASA), the Wireless Cable Association International, Inc. (Wireless Cable), Rockwell International Corporation (Rockwell), Communications Satellite Corporation (Comsat), the U.S. Army, Aeronautical Radio, Inc. (ARINC), and Celsat, Inc. (Celsat)." *Id.* ¶ n.20.

107. Large LEO Satellite NPRM, *supra* note 2.

108. 47 U.S.C. § 309(i) (1988).

109. Compare GUIDO CALABRESI & PHILIP BOBBITT, *TRAGIC CHOICES* 41-44 (1978) with JOHN RAWLS, *A THEORY OF JUSTICE* 83-90 (1971).

lowed."¹¹⁰ Allocation by lot is a form of simple egalitarianism, treating members within an eligible group in the same way regardless of their individual differences.¹¹¹ Despite the simple appeal of lotteries, the FCC has experienced difficulties with random selection as a licensing process.¹¹²

The number of speculative license applications rose dramatically because, although application costs were inexpensive, the licenses were extremely valuable; and the FCC imposed no limit on the number of lottery applications filed by a single applicant.¹¹³ As a result, administrative costs increased as "application mills" provided completed standard applications at affordable rates.¹¹⁴ The FCC attempted to reduce the number of speculative applications by shortening the filing window, but this just induced the majority of applicants to file on the first possible day.¹¹⁵

Allocation by lottery is flawed in that random selection treats all license applicants as equals although they are not necessarily equally deserving or situated.¹¹⁶ This is especially true in licensing LEO satellite systems, because just a handful of companies have already expended the time and financial resources to develop the innovative LEO satellite technology. To award a license in a random selection would unfairly ignore the differences among applicants seeking a license for purely speculative reasons and those applicants that actually developed the technology.¹¹⁷

D. *Pioneer's Preferences*

Responding to the concerns of the private sector that the FCC's licensing rules discouraged innovation, the FCC in 1991 determined that certain applicants requesting spectrum allocation rule changes were entitled to a licensing preference or "pioneer's preference."¹¹⁸

110. RAWLS, *supra* note 109, at 86.

111. CALABRESI & BOBBITT, *supra* note 109, at 41-42.

112. See PCS Rules, *supra* note 76, app. D.

113. See PCS Rules, *supra* note 76, app. D. "Many lottery applicants had no intention to build or operate a system using the spectrum, but instead sought only to acquire a license at nominal cost and then sell it, making a large profit and at the same time delaying the delivery of services to the public." H.R. REP. NO. 111, 103d Cong., 1st Sess. pt. 2 (1993).

114. *Id.* For example, one company filed ten thousand applications for a single lottery, and sixty percent of all the applications received in the lottery were from only ten companies. *Id.*

115. *Id.*

116. See CALABRESI & BOBBITT, *supra* note 109, at 43.

117. Congress was aware of several instances where innovators of a new technology, having invested money and time on research and development, lost their chance to capitalize on their investments in "a flood of lottery applicants." H.R. REP. NO. 111, 103d Cong., 1st Sess. pt. 2 (1993).

118. Pioneer's Preference, *supra* note 73.

The FCC has declared that the objectives of its pioneer's preference are to "encourage present and future innovators to submit proposals; to decrease regulatory uncertainty for the innovator; and to encourage investors to provide financial support."¹¹⁹

To obtain a pioneer's preference, the applicant must demonstrate to the FCC that the applicant's proposal is technologically innovative, and that the innovation will reasonably lead to the establishment of a new service or will substantially enhance an existing service.¹²⁰ In making its determination, the FCC relies on detailed technical information demonstrating the viability of a proposal, including experimental data provided by the proponent.¹²¹ However, the FCC does not intend to grant a pioneer's preference that would create a nationwide monopoly.¹²²

In adopting pioneer's preferences, the FCC concluded that a licensing preference would "ensure that innovators have an opportunity to participate either in new services that they take the lead in developing or in existing services to which they wish to apply to technologies."¹²³ The FCC further concluded that a pioneer's preference is strongly justified by the public interest in encouraging "the development of new services and improving existing services by reducing for the innovator the risks and delays associated with the [FCC's] allocation and licensing processes."¹²⁴ The FCC agreed with some private companies who argued that innovators of new services are more likely to invest the considerable time and money necessary to develop innovative technology if the FCC would provide assurances that these companies would receive a license, if otherwise qualified.¹²⁵

The FCC was concerned that American consumers might not enjoy the early benefits of innovative technologies if innovators are dissuaded from providing new services by their belief that the FCC's regulatory process puts an excessive burden on license applicants.¹²⁶ Thus, the FCC created pioneer's preferences as an inducement to pres-

119. In the Matter of Establishment of Procedures to Provide a Preference to Applicants Proposing an Allocation for New Services, Memorandum Opinion and Order, GEN Docket No. 90-217, 7 F.C.C.R. 1808, ¶ 23 (released Feb. 26, 1992; adopted Feb. 13, 1992) [hereinafter New Services].

120. *Id.* ¶ 3.

121. *Id.* ¶ 4. Experimental data is not a prerequisite to obtaining a preference but the petitioner is required to "demonstrate feasibility of the new service or technology." *Id.*

122. See Pioneer's Preference, *supra* note 73, ¶ 54.

123. *Id.* ¶ 1.

124. *Id.* ¶ 1.

125. *Id.* ¶¶ 6, 18.

126. *Id.* ¶ 18.

ent proposals for new services in a timely manner.¹²⁷ If granted, a pioneer's preference permits a party to file for a license without comparative hearings.¹²⁸ In the case of multiple petitioners, the FCC will grant a preference to each applicant who meets the eligibility standard.¹²⁹ The FCC rejected proposals to guarantee an exclusive license for six months to a year.¹³⁰ In so deciding not to provide a head start, the FCC noted that the "key public interest benefit of a preference is the assurance to the pioneering entity that, if otherwise qualified, it will receive a license."¹³¹

Each applicant must submit a separate request for a pioneer's preference when petitioning for a rulemaking on either an allocation of the spectrum for a new service or an amendment to permit the use of a new technology.¹³² A pioneer's preference request must show that the petitioner has developed the technology or brought the technology to a more advanced or effective stage.¹³³ The request must contain pertinent information concerning how the service will be implemented, the frequencies to be used, and the area for which the service is sought. Each request must also demonstrate the technical feasibility of the new service and show whether conflicting licensing rules will apply.¹³⁴ Significantly, the FCC has concluded that the petitioner's financial and technical qualifications are not eligibility requirements.¹³⁵

Next, the FCC places petitions for pioneer's preference on Public Notice, and may solicit the comment of recognized experts.¹³⁶ If review of the relevant material indicates that a proposal is meritorious, the FCC will issue a "Tentative Decision" that a conditional preference is warranted.¹³⁷ The Tentative Decision will be made when a Notice of Proposed Rulemaking is issued, and the preference will become final when and if the final rules issued in a "report and order" are similar to the innovator's proposal.¹³⁸ Requests for pioneer's preference will be accepted until the issuance of a notice of proposed

127. *Id.*

128. 47 CFR § 1.402(d) (1993).

129. Pioneer's Preference, *supra* note 73, ¶ 74.

130. *Id.* ¶¶ 24-32.

131. *Id.* ¶ 34.

132. *Id.* ¶ 74; 47 CFR § 1.403 (1993).

133. 47 C.F.R. § 1.402 (Supp. 1993).

134. *Id.*

135. Pioneer's Preference, *supra* note 73, ¶ 41.

136. *Id.* ¶ 74; 47 CFR § 1.403 (1993).

137. Pioneer's Preference, *supra* note 73, ¶ 74; 47 CFR § 1.402(d) (1993). This tentative decision is an extra step in the FCC's rulemaking procedure, applicable to pioneer's preference.

138. 47 CFR § 1.402(d) (1993).

rulemaking.¹³⁹ Finally, the FCC has decided that a pioneer's preference may not be transferred as a separate object of sale once it is granted.¹⁴⁰

Three companies have petitioned for pioneer's preferences in the small LEO satellite format;¹⁴¹ five companies petitioned for pioneer's preference in the large LEO satellite format.¹⁴² In reviewing the petitions for pioneer's preference in both formats, the FCC considered whether the proposal adds functionality, involves a new use of the spectrum, changes some technical or operating characteristic, increases spectrum efficiency, boosts the speed or quality of information transferred, and whether the cost of the service to the public is reduced.¹⁴³

The first and only pioneer's preference for the LEO satellite systems was granted to "Volunteer in Technical Assistance" for a small LEO satellite system operating below 1 GHz.¹⁴⁴ All other petitions in both LEO satellite formats were denied because the petitioners failed to demonstrate that their technology was unique or that their design surpassed the state of art in satellite communication technology.¹⁴⁵

One area of debate concerning pioneer's preference has been whether this policy has reduced the regulatory and licensing burden on American firms or increased the potential for delay.¹⁴⁶ Since each company would have applied for a license without the preference policy, it might be argued that this policy has actually increased the licensing process.¹⁴⁷ At least one possible reason that a company would file for a preference and object to other petitions is in order to gain a time advantage to find investors and to develop its own system further. Given the benefits that a licensing preference engenders,

139. Pioneer's Preference, *supra* note 73, ¶ 74.

140. *Id.*

141. See Small LEO Satellite NPRM, *supra* note 2, n.7.

142. See Large LEO Satellite TD, *supra* note 1, ¶ 33.

143. Pioneer's Preference, *supra* note 73, ¶ 49.

144. Small LEO Satellite R&O, *supra*, note 2, ¶ 1. In related rulemaking concerning personal communication services, the FCC granted 3 pioneers preferences in the 2 GHz band, denying 47 other petitions, PCS Pioneer's Preference Granted to APC, Cox, and Omnipoint, News, GEN Docket 90-314 (released Dec. 23, 1993), available in LEXIS, FEDCOM library, FCC file; and granted one pioneer's preference in the 900 MHz band. Review, *supra* note 72, ¶ 18. For a brief discussion of the proposals of each LEO satellite system applicant, see *infra* appendix A.

145. Compare Small LEO Satellite R&O, *supra* note 2 with Large LEO Satellite TD, *supra* note 1, ¶ 2. The FCC further noted that none of the five proponents in the large LEO satellite format had fully established the technical feasibility of their systems. Large LEO Satellite TD, *supra* note 1, ¶ 50.

146. See, e.g., Pioneer' Preference, *supra* note 73 (separate statements of Commissioner Ervin S. Duggan and Commissioner Sherrie P. Marshall).

147. *Id.*

every company that has the slightest chance of receiving a pioneer's preference will no doubt attempt to convince the FCC that its proposal is innovative or is a substantial enhancement of existing technology.¹⁴⁸ Responding to each request may delay the licensing process.

Other criticisms of the pioneer's preference policy include fears that the licensing process may "politiciz[e] awards that should be impartial," and that the FCC will become distracted "with hair-splitting debates about what constitutes real newness, novelty, and pioneering."¹⁴⁹ Given the FCC's conservative approach towards awarding pioneer's preferences,¹⁵⁰ the benefits of such a preference should outweigh its potential disadvantages. Pioneer's preference requests are decided when the FCC issues a Notice of Proposed Rulemaking concerning the allocation of the spectrum.¹⁵¹ This policy ensures that any delay added to the licensing process will be minimal. The pioneer's preference policy has encouraged innovators to apply for the allocation of the radio frequency spectrum to LEO satellites at the early stages of the development process.

The FCC has recently proposed to amend its pioneer's preference rules, which would limit acceptance of requests to new technologies and eliminate requests for a preference based upon new uses of existing technologies.¹⁵² To accelerate the licensing process, the FCC may also change its pioneer preference rules to eliminate the Tentative Decision at the Notice of Proposed Rulemaking stage.¹⁵³ Decisions would be made at the Report and Order stage, permitting the FCC "to consider fully the pioneering efforts and technologies in conjunction with the proposed service."¹⁵⁴ However, after Congress authorized the FCC to use the competitive bidding process to select licensees from mutually exclusive applicants, the FCC is currently reviewing the possibility of repealing its pioneer preference policy altogether.¹⁵⁵

148. *Id.*

149. *Id.* (separate statement of Commissioner Ervin S. Duggan).

150. The FCC has indicated that it will strictly follow its pioneer's preference rules, awarding the preference only after the applicant has overcome "a significant burden to persuade the Commission that its proposal is innovative, has merit and that the applicant is the original developer or proponent of the innovation at issue." Eric Fishman, *Awarding Today's Innovators With Pioneer's Preferences*, N.Y.L.J., Dec. 31, 1992, at 7.

151. Pioneer's Preference, *supra* note 73, ¶ 61.

152. Review, *supra* note 72, ¶ 17. The rules may also be amended to require that requests be filed before the FCC initiates a rulemaking proceeding, and to limit the submission of experimental data to selected, relevant material rather than the entire experimental file. *Id.* ¶ 15.

153. *Id.* ¶ 16.

154. *Id.*

155. *Id.* ¶ 1.

E. *Competitive Bidding*

The FCC now has the authority to use competitive bidding to assign licenses if mutually exclusive applications are filed.¹⁵⁶ As part of the president's budget submitted to Congress, President Clinton proposed competitive bidding as a revenue source and as a method to improve the FCC's licensing process.¹⁵⁷ The FCC itself had indicated that limiting the licensing procedures to comparative hearings and lotteries often resulted in arbitrary and inefficient assignments.¹⁵⁸ Since the 1980s, a number of commentators, including the members of the FCC, believed that "the government is failing to manage wisely one of the nations [sic] most valuable national resources" by failing to receive compensation for assigning the spectrum to private licensees.¹⁵⁹

Under a competitive bidding system, "the value of innovation may be considered in the marketplace and measured by the ability to raise funds necessary to obtain the desired license(s)."¹⁶⁰ Administrative delays in the licensing process should be shorter than in comparative hearings and lotteries.¹⁶¹ Given the federal government's current fiscal troubles, competitive bidding offers the least costly process to select among mutually exclusive applicants and "would give taxpayers a return for value conferred in a license."¹⁶²

The use of competitive bidding to allocate licenses has been criticized as favoring established companies with large financial resources over new, "start-up" businesses.¹⁶³ Not only will incumbents have greater resources to submit higher bids, but the smaller firms may have difficulty obtaining financing from the capital markets to research and develop innovative technology in the first place, because the new or smaller firms would be disadvantaged under the competitive bidding system. However, the FCC determined that:

156. Authority to Use Competitive Bidding, § 6002, Omnibus Reconciliation Act of 1993, (to be codified at 47 U.S.C. § 309(j)).

157. H.R. REP. No. 111, 103d Cong., 1st Sess., pt. 2 (1993). President Clinton's proposal was similar to the position of the Bush and Reagan administrations. *Id.*

158. *Id.*

159. *Id.* Competitive bidding as an allocative method has already been used by other governmental agencies. 43 U.S.C. §§ 1331-1356 (1988) (lease rights to drill for oil and gas in the outer continental shelf); 30 U.S.C. § 181 (1988) (federal coal leases). Both New Zealand and the United Kingdom have used competitive bidding to award licenses. PCS Rules, *supra* note 76, app. D.

160. Review, *supra* note 72, ¶ 7.

161. PCS Rules, *supra* note 76, app. D. Even the most streamlined comparative hearings average 30 months; the random selection process averages 12 months. *Id.*

162. *Id.*

163. H.R. REP. No. 111, 103d Cong., 1st Sess., pt. 3 (1993).

[C]ompetitive bidding is superior or equivalent to lotteries and comparative hearings in all respects. All methods would ultimately assign a license to the user who values it most, but competitive bidding would do so more quickly. It would reduce the FCC's cost of administering selections, and most importantly would reduce the real private resources expended in seeking licenses.¹⁶⁴

Despite the FCC's new authority to use competitive bidding in lieu of comparative hearings or lotteries, the FCC's pioneer preference policy was not directly affected by the amendments to the Communications Act. The House Report on the bill authorizing competitive bidding was expressly neutral toward the FCC's pioneer's preference policy.¹⁶⁵ Since the FCC itself adopted and implemented its pioneer's preference policy, the FCC may continue to award pioneer's preferences as long as doing so does not conflict with its new competitive bidding mandate.¹⁶⁶ However, the FCC has concluded that it must re-examine the public interest basis for its pioneer preference rules, since an innovator may obtain a license for a new service through competitive bidding without filing for a pioneer's preference.¹⁶⁷

Both policies were adopted in response to the general dissatisfaction with comparative hearings and lotteries but they address different public concerns. The pioneer's preference rules were adopted by the FCC to encourage innovation and to ensure that true innovators were rewarded for their efforts, which benefits the public in the end by encouraging the earliest introduction of new technologies and services. Competitive bidding was advanced by Congress at least partially in response to the federal government's own need to reduce spending. The goals of competitive bidding are to reduce the time burden and costs on the FCC, and to make private companies pay for their right to use an important public resource.¹⁶⁸ Two main questions remain: are these policies consistent, and do they both serve the public interest?

In the final analysis, both policies should be followed in appropriate situations. Competitive bidding does not permit start-up or smaller businesses to have a reasonable expectation of obtaining a license even though they develop innovative technologies. On the other hand, competitive bidding promotes the public interest by requiring companies to pay for the right to exploit the radio frequency spectrum. The FCC is currently considering a way to reconcile these two policies by changing the pioneer's preference rules to charge a fee for such a

164. PCS Rules, *supra* note 76, app. D.

165. H.R. REP. NO. 111, 103d Cong., 1st Sess., pt. 3 (1993).

166. *Id.*

167. Review, *supra* note 72, ¶ 7.

168. See *supra* note 164 and accompanying text.

preference.¹⁶⁹ Some companies have suggested that "pioneer's preference licensees should be required to pay a fee equal to the lowest winning bid for the appropriate licensing area."¹⁷⁰

Pioneer's preference licensees should not have to pay for such a licensing preference because the sole purpose of the policy is to encourage innovation. Requiring the innovator to pay for the preference would take away a major reason for the preference. Since the FCC's implementation of this policy so far indicates that pioneer's preference awards will be difficult to obtain, the preference policy should be continued. Especially with the proposed changes to the preference rules,¹⁷¹ which should reduce speculative requests and accelerate the procedure, pioneer's preferences will benefit the public interest in a way that competitive bidding cannot. In most instances, however, competitive bidding should be the FCC's licensing method, since few companies will be able to obtain a pioneer's preference.

IV. CONCLUSION

Within a few years, the first generation of LEO satellite systems should be providing new global telecommunications. The FCC now has the authority to auction licenses to the highest bidder or to provide a pioneer's preference license. Both of these policies are superior to the comparative hearing and random selection methods previously used by the FCC to issue licenses.¹⁷² While the issue of pioneer's preferences has been addressed and resolved in the LEO satellite format, this policy has continued application in licensing future satellite technology and in the related technologies associated with personal communication services. However, the FCC's pioneer's preference and competitive bidding policies must continue to evolve with the technology in order to continue to serve the public interest best.

169. *Id.* ¶ 10.

170. *Id.* n.12

171. *See supra* note 152 and accompanying text.

172. The FCC retains the authority to use either comparative hearings or random selection methods under appropriate circumstances. *See discussions supra* parts III.A. & III.C.

APPENDIX A: LEO SATELLITE PROPOSALS¹⁷³A. *Small LEO Satellite Proposals*

◆ Volunteers in Technical Assistance (VITA) is a non-profit organization planning to provide humanitarian assistance to developing countries. Using a two satellite system, VITA plans to connect about 1,000 ground stations around the world to provide disaster prevention and response communications. VITA has installed ground systems in Sierra Leone, Djibouti, Indonesia, Ireland, Pakistan and New Mexico. VITA's system can incorporate either FDMA or CDMA technology for transmission. (FDMA and CDMA are two of the competing digital transmission technologies currently vying to become the industry standard. See appendix B).

◆ Orbital Communications Corporation (ORBCOMM) is a subsidiary of Orbital Sciences Corporation based in Fairfax, Virginia. ORBCOMM has proposed to provide commercial messaging and position determination using a 36 satellite system. ORBCOMM's most recent plans as of June 1994 call for the LEO satellites to be placed in orbit at 775 km. ORBCOMM plans to use FDMA modulation technology to provide communications to and from commercial fixed and mobile terminals.

◆ STARSYS is a subsidiary of Collecte Localisation Satellite which is 51% owned by the French government's space agency. STARSYS has proposed to provide commercial two-way messaging and position determination with a 24 small LEO satellite system orbiting at about 1,300 km. STARSYS plans to use CDMA technology.

B. *Large LEO Satellite Proposals*

◆ Motorola Satellite Communications plans to operate "Iridium," a system of 66 large LEO satellites placed in six orbital planes at 765 km above the earth in order to provide global voice and data services. (77 satellites were original planned, hence the name based on the atomic number of Iridium). Iridium is the sole large LEO system designed to operate on FDMA and TDMA technologies. (See appendix B). Motorola's \$3.7 billion dollar project is the only large LEO system which plans to bypass land-based telephone systems entirely. At this point, Motorola envisions charging \$3,000 for each satellite-phone with calls costing \$3 per minute.

173. The following sources were used to compile summaries of the LEO satellite proposals: Small LEO R&O, *supra* note 2; Pioneer's Preference, *supra* note 73; Large LEO Satellite TD, *supra* note 1; Large LEO Satellite NPRM, *supra* note 2; *FCC Awards Pioneer's Preference to Volunteers in Technical Assistance*, U.S. NEWSWIRE, Jan. 14, 1993, available in LEXIS, NEWS library, CURNWS file.

- ◆ Loral Qualcomm has proposed "Globalstar," a \$1.5 billion project using 48 large LEO satellites orbiting at 1380 km to provide worldwide services at an estimated 50 cents per minute. Globalstar will use CDMA technology.
- ◆ TRW has proposed "Odyssey," a 12 satellite system of intermediate orbiting satellites to provide global services at an estimated 65 cents per minute. TRW plans to place its satellites in three orbital planes, 4 per plane, at approximately 8,600 km above the earth.
- ◆ Constellation Communications has proposed "Aries," a system of 48 satellites orbiting at 845 km, including 4 satellites in polar orbit, to provide its global services. Aries will use CDMA technology.
- ◆ Ellipsat International has proposed "Ellipso," a 24 satellite system placed in an intermediate-range elliptical orbit at 1250 km above the earth. Ellipso will operate on CDMA technology.
- ◆ Teledesic Corporation has announced plans for a \$9 billion project to provide video, telephone and computer services to fixed points, rather than mobile services with a system of 840 LEO satellites orbiting at 700 km. Formed in March 1994 by Microsoft's Bill Gates and Craig McCaw of McCaw Cellular Communications, Teledesic did not participate in the negotiated rulemaking or pioneer's preference proceedings.

APPENDIX B: MODULATION-ACCESS TECHNOLOGIES¹⁷⁴

- ◆ Time Division Multiple Access (TDMA) is a digital modulation-access technology which divides a single frequency channel among multiple users by allocating unique time slots of roughly half a millisecond to each user. The Telecommunications Industry Association has adopted TDMA as one of the digital standards in America. More than 50 cellular telephone carriers in almost 40 countries, including most of the European Union have also adopted TDMA as their digital telephone standard.
- ◆ Code Division Multiple Access (CDMA) is a form of digital modulation-access technology which transmits numerous signals within the same frequency bandwidth, all at the same time. Each signal is tagged with an unique code which allows the signals to be distinguished by the receiver and avoid mutual interference. CDMA is also

174. The following sources were used to create summaries of the three competing digital modulation-access technologies: PCS Rules, *supra* note 76; *Telecommunications Survey*, ECONOMIST, Oct. 23, 1994 (insert after page 68). For greater technical explanations of these modulation technologies, see e.g. ROGER L. FREEMAN, TELECOMMUNICATION TRANSMISSION HANDBOOK 308-314 (2d ed. 1981) and MARVIN K. SIMON ET AL., 1 SPREAD SPECTRUM COMMUNICATIONS 23 (1985).

one of the digital standards recently adopted by the Telecommunications Industry Association.

◆ Frequency Division Multiple Access (FDMA) is another digital modulation-access technology which shares a frequency bandwidth among multiple users by allocating each user a smaller channel within the main bandwidth.