



Cell Towers on the Horizon: An Analysis of Demand for New Wireless Towers in the Coming Years

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Abstract:

Cell tower or “vertical real estate” companies – large and small – continue to build new towers and lease space to wireless service providers. But what is their mid- and long-term viability in light of emerging technologies and alternate services? Will there continue to be a need for new towers? Will existing ones become obsolete? This paper looks at these questions from a variety of approaches and also examines potential threats.

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- 9.2** In millions of dollars went into SureWest Communications' checking account after it completed the sale of its 52 towers to Global Tower Partners of Boca Raton, FL on Friday.
- 85** The amount of new towers built by SBA Communications Corporation during 2008. The Boca Raton, FL-based company said this week it anticipates building a similar number of towers during 2009.
- 85.8** The fourth quarter net profit in millions of dollars announced by American Tower Corporation compared to a loss of \$5.5 million a year earlier.
- 336** Not including the Global Signal merger, Crown Castle, International built and acquired this total of towers during 2008, the company announced on Thursday.
- 800** The anticipated number of towers American Tower Corporation expects to build during 2009, according to their fourth quarter report released this week.

These recent statistics¹ paint an attractive picture for the future of the “Vertical Real Estate” (AKA cell tower) business. But what about the possible changes – new technologies, new applications – that could alter these kinds of numbers in the future? This paper will look at the future of the tower industry from a variety of perspectives and try to answer this question:

1. Historical trends.
 - How has tower growth trended in recent years?
 - What have been the drivers of this growth?
 - How have the new technologies of the past impacted numbers?
2. Benchmarking other industry participants
 - What are the other major players doing?
 - What are their tower builds and revenues?
 - What are they predicting for the future?
3. Current market trends and developments
 - What indicators predict a positive future?
 - Any negative indicators?
4. Potential threats
 - What new services might alter the landscape?
 - What new technologies might alter the landscape?
 - How might they affect the tower industry?

Summary:

Emerging services and technologies will mostly complement or coexist with current technologies rather than supplant or replace them.

As capacity demands increase, demand for new traditional (100'+) towers will likely flatten over time, supplanted by smaller, ubiquitous sites on lower (sometimes existing) structures. However, as evidenced by the major industry players continuing to invest in new structures, existing towers and those built in upcoming years should have a productive economic life as once they are in place and in use, they remain the most economical way to provide service to their surrounding area.

¹ Source: http://www.wirelessestimator.com/breaking_news.cfm, March 1, 2009

1. Historical trends in cell site growth

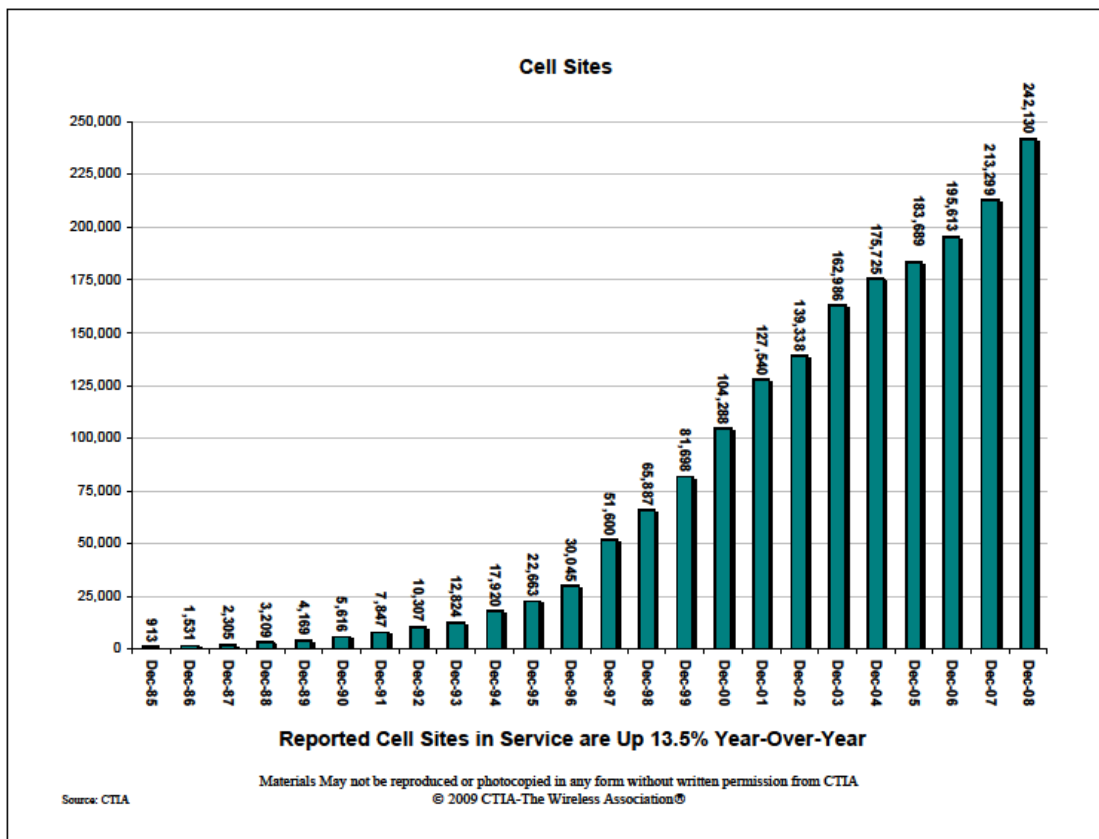
The growth in wireless services and their networks has been driven by a number of key factors: subscriber rates (number of customers), minutes of use (how much and how long subscribers use their wireless devices), number and types of applications (no longer just voice and text, but a whole new range of broadband services), and where people use their phones (not just in the car, but where they “work, live and play”) have all increased, placing increased demands on the wireless networks.²

In the early years, the growth was primarily to provide increased *coverage*: providing service where it hadn’t previously existed, such as suburban and residential area, recreation centers, and even rural roads. In recent years, growth has been driven more by the need for increased *capacity*: with more users and more bandwidth-hungry broadband applications, and limited frequencies in use, these frequencies have to be used more efficiently.

This demand has been met in a number of ways: new equipment such as higher gain antennas; new signal processing techniques such as the migration from analog to digital; the licensing of additional spectrum (frequencies) by the FCC; but the primary way that this demand has been met is through increasing the number of “cell sites” or wireless communications facilities. More cell sites means that service both covers more geographic area - increasing coverage - AND that the licensed frequencies can be re-used over a smaller geography - thereby increasing capacity. And for most of the country, more cell sites mean more of what we call *cell towers*.

The number of cell sites in the US has increased – mostly at double-digit rates – every year since the launch of the first “cellular” networks in the early 1980s³.

US Cell Sites 1985 – 2008 ⁴



² See Comp Comm’s White Paper “Trends in Mobile Wireless (AKA “Cellular”) Usage And Implications for Wireless Facilities Siting - 2007” for more details.

³ Technically the first commercial cellular service was launched by Bell Labs in Chicago in 1978, but it wasn’t until the FCC licensed the cellular frequencies in the early 1980’s that real commercial service began.

Slower growth times, in 2002 for example, have been due more to issues related to companies' inability to raise capital (the tech slowdown and the capital crunch), not demand. The mergers of Sprint with Nextel and AT&T with Cingular were predicted to reduce tower growth as they consolidated networks and shared sites, and this may have been the reason behind some of the growth slowdown in 2006 and 2007, but growth rates seem to have "snapped back" for 2008. So consolidation doesn't seem to negatively impact the growth in sites over time.

Major growth spurts can also be the result of new competition: The licensing and introduction of PCS services in the mid-90's brought new entrants and increased competition, and, consequently, brought consumer pricing way down, dramatically increasing demand and usage⁵, and therefore increasing the number of cell sites.

The big leap in the number of sites for 2008 may also be due to in part the entrance of two new major service providers – MetroPCS and Cricket – into a marketplace that had been seeing increased consolidation since the mid 1990's. Not only have those two carriers been building out their own networks, adding new sites as they expand, but they've also (re)lit a competitive fire in some of the incumbents. So competition, and the introduction of new services, does not seem to negatively impact the growth of sites, but rather fosters growth.

It's also interesting to see that some predicted "technology killers" of the past did not have the anticipated (by some) impact of reducing demand for cellular-type service.⁶ The Iridium **Satellite** network was launched with great fanfare in 1998 and many believed it would be a viable competitor to terrestrial wireless, but it was too expensive and had limited bandwidth. And today, after multiple bankruptcies, owners and reorganizations, satellite is a "niche" service used in extremely remote areas where other wireless service is not available: it did not supplant existing terrestrial wireless, it now complements it. **WiFi**, i.e. the 802.11x services which use unlicensed spectrum, was another technology that might have supplanted (some) cellular service. But WiFi is very local (limited by the low power requirements of unlicensed spectrum use), is not mobile (doesn't have hand-off functionality, so users can't quickly move from hotspot to hotspot without losing and re-establishing a connection), and is not as ubiquitous as cellular service. So, while some usage – e.g. email, web browsing – has situationally migrated to WiFi because it is often "free" or "all you can eat", cellular subscriber rates *and* usage has continued to increase, even as WiFi usage (and WiFi-enabled devices in use) has expanded. So again, WiFi has been complementary to and not cannibalistic of cellular wireless service. Some even argue that these uses and technologies are synergistic: usage of one begets usage of the other, as people get more accustomed to being able to connect everywhere and at all times.

2. Benchmarking other industry participants

Another approach to answering the question of the future for cell towers is to look at what the major industry players are doing and planning. And current information on both the carriers and the tower companies indicate that tower building and leasing will continue.

The major publicly-traded tower companies in the US today are Crown Castle International⁸, American Tower Corporation⁹, and SBA Communications¹⁰. All three of these companies continue to raise capital, build new towers, and lease space on their existing sites. As mentioned in the introduction, SBA plans to build ~85 new towers in 2009, Crown Castle built or acquired 336 towers in 2008 (no announcement for 2009), and American Tower expects to build ~800 towers in 2009¹¹.

⁴ © 2009 CTIA, from http://files.ctia.org/pdf/CTIA_Survey_Year-End_2008_Graphics.pdf. Reproduced with permission.

⁵ While subscriber rates increased steadily and Minutes of Use (MOU) increased dramatically, average monthly bills fell by about 50% from the early 90's to the late 90's. See http://files.ctia.org/pdf/CTIA_Survey_Year-End_2008_Graphics.pdf

⁶ For the purpose of this paper, cellular-type service means commercial, terrestrial, mobile wireless services such as cellular, ESMR, PCS and the new AWS; in other words, those services that appear functionally equivalent to the average consumer and are referred to as "cellular" or "cell" or "mobile" service (e.g. provided by AT&T, Verizon, T-Mobile, Sprint/Nextel, Alltel, MetroPCS, Cricket, etc.).

⁷ For example, "cell phones" (more accurately "mobile devices") such as the iPhone will first look for an available, open WiFi connection for data services such as email and browsing, and if one is not available, will then use AT&T's wireless data network.

⁸ www.crowncastle.com, NYSE: CCI.

⁹ www.americantower.com, NYSE: AMT

¹⁰ www.sbasite.com, NASDAQ:SBAC

¹¹ American Tower's build plans are higher because of their build-to-suit agreements with T-Mobile, AT&T and Cricket.

Also, revenue from existing towers appears steady or even increasing. Crown Castle, in its recent 1Q09 results, announced an 8% increase in lease revenues and no increase in ending sites for the US compared to 1Q08.¹² American Tower posted “Core rental and management segment revenue growth” at 9%, and that “Growth was primarily from existing sites, but supplemented by new high quality sites - Approximately 1,200 new sites [built] since the beginning of 2008.”¹³

There are many privately-owned tower companies operating in the US as well, owning from a few to many thousands of towers. The two biggest are TowerCo¹⁴ and Global Tower Partners¹⁵. TowerCo owns more than 8,000 towers, including 3,080 acquired from Sprint/Nextel for \$670 Million in September, 2008¹⁶ (more than \$217k/tower). According to the company’s press release: “Richard Byrne, president and CEO of TowerCo stated, ‘We are very excited that we have completed the purchase of the Sprint Nextel towers. Wireless carriers continue to grow and enhance their networks, creating strong demand for the towers we’ve just acquired.’” Global Tower Partners, which currently owns more than 3000 towers in the US, was acquired by The Macquarie Group from the Blackstone Group in July 2007 for \$1,425 Million¹⁷. They have recently announced two tower acquisitions: 235 towers from AT&T for an undisclosed sum in January 2009¹⁸, and more than 50 towers from SureWest for \$9.2 Million in late February¹⁹ (approximately \$180k per tower). These acquisitions indicate that these companies also believe in the strong continued demand for and financial viability of tower ownership and development.

The major carriers continue to announce new search rings and the intent to build (or locate on) new towers. AT&T has announced plans to build at least 2100 new sites nationwide in 2009-2010²⁰. T-Mobile plans to continue its aggressive growth plan, designed to staunch its competitive losses – primarily to MetroPCS and Cricket. Verizon has a steady build plan. For example, it is planning about 40 new sites in New Jersey for 2009-2010 vs. 180+ for T-Mobile. Only Sprint/Nextel seems to have limited its build plans, and this is generally believed to be an effect of its current cost cutting measures (a result of the cost of the merger) rather than reduced desire for new sites.²¹

Furthermore, current tower leases that are being signed continue to have the same term lengths that have been standard in the industry for many years: 5-10 years initial term with multiple 5-year extensions for 20-25 year contracts^{22, 23}. This indicates that the industry does not anticipate any major disruptions during this timeframe.

3. Current market trends and developments

In general, new developments indicate a very positive outlook for the growth of wireless networks, all driven by increased demand for wireless service:

- **Increased users:** US market penetration now stands at 89%²⁴ and is expected by some to exceed 100%²⁵ (some users will have multiple devices, such as both a personal device AND a business/work device)
- **Increased usage:** Minutes of Use (MOU) per subscriber continues to increase²⁶. Users are both using their wireless devices for “more of the same” (i.e. more messaging, more voice calls, more browsing, etc.) AND will be using their devices for **new and different applications** (e.g. mobile

¹² www.crowncastle.com/investor/factSheets/Q1_2009_CC_FactSheet.pdf

¹³ AMT Earnings release for 1Q09 dated 4/29/09, available at www.americantower.com/atcweb/irpages/irhome.asp

¹⁴ www.towerco.com/

¹⁵ www.global-towers.com/

¹⁶ www.towerco.com/news/09_24_08.htm

¹⁷ www.prnewswire.com/cgi-bin/stories.pl?ACCT=109&STORY=/www/story/07-01-2007/0004618775&EDATE=

¹⁸ www.global-towers.com/Pgs/News/01202009.aspx

¹⁹ www.global-towers.com/Pgs/News/02272009.aspx

²⁰ “AT&T to invest more than \$17B in 2009, expand 3G network” www.fiercewireless.com/story/t-invest-more-17b-2009-expand-3g-network/2009-03-10

²¹ This information comes from conversations with local site acquisition specialists – through Bert Stern and Tom Waniewski.

²² Based on current leases for Stratus and also RFPs of Comp Comm municipal clients.

²³ See also www.wirelessestimator.com/t_content.cfm?pagename=Cell+Tower+Outlook+2009, (reprinted in Appendix)

²⁴ Source: www.ctia.org and www.census.gov.

²⁵ See www.eweek.com/c/a/Mobile-and-Wireless/Wireless-Penetration-Rates-Will-Top-100-Percent/.

²⁶ See http://files.ctia.org/pdf/CTIA_Survey_Year-End_2008_Graphics.pdf, page 7. Also reproduced at the end of this document.

TV, shopping, various location-based services, etc.). More people and homes are going “all wireless”, i.e. eliminating their land lines and relying on their cell service.²⁷

- **New Frequency availability:** the FCC auctions of both AWS (Advanced Wireless Services) frequencies (1710-1755 and 2110-2155 MHz), and the 700 MHz frequencies freed by the DTV conversion are making additional frequencies available. That this spectrum is being acquired for \$Billions is an indication of the anticipated strong demand and growth of wireless services. Networks using these new frequencies will all need sites to “deliver” these frequencies.
- These new frequencies are being acquired not only by current wireless service providers to increase their capacity and service offerings, but also by totally **new service providers** that come from outside wireless but have or are planning to enter the wireless arena. For example, cable operator “**Cox Communications** recently announced that it will build its own Cox Communications cellular network. Cox Communications spent \$550 million to purchase spectrum in Atlanta, New Orleans, San Diego, Omaha, and Las Vegas along with a good part of Kansas and southern New Mexico...While the full impact of Cox's development plan is yet to be known, at a bare minimum, this should equate to at least 2000 new cell sites over the next few years.”²⁸ **Google** (NASDAQ: GOOG) purchased spectrum in the 700 MHz band. **Clearwire** (NASDAQ: CLWR), founded from a consortium of Craig McCaw, Sprint/Nextel, Comcast, Time Warner, Intel, Google, and Bright House, plans to provide wireless broadband internet service, initially using WiMax technology (see discussion below), and operating in the 2.5 MHz band in the US. This service will compete with the wired broadband services currently offered by cable, telco and other providers. So these new entrants will all need infrastructure to provide their planned services. See further discussion under “Potential Threats”, below.

In addition to these drivers of demand for “traditional” commercial wireless services, there are other users of wireless towers, including government and emergency services, and commercial backhaul (e.g. microwave) links. In the post-9/11 world, many states are working to develop state-wide networks for interoperability of emergency services as required by Federal mandate²⁹. For examples, see the New York and Oregon state-wide networks (<http://www.oft.state.ny.us/SIPO/Aboutsip0/aboutsip0.htm> and <http://www.oregon.gov/OSP/OWIN/index.shtml>) as well as many others. And the recent Federal stimulus package included \$4.4B “to extend broadband and wireless services to rural, suburban and urban areas through the U.S. Commerce Department’s National Telecommunications and Information Administration” [NTIA].³⁰ While many of these networks will be developed using existing sites and/or government-owned property, there will certainly be a need for commercially-owned sites as well.

Lastly, one can assume a reasonable probability of totally new applications being introduced in the upcoming years. We may not be able to predict what these applications will be, how they will work, or how successful they will be. But the marketplace has certainly shown a willingness to adopt new wireless technologies, and any new technology will certainly need a delivery infrastructure. And that can’t be bad for tower owners.

4. Potential Threats

Despite all these positive indicators, it is important to consider how new technologies and new services might disrupt the current tower industry. There are a couple of **new services** that could potentially pose a threat:

- WiMax** (IEEE 802.16) and similar wireless broadband services are technologies that allow for point to multipoint wireless data (primarily internet) access. The service is considered primarily as an alternative to wired broadband. Even the WiMax Forum states that WiMax is “a standards-based technology enabling the delivery of last mile wireless broadband access as an alternative to cable and DSL.”³¹ Unlike BPL, however, WiMax standards are evolving for both Fixed and Mobile usage models, with a typical anticipated cell radius or 3-10 km (1.9 – 6.2 miles) for fixed

²⁷ US Centers for Disease Control and Prevention: “Wireless Substitution: Early Release of Estimates From the National Health Interview Survey, July-December 2008”, May 2009. Available at www.cdc.gov/nchs/data/nhis/earlyrelease/wireless200905.htm.

²⁸ www.steelinthear.com/Blog/celltowerinfoblog.html

²⁹ www.fcc.gov/pshs/public-safety-spectrum/700-MHz/

³⁰ www.govtech.com/qt/619606

³¹ www.wimaxforum.org/ via <http://en.wikipedia.org/wiki/WiMax>

and up to 3 km (1.9 miles) for mobile³². This is comparable with the cell radius of many “cellular” (PCS, etc.) sites. So, to the extent that WiMax may supplant or replace some “cellular” service, it will likely need a comparable number of sites, and so should not negatively impact demand for towers. And to the extent that it complements or augments (provides service and subscribers in addition to “cellular” service), it should *increase* demand for cell sites and therefore towers.

Clearwire³³ is currently the main WiMax operator with a declared national (and international) business and buildout plan. They appear to be well-funded (receiving \$3.2B in 2009³⁴) and have planned launches in 60 markets in 16 states. (See coverage areas on the company’s web site at www.clearwire.com/store/service_areas.php.) Clearwire is marketed as a mobile broadband service (i.e. primarily data, with VoIP capability). And though at launch they share spectrum and 3G infrastructure with Sprint (which owns 51% of Clearwire), their business plan is based on deploying their own 4G network. The Clearwire 2008 Annual Report states they have “more than 18,000 cell sites in our robust development pipeline.”³⁵ So this is yet another strong indicator of increasing demand for wireless sites, and not a threat to the industry.

- B. BPL or “Broadband over Power Lines”** uses the existing power infrastructure, even electric service into the home, as the conduit (infrastructure) for broadband services. As with WiMax, BPL is generally considered to be an alternative to *wired* broadband services from cable and telco providers, but with the addition of micro- or femtocells, could deliver a wireless component. However, two factors indicate this threat is limited: 1) the technology for BPL is not new, and yet the service has not really taken off except in limited areas, and 2) there has been no discussion of making it *mobile*, which limits its ability to replace current mobile wireless services. BPL continues to look like a “non-starter” in the telecom universe. At best, BPL will, like existing wired broadband, serve as a complement and selective/situational replacement (e.g. in the home) for wireless, similar to WiFi, and therefore should not significantly dampen the growth of demand for cell sites (including towers).

There are also some **new technologies** that could potentially pose a threat to the demand for new cell towers:

- A. DAS or Distributed Antenna Systems** – defined as “A network of spatially separated antenna nodes connected to a common source via a transport medium that provides wireless service within a geographic area or structure.”³⁶ In other words, it is a network of small (lower height, lower power) cell sites (“microcells”), instead of typical cell sites, with shared equipment (transmitters, antennas), and connected by fiber optic links to the BTS hub. They commonly use existing structures (e.g. buildings, utility poles). A DAS network is often a “Carrier of Carriers,” i.e. common infrastructure shared by multiple wireless service providers and often owned by a third party. The service radius of a DAS node is typically ¼ to ½ mile (terrain permitting).

DAS networks are generally a more expensive solution (vs. a standard cell tower) to providing service to a designated area because of the increased number of sites required. So, in general, they are being installed in locations where traditional cell towers are not practical or desirable – usually due to difficult zoning or environmental issues. MetroPCS and Cricket are partnering with various DAS network providers for some of their urban deployments (e.g. Camden, Philadelphia), probably for a variety of reasons including reduced capital requirements and increased deployment speed (fewer lease relationships). Another common use for DAS is indoor coverage that primary (outdoor) networks can’t reach, such as for stadiums, convention centers, airports, etc.

DAS solutions will likely continue to be used selectively where individual cell sites aren’t practical for one reason or another (as described above). However, when DAS infrastructure is put in place, it is *in addition to* existing towers or other sites, often as a “fill-in” to provide additional

³² www.wimaxforum.org/resources/frequently-asked-questions <http://arstechnica.com/telecom/news/2009/01/verizon-getting-on-femtocell-bandwagon-with-sprint-att.ars>

³³ www.clearwire.com/

³⁴ 2008 Annual Report, p. 3, available at <http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9NDQ4MnxDaGlsZEIEPS0xfFR5cGU9Mw==&t=1>

³⁵ *Ibid*, p. 9.

³⁶ www.theDASforum.org

capacity, and not as a replacement. Existing sites are not typically decommissioned when a DAS network is inserted. "Looking ahead for DAS, 'it's not replacing the towers, but it's definitely a complement and you will see it become a tool in capacity planning from the get-go rather than being an afterthought,' Larsen [Tormod Larsen, vice president and chief technology officer at ExteNet, a leading DAS provider] said."³⁷

- B.** As mentioned in Section 1, above, **Satellite** communications technology has been around for some time, but has failed to evolve much beyond a niche service. This is due not so much to a failure of the technology, but of the business model(s). The capacity of a satellite network is severely constrained by the expense of the satellites themselves, and the market has just not been willing to support the costs. The form and function of end-user devices for satellite-based services have never equaled those for cellular, due to the larger battery and antenna requirements, limiting their mass appeal and therefore adoption. Furthermore, satellite networks don't readily lend themselves to technology upgrades or repair: you can't just send a truck out to replace the transmitters or upgrade the antennas, so their ability to keep up with the technology advances of terrestrial wireless systems is limited, increasing the risk for investors.

TerreStar Networks, Inc. (www.terrestar.com) has announced plans for a hybrid satellite-terrestrial network that they expect will address some of these issues. TerreStar will not be a service provider itself (i.e. will not sell services to end users) but provide network infrastructure to "a diversified range of customers including homeland defense agencies, public safety agencies, rural communities, wireless carriers, and multiple enterprise verticals."³⁸ The company has announced a reciprocal roaming agreement with AT&T to provide the terrestrial component of its network³⁹ and the (much delayed) launch of their first satellite, TerreStar-1, is currently scheduled for mid-July.⁴⁰ They are also working with Elektrobit Corporation to develop a GSM-compatible smartphone-style handheld device. This business model may address some of the issues of all-satellite networks, but with an anticipated price point of \$1/minute⁴¹, it's expected to compete with other satellite services, i.e. where terrestrial wireless is not available. So even if it ever launches (literally and figuratively), this service will, once again, complement terrestrial wireless, not cannibalize it, thereby providing no significant threat to the tower industry.

- C. Femtocells** are micro-microcells: very small, very low power "base stations" (often no more than a small box) connected to the backbone network via a broadband (IP/Internet) connection. They are designed to provide highly localized capacity and/or indoor coverage. Femtocells, unlike DAS networks, are carrier-specific and not shared.

Femtocells are commonly deployed in dense urban environments, e.g. on and inside buildings. They are also being sold by some major US carriers (Verizon, Sprint/Nextel, AT&T⁴²) to their subscribers. The customer buys the box and connects it to their own broadband Internet connection and now has their own little cell site as a way to improve their (and perhaps their neighbors') coverage in/around their home (or office). The carrier benefits in that this usage is now offloaded from their primary network, so they can theoretically deploy fewer sites for the same capacity.

Femtocells will continue to be deployed as demand for wireless capacity increases with the increase in both subscriber growth and usage. As with DAS, they should primarily be a complement to the existing tower network, not a replacement. Increased deployment of femtocells bring increased issues/requirements related to frequency (re)use, interference, handoff and access control, because they may operate on the same frequencies as the nearby primary cell site or other surrounding femtocells, but equipment manufacturers have been working to solve these problems. In the densest wireless usage environments (cities, shopping districts, office parks, etc.), femtocells - or their future counterpart - may eventually replace tall traditional

³⁷ www.wirelessweek.com/Article-Tower-Co-Location-Changes.aspx

³⁸ www.terrestar.com/services/index.html

³⁹ www.terrestar.com/news/press/archive/20080801.html

⁴⁰ www.terrestar.com/news/press/20090608.html

⁴¹ www.informationweek.com/blog/main/archives/2008/04/ctia_satellite.html;jsessionid=CVHU3COC22DYEQSNLQSKHSCJUNN2JVN

⁴² <http://arstechnica.com/telecom/news/2009/01/verizon-getting-on-femtocell-bandwagon-with-sprint-att.ars>

cell towers, but this will take some time, even today there are not a lot of these tall towers in these environments.

- D. Mesh Networks:** A mesh network is not a technology so much as a topology or network architecture where there is a peer-to-peer relationship between nodes (users) rather than a base-station-to-end-user hierarchical relationship. Users act as nodes – base stations or relay stations – in addition to being end users. Mesh networks can be deployed for pretty much any kind of wireless network – cellular, WiFi, wireless LAN, whatever – as long as the equipment on the network is designed to provide this functionality. For example, mesh network technology may be used to connect femtocells without an underlying broadband connection at each cell (although at least one node must be connected to the primary network). Mesh networks are being used today for military ad hoc networks and municipal/public applications such as wireless utility metering. However, because of the additional equipment and power (drain) required for a device to also function as a node, personal mobile devices will not likely become mesh nodes, at least for the foreseeable future (because users won't want to bear the equipment expense or the battery drain), meaning these devices will still need some other (more traditional) way to connect to their network. And that means a cell site.
- E. Equipment Advances:** there will likely continue to be advances in equipment and software technologies, such as a signal processing techniques and antenna technologies, which will continue to offer efficiency improvements for wireless networks. Though there is no crystal ball that can predict future technological advancements, these improvements will likely continue to be evolutionary, not revolutionary. There are also new solutions designed to address specific issues, such as high altitude balloons carrying base station equipment in extreme rural areas,⁴³ but these are, by design, destined to be an exception and not “the rule.”
- F. “FMC” or Fixed Mobile Convergence:** this is the capability for a device to use the “fixed” - and often free or lower cost (to the end user) - wireless network (e.g. WiFi) where it is available and the end user is staying “local” and then the mobile (e.g. cellular) network when the end user is either mobile or where no fixed wireless network is available. For example, a user with an iPhone uses a WiFi node for web browsing if one is available, and the AT&T “cellular” network if it is not. There is even an iPhone application for VoIP telephony that should allow users to ride the WiFi network for voice calls. A “cell phone” might be designed to connect through the cellular network while mobile, and the office PBX⁴⁴ while at the office. This functionality is designed to reduce the cost to the end user/device owner and also offload capacity from the cellular network. As such, it won't supplant the existing network, but, like many other new technologies, perhaps “siphon off” some of the growth and augment or compliment the more traditional network.

Conclusion:

There are many forces at work increasing the demand for wireless networks. This demand will be for both increased *coverage* – for un- or under-served areas and for new technologies, services, and applications – and increased *capacity*. If history is any indicator, the introduction of new services increases overall demand for and usage of wireless service. From this demand will flow a corresponding demand for new wireless sites, including towers.

As capacity demands and the resulting number of sites increase, sites only need to serve smaller geographic areas. As a result, the height of the average new site will likely decrease over time. We are already seeing more new towers being built in the 100-150' range rather than the 150'+ range. And as the heights needed decline, alternate, existing structures become more viable as the basis for a site. Usage of alternate technologies such as DAS and Femtocells will continue to be deployed in specific environments where these technologies have an advantage. However, there is still no quicker and more cost-effective way to provide wireless service to a broad area than a cell tower. This is why – despite the current availability of all these alternatives – new towers are applied for, built and commissioned every

⁴³ See <http://online.wsj.com/public/article/SB120347353988378955.html?mod=blog>

⁴⁴ “A private branch exchange (PBX) is a telephone exchange that serves a particular business or office, as opposed to one that a common carrier or telephone company operates for many businesses or for the general public.”
http://en.wikipedia.org/wiki/Private_branch_exchange

day. And once a tower is built, it has two distinct advantages: 1) it is an even more cost-effective solution for new service providers, and 2) it is the quickest way to get up and operational. Even when a lower height is needed, carriers are often using lower centerline heights on existing tall towers (you can see this on the occasional tower along many major highways – the higher platforms are empty, and the antennas are placed lower on the towers) or using electronic downtilts on their antennas at the higher centerlines, but still using these existing towers. The “installed base” of existing towers is probably the biggest “barrier to entry” to the deployment of new technologies, and current trends and usage indicates this should continue to be the case.

Structures in the 100' +/- range provide a nice “middle ground” as a basis for a cell site in most non-urban⁴⁵ environments: they are tall enough to support multiple providers, serve a reasonable geographic area, and, in most environments, be above surrounding structures and geography.

In the more distant future, as wireless applications and devices becomes interwoven with nearly all aspects of our lives, wireless sites may become so ubiquitous that new towers are no longer needed in most urban and suburban locales. But neither current tower companies nor wireless service providers seem to have any plans to abandon the use or development of new towers any time soon. If a business case can be built for a tower today, it should continue to prove viable for the life of its leases.

⁴⁵ In urban environments, the capacity demand – i.e. lower height requirement – and availability of existing tall structures generally means that towers are not needed.

Additional Reading

From www.wirelessestimator.com/t_content.cfm?pagename=Cell+Tower+Outlook+2009

Tower Sector Report

In the following excerpt from the Wall Street Transcript's Telecommunications Equipment issue, Clayton Moran, Stanford Group Company, discusses the outlook for the tower sector.

TWST: Looking back at 2008, how would you characterize the business in the tower space?

Mr. Moran: The communication towers business has been strong for many years now, benefiting from sustained network development by the largest wireless carriers. Wireless carrier network deployment is driven by consumer usage of their wireless products which has shown steady growth. What we are currently seeing is, as subscriber growth has slowed down a little, usage trends have remained strong. For instance, the use of wireless data services grew about 50% in 2008 and now represent over 20% of carrier revenue per user. This is, in part, due to e-mail, text messaging and Web surfing on traditional handsets, but is also largely driven by smartphones, which are making Web surfing and watching videos and TV and other things much easier and more compelling for users. So the demand from wireless subscribers is driving wireless carriers to invest in their networks by building new cell sites, therefore driving good growth for tower companies.

TWST: So there was no interruption in 2008 despite the financial issues and the economic slowdown?

Mr. Moran: It's interesting because what we have seen from the macro economy is two things - one, a credit crunch, and two, a severe recession. The credit crunch does impact the tower stocks, but the recession does not impact tower cash flow. Tower cash flow appears largely, if not completely, immune to the recession due to towers' positioning as a mission critical service provider for wireless companies. For instance, the recession is unlikely to cause Verizon Wireless and AT&T to remove or reduce the size of their wireless networks. But the credit crunch and the limited credit availability does impact tower balance sheets and tower valuation multiples.

Over the past year, tower cash flow has grown steadily, but tower stocks have declined about 50%. The drop is due to investors' fear that tower companies will have a hard time rolling over their debt and getting attractive debt terms, and also because the overall stock market has seen significant valuation multiple contraction.

TWST: Have they been able to raise the capital they need?

Mr. Moran: Yes, but at elevated prices. Crown Castle (CCI) rolled over its credit facility in late December 2008, paying 8%-8.5% interest, up from 4% or so. Crown Castle has about a \$170 million drawn on this credit line so it is relatively minor compared to its \$5.6 billion of debt. But the refinancing of this credit line was the first test of the credit markets for the tower companies since this credit crunch began. We view the outcome as positive, given the severe reduction in access to credit. We also believe that resilient tower cash flow will enable relatively attractive terms in the future.

There is no major tower refinancing risk in 2009. There is only one small tranche Crown Castle has coming due of \$294 million. SBA Communications (SBAC) and American Tower (AMT), the other two public tower companies, don't have any refinancings in 2009. Therefore, the risk is distant. It primarily starts in 2010, yet investors have been very concerned about what the potential impact is on towers.

TWST: So in this kind of an environment, hiding out is I guess the first thing investors do. With lack of knowledge, they stay on the sidelines.

Mr. Moran: Yes, I think with so much uncertainty around the availability and cost of debt, investors have fled to the sidelines in a lot of different stocks. That's happened with the towers as well.

TWST: As you talk to the companies, what's their attitude? What are they thinking about at this point?

Mr. Moran: They see strong trends in their core business, just as we do. So I think, to some extent, mid-level tower executives are probably scratching their heads right now because their cash flow remains

resilient and their growth outlook strong. The C level executives are very much aware of the credit environment. I think they are certainly disappointed in the way the stock market has treated their stocks, but they recognize that there's a lot of uncertainty and a lot of credit concern in the overall marketplace. At the same time, tower Chief Executives and Chief Financial Officers recognize that tower cash flow is like an annuity or it's probably the closest thing you'll find from a public company, because their underlying tenants, Verizon Wireless, AT&T and others, are on five-year to 25-year contracts. Basically they are 25-year contracts that renew every five years automatically. So the revenues that come from these contracts are as highly recurring as you'll find. So if you think of the business and what lenders seek in a borrower, this would be as good as lenders could find. As such, the leaders of the tower companies are probably a bit perplexed that things have gotten so bad that lenders and investors are questioning their ability to repay debt down the road.

TWST: Are there any signs that the telecom companies are cutting back on infrastructure building because of the economy?

Mr. Moran: Yes. Sprint and AT&T have indicated that they will pull back a little bit, and I think it's likely that we'll hear from other telecommunications companies that capital spending will be reined in somewhat. If you look at the natural progression of a recession, sometime after you see the consumer impact, you typically see capital spending from businesses decline as well. But we believe that AT&T and Sprint and those types of companies will pull back on wireline spending and spending in other areas outside of wireless since wireless has been their strongest profit driver.

In addition, if you look at the two largest wireless companies, AT&T and Verizon Wireless, we think they're unlikely to pull back on wireless spending - AT&T because of the launch of the iPhone and the resulting network demands, and Verizon because they are historically very steady in building out their network. So the two biggest wireless companies are unlikely to reduce capital expenditures. As such, we doubt that the tower growth outlook will change.

TWST: What kind of growth do you see for the tower companies over the next couple of years?

Mr. Moran: In 2008, tower organic revenue growth was about 10%. In 2009, it'll probably be more like high single digits, 8% or so, and probably will taper off over the upcoming years in part because of the magnitude of the industry.

Tower companies have very strong operating leverage. Once the tower is built, the cost associated with operating that tower is pretty much fixed and as tenants are added - say, Verizon to a tower that already has AT&T as a tenant - the margins improve dramatically. As a result, the largest tower company today, American Tower, has gross margins over 75%, and those are improving every quarter. While revenue growth is not as high (15% or 20%) as you'd like from growth companies, cash flow growth is very strong as a result of the superior operating leverage. Furthermore, free cash flow per share growth should be robust as well, even in this credit environment. Free cash flow per share should grow at 20% or better for these companies in 2009. So the growth characteristics remain very attractive.

This brief excerpt is from The Wall Street Transcript's just published Telecommunications Equipment issue, a report offering a timely review of the sector to investors and industry executives. This 121-page feature contains a roundtable forum and industry commentary through in-depth interviews with top management from 22 firms and 3 analysts. The full issue is available through [The Wall Street Transcript Online](http://www.twst.com/tt/info/yhoo/info1605.htm). \$175 at <http://www.twst.com/tt/info/yhoo/info1605.htm>.

From www.steelintheair.com/Blog/celltowerinfoblog.html

How will cell tower leases be impacted by the current market conditions?

The last month has been a tumultuous time in the cell tower lease industry, primarily on the side of lease buyouts. With the plummet of the stock market, rising concerns about the availability of credit, and consumer confidence very low, the industry is starting to see the impact. Through our consultations, we have already started to see tangible evidence of a declining market especially in the lease buyout side.

From our vantage, there is a distinct shrinking of the lease buyout market. Of the numerous players who purchase long term easements under cell towers and rooftop sites in exchange for a lump sum, there has definitely been a slide in the purchase prices and an increase in the due diligence requirements for purchases. Companies that buy the leases are looking to pay less and to be more selective in their choice of leases - preferring to purchase only "investment grade" leases. (i.e. those that are from AT&T, T-Mobile, Verizon). While they still purchase non-investment grade leases, the multiples paid for all leases has definitely gone down.

One primary reason for this is that Wireless Capital Partners shut its doors about a month ago. With one major competitor out of the way, the remaining firms recognized the advantage they now have and have started to lower their prices and increase their due diligence requirements. Prices are lower than they were just two months ago. There are rumors that a new entity may be formed to fill WCP's shoes, but SITA has not seen any evidence of such yet.

Even the tower companies have started to pull back from previous offers. Crown Castle's agents have been representing to landowners that today (Oct 16, 2008) is the last day that they will be honoring most if not all of the lump sum buyouts they previously made. Unlike virtually every other time that lease buyout firms give "hard deadlines", SITA believes that this one is for real. Crown's stock price has plummeted from a 52 week high of \$43 to their current price of \$19. One specific reason for this is that Crown may have to pay back a \$160MM credit facility. SITA does not believe that Crown or their landowners are in any jeopardy [sic] - but this does put Crown in a situation where they need to retain their capital for more immediate needs than purchasing long term easements under their leases. Crown's representatives have stated that they will still continue to push the extensions of the leases but won't be making lease buyout offers until they can resolve their credit facility issues. This could take quite a while.

WHERE DOES THIS LEAVE ME AS A LANDOWNER?

Recognize that the value of your tower or rooftop lease is still the same. Nothing has changed that would reduce the value to the owner of the tower. What has changed is availability of capital to those companies that purchase tower and rooftop leases. Unfortunately for many landowners, the recent turmoil comes during a time when many landowners are going to need capital to keep their houses or run their businesses. So as the average landowner's need for the capital increases, the number of competing companies that want to buy the lease decreases and the rates that the remaining companies are willing to pay decreases as well. We are getting an increased number of inquiries from landowners who need to sell their tower lease(s).

Our advice: if you don't need to sell at this time- DON'T. We started in this industry in 1997, weathered the downturn in 2001-2002 and have seen the cycles. As with previous downturns, this too shall pass. The vacuum [sic] filled by WCP and by the reduction of offers from towers companies will either be filled again by the tower companies or opportunistic companies that see value in the lease buyout market.

If you do need to sell, recognize that you don't have the same negotiating position that you had just one month ago. However, don't believe that you have to accept the offer that you are given. Even now, we rarely see situations where the first offer is the best. At SITA, we can assist you in making sure that you get the best offer available. We know the players and we have assembled substantial comparable data to assist us in recognizing trends in pricing- both short term and long term. Please see our cell tower lease buyout page for more information.

If you don't know whether you should sell, please contact us. We can help you determine whether there is any probability [sic] that your lease might be terminated. We can also help guide you on what the pros/cons of selling now are and discuss what the future holds for this industry and lease buyout firms.

Appendix: CTIA's Semi-Annual Wireless Industry Survey, December 2008

© 2009 CTIA. From http://files.ctia.org/pdf/CTIA_Survey_Year-End_2008_Graphics.pdf

Background on CTIA's Semi-Annual Wireless Industry Survey

CTIA-The Wireless Association®'s Semi-annual wireless industry survey develops industry-wide information drawn from operational member and non-member wireless service providers. It has been conducted since January 1985, originally as a cellular-only survey instrument, and now including PCS and ESMR providers. No break-out of results specific to PCS or ESMR is performed at this time.

The information solicited from the service providers includes: direct employment, number of cell sites, total service revenues, roaming revenues as a subset of total service revenues, the average local monthly bill, and the average length of call. The average local monthly bill is developed on a weighted basis, to avoid skewing the figures. It is not an average of averages. No adjustments are made to these figures.

The CTIA survey also develops information on the number of reported wireless service subscribers for the responding systems, and an estimated total subscriber figure (taking into account non-responding systems). Because the CTIA survey is a voluntary survey, it cannot compel responses from wireless carriers. However, the survey has an excellent response rate. For the December 31, 2008, installment of the semi-annual survey, CTIA received responses from companies serving 96.1 percent of wireless subscribers.

Because not all systems do respond, CTIA develops an estimate of total subscribership. The estimated subscriber figure is developed by determining the identity and character of non-responding markets (*i.e.*, RSA/MSA or equivalent-market designation, age of system, market population), and using a surrogate penetration rate applicable to similar, known systems to derive probable subscribership. These numbers are then summed with the reported subscriber numbers to reach the total estimated subscriber figures. No carrier-specific or market-specific information is maintained as a result of the survey. All such information is aggregated by an independent accounting firm to a nationwide level. The underlying source material for the survey is then destroyed per confidentiality agreements.

The following tables and charts reflect selected top-of-the-line data. Complete results of CTIA's semi-annual survey are available for purchase in the comprehensive report, *CTIA's Wireless Industry Indices: 1985 – 2008*, including data on prepaid and toll revenues, subscriber usage, investment, digital subscribership, and other operational indicators and ratios. The report is available for a member price of \$850 and a non-member price of \$1,075. Subsequent copies are available to members at \$475 each and to non-members at \$535 each. Annual subscriptions are available at a member price of \$1,445 and non-member price of \$1,825. The report may be ordered by contacting research@ctia.org or by ordering directly from CTIA's Research eStore at http://www.ctia.org/store/producttyperesults.cfm?group_id=1.

CTIA-THE WIRELESS ASSOCIATION®
ANNUALIZED WIRELESS INDUSTRY SURVEY RESULTS - DECEMBER 1985 TO DECEMBER 2008
Reflecting Domestic U.S. Commercially-Operational Cellular, ESMR and PCS Providers

| Date | Estimated Total Subscribers | Twelve-Month Total Service Revenues (in \$000s) | 12-Month Roamer Revenues (in \$000s) | Cell Sites | Direct Service Provider Employees | Average Local Monthly Bill (Dec. Survey Periods) | Average Local Call Length (Dec. Survey Periods) |
|-------------|------------------------------------|--|---|-------------------|--|---|--|
| 1985 | 340,213 | \$482,428 | N/A | 913 | 2,727 | N/A | N/A |
| 1986 | 681,825 | \$823,052 | N/A | 1,531 | 4,334 | N/A | N/A |
| 1987 | 1,230,855 | \$1,151,519 | N/A | 2,305 | 7,147 | \$96.83 | 2.33 |
| 1988 | 2,069,441 | \$1,959,548 | N/A | 3,209 | 11,400 | \$98.02 | 2.26 |
| 1989 | 3,508,944 | \$3,340,595 | \$294,567 | 4,169 | 15,927 | \$89.30 | 2.48 |
| 1990 | 5,283,055 | \$4,548,820 | \$456,010 | 5,616 | 21,382 | \$80.90 | 2.20 |
| 1991 | 7,557,148 | \$5,708,522 | \$703,651 | 7,847 | 26,327 | \$72.74 | 2.38 |
| 1992 | 11,032,753 | \$7,822,726 | \$ 973,871 | 10,307 | 34,348 | \$68.68 | 2.58 |
| 1993 | 16,009,461 | \$10,892,175 | \$1,361,613 | 12,824 | 39,810 | \$61.49 | 2.41 |
| 1994 | 24,134,421 | \$14,229,922 | \$1,830,782 | 17,920 | 53,902 | \$56.21 | 2.24 |
| 1995 | 33,785,661 | \$19,081,239 | \$2,542,570 | 22,663 | 68,165 | \$51.00 | 2.15 |
| 1996 | 44,042,992 | \$23,634,971 | \$2,780,935 | 30,045 | 84,161 | \$47.70 | 2.32 |
| 1997 | 55,312,293 | \$27,485,633 | \$2,974,205 | 51,600 | 109,387 | \$42.78 | 2.31 |
| 1998 | 69,209,321 | \$33,133,175 | \$3,500,469 | 65,887 | 134,754 | \$39.43 | 2.39 |
| 1999 | 86,047,003 | \$40,018,489 | \$4,085,417 | 81,698 | 155,817 | \$41.24 | 2.38 |
| 2000 | 109,478,031 | \$52,466,020 | \$3,882,981 | 104,288 | 184,449 | \$45.27 | 2.56 |
| 2001 | 128,374,512 | \$65,316,235 | \$3,752,826 | 127,540 | 203,580 | \$47.37 | 2.74 |
| 2002 | 140,766,842 | \$76,508,187 | \$3,895,512 | 139,338 | 192,410 | \$48.40 | 2.73 |
| 2003 | 158,721,981 | \$87,624,093 | \$3,766,267 | 162,986 | 205,629 | \$49.91 | 3.07 |
| 2004 | 182,140,362 | \$102,121,210 | \$4,210,331 | 175,725 | 226,016 | \$50.64 | 3.05 |
| 2005 | 207,896,198 | \$113,538,221 | \$3,786,331 | 183,689 | 233,067 | \$49.98 | 3.00 |
| 2006 | 233,040,781 | \$125,456,825 | \$3,494,294 | 195,613 | 253,793 | \$50.56 | 3.03 |
| 2007 | 255,395,599 | \$138,869,304 | \$3,742,015 | 213,299 | 266,782 | \$49.79 | N/A |
| 2008 | 270,333,881 | \$148,084,170 | \$3,739,274 | 242,130 | 268,528 | \$50.07 | 2.27 |

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CTIA'S SEMI-ANNUAL WIRELESS INDUSTRY SURVEY RESULTS

DECEMBER 1985 – DECEMBER 2008

| Date | Estimated Subscribers | Total Six-Month Revenues (\$000) | Roamer Service Revenues (\$000) | Cell Sites | Employees | Average Local Monthly Bill | Avg. Local Call Length (Min) | Avg. Roam Call Length |
|--------|-----------------------|----------------------------------|---------------------------------|------------|-----------|----------------------------|------------------------------|-----------------------|
| Dec-85 | 340,213 | \$306,197 | N/A | 913 | 2,727 | N/A | N/A | N/A |
| Jun-86 | 500,000 | \$360,585 | N/A | 1,194 | 3,556 | N/A | N/A | N/A |
| Dec-86 | 681,825 | \$462,467 | N/A | 1,531 | 4,334 | N/A | N/A | N/A |
| Jun-87 | 883,778 | \$479,514 | N/A | 1,732 | 5,656 | N/A | N/A | N/A |
| Dec-87 | 1,230,855 | \$672,005 | N/A | 2,305 | 7,147 | \$96.83 | N/A | N/A |
| Jun-88 | 1,608,697 | \$886,075 | N/A | 2,789 | 9,154 | \$95.00 | N/A | N/A |
| Dec-88 | 2,069,441 | \$1,073,473 | \$89,331 | 3,209 | 11,400 | \$98.02 | N/A | N/A |
| Jun-89 | 2,691,793 | \$1,406,463 | \$121,368 | 3,577 | 13,719 | \$85.52 | N/A | N/A |
| Dec-89 | 3,508,944 | \$1,934,132 | \$173,199 | 4,169 | 15,927 | \$89.30 | N/A | N/A |
| Jun-90 | 4,368,686 | \$2,126,362 | \$192,350 | 4,768 | 18,973 | \$83.94 | N/A | N/A |
| Dec-90 | 5,283,055 | \$2,422,458 | \$263,660 | 5,616 | 21,382 | \$80.90 | N/A | N/A |
| Jun-91 | 6,380,053 | \$2,653,505 | \$302,329 | 6,685 | 25,545 | \$74.56 | N/A | N/A |
| Dec-91 | 7,557,148 | \$3,055,017 | \$401,325 | 7,847 | 26,327 | \$72.74 | N/A | N/A |
| Jun-92 | 8,892,535 | \$3,633,285 | \$436,725 | 8,901 | 30,595 | \$68.51 | N/A | N/A |
| Dec-92 | 11,032,753 | \$4,189,441 | \$537,146 | 10,307 | 34,348 | \$68.68 | N/A | N/A |
| Jun-93 | 13,067,318 | \$4,819,259 | \$587,347 | 11,551 | 36,501 | \$67.31 | 2.38 | 3.38 |
| Dec-93 | 16,009,461 | \$6,075,916 | \$774,266 | 12,824 | 39,810 | \$61.49 | 2.41 | 3.26 |
| Jun-94 | 19,283,306 | \$6,519,031 | \$778,116 | 14,740 | 45,622 | \$58.65 | 2.36 | 2.89 |
| Dec-94 | 24,134,421 | \$7,710,891 | \$1,052,666 | 17,920 | 53,902 | \$56.21 | 2.24 | 2.85 |
| Jun-95 | 28,154,414 | \$8,749,625 | \$1,120,337 | 19,844 | 60,689 | \$52.45 | 2.27 | 2.74 |
| Dec-95 | 33,758,661 | \$10,330,614 | \$1,422,233 | 22,663 | 68,165 | \$51.00 | 2.15 | 2.79 |
| Jun-96 | 38,195,466 | \$11,194,247 | \$1,314,943 | 24,802 | 73,365 | \$48.84 | 2.24 | 2.8 |
| Dec-96 | 44,042,992 | \$12,440,724 | \$1,465,992 | 30,045 | 84,161 | \$47.70 | 2.32 | 3.14 |
| Jun-97 | 48,705,553 | \$13,134,551 | \$1,392,440 | 38,650 | 97,039 | \$43.86 | 2.25 | 2.95 |

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CTIA's SEMI-ANNUAL WIRELESS INDUSTRY SURVEY RESULTS

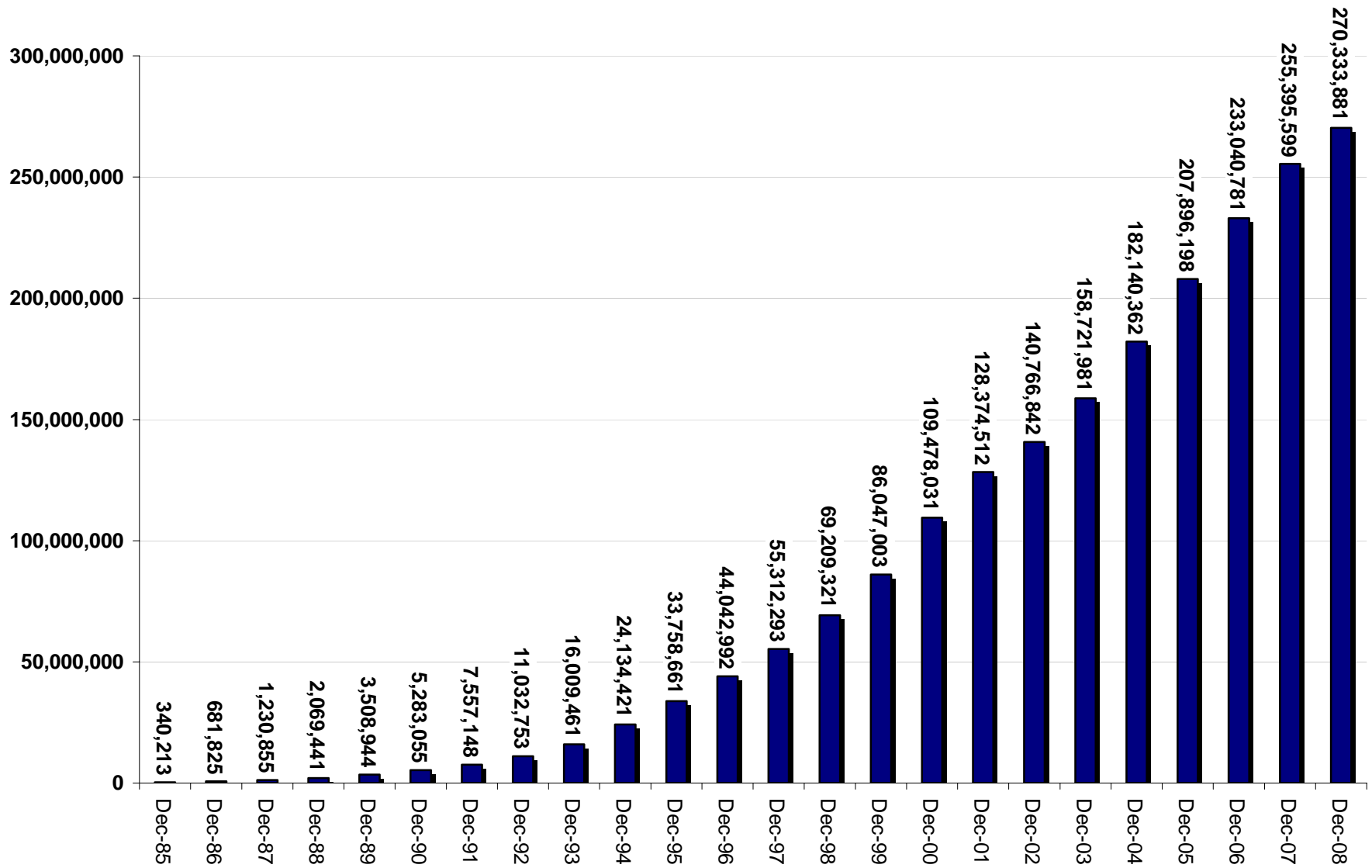
DECEMBER 1985 – DECEMBER 2008

| Date | Estimated Subscribers | Total Six-Month Revenues (\$000) | Roamer Service Revenues (\$000) | Cell Sites | Employees | Average Local Monthly Bill | Avg. Local Call Length (Min) | Avg. Roam Call Length |
|-------------|------------------------------|---|--|-------------------|------------------|-----------------------------------|-------------------------------------|------------------------------|
| Dec-97 | 55,312,293 | \$14,351,082 | \$1,581,765 | 51,600 | 109,387 | \$42.78 | 2.31 | 2.94 |
| Jun-98 | 60,831,431 | \$15,286,660 | \$1,584,891 | 57,674 | 113,111 | \$39.88 | 2.34 | 2.65 |
| Dec-98 | 69,209,321 | \$17,846,515 | \$1,915,578 | 65,887 | 134,754 | \$39.43 | 2.39 | 3.11 |
| Jun-99 | 76,284,753 | \$19,368,304 | \$1,922,416 | 74,157 | 141,929 | \$40.24 | 2.40 | 2.96 |
| Dec-99 | 86,047,003 | \$20,650,185 | \$2,163,001 | 81,698 | 155,817 | \$41.24 | 2.38 | 3.11 |
| Jun-00 | 97,035,925 | \$24,645,365 | \$1,971,625 | 95,733 | 159,645 | \$45.15 | 2.48 | 3.19 |
| Dec-00 | 109,478,031 | \$27,820,655 | \$1,911,356 | 104,288 | 184,449 | \$45.27 | 2.56 | 3.23 |
| Jun-01 | 118,397,734 | \$30,905,721 | \$1,727,058 | 114,059 | 186,317 | \$45.56 | 2.62 | 3.01 |
| Dec-01 | 128,374,512 | \$34,410,513 | \$2,205,768 | 127,540 | 203,580 | \$47.37 | 2.74 | 2.94 |
| Jun-02 | 134,561,370 | \$36,707,086 | \$1,846,267 | 131,350 | 186,956 | \$47.42 | 2.60 | 3.07 |
| Dec-02 | 140,766,842 | \$39,801,101 | \$2,049,245 | 139,338 | 192,410 | \$48.40 | 2.73 | 3.11 |
| Jun-03 | 148,065,824 | \$41,384,171 | \$1,825,243 | 147,719 | 187,169 | \$49.46 | 2.63 | 3.15 |
| Dec-03 | 158,721,981 | \$46,239,922 | \$1,941,024 | 162,986 | 205,629 | \$49.91 | 3.07 | 3.45 |
| Jun-04 | 169,467,393 | \$49,275,671 | \$2,015,799 | 174,368 | 212,186 | \$49.49 | 3.06 | 3.45 |
| Dec-04 | 182,140,362 | \$52,845,539 | \$2,194,532 | 175,725 | 226,016 | \$50.64 | 3.05 | 2.80 |
| Jun-05 | 194,479,364 | \$55,689,208 | \$1,941,960 | 178,025 | 225,162 | \$49.52 | 3.04 | 2.66 |
| Dec-05 | 207,896,198 | \$57,849,013 | \$1,844,371 | 183,689 | 233,067 | \$49.98 | 3.00 | 3.36 |
| Jun-06 | 219,652,457* | \$60,450,669 | \$1,713,680 | 197,576 | 238,236 | \$49.30 | 2.94 | 3.40 |
| Dec-06 | 233,040,781 | \$65,006,156 | \$1,780,614 | 195,613 | 253,793 | \$50.56 | 3.03 | 3.47 |
| Jun-07 | 243,428,202 | \$67,887,668 | \$1,830,435 | 210,360 | 257,401 | \$49.94 | 3.13 | 3.35 |
| Dec-07 | 255,395,599 | \$70,981,636 | \$1,911,579 | 213,299 | 266,782 | \$49.79 | N/A | 3.40 |
| Jun-08 | 262,720,165 | \$72,728,764 | \$1,778,519 | 220,472 | 267,855 | \$48.54 | 2.43 | 3.16 |
| Dec-08 | 270,333,881 | \$75,355,406 | \$1,960,755 | 242,130 | 268,528 | \$50.07 | 2.27 | 3.27 |

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Estimated Subscribers



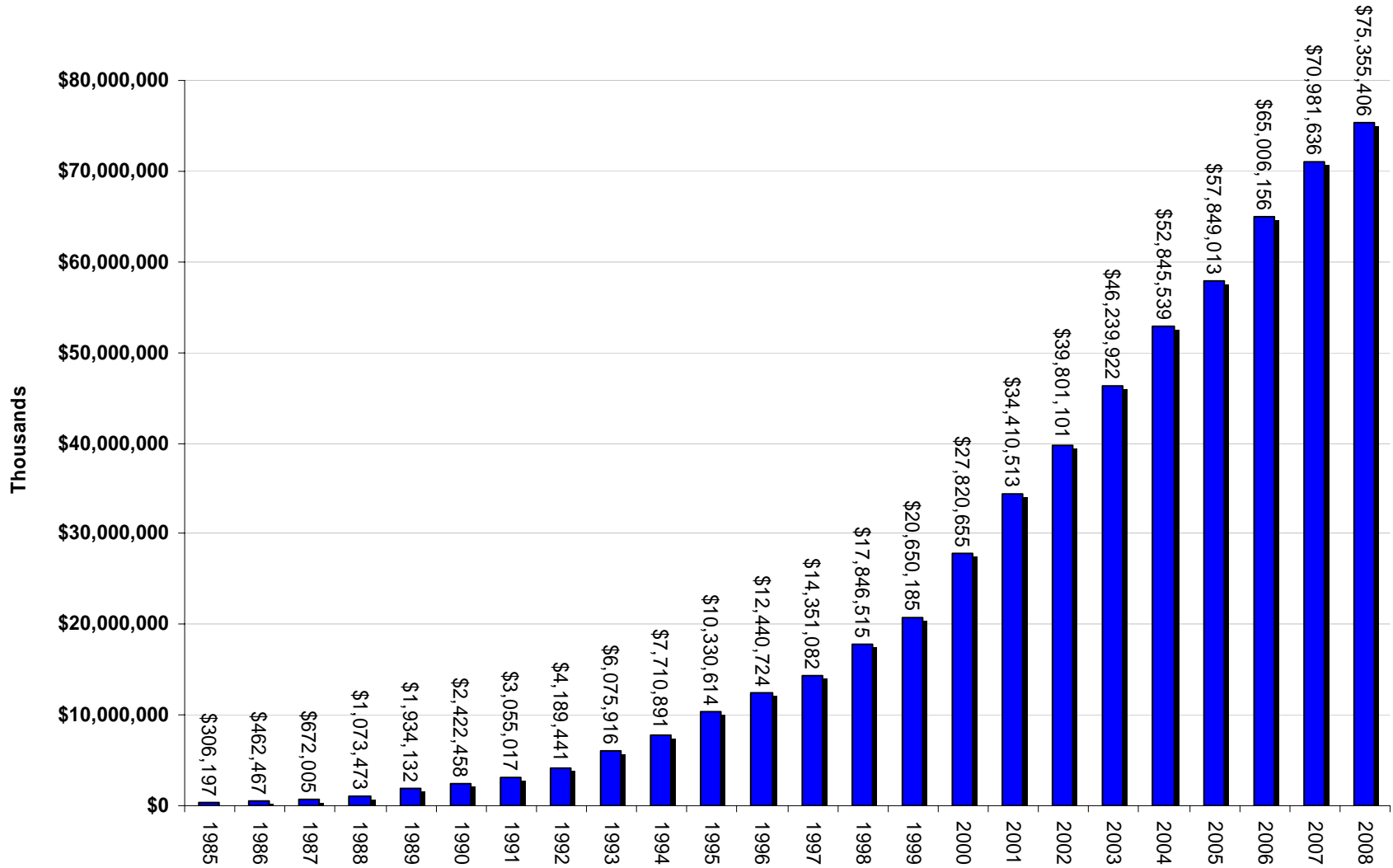
*Restated

Source: CTIA

Year-End 2008 Estimated Wireless Subscribers Up Almost 15 Million from December 2007

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Total Six-Month Service Revenues (000s)

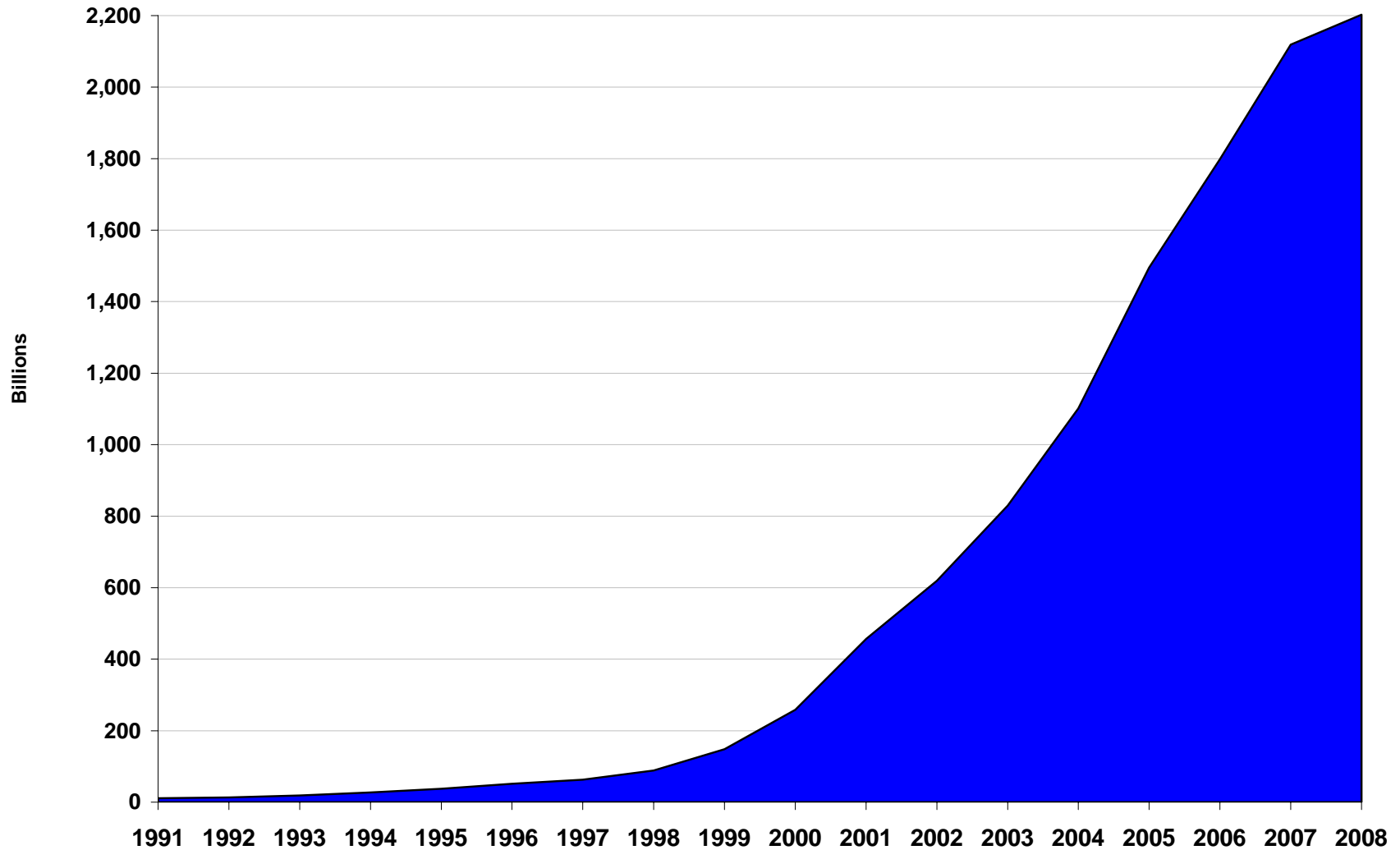


**Total Wireless Service Revenues Reach More Than \$75 billion for the Last Six Months of 2008
- Total Twelve-Month Revenues Reach More Than \$148 Billion in 2008**

Source: CTIA

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Reported Wireless Minutes of Use Exceed 2.2 Trillion in 2008

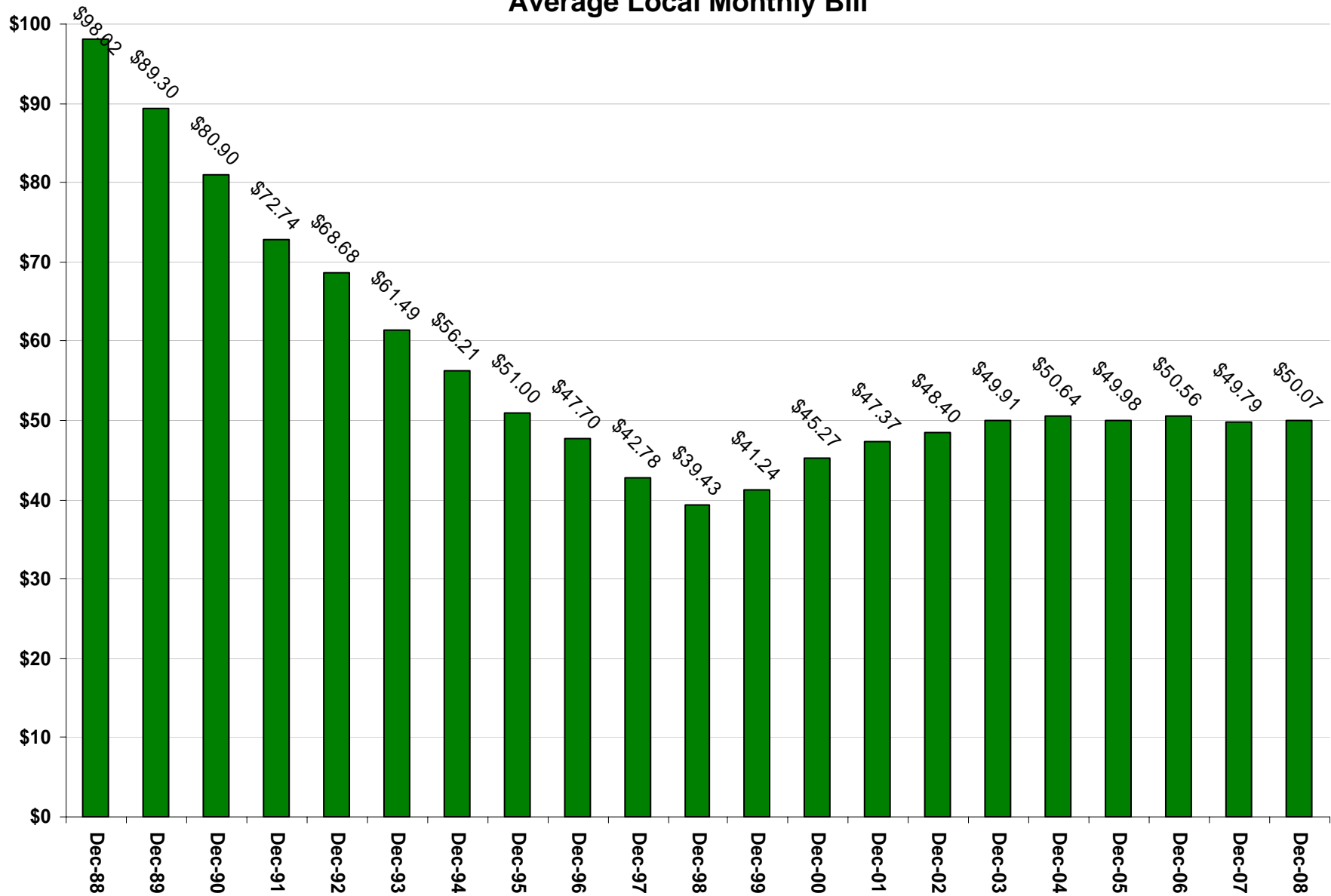


Total Annual Reported Wireless MOUs Grow 4% Year-over-Year

Source: CTIA

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Average Local Monthly Bill



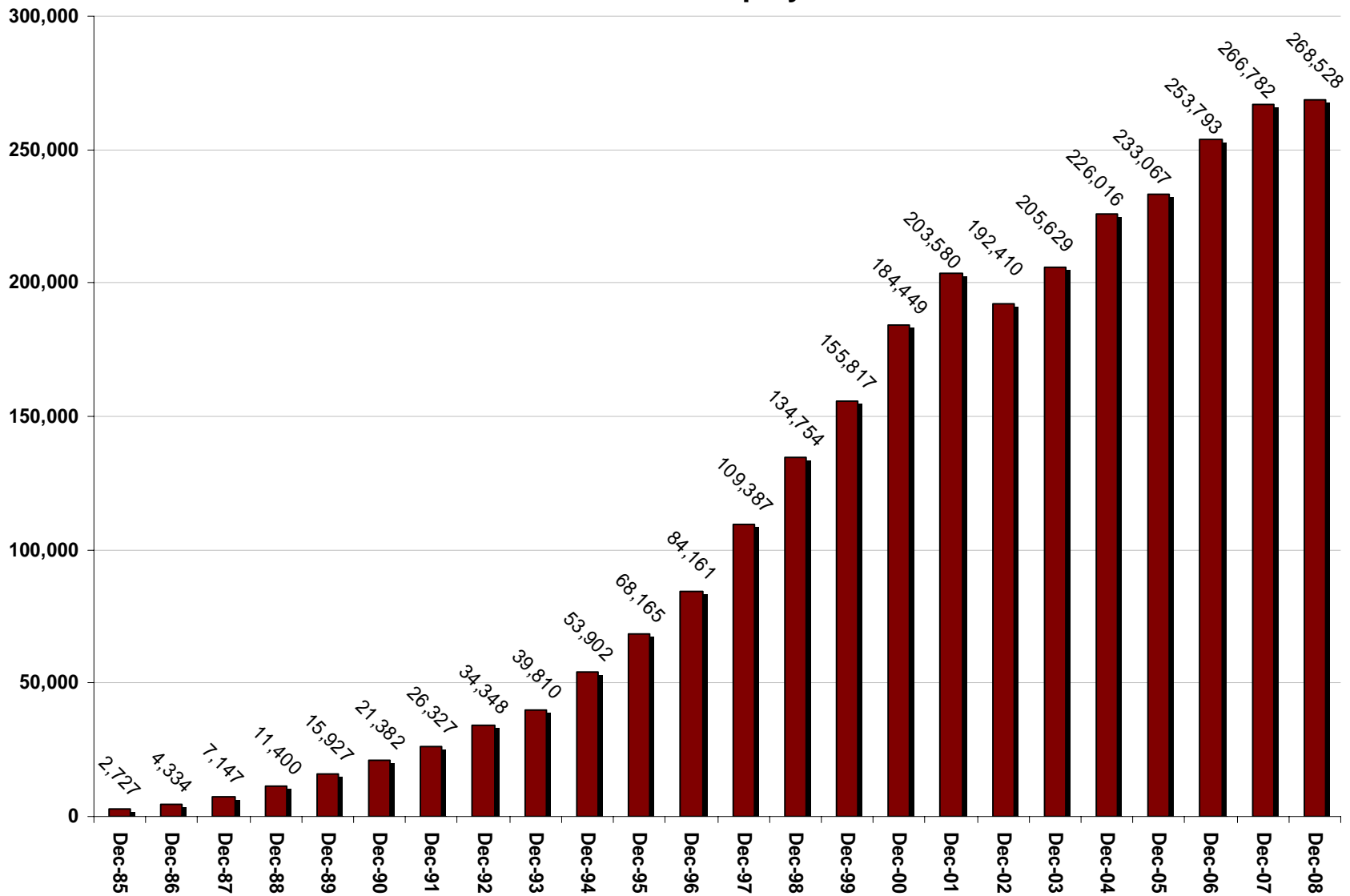
Average Local Monthly Bill Rises 0.6% Year-over-Year

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Source: CTIA

Direct Carrier Employees

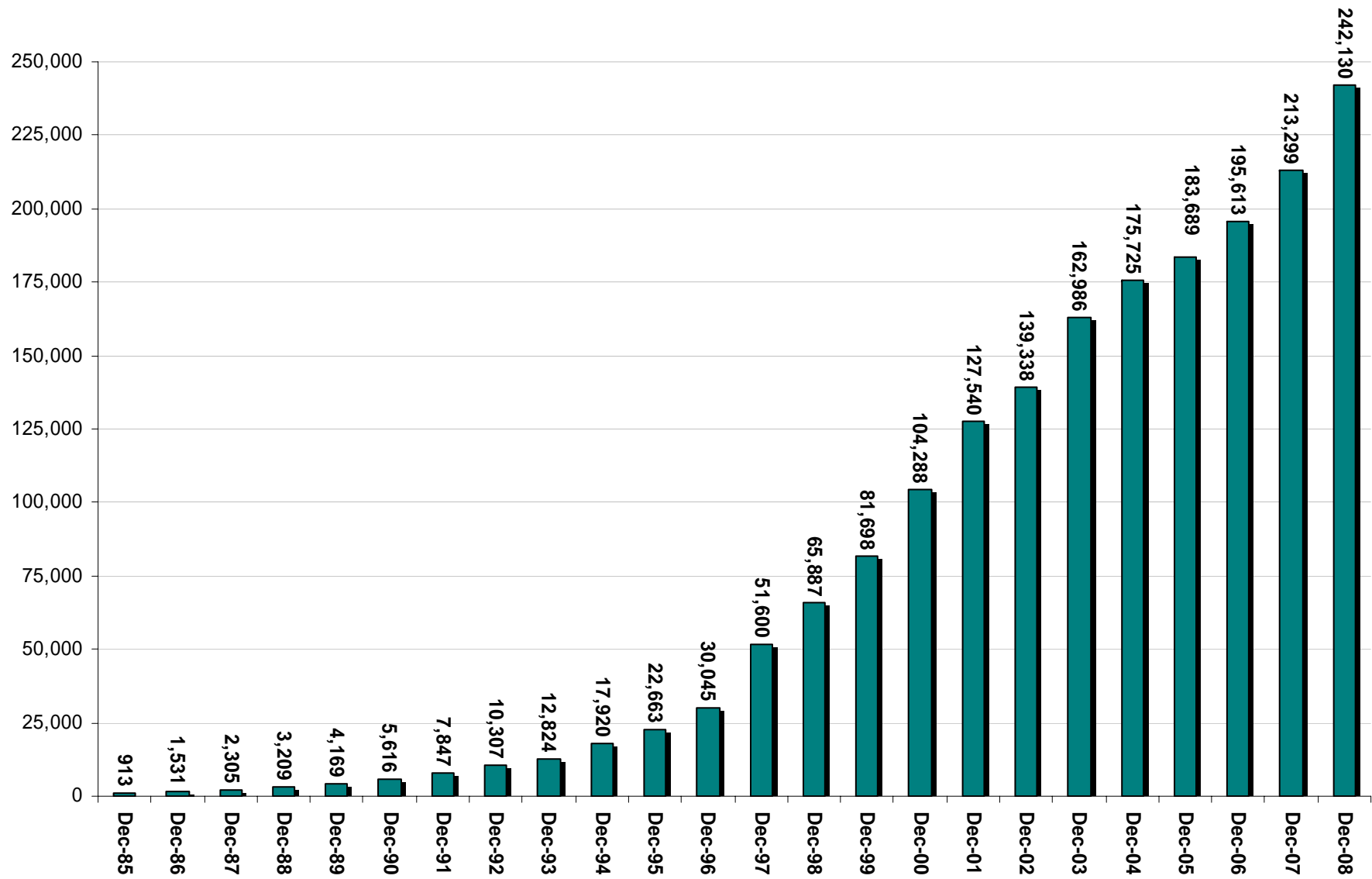


**Direct Wireless Carrier Employment Grows 0.7% Year-over-Year
Direct Employment Exceeds 268,000 at Year-End 2008**

Source: CTIA

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Cell Sites



Reported Cell Sites in Service are Up 13.5% Year-Over-Year

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