Before The
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
	)	
2000 Biennial Regulatory Review	)	WT Docket No. 01-14
Spectrum Aggregation Limits for	)	
Commercial Mobile Radio Services	)	

Declaration of Richard J. Lynch

I, Richard J. Lynch, hereby declare as follows:

My full name is Richard J. Lynch. I am Executive Vice President and Chief Technical Officer of Verizon Wireless. I offer this declaration in support of the Reply Comments of Verizon Wireless in the captioned docket.

I. Background and Qualifications

1. As the Chief Technical Officer for Verizon Wireless, the largest wireless carrier in the U.S., I am responsible for the performance of the company's coast-to-coast multibillion-dollar wireless voice and data network covering more than two million square-miles.

2. Previously, I was executive vice president and chief technical officer for Bell Atlantic Mobile. Under my leadership Bell Atlantic Mobile built one of the largest Cellular Digital Packet Data ("CDPD") networks in the country while at the same

time launching the nation's first commercial Code Division Multiple Access ("CDMA") service.

3. I have served as chairman of the Wireless Data Forum, formerly the CDPD Forum; an organization dedicated to promoting the benefits of wireless data to end user communities, the telecommunications industry, the media, and the information technology industry. Under my guidance, the CDPD forum was reformed as the Wireless Data Forum, embracing all wireless data technologies and a wider variety of members. In recognition of this accomplishment, I was honored with the CTIA President's Award.

4. Previously, I served as an executive board member of the CDMA Development Group, an organization responsible for promotion, advancement, deployment and future developments of CDMA. Currently, I am a member of The Institute of Electrical and Electronics Engineers, Inc. ("IEEE").

5. Throughout my career, I have held a variety of positions in all aspects of planning, operations and engineering, beginning with New England Telephone in 1972. Prior to joining Bell Atlantic Mobile, I was general manager of operations for Bell of Pennsylvania's Central Area.

6. In 1970, I graduated from the University of Lowell, Massachusetts, with bachelor's and master's degrees in electrical engineering. I have completed postgraduate work at the Wharton School at the University of Pennsylvania and the Johnson School of Management at Cornell University. In addition, I hold patents for advances in the area of wireless technology.

II. Summary of Conclusions

7. I am submitting this declaration to provide technical information that supports a well-reasoned decision to eliminate the current 45 MHz spectrum cap. My declaration addresses the following points:

8. First, Verizon Wireless has one of the most sophisticated mobile networks in the industry and continually makes every effort possible to use its licensed spectrum efficiently to meet the needs of its customers.

9. Second, despite our deployment of the most spectrally-efficient technologies, the enormous growth in mobile voice and narrowband data services will ultimately constrain our ability to meet future customer demand under current spectrum restrictions imposed by the FCC.

10. Finally, the expected growth of advanced mobile services such as high-speed data services will greatly increase the need for spectrum as these services are very spectrum-intensive.

III. Verizon Wireless' Is Constantly Working to Drive Spectrum Efficiencies

11. *Verizon Wireless has deployed one of the most sophisticated and spectrally-efficient networks in the industry* – Prior to introducing new digital technology in the mid-1990s, Verizon Wireless' predecessor companies (GTE Wireless, Bell Atlantic Mobile, and Vodafone Airtouch) evaluated and tested multiple digital technologies, including TDMA and GSM. We ultimately chose to deploy CDMA because it was proven to be the most spectrally-efficient mobile technology available. The current generation of CDMA, cdmaOne™, offers

approximately an 8 to 10 times capacity increase over “first generation” analog systems, and was found to be more efficient than TDMA or GSM.

12. *Verizon Wireless is active in industry groups to improve the efficiency of CDMA* – Verizon Wireless is aggressively engaged in driving key technology areas, with potential impact on its ability to increase its competitiveness, reduce operating costs, and use spectrum resources more effectively. Through active participation in standards groups and industry fora, Verizon Wireless has been influential in improving the competitiveness and efficiency of CDMA in multiple areas. These include: efficient multi-carrier deployment, enhancement of infrastructure equipment to maximize capacity, support for the evolution of CDMA to third generation systems (3G), and new vocoding technologies. Through its partnership with global suppliers of CDMA equipment, Verizon Wireless is relentlessly working on air interface improvements.

13. *Verizon Wireless’ deployment of the Enhanced Variable Rate Codec increases its spectrum efficiency* – The new 8 kbps Enhanced Variable Rate Codec (EVRC) was designed to provide CDMA networks with voice quality comparable to or better than the 13 kbps codecs previously used while also increasing spectrum efficiency. Verizon Wireless conducted field-testing of EVRC in mid-1999, followed shortly by commercial deployment.

14. System capacity gains promised by EVRC require a significant penetration of EVRC. Current capacity for CDMA operators is fundamentally a weighted average of the 13 Kbps and EVRC handsets in operation today. It can take several years to cost effectively replace an older technology. However, two

years after initial deployment of EVRC, Verizon Wireless has approximately a 70% to 80% EVRC penetration.

15. *Deployment of 3G technologies will provide greater efficiencies* – Verizon Wireless continues to look for ways to improve the efficiency of its network and provide greater capabilities for its customers. We have conducted extensive technical trials of cdma2000 1xRTT – one of the 3G technologies approved by the International Telecommunications Union (ITU). In addition to supporting a variety of data applications with rates up to 144 kbps, cdma2000 1xRTT will nearly double our network capacity for handling voice calls. In March, we announced our plan to begin aggressively deploying cdma2000 1xRTT in the second half of 2001. This early introduction demonstrates our commitment to the introduction of spectrum-efficient advanced services that will ultimately benefit the consumer.

16. Verizon Wireless is testing an evolutionary 3G technology called cdma2000 1xEV-DO, capable of delivering data-only services operating at peak rates of 2.4 Mbps in a 1.25 MHz channel. Pending the outcome of these field trials, deployment of 1xEV-DO could begin sometime in 2002.

17. *Verizon Wireless is aggressively migrating its analog customers to digital service* – While Verizon Wireless continues to support a large number of analog customers, over the past three years many of these customers have switched to digital service to obtain the many benefits offered by digital technology and in response to a variety of attractive service plans. As one might expect, this migration has occurred more rapidly in high-density markets where we are more

capacity-constrained. As illustrated in Table 1, the percentage of analog customers has fallen dramatically in these bigger markets. Moreover, the total minutes of use (MOUs) generated by analog customers has declined at an even more rapid rate. In 2-3 years, we anticipate that only 1-2% of total network usage will be from analog.

Table 1. Percentage of Analog Use for Sample High-Density Market

	1998	1999	2000	2001
Customers	94%	64%	40%	16%
MOUs	93%	55%	17%	6%

18. Verizon Wireless will continue to support analog technology for the foreseeable future. This is because we still have a large base of analog customers to whom we must continue to provide quality service. While many of these customers are low-volume users, they rely on access to our analog network for communications in the event of an emergency. Their analog phone is a valuable safety tool.

19. Analog provides an important link between disparate digital technologies. For example, customers who subscribe to a carrier that employs TDMA can roam on a CDMA carrier's network using their analog platform. As a result of these important analog uses, a minimum of 5 MHz of spectrum will need to be dedicated to analog use for the foreseeable future

20. We also must continue to support our very successful Celllar Digital Packet Data service. This data service is the predecessor to today's digital data

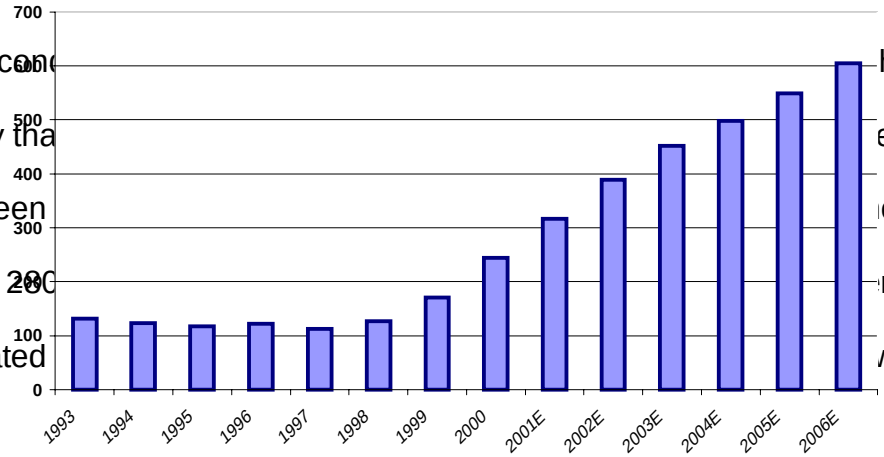
services and provides important capabilities for a variety of applications and users, including the public safety community and public utilities.

IV. Spectrum Requirements for Existing Services

21. *Wireless operators are capacity-constrained in their ability to meet the long term demand for traditional 2G voice and data services* – This is affected by three key factors. First, the wireless industry continues to grow at a rapid pace. There are currently more than 110 million wireless subscribers in the United States. The number of subscribers continues to grow rapidly; penetration, now over 40 percent, is expected to pass 60 percent in 2003 and continue to climb. Figures 1 and 2 illustrate the anticipated growth of mobile services over the next several years.[1]

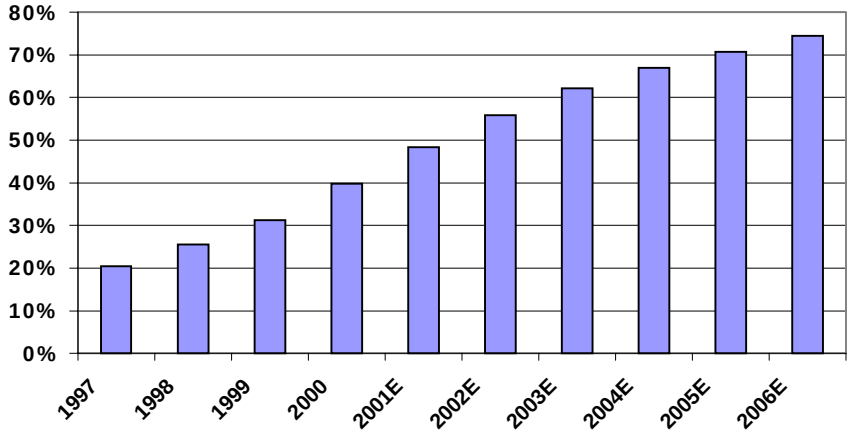
[1] Data for Figures 1, 2 and 3 are from Cellular Telecommunications and Internet Association (CTIA) and JP Morgan Securities, Inc.

Figure 3. Average MOU/Customer



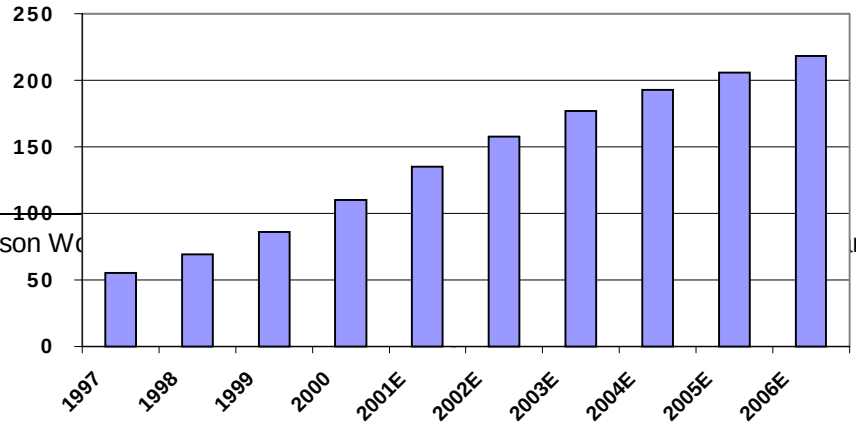
22. Secon h more frequently tha estimates that between creased 20-fold to 200 rcent.[2] As illustrated ween

Figure 2. US Wireless Penetration



1997 and 2000 and is projected to double again between 2000 and 2004. Our own experience confirms continued rapid growth in minutes of use, putting ever more demand on capacity already being used to serve the growing number of subscribers.

Figure 1. US Wireless Subscribers (M)



[2] Legg Mason W nuary 2001.

23. Finally, the growth of spectrum-intensive mobile data services is adding still more demand on our network. Today, we offer data services at rates up to 19.2 kbps. These narrowband data services support a variety of applications including instant messaging, e-mail, and web browsing. The introduction of cdma2000 1x will facilitate more robust data services, with rates up to 144 kbps.

24. At the end of 2000, data services represented less than 2% of network usage. This is expected to change dramatically, even within a few short years, as 3G technologies are deployed and more advanced mobile data applications are developed.

25. The growth in mobile data is being fueled by three factors: (1) at 40% penetration, we now have a critical mass that's comfortable with wireless technology; (2) universal acceptance of e-mail and wireline Internet that will drive the demand for mobile access to the these same and new services; and (3) we now have the technology to support wireless data at increasingly higher data rates.

26. Wireless operators must increase the capacity of their systems to meet the continued growth in subscribers and network usage and the emergence of mobile data. To meet the demand for voice alone, operators must double the capacity of their systems every 2-4 years, and in some places, demand is doubling annually. The expected growth of mobile data will add significantly to this requirement because of the amount of spectrum required to deliver data applications. While our specific spectrum requirements will vary by market, we

expect to require significant amounts of new spectrum just to satisfy the demand for existing mobile voice and narrowband data services.

V. Spectrum Requirements for Advanced Services

27. *The development of advanced wireless services will further increase the need for spectrum* – The introduction of 3G technology will facilitate the provision of a variety of advanced mobile communications services. These will include:

> Voice Services (including videophone) – traditional voice services plus enhanced applications including Voice over IP (VoIP), videoconferencing, and Session Initiation Protocol (SIP) –based services.
>
> Location-based Services – for business and consumers; enabling customers to locate other people, machines, devices, and businesses.
>
> Multimedia Messaging – providing instant messaging with always-on capability.
>
> Customized Infotainment – providing personalized content typically through portals.
>
> Mobile Intranet / Extranet Access – business-oriented service that provides secure communications between mobile users and corporate LANs and virtual private networks.
>
> Mobile Internet Access – offering mobile access to fixed Internet Service Providers with data rates and quality competitive with wirelines alternatives. Most typical applications include web access and e-mail.

28. Many of these applications will require the transmission of graphics, pictures, and video clips, and thus, are very spectrum-intensive. Table 3 illustrates the corresponding data requirements for some of these high-speed data applications. Even e-mail can require significant spectrum resources if associated with the transfer of attachments several megabits in size. We are constantly modeling the impact of these advanced services on our network's capacity. We consider the numbers of current and projected customers,

expected length of the on-air session, and the expected allocation of customer time among different applications. We also factor in the planned deployment of 1xEV-DO – a spectrum-efficient technology designed for advanced services. We calculate the number of users who can access advanced services simultaneously with other (e.g., voice) users, and translate those calculations into the amount of spectrum needed.

Table 3. Typical User Data Requirements for Various Advanced Data Applications

Application	Data Per Session (kbytes)	Session	Data/Busy Hour (kbytes)	Avg. Data Rates (kbps)	Probability of Occurrence
Infotainment, M-commerce, Location Svcs	25 – 50	75 sec.	40	4	0.5%
Streaming Video & Audio	2,250	45 sec.	2,250	400	9.5%
E-mail with no attachments	10	One e-mail	60 (6 e-mails in 10 min.)	0.8	20%
E-mail with large attach. or FTP	500	One attach. or large file	750 (1 to 2 files in 10 min.)	10	20%
WWW	2,025	10 min.	2,025	27	50%

29. The high-speed data traffic models reveal the need for substantial additional spectrum just to support advanced services, depending on the number of customers who use such services. When this spectrum requirement is combined with the need for much more spectrum to support the growth of existing voice and narrowband data services, it becomes apparent that a successful wireless operator that desires to offer the range of services our customers will demand, will require far more than 45 MHz.

VI. Conclusion

30. As described in this declaration, the continued growth of existing mobile voice and narrowband data services and the emergence of high-speed data services will exceed the current capacities of existing wireless operators. It is apparent from the analysis included here that operators will require additional spectrum to support these increasing demands, and that the current 45 MHz spectrum cap will impede their ability to do so. I urge the Commission to immediately eliminate its 45 MHz spectrum cap and cellular cross-ownership restriction.

I declare under the penalty of perjury that the foregoing is true and correct.

_____ Date: 5/14/01

Richard J. Lynch

Executive Vice President and
Chief Technical Officer

/s/