

**REPORT ON**  
**THE FUTURE OF WIRELINE AND WIRELESS**  
**TELECOMMUNICATIONS IN FLORIDA**

**FLORIDA PUBLIC SERVICE COMMISSION**

**DIVISION OF TELECOMMUNICATIONS**

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## List of Acronyms (and selected definitions)

Analog	<p>Analog</p> <p><i>Definition: A transmission method that employs "continuous" electrical signals of varying voltages that vary in amplitude or frequency. Human speech is an analog signal; the electrical signal transmitted by analog Cellular, is "analogous" or similar to the voice signal.</i></p>
ALEC	<p>Alternative Local Exchange Telecommunications Company</p> <p><i>Definition: Any company certificated by the Commission to provide local exchange telecommunications services in Florida on or after July 1, 1995.</i></p>
BTA	<p>Basic Trading Area</p>
Cellular	<p>Cellular</p> <p><i>Definition: The wireless (radio) communications service that was introduced in 1983 and that provides two-way mobile communications. Cellular first carried analog signals, but is converting to digital signals. Analog and digital Cellular systems are assigned UHF frequencies 824 to 849 MHZ and 869 to 894 MHZ. A Cellular system's total bandwidth equals 25 MHZ.</i></p>
CDMA	<p>Code Division Multiple Access</p>
CMRS	<p>Commercial Mobile Radio Services</p> <p><i>Definition: The FCC statutory classification for mobile services that are provided for profit, are interconnected with the Public Switched Telephone Network, and are available to the public or to a substantial portion of the public. CMRS includes Cellular, Personal Communications Services, Specialized Mobile Radio, Private Paging, and other services.</i></p>
CPE	<p>Customer Premises Equipment</p>
CPP	<p>Calling Party Pays</p>
Digital	<p>Digital</p> <p><i>Definition: A transmission method that employs "discrete" signals to represent human speech. This contrasts with analog transmission that uses continuously variable signals. The digital signal results from sampling an analog voice signal and converting the sampled values to specific voltage values that are transmitted as binary codes of ones and zeroes.</i></p>

FCC	Federal Communications Commission
FTIA	Florida Telecommunications Industry Association
GSM	Global System for Mobile Communications
KB/sec	Kilobits per second
KHz	Kilohertz
LEC	Local Exchange Telecommunications Company <i>Definition: Any company certificated by the Commission to provide local exchange telecommunications service in Florida on or before June 30, 1995.</i>
MHZ	Megahertz
MSA	Metropolitan Service Area
MRC	Monthly Recurring Charge
MTA	Major Trading Area
MTSO	Mobile Telephone Switching Office
NARUC	National Association of Regulatory Utility Commissioners
One Rate	One Rate <i>Definition: A new wireless rate plan that offers a large number of airtime minutes for a fixed monthly rate; measured service for airtime exceeding the above included minutes; no long distance charges when on the provider's network; and no or reduced roaming charges.</i>
PCS	Personal Communications Services <i>Definition: A wireless communications service, introduced in 1995, that provides two-way "digital" mobile communications, messaging, and paging services. PCS systems are assigned UHF frequencies 1850 to 1910 MHZ and 1930 to 1990 MHZ. A PCS system's total bandwidth equals 20 or 60 MHZ depending on its assigned band or license.</i>
PSAP	Public Safety Answering Point
PSTN	Public Switched Telephone Network

*Definition: The telephone network that provides switching and transmission facilities to the general public.*

RSA Rural Statistical Area

SMR Specialized Mobile Radio

*Definition: A wireless radio service primarily used by businesses for two-way, mobile dispatch services within the business.*

TA 96 Telecommunications Act of 1996

TDMA Time Division Multiple Access

UHF Ultra High Frequency

WLL Wireless Local Loop

*Definition: A fixed wireless service, actually a "simplified" mobile service, that replaces the local loop or the LEC's physical connections from its central offices to the subscribers' homes or businesses.*

## Executive Summary

This "Future of Wireline and Wireless Telecommunications in Florida" report was prepared to address the following questions: (1) Is wireless a complementary, competing, or replacement service? (2) How will price affect the services? (3) Can wireless provide adequate Internet access? (4) Consumer protection- what impact will wireless have on service quality, 9-1-1, etc.? (5) What impact will wireless have on local service competition & on local service providers? and (6) What should the role of the Commission be regarding wireless service?

As discussed in the technology review module and throughout the report, wireless telecommunications consists mainly of Cellular service, first offered in 1983, and Personal Communications Services (PCS), first offered in 1995. According to the Cellular Telecommunications Industry Association's Semi-Annual Wireless Industry Survey, dated March 31, 1999, the estimated number of wireless subscribers equaled 91,600 in January of 1985. The estimated number of wireless subscribers grew to 69,209,321 in December of 1998.

Wireless is a viable communications option in the Florida telecommunications marketplace. It is a complementary service to traditional wireline service, allowing customers to communicate beyond their homes and offices. Wireless local and long distance service costs, *at best, three times more* than wireline service. When considering local service alone, this cost premium increases. Wireless subscribers pay this cost premium for its "mobility" and "convenience."

A few wireless companies provide fax and Internet access, but their transmission rates are generally limited to 9.6 KB/sec. The slow rates deter customers from choosing wireless for second lines for fax machines and Internet access.

Wireless service does not provide the same voice quality and system reliability as wireline service. In addition to reducing costs, wireless companies need to improve these in order to encourage Florida subscribers to accept wireless as a substitute, not complementary, service. However, subscribers get almost immediate service as compared to the normal three day waiting period for Local Exchange Company (LEC) wireline service. Wireless access to 9-1-1 service has been a problem, but will improve with recent Federal legislation that requires Cellular companies to complete **all** analog 9-1-1 calls, not just calls from their subscribers.

Wireless has had little impact on local service competition as only a small percentage of wireless users have replaced their wireline service. This is due primarily to its "complementary" nature; its higher costs and "measured" service type have not induced customers to substitute wireless for wireline local service. While continued decreases in wireless costs, new "lower cost" rate plans, and new free or low cost

features may lead to some substitution, we expect wireless to continue as a "complementary" service for many years. However, as wireless rates decrease, more residential subscribers may choose wireless to replace their non-fax and non-Internet second lines.

The Federal Communications Commission (FCC) regulates domestic wireless telecommunications offered to all but federal governmental agencies. In the Omnibus Reconciliation Act of 1993 (1993 Budget Act), Congress created the statutory classification of Commercial Mobile Radio Services (CMRS) and established the promotion of competition among CMRS providers as the fundamental goal for CMRS policy formulation and regulation. The FCC does not regulate rates; it found State regulation to be unnecessary to protect consumers from unreasonable or discriminatory rates. Sections 251 and 252 of the Telecommunications Act of 1996 (TA96) required that LECs offer interconnection and access to their networks to CMRS providers on reasonable terms and conditions, establishing just and reasonable reciprocal compensation agreements.

The Executive Director of the Florida Telecommunications Industry Association, representing seven wireless companies, addressed the Commissioners on May 18, 1999 and concluded in her written comments that "We do urge the Commission to resist efforts to regulate the wireless industry in any way."

The Commission should continue to review, approve, and arbitrate interconnection agreements between wireless companies and LECs. Staff will continue to monitor the wireless marketplace and technological developments, assessing their effects on local service competition in Florida.

## **Module I. Introduction**

This report addresses the following concerns: (1) Is wireless a complementary, competing, or replacement service? (2) How will price affect the services? (3) Can wireless provide adequate Internet access? (4) Consumer protection- what impact will wireless have on service quality, 9-1-1, etc.? (5) What impact will wireless have on local service competition & on local service providers? and (6) What should the role of the Commission be regarding wireless service?

This report is structured as follows: Executive Overview; Module I introduces the reasons for the study and the issues addressed; Module II explains three wireless technologies that impact or will impact local wireline service; Module III presents a comprehensive review of wireless rate plans and features; Module IV performs rate comparisons of wireless and wireline services; Module V presents Federal Communications Commission (FCC) and State wireless legislation, and Congress's fundamental goal (the promotion of competition) for the FCC's regulation of wireless services; Module VI reports industry comments about the "complementary or substitute" nature of wireless and wireline services; and Module VII draws conclusions about the nature of wireless and wireline service, and the impact(s) of wireless on local telephone service and regulation in Florida. It concludes with Figures 1 through 12, Appendix 1, and a Bibliography.

Cellular telephone service was first offered to the general public in 1983. According to the Cellular Telecommunications Industry Association's Semi-Annual Wireless Industry Survey, dated March 31, 1999, the estimated number of wireless subscribers equaled 91,600 in January of 1985 and has grown to 69,209,321 by December of 1998. There are over 67,000 wireless towers across the nation. Wireless is now a viable communications option in the Florida telecommunications marketplace. While LECs still dominate the local residential service arena, wireless has multiple providers in most markets. Affiliates of the large Florida LECs provide wireless service across much of the state. For many years, wireless service was viewed as a complementary service to traditional wireline telephone service, but as wireless subscribership grew, questions were raised about its ability to substitute for traditional wireline service. Some people see a future telecommunications world where a wireless user will have a personal identification number and full portability enabling callers to reach him/her at his/her personal number regardless of location.

## Module II. Technology Review

### A. History

Wireless, or mobile, communications may be the most exciting telecommunications development since the invention of the telephone. The nation's first commercial wireless service was provided in 1983 via analog Cellular radio. The FCC regulates domestic wireless telecommunications; it allocates frequencies and licenses individual carriers, but does not regulate rates. In 1993, Congress created the statutory classification of Commercial Mobile Radio Services (CMRS) to promote consistent regulation of Cellular, PCS, and Specialized Mobile Radio (SMR), and established the promotion of competition as the fundamental goal for CMRS policy formulation and regulation. Title III, §332, Mobile Services, of the Communications Act of 1934 preempted state regulation of CMRS market entry and rates.

The FCC has minimized wireless regulation to encourage availability, rapid growth, and the natural evolution of wireless competition. Wireless communications has experienced dramatic growth since the mid 1980s, evolving from a primarily mobile (installed in a vehicle) business service to a combination mobile and portable/pedestrian, anytime/anywhere service. At the end of 1998, wireless mobile subscribers exceeded 69.2 million subscribers (a 25 percent increase over 1997), nearly 26 percent of the nation's population. A University of Florida's Bureau of Economic and Business Research survey of Florida residents in July and August 1998, found that 36.7 percent of the surveyed households in Florida subscribed to Cellular service. Estimates of national penetration, made in 1997, range from 38 to 47 percent in 2002.

Wireless communications uses a radio frequency or channel that propagates information over-the-air to communicate to and from mobile locations and landline locations. The electromagnetic spectrum encompasses all possible frequencies of waveforms caused by electric and magnetic fields moving through space at different frequencies; as shown, Cellular (both analog and digital) and PCS services are assigned Ultra High Frequency (UHF) frequencies. See the top half<sup>1</sup> of Figure 1, page 36. The wireless transmission path may be entirely wireless or part wireless and part wireline. Both wireless and wireline technologies use the Public Switched Telephone Network (PSTN) to carry calls across the country to wireline customers. Calls between wireless customers may bypass the PSTN and use only wireless facilities.

The University of Florida's Public Utility Research Center, Telecommunications Industries Analysis Project, presented "A Guide to Evolving Wireless Services" at the February 1999 National Association of Regulatory Utility Commissioners (NARUC) Meeting in Washington, DC. It reviewed 29 categories of wireless technologies, noting that 12 were

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<sup>1</sup>Dayem, "PCS and Digital Cellular Technologies: Assessing your Options," 1997.

potential competitors to wireline local telephone service. From the above report, Appendix 1's third column highlights the 12 (circled) potential wireline competitors; due to their heavy penetration and/or significance to local competition, this module addresses three of these technologies- Cellular, PCS, and Wireless Local Loop (WLL).

## B. Cellular

The FCC allocated part of the UHF radio frequency spectrum for Cellular use in 1981. After establishing 306 Metropolitan Service Areas (MSAs) and 428 Rural Statistical Areas (RSAs) across the USA, it assigned a total bandwidth of 50 MHz of the UHF spectrum from 824 to 849 MHz and from 869 to 894 MHz within each MSA and RSA to two separate Cellular carriers (25 MHz total bandwidth each), encouraging competition between two facility-based companies. Block A frequencies were assigned to non-LEC companies (new competitors unaffiliated with the LEC), while Block B frequencies were reserved for LECs. Since voice telecommunications requires simultaneous transmission in two directions, separate transmit and receive frequencies were assigned to each licensee.

Wireless communications converts human speech into electrical signals. Early Cellular systems converted speech into *analog* electrical signals represented by a sinusoidal waveform composed of two variables - amplitude (the height of the signal) and frequency (the rate of change over a specific time.) Since the bandwidth of the human voice is 3,000 cycles per second or 3 KiloHertz (KHz), (encompassing frequencies from 300-3,400 Hertz), analog Cellular systems convert human speech into 3 KHz electrical waves that are applied to a radio-based carrier and transmitted over-the-air. Today, analog Cellular systems are being converted to *digital* systems and new Cellular installations use *digital* signals. Digital transmission converts human speech into binary-coded signals composed of ones and zeroes. Digital technology increases the range, quality, system capacity, security or privacy of transmission, and allows for transmission of services other than voice communications. PCS, first introduced in the mid 1990s, also uses digital signals. By June 30, 1997, digital became the dominant wireless technology. At the end of 1998, digital subscribers numbered 29 percent of the industry's total subscribers.<sup>2</sup>

The components of a Cellular system are cells; a cell site; a Mobile Telephone Switching Office (MTSO); and a Cellular (mobile) handset. See the bottom half<sup>3</sup> of Figure 1, page 36. Cells are clusters of hexagonal geographic coverage areas that overlap at their boundaries. The overlap allows for monitoring signal strength across adjacent cells to ensure continuous coverage. The average cell is three to five miles across. When the number of subscribers grows beyond the system's 128 channel capacity, cells are split into smaller cells. Clusters of seven cells reduce signal interference by allowing reuse of

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<sup>2</sup>FCC 99-136. *Fourth Report*. June 24, 1999. pg. 10.

<sup>3</sup>Winch, "Telecommunications Transmission Systems, 2nd Edition," 1998.

individual frequencies in nonadjacent cells. Each cell contains a cell site that consists of the necessary antennas, transmitters, receivers, a controller, and data links to the MTSO. Handoffs (described later) take place from antenna to antenna, cell site to cell site. The MTSO is the wireless central switching office, providing the connection (either landline or microwave) to the LEC and thus to the PSTN. The MTSO controls wireless call processing and call switching. Finally, the handset contains the transceiver that can transmit and receive on all 666 frequencies, an antenna, a number assignment module that identifies the particular handset, logic unit, and so on. The handset beams into a radio receiver at a cell site or several cell sites depending on its location.

Each cell phone has a unique identity so that the MTSO can determine its cell location and for billing purposes. Each phone is assigned a home area and specific channels for calls within the home area. When outside the home area, the handset continually notifies its cell site and nearest MTSO of its location so that incoming calls can be sent to the correct cell site. This registration, or location, function occurs automatically when the handset is turned on. To make a call, the user dials the number and presses SEND. The set transmits subscriber identification, handset identification, the dialed number, and requests call setup. After the cell site replies with a specific transmit channel to be used, the handset tunes to that frequency and places the call to the cell site for relay to the nearest MTSO. The MTSO then relays the called number to the LEC and to the PSTN if the call is being placed to a wireline phone, or to the appropriate MTSO (if different) and cell site if the call is being placed to another wireless phone. When receiving a wireline call, the PSTN first recognizes that the called exchange is a Cellular exchange and sends the call to its wireless provider where the MTSO locates the called handset - if the set is turned on - and identifies the cell site that will handle the call. It then sends the call to the cell site and on to the handset. During a call, the cell site monitors the call's returned signal strength. When the signal strength falls as the user moves farther away from the cell site, the cell site alerts the MTSO that queries adjacent cell sites to learn which site is receiving the strongest signal from the call. The MTSO directs the cell site with the strongest signal to set up a parallel voice path with the departing cell site; it then hands off the call to the (entering) cell site receiving the strongest signal. The channel, or frequency, in the departing cell is then made idle.

### C. Personal Communications Services (PCS)

"Broadband Personal Communications Services" provides two-way mobile communications, messaging, and paging services. Broadband PCS should not be confused with the greater bandwidth and capabilities of fiber telecommunications cables; it refers to its 60 MHZ total bandwidth (for bands A, B, and C) that exceeds Cellular's 25 MHZ bandwidth. First introduced during the fourth quarter of 1995, PCS competes with Cellular services, paging services, and (on a small scale) traditional, wireline telephone service. As discussed below, PCS offers services today that are much like Cellular services. By operating at higher UHF frequencies than Cellular services, PCS provides (by decreasing noise and by transmitting "new" or re-created digital signals) a higher quality voice signal and messaging and paging services. There are two other PCS services,

Narrowband and Unlicensed, that are not potential competitors to wireline local service. Briefly, Narrowband PCS provides advanced paging, response paging, data transfer, and digital voice messaging, while Unlicensed PCS may be used for wireless Local Area Networks (LANs), new data communications systems and devices for linking personal computers, and advanced cordless telephones.

The FCC allocated 120 MHz (1850-1910 MHz for "transmit" from a user's handset and 1930-1990 MHz for "receive" to a user's handset) to PCS. The spectrum allocations were made in six bands- A, B, C, D, E, and F. The A through C bands are 30 MHz each, while the D through F bands are 10 MHz each. The FCC auctioned the A through C bands from December 1994 through July 1996 and auctioned the D through F bands in August 1996. The licensed service areas are composed of 51 Major Trading Areas (MTAs) and 493 Basic Trading Areas (BTAs) where MTAs are big metropolitan areas like New York, Chicago, Los Angeles, etc., and BTAs are smaller cities. Bands A and B were for MTA licenses where the bidding was open to all interested companies already established in the Cellular industry; Band C was for BTA licenses where the bidding was limited to new non-LEC entrants, rural telephone companies, minority-owned and women-owned businesses, and small businesses under \$40M in gross revenues and \$500M in total assets. Bands D, E, and F were for BTA licenses where D and E were open to all parties and F was limited to the above new entrants. The FCC segmented the auctions as described to encourage greater CMRS competition; it offered financial incentives to attract the non-LEC and minority-owned businesses. Band D, E, and F licenses attracted A, B, and C licensees who wanted to add to their 30 MHz license or acquire adjacent service areas. Small businesses won 41 percent of the D, E, and F licenses. Each trading area can have as many as six PCS providers. Given six PCS providers, two Cellular licensees, and one SMR provider (not discussed in this report), each marketplace can have as many as nine wireless providers.

The components of a PCS system are similar to the Cellular components described above except that PCS uses a microcellular cell structure, resulting in smaller cells (less than one kilometer) and a greater number (as much as five times more) of cell sites and therefore greater investment costs. The microcellular structure is required due to the lower transmitted power of PCS handsets, that are smaller and lighter than Cellular phones or handsets and that operate longer on a single battery charge; it means more handoffs as a user moves from one cell to another and means higher processing power needed at the cell sites and Wireless Telephone Central/Switch (PCS's version of Cellular's MTSO). Calls are processed much like Cellular calls. Similar to new digital Cellular systems, PCS uses several transmission technologies. The FCC allowed multiple digital technologies to develop, rather than requiring a single standard. There are three dominant technologies: Time Division Multiple Access (TDMA) transmits signals from several callers in specific time slots across a frequency channel, and Code Division Multiple Access (CDMA) and Global System for Mobile Communications (GSM) transmits signals after attaching unique codes across a broader frequency channel (1.25 MHz). GSM is the European version of CDMA. Since PCS uses the "code" technologies, handoffs from cell to cell are processed more efficiently and with greater certainty; as a user passes from cell to cell, the signals are

carried across the same broad frequency channel in both the departing and receiving cell sites, resulting in fewer dropped calls. PCS handoffs, therefore, are called "soft" handoffs.

With the introduction of PCS commercial service in late 1995 and growth from 31,667 subscribers at the end of 1995 to 2.451 million at the end of 1997 and to 6.892 million subscribers at the end of 1998, the nation's (and Florida's) telecommunications industry has moved from a single provider (the LEC) to two providers (the LEC for wireline and Cellular and another Cellular provider) to multiple providers (the LEC, the ALEC or Alternative Local Exchange Company, and as many as five or more wireless providers). PCS subscriber growth, during the third and fourth quarters of 1998, exceeded 45 percent of the combined Cellular and PCS growth. Furthermore, this increased wireless competition has lowered the average local monthly mobile bill from \$51.00 at year end 1995 to \$39.43 at year end 1998. Finally, FCC 1997 projections of CMRS growth anticipate that 24.69 to 30.70 percent of the nation's population will subscribe to Cellular service in 2002 and that 7.70 to 14.60 percent will subscribe to PCS service in 2002.

#### D. Wireless Local Loop (WLL)

CMRS encompasses, by definition, wireless mobile communications services. It also includes some "fixed" wireless services operating at CMRS frequencies in keeping with Congressional and FCC goals to promote (facilities-based) competition in the telecommunications marketplace. Fixed wireless telephone, called WLL, replaces the local loop, the physical connection from a subscriber's phone to the central switching office. The FCC views WLL as an alternative network that may displace traffic from LEC networks.

Since they are fixed, WLL networks are really simplified mobile networks; they do not require handoffs between cells, roaming agreements with other wireless providers to provide service beyond the subscriber's own Cellular or PCS network, and so on. A WLL radio transmitter at a customer's premises will communicate with a central antenna site, that will provide access to the PSTN. Since WLL will replace the local loop and can be built more quickly and less costly, a WLL licensee may more readily compete for local service than if it had to duplicate wireline loops. "Wireless systems are easier to . . . maintain than wired distribution systems. Wireless Local Loop technology is ideal for bandwidth-on-demand services because it is easy to add or subtract channels. Problems that plague buried copper loops - water, bridge taps, and the ravages of time - are eliminated. Power (including emergency backup) for wireless customer premises equipment (CPE) must be supplied by the customer."<sup>4</sup> (A bridge tap is any portion of the local loop where a subscriber's cable pair is spliced outside of or beyond the direct path from the LEC's central office to the subscriber.) Interconnection agreements will be needed for termination and origination in the wireline network, plus unbundled network elements like switching and operator services. As wireline competitors, WLLs will have to exceed the voice quality of wireless systems, will have to equal the transmission rates of wireline services, and will

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<sup>4</sup>Brodsky, *"Wireless: The Revolution in Personal Telecommunications,"* 1995.

have to be priced less than mobile systems.

The greatest opportunities for WLL lie in undeveloped and underserved countries across the world where telephone penetration rates range from five to eleven percent. In developed countries, WLL may serve two purposes: to implement or grow local service competition and to offer new fixed wireless services to unserved remote areas where constructing traditional wireline service is too expensive. In 1998, the FCC auctioned 864 licenses in the 27.5 MHz to 31.3 MHz spectrum for Local Multipoint Distribution Service, a WLL technology providing fixed voice, data, and video services. WLL equipment, systems, and technologies will not mature for a number of years; 1997 penetration estimates vary from 1.2 to 5 million subscribers by 2002, and from 8 to 30.8 million subscribers by 2007. Despite the early developmental status of WLL in the United States and little penetration to date, several applications and developments should be mentioned: (1) WirelessNorth, a PCS company, is providing city-wide WLL service in Grand Forks, ND. Its subscribers, for a \$75.00 monthly fee, get an unlimited number of minutes (flat-rated service) for calls within the city and measured access to subscribers outside the city; (2) Western Wireless Company (WWC) is providing WLL service in Nevada and North Dakota using its Cellular licenses. It provides service to two small (previously unserved) rural communities as a contractor to Nevada Bell at regular tariffed wireline rates. WWC is also providing WLL service to a small North Dakota town as an ALEC at rates competitive to the LEC's wireline rates; (3) AT&T field-trialed a system in Chicago in late 1997, put it on hold due to high implementation costs, and began in May 1999, to test fixed wireless service in Dallas, Texas; and (4) Two Florida LECs (Sprint and GTCOM) chose to provide fixed wireless service to two unbridged islands rather than constructing more costly submarine copper or fiber facilities to the islands.

#### E. Technological Concerns<sup>5</sup>

Despite the phenomenal growth of mobile, wireless services since 1983, there are still some technological concerns to resolve before they may be considered replacements for wireline service. A brief list of these concerns follows:

1. System capacities. While the new digital system capacities exceed analog system capacities, the 25 percent or more subscriber growth experienced by the wireless industry quickly uses up system capacity. When additional capacity is needed, new base stations need to be constructed and cells need to be split into microcells - increasing frequency reuse (interference) concerns among adjacent cells. Industry representatives reported that capital-limitations and system capacity-limitations prevent full replacement of all wireline local service in an area. In May 1998, AT&T Wireless introduced a new "one rate" PCS plan in several large cities, including Washington, San Francisco, Seattle, Boston, and Los Angeles. Its popularity caused capacity problems (overloading the company's circuits, making it hard to place and receive calls) and dead spots where service

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<sup>5</sup>Winch, *Telecommunications Transmission Systems, 2nd Edition*, 1998. pgs. 352-365.

could not be provided.

2. Design of frequency reuse and blocking probabilities. Given the smaller cell, or microcell, structures, the use of the same channels must be set apart sufficiently to reduce interference between channels and to ensure a trunking efficiency of 98 percent (no more than 2 percent of calls reach an all-trunks busy.) The co-channel interference affects the quality of the voice signal that, while improved with digital wireless, still falls short of wireline quality.

3. Radio propagation problems. Due to the continuously varying environment of a mobile subscriber, path loss design is very complicated. Wireless communications faces the following obstacles: wide-open spaces, houses, trees, large buildings, rolling hills, isolated mountains, and slopes.

4. Dropped calls. High-level digital switching systems are needed in the wireless switching offices to set up and maintain calls while a caller travels.

5. Wireless data speeds are slower than wireline systems, affecting the provider's ability to offer fax and Internet services. One company is developing a private data network with data speeds less than 28.8 KB/sec.

6. Easements for wireless towers and antennas. Recently, BellSouth was forced to remove a tower in Tallahassee for violation of restrictive covenants on the property. Some wireless companies are leasing antenna space on existing towers; new companies have been formed to lease antenna space of the company's towers. The July 25, 1999 Boston Sunday Globe even reported a "celestial connection," where a wireless company signed a 20-year lease with a church and paid more than \$188,000 for repairs to the church and its steeple, in return for locating its antenna and equipment in the church's steeple.

7. Increasing the time between recharging wireless handset batteries. The batteries for the lighter digital handsets are improved over the older analog handsets.

8. The coexistence of analog and digital signals during the transition to digital systems, causing subscribers to buy dual-mode handsets that were developed to operate with either signal type.

9. Incompatibilities of the TDMA, CDMA, and GSM transmission technologies, relating to signal format and power output. Tri-mode handsets are coming available to process calls that are carried by multiple providers over a combination of analog and digital signal types.

## Module III. Wireless Rate Plans and Features

### A. Review of Three Cities' Wireless Rate Plans and Features

We next reviewed and charted wireless rate plans "current" as of June 30, 1999, available calling features, and billing practices in Tallahassee, Miami, and Tampa. These cities were chosen to provide statewide information in cities served by each of the three large LECs. Affiliates of the large Florida LECs provide wireless service across much of the state. We also reviewed, to a lesser degree, the local and national coverage areas of the providers in the three cities. Each company charges a Monthly Recurring Charge (MRC) that varies depending on the number of included minutes purchased by a subscriber. Most companies bill for airtime in one minute increments, while some provide a free first incoming minute, and generally require a phone purchase of \$60 to \$200.

Due to strong market competition among as many as six PCS licensees per city, each wireless provider (Cellular and PCS) and associated resellers offer several rate plans. The rate plans and specific features- free long distance, free roaming, no annual contract, free voice mail, free Caller ID, free Call Waiting, etc- of each are designed to meet the specific needs of different customer types or segments. "Current" rate plans change as the companies vary rates and features to meet competitor's offerings. Wireless companies also offer promotions to attract new wireless customers. Over the last three months, we have seen the following promotions in the Tallahassee area: double free minutes, decreased MRCs, bonus free minutes for a period of time, free or reduced cost phone, free case, free auto charger, free night and weekends over a period of time, waivers of activation fees, and a \$25 cash discount off one's wireline bill. Usually, a wireless subscriber is charged airtime minutes anytime he uses his phone, whether he places or receives the call. Most rate plans include free Caller ID; as a subscriber selects higher-cost (greater number of included minutes) plans, he gets more free features such as Call Waiting, Conference Calling, and Voice Mail. Fax and Internet capabilities are limited due to slower transmission speeds than wireline service. Most providers, following AT&T's lead in May 1998, have recently introduced and aggressively promoted "one rate" plans. "While the details of various operators' plans differ, they generally include some combination of the following: bundles of large quantities of minutes for a fixed monthly rate that translated into a low per-minute price; no long distance charges when used on the operator's network; no roaming charges when used on the operator's network; reduced roaming charges when off the operator's network; and, sometimes, no extra roaming charges anywhere."<sup>6</sup>

"Careful" study is required by a new subscriber to make a wise economic choice

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<sup>6</sup>FCC 99-136. *Fourth Report*. June 24, 1999. pg. 11.

of provider and rate plan. A new subscriber will find information about rate plans, coverage areas, and service contracts on the wireless companies' Internet websites. Wireless charges for local and long distance calls, calls made outside the home area or outside the provider's network, and the timing of calls vary with provider and rate plan. Wireless coverage areas generally exceed LEC local calling areas. Each company's website provided a coverage map, showing home calling areas where calls within that area are considered local. But, the companies' coverage areas differed and thus defined local calls and long distance calls differently. For example, a long distance, wireline, Tallahassee to Gainesville call may be a local wireless call depending on provider and/or rate plan. Also, some companies consider calls placed and received within Florida to be local calls, while others do not. Careful study is also needed to understand how and when roaming charges are incurred; some companies charge for roaming when a subscriber places or receives a call outside his home calling area, while others charge for roaming when a subscriber places or receives a call outside his provider's coverage area or network. In general, however, a wireless subscriber is not charged "roaming" for calls placed or received on his provider's network. Some new "one rate" plans do not charge roaming fees at all. Industry experts advised, during the June 1999 workshop, that roaming charges depend on the provider, the rate plan, and roaming agreements between wireless providers; these experts recommended that a new subscriber discuss his calling needs and patterns with the company's account representative at the time of purchase, while new or existing subscribers may call a company's Customer Service 800 number for billing information for specific calls. One company's newspaper advertisement touts that a new subscriber's "questions will be answered by knowledgeable representatives." Since a wireless user is generally charged airtime anytime he uses his phone, he can save on airtime by choosing a rate plan that comes with the first incoming minute free and by handling an incoming call quickly. Finally, the Tallahassee Democrat reported on July 7, 1999, that most wireless companies charge from the initiation of a call (when the caller presses the "send" button), and some even charge for unanswered calls. Most wireless subscribers therefore pay for airtime while the called party's phone is ringing. Wireline companies charge from connection to the called party to disconnection. The Democrat reported that BellSouth Mobility and U. S. Cellular do not charge for unanswered calls, while ALLTEL charges for unanswered calls after the phone rings for 60 seconds. For completed calls, BellSouth Mobility, ALLTEL, U. S. Cellular charge from "send."

Each provider offers multiple rate plans for a subscriber's choice depending on the number of free minutes wanted, the features wanted, and types of calls made. Since each wireless provider offers a variety of plans, a consumer should know his personal phone habits and calling patterns before purchasing a wireless telephone service plan. Figures 2 through 7, pages 37 through 42, present composite pictures of all the plans available in Tallahassee, Miami, and Tampa. The Figures are formatted based on the number of free, or included, airtime minutes according to the following categories of free minutes: 0-50, 51-150, 151-250, 251-500, 900-1200, and "one rate". They provide "current" (as of June 30, 1999) information about each rate plan's MRC,

number of free minutes, the cost of additional minutes above the free minutes, the type of service provided, whether the service is analog or digital, and activation fee if charged. The Figures then list the features offered for each rate plan, and provide the following information for each provider and feature: the cost of the feature, "free" if there is no charge for the feature, "not included" if the feature is not provided, location information for toll free calling areas, and "blank" where no information was found. Some providers offer "rechargeable" prepaid plans where customers purchase a handset and a specific number of minutes. These prepaid plans target subscribers with poor credit ratings and cost-conscious subscribers who want to control their wireless spending.

Figures 2 through 7, pages 37 through 42, show that five companies provide wireless service in Tallahassee: U. S. Cellular, ALLTEL, Powertel, Sprint PCS, and BellSouth Mobility. Rates range from \$15.95 for ALLTEL's most basic plan (10 free minutes) to \$149.99 for Sprint PCS's "one rate" plan (1500 free minutes). Five companies provide wireless service in Miami: OmniPoint, BellSouth Mobility, AT&T, Sprint PCS, and PrimeCo. Rates range from \$16.99 for a Sprint PCS plan (15 free minutes) to \$149.99 for Sprint PCS's (1500 free minutes) and AT&T's (1400 free minutes) "one rate" plans. Finally, six companies provide wireless service in Tampa: AT&T, GTE, Sprint PCS, PrimeCo, BellSouth Mobility, and Aerial. Rates range from \$16.99 for a Sprint PCS plan (15 free minutes) to \$155.00 for a GTE plan (1500 minutes).

## B. Wireless Advantages and Disadvantages

In the following lists, we have summarized the advantages and disadvantages of wireless services versus wireline (voice) services.

### 1. Advantages:

a. **Mobility, portability, and convenience.** Wireless subscribers can call and be called while moving from one place to another via small, hand-held handsets; they are not restricted to a fixed-location wireline phone at home or business.

b. **Instant service.** CMRS providers provide immediate service after a subscriber's buying decision and after minor handset programming.

c. **Optional services.** Varying by provider and rate plan, wireless companies provide free or discounted handsets, free local airtime (Wireless North), free long distance for calls made on their network, free or low cost night and/or weekend calling, one bill for both wireline and wireless services, and so on.

d. **Larger local calling areas.** In general, the local calling areas of wireless companies exceed those of the LECs. For example, one company provides local calling from Miami to Naples, one company provides the same from Tallahassee to Gainesville,

one provides local calling statewide, and so on.

e. Construction timetable and costs. Wireless systems can be built, in stages, to meet increasing subscriber demand, requiring lower capital expenditures than traditional wireline facilities.

f. Less expensive Custom Calling features. CMRS providers, generally, depending on rate plan, offer free or low cost Custom Calling features. For example, Sprint-Florida charges \$8.00 per month for Caller ID where all but two of the Tallahassee wireless providers offer it free; of the two that charge for Caller ID, one charges \$3.95 while the other charges \$4.95.

## 2. Disadvantages:

a. Higher cost and type of service. In general, wireless costs at least three times more than wireline service in Tallahassee, Miami, and Tampa. This cost premium results primarily from wireless being a "measured" service, where wireline local service is a "flat-rated" service.

b. Networks are less widely deployed. Some CMRS providers have national coverage while others have or are seeking national coverage via agreements with other wireless companies.

c. Less capacity. Digital technology and microcellular installations have increased wireless's capacity-to-serve, that is still limited by the number of frequencies allocated and each system's design/channel capacity. Industry representatives report that capital-limitations and system design-limitations would prevent full replacement of all wireline local service in an area even if they had such demand. For example, on July 8, 1999, Bloomberg News reported the following: "AT&T Corp.'s new Digital "one rate" Cellular-phone service, which promises that cell phones will be as simple and affordable as their land-line counterparts, has service problems in many U.S. cities, Walter Mossberg said in his Wall Street Journal column. The service's popularity has overloaded its circuits, making it hard to place or receive calls, and there are some so-called dead spots where service isn't available. Cities with problems include Washington, San Francisco, Seattle, Boston and Los Angeles, and AT&T Wireless Services Chief Executive Dan Hesse told Mossberg that there are 'certain markets and locales where we have had capacity problems,' though the service is delivering what it promised."

d. Low data transmission rates. A few wireless companies provide fax and Internet access, but their transmission rates are generally limited to 9.6 KB/sec. The slow rates deter customers from choosing wireless for second lines for fax machines and Internet access. Recently, several companies have introduced wireless handsets capable of restricted Internet access, limited (without graphics) to stock quotes, e-mail,

and the like.

e. Lack of a uniform transmission standard. Three transmission standards (TDMA, CDMA, and GSM) cause incompatibility between systems. Wireless companies are developing tri-mode handsets for use where a call is carried by multiple providers by multiple providers over a combination of analog and digital signal types.

f. Privacy / security / theft. Privacy and security concerns, significant with analog wireless systems, still exist (but are improved) with the new digital Cellular and PCS systems. These concerns are very real for cordless phones used in one's home for wireline service. Cloning of a handset's Electronic Serial Number that identifies the wireless user, provider, and rate plan, is minimized with digital systems. Cellular phones invite thieves, especially when left unattended in one's car. A subscriber, whose phone has been stolen, should call his provider to deactivate the phone in order to avoid charges for fraudulent calls.

g. Lower voice transmission quality and system reliability. These have improved due to the introduction of digital technology. A 1998 national survey of wireless users reported that 72 percent believed their service was improving and had improved over the past few years<sup>7</sup>. Nevertheless, some calls are dropped or not completed when a subscriber moves between cell sites or travels where coverage is not yet provided. Wireless companies need to improve these in order to encourage Florida subscribers to choose wireless service over wireline service.

h. Social and safety concerns. Incoming wireless calls in quiet places cause anti-social sentiments. Speaking on a wireless handset while driving raises significant safety concerns.

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<sup>7</sup>www.wow-com.com. *The Evolving Wireless Marketplace*. February 1998. pg. 5.

## Module IV. Wireless versus Wireline Rate Comparisons

### A. Rate Comparisons for "average" and "high user" subscribers

This module first compares wireless and wireline rates for "average" and "high wireless" users. To do so, using Figures 2 through 7, pages 37 through 42, we calculated composite statistics, across all providers, for each city and for each category of free minutes (51-150, 151-250, 251-500, 900-1200, and "one rate" plans). We averaged the MRCs, the number of free or included minutes, the cost of additional minutes, and the cost of four commonly-used features- Caller ID, Call Waiting, Call Forwarding, and Conference Calling. The second column of Figure 8, page 43, summarizes these average, wireless costs.

We next determined the costs of basic local residential service in Tallahassee, Miami, and Tampa, listed at the top of Figure 9, page 44. For example, the monthly cost of a residential phone line in Tallahassee is \$14.15, for which, a subscriber gets an unlimited amount of local calling. The \$14.15 includes Sprint's basic residential rate of \$9.65, the Subscriber Line Charge of \$3.50, and a touchtone charge of \$1.00. When the rates for a combination package of Caller ID, Call Waiting, Call Forwarding, and Conference Calling services is added, as done above for the wireless rate plans, the total cost of residential service in Tallahassee equals \$27.65. The second column and note at the bottom left of Figure 9, page 44, detail this total cost calculation.

To compare wireless rates with wireline local service rates, since wireless service is a measured service, we needed certain wireline "usage" benchmarks. We needed to know how much an average customer uses his phone for local calling (and for long distance calling for a later comparison) per month. For 1997, the FCC reported per line (residential and business) telephone usage for local calls of 42 minutes per day.<sup>8</sup> Therefore an average consumer spends 1,260 minutes on the phone making and receiving local calls per month. Since wireless providers charge airtime for both incoming and outgoing calls, it was unnecessary to divide the 1260 minutes into calls placed and received. We then compared wireless and wireline rates based on minutes of use.

For rate comparisons of all the categories except the "one rate" plans, we assumed that the typical subscriber talks locally for 1,260 minutes per month but makes no long distance calls. Adding in costs for long distance calls would only worsen the comparison since the average cost of wireline long distance (\$0.10 per minute<sup>9</sup>) falls below the lowest wireless long distance cost of \$0.14 per minute. Next, we assumed

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<sup>8</sup>FCC. *Trends in Telephone Service*. February 1999. pg. 12-4.

<sup>9</sup>FCC. *Trends in Telephone Service*. February 1999. pg. 14-6.

that both wireless and wireline users subscribe to the same four optional calling features- Caller ID, Call Waiting, Call Forwarding, and Conference Calling. We made this assumption because up to 70% of all wireline users subscribe to these services.<sup>10</sup>

We then calculated the cost of monthly wireless telephone service for each of the non-one rate categories. For the details, see the third through fifth columns of Figure 8, page 43. A rational wireless subscriber in Tallahassee, talking for 1260 minutes, might choose the 900-1200 minutes rate category. Its estimated cost of \$147.30 is *five* times greater than the \$27.65 wireline cost; the same rational subscriber would not choose any of the four lowest rate categories since they have even higher cost premiums.

We next compared "one rate" wireless and wireline rates. Since "one rate" plans offer free long distance service, billing long distance calls over their networks as local calls, each call uses up only included or additional airtime minutes. Figure 7, page 42, identifies all available "one rate" plans in the three cities; their free minutes range from 120 to 1500 minutes. We next needed to know the number of minutes that a typical wireline caller makes long distance calls. According to the FCC, a 1997 wireline caller called long distance for 14 minutes per day or 420 minutes per month,<sup>11</sup> resulting in an average monthly long distance bill of \$42.00. Adding \$42.00 to the LEC's local service rates results in a total wireline bill of \$69.65 in Tallahassee for 1,680 total minutes (1,260 local and 420 long distance minutes), as listed at the bottom of Figure 10, page 45.

We then calculated an average cost including long distance minutes for "one rate" plans in the three cities. For details, see the bottom of Figure 8, page 43. Figure 11, page 46, graphs these "one rate" wireless to wireline rate comparisons. These average cost calculations show a *3½ to 1* cost ratio to wireline services. Turning from "average" plans and choosing a specific Sprint PCS plan, available statewide, we calculated the following costs: \$149.99 for 1500 minutes per month and four custom calling features; \$42.00 for 168 (1680 - 1260) additional minutes at \$0.25 per minute; for a total monthly bill of \$197.03. When compared, in Tallahassee, to a total wireline bill of \$69.65, we found a cost premium of *2.8 to 1*.

Hence, wireless subscribers pay a premium of *3 to 1* or more for the portability and convenience of wireless service. While a few have substituted wireless for their wireline local service, most have not at today's wireless rates and rate structure where wireless is a measured service and wireline is flat-rated service. As wireless rates decrease, more residential subscribers may use wireless to replace their second (non-fax

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<sup>10</sup>Florida Public Service Commission. *Report on the Relationship of the Costs and Charges of Various Services Provided by Local Exchange Companies and Conclusions as to the Fair and Reasonable Florida Residential Basic Local Telecommunications Service Rate*. Volume 2. February, 1999. pg. 92.

<sup>11</sup>FCC. *Trends in Telephone Service*. February 1999. pg. 12-4.

and non-Internet) lines.

## B. Rate Comparisons for three types of wireless users

We next considered whether wireless and wireline services are "complementary" or "substitute" services. To do so, we identified three types of wireless users: the low end, or security, user; the typical user; and the high end, or business, user.

First, the security user has Cellular service for emergency purposes and for urgent matters. According to a 1998 national survey, 60 percent of wireless subscribers use their handsets for "personal" reasons. Of those personal users, 25 percent use their phone for personal safety reasons, 24 percent use it for convenience, and 11 percent use it for both safety and convenience.<sup>12</sup> This group of senior citizens and parents with children views wireless service as a complement to traditional wireline service. For them, paying around \$25 for a low usage rate plan is a viable solution, since (like an insurance policy) it assures portable, mobile communications when needed.

The typical user uses his handset for between 200 and 300 minutes per month, with an average bill of about \$48 per month.<sup>13</sup> The FCC's Fourth Report on CMRS competition (FCC 99-136) reports that an average analog Cellular customer uses 100 minutes per month, while an average PCS customer uses 300 to 375 minutes per month. These users probably spend about \$50 to \$60 a month (Figure 5, page 40) for a 151-250 or 251-500 included minute rate plan and some free or low cost custom calling features and unlimited calling features. They purchase enough free minutes to use the phone for more than emergencies, but, assuming they are well informed, they take advantage of features like unlimited weekend calling. They also likely view wireless service, at today's wireless rates and wireless's measured service type, as a complementary good to wireline service.

High end, or business, users travel quite a bit, and, for personal and business reasons, need to call and be called while away from home or business. Viewing their wireless service a "business necessity," they use a considerable amount of airtime talking business, taking orders, or calling their customers. Therefore, they have probably migrated to "one rate" plans with a large amount of included minutes and "free long distance." This portability, accessibility, and ability to conduct business may make the *3 or more to 1* "premium" of wireless to wireline costs an acceptable cost of doing business. The high end user may be the most likely subscriber type to view wireless as a substitute for wireline service. As the costs of "one rate" plans decline and more features (Internet and fax) and higher data speeds become available and since the fixed nature of wireline poorly serves his business and travel needs, this business user may

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<sup>12</sup>www.wow-com.com. *The Evolving Wireless Marketplace*. February 1998. pg. 4.

<sup>13</sup>Wall Street Journal. February 3, 1998. pgs. 4 & 11.

someday view wireless as a replacement for wireline. We agree that the high user justifies higher wireless costs for business reasons. "The Yankee Group sees a 3:1 wireless "premium" as a key ratio at which both wireless penetration enters a new growth phase and serious displacement of landline begins to occur."<sup>14</sup> The Dallas Morning News reported on February 2, 1999 that a domestic wireless user pays five or six times more than a wireline user. A 1999 Yankee Group Mobile User survey found that wireless users, on the average, are replacing 12 percent of their wireline traffic today, and expect that number to increase to 17 percent by 2001.<sup>15</sup>

In summary, the security user views wireless as a complementary service and is expected to continue to do so. The typical user, viewing wireless service as a complementary service today, might switch to wireless service as wireless costs continue to decrease or as they become aware of "one rate" plans and their free/low cost features. Finally, the high volume user appears most likely to substitute wireless for traditional wireline service for business reasons.

### C. Wireless users need to be "smart" users

Certain wireless users, educated and disciplined callers, may find that prudent use of the unlimited nights and/or weekend feature and the "one rate" plan's high number of included airtime minutes might decrease wireless's cost "premium." Wireless users must be "smart" consumers who (a) study the different rate plans and features available in their area, (b) consider their called locations and calling patterns, and (c) adhere to the conditions of the free or low cost features. We looked at two such examples: (a) A disciplined and rational customer (planning to make all of her wireless calls on Saturday and Sunday) purchases the cheapest rate plan that allows her the unlimited weekend feature. Assume this consumer lives in Tallahassee and makes all of her calls to Gainesville, considered a local call by her wireless provider but a long distance call (at \$0.10 per minute) by her LEC. This customer buys U. S. Cellular's 30 minute plan for \$24.95 a month and purchases the unlimited weekends feature for an additional \$9.95 per month, bringing her total monthly bill to \$34.90. Using wireline service, she pays \$27.65 for service plus 10 cents per minute for her long distance airtime. Under these specific assumptions, her wireless service costs less than her total wireline service after she talks for 73 minutes. (See the graph on Figure 12, page 47.) and (b) (This "average business user" example comes from an International Data Corporation Bulletin #W17810, December 1998, entitled *Landline Replacement- How Much Traffic Will Wireless Steal?*) An IDC employee in its Austin, Texas office in a managed business suites group pays \$0.25 per minute for long distance. Recall that the national average for long distance calling is now \$0.10 per minute. From May 19 to June 18, he used 1,280 minutes of wireline long distance service for \$495.64, including tax. Then, from

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<sup>14</sup>www.yankeegroup.com. June 21, 1999.

<sup>15</sup>ibid.

June 19 to July 18, he used only 468 wireline minutes and paid \$186.88. He shifted much of his long distance calling to an AT&T One Rate Plan that provides 1,400 minutes of airtime for \$140, where he used a total of 1,157 wireless minutes for just \$156.82 including tax. The net effect was that he increased his usage by 345 minutes, but paid \$151.94 less than the month before.

In the first two parts of this module, we saw that wireless calling costs exceed wireline costs for average callers talking for the nation's average number of minutes and for three customer types. It appears, however, that under certain conditions (such as paying a high rate for wireline long distance, limiting airtime minutes to less than the nation's average of wireline minutes used, and prudently using wireless features like unlimited weekend calling and free long distance), disciplined and rational users may gain both mobility and savings on their telephone bill. We note that such conditions are difficult to achieve, requiring a smart and disciplined wireless consumer.

#### D. "Fair and Reasonable Florida Residential Basic Local Telecommunications Service Rate" report survey results

We next considered several survey results from the Commission's February 1999 "Fair and Reasonable Rate" report to the Florida Legislature. The Commission directed an Affordability Survey of 1500 Florida residents in July and August 1998. It found the following: (a) "The percentage of respondents who said they would discontinue local telephone service at various price increases is significant. . . those with household incomes over \$20,000 indicate that they would use a Cellular phone as an alternative. Given that 36.7% of the surveyed households already subscribe to Cellular service, the idea of using Cellular service as a substitute for wireline service is plausible. While wireline and wireless service have heretofore been complementary, price changes for either service could change that relationship, and the two could become substitutes."<sup>16</sup> and (b) "Some 52.4% of respondents indicated that if the price of local telephone service rose to a level they found unacceptable, they would switch to Cellular service. . . As the rates for Cellular and wireline service come closer together, more customers may view Cellular and other wireless services as a reasonable substitute for traditional telephone service."<sup>17</sup> The probability of switching to Cellular service increased with income level, increasing to a maximum 86.2 percent for the \$100,000 to \$150,000 level.

While local wireline service rates have not increased since the "Fair and

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<sup>16</sup>The Florida Public Service Commission. *Report of the Costs and Charges Provided by Local Exchange Companies and Conclusions as to the Fair and Reasonable Florida Residential Basic Local Telecommunications Service Rate*. Volume 1. February 1999. pg. 68.

<sup>17</sup>The Florida Public Service Commission. *Report of the Costs and Charges Provided by Local Exchange Companies and Conclusions as to the Fair and Reasonable Florida Residential Basic Local Telecommunications Service Rate*. Volume 1. February 1999. pg. 119.

Reasonable Rate" report, wireless rates have continued to decrease and the new "one rate" plans have prospered. As discussed earlier, significant cost premiums still exist for wireless versus wireline service. We expect these cost premiums, while decreasing, to continue even as wireless costs decrease and innovative rate plans are introduced. We therefore believe that wireless and wireline services will remain complementary, not substitute, services for the near future. As wireless rates decrease, more residential subscribers may, however, use wireless to replace their second (non-fax and non-Internet) lines.

## Module V. FCC/State Wireless Legislation

The FCC regulates commercial, domestic wireless telecommunications services offered to all but federal governmental agencies. In the Omnibus Reconciliation Act of 1993 (1993 Budget Act), Congress created the statutory classification of CMRS to promote consistent regulation of Cellular, PCS, and SMR services, and established the promotion of competition among CMRS providers as the fundamental goal for CMRS policy formulation and regulation. According to the Communications Act of 1934 as amended by the Telecommunications Act of 1996 (TA 96), the FCC licenses carriers and manages the Radio Frequency (RF) Electromagnetic Spectrum via frequency allocations to wireless technologies and providers. But it does not regulate rates. In fact, it has systematically removed regulatory constraints: in 1995, for example, it forbore (refrained from enforcing) several sections of Title II, Common Carrier, of the Communications Act of 1934, and in Title III, §332, Mobile Services, it preempted state regulation of CMRS entry and rates and then denied petitions by seven states to reinstate State authority to regulate CMRS rates. The FCC found State regulation to be unnecessary to protect consumers from unreasonable or discriminatory rates. §332 does, however, allow a State to petition for authority to regulate rates given market conditions in which rates are unjust or unreasonably discriminatory and where the wireless service is a replacement for landline telephone exchange service for a substantial portion of that service. As part of the 1993 Budget Act, Congress authorized the FCC to award licenses for use of the electromagnetic spectrum via competitive bids, auctions, to make them available quickly and efficiently, and to encourage new service providers. It has used this auction authority extensively, holding 21 auctions from July 1994 through March 1999; in 1996, it introduced electronic filing for licenses and electronic bidding for spectrum auctions.

The FCC's awarding of Cellular licenses to two companies in 1981 stimulated wireless competition, but provided only limited competition. Then in 1995, to further stimulate CMRS competition, the FCC allocated 120 MHz (three times the allocation for Cellular) for six PCS providers in each MTA and BTA, giving PCS licensees increased flexibility to provide not only PCS service but also paging services, dispatch services, and "fixed" wireless local loop services. This allows CMRS providers to expand their service offerings and compete for local service without regulatory burden or delay. In the PCS auctions, the FCC also encouraged market entry of non-LEC, minority-owned, and small businesses by restricting certain Blocks and auctions to such companies.

The Telecommunications Act of 1996 significantly affected CMRS. Sections 251 and 252 require LECs to offer interconnection and access to their networks to CMRS providers on reasonable terms and conditions, establishing just and reasonable reciprocal compensation agreements. §254 required CMRS providers to support Universal Service and allowed them to receive universal service support. §251 required LECs and CMRS providers to offer local number portability (LNP) to their customers to promote local competition. On February 8, 1999, the FCC granted a Cellular Telecommunications

Industry Association request for forbearance from LNP and extended the deadline for CMRS carriers to implement it until February 24, 2002; the FCC emphasized that this extension did not relieve CMRS providers of their obligation to provide LNP.<sup>18</sup> § 254 of TA96 required CMRS providers to contribute to a new universal service support system and permitted them to receive universal service support when so designated, by a state commission, as eligible telecommunications carriers. TA96 also limited state and local zoning boards from prohibiting the construction of wireless towers; in July 1997, the FCC reasserted its authority to preclude delays by local authorities in granting permissions for such towers.

The following three 1996 FCC actions also affected CMRS:

1. To encourage entry of new wireless competitors, the FCC adopted rules to permit PCS licensees to sell portions of their assigned spectrum or licensed geographic area.

2. To help new licensees overcome an incumbent's advantage, the FCC ordered CMRS providers to not unreasonably restrict the resale of their services and required Cellular licensees to provide roaming service upon request to any CMRS subscriber of technically-compatible handsets.

3. In order to improve a wireless user's ability to complete a 9-1-1 call while traveling across rural and suburban areas, the FCC adopted rules governing wireless transmission of 9-1-1 calls to Public Safety Answering Points (PSAPs). The FCC required Cellular companies to complete all 9-1-1 calls, not just calls from their subscribers. On May 13, 1999, effective in nine months, the FCC ordered all analog Cellular handsets and all dual-mode Cellular handsets operating in the analog mode to include a separate capability for processing 9-1-1 calls. Housed in the handset, this capability would first attempt to complete the call over the user's Cellular provider; but, if the provider's signal were weak or non-existent, it would direct call completion by the provider with the strongest control channel signal.

On July 7, 1999 in FCC 99-137, the FCC issued a Declaratory Ruling asserting its CMRS jurisdiction over wireless services with Calling Party Pays (CPP), an optional service where the caller (not the called party) pays the airtime charge for calls placed within a Local Access and Transport Area (LATA), and issued a Notice of Proposed Rulemaking. Since CPP makes wireless billing "similar" to wireline billing, the FCC believes that this different service option will benefit the development of local service competition by attracting low income and low-to-middle volume wireless users.

In concert with the aforementioned Federal legislation, the Florida Public Service

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<sup>18</sup>FCC Report No. WT 99-1. *FCC Grants Forbearance of Local Number Portability for Wireless Carriers*. February 8, 1999.

Commission does not regulate CMRS services. In May and June, 1999, the Florida legislature passed three bills that have become law about wireless's completion of 9-1-1 calls. House Bill 621 established a comprehensive statewide emergency telephone system that gives wireless users rapid direct access to PSAPs by dialing 9-1-1; provided for funds for local governments and wireless providers to install and operate 9-1-1 services and to reimburse wireless providers for costs incurred to provide 9-1-1 or enhanced 9-1-1 services; and created a Wireless 9-1-1 Board to oversee and administer an E-9-1-1 fee (\$0.50 per month) imposed by the legislation on wireless subscribers with a Florida billing address. Senate Bills 180 and 182, respectively, awarded proprietary confidential treatment to business information provided to the Wireless 9-1-1 Board and established the Wireless Emergency Telephone System Fund for E-911 fee revenues.

In conclusion, the FCC strongly believes that its regulation has promoted CMRS competition, resulting in new services, more competitors, and rate reductions. The FCC's Third and Fourth Annual CMRS Competition Reports best sum up wireless's competitive status as follows: "The increase in services offered in the marketplace, the reduction in prices for many of these new services, and the emergence of new technologies all clearly demonstrate that the Commission's policy formulation and regulation have promoted competition in the CMRS marketplace as required by Congress. The most important of these pro-competitive policies have been making large amounts of new spectrum available and permitting service flexibility. The Commission will continue to promote competition in its policy formulation for CMRS providers, in particular, by working to facilitate market entry by new entities, increase spectrum flexibility and position CMRS licensees to compete directly with wireline services thereby providing more options for consumers at a lower cost."<sup>19</sup> "In the year since the release of the *Third Report*, the mobile telephone market has made steady competitive progress. There are now over two dozen broadband PCS and digital SMR operators providing competition in numerous cities across the country."<sup>20</sup> The FCC will continue to promote competition in the CMRS marketplace and in the local service arena. On May 14, 1998, FCC Chairman Kennard in a separate statement to the FCC's *Third Annual CMRS Competition Report* wrote ". . . some wireless providers are gearing up to compete against wireline providers. We should explore every opportunity to promote that competition . . . using the regulatory authority we now have to hasten the day when wireless is a real substitute for wireline, and not just a complement."

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<sup>19</sup>FCC. *Third Annual CMRS Competition Report*. June 11, 1998. pg. 64.

<sup>20</sup>FCC 99-136. *Fourth Report*. June 24, 1999. pg. 62.

## Module VI. Comments

This module provides comments from industry and non-industry groups and from Telecommunications literature on wireline and wireless telecommunications.

1. On May 18, 1999, Susan Langston, Executive Director, of the Florida Telecommunications Industry Association (FTIA) addressed the Commissioners on the wireless industry. She commented that "Wireless service is certainly a complementary service to landline service. It expands the ability of consumers to communicate beyond their homes or offices." She concluded in her written comments that "The local service provided by wireless carriers is completely distinct from the local service provided by landline companies. We do urge the Commission to resist efforts to regulate the wireless industry in any way."

2. A workshop was held on June 28, 1999, to discuss "The Effects of Wireless Service on Wireline Service." Invited were all Florida LECs and ALECs, the FTIA and its seven wireless member companies, and 22 other wireless companies doing business in Florida. Eight companies and the FTIA participated, and two companies submitted written comments. The following are brief summaries of their significant comments:

a. *Wireless is a complementary service*; it is not today, in general, a substitute for wireline service. There are however narrow segments of the marketplace (certain customer types) where it might be considered a substitute service; the industry calls this "segmented" competition.

b. *The Commission role with respect to wireless services in Florida should be one of continued non-regulation.* When asked about a Commission "consumer information" role, the industry responded that such a role was unnecessary since its sales associates and 800 Customer Service representatives are capable of, and already, providing information every day.

c. From AT&T Wireless Services: "It is difficult to predict whether wireless will replace wireline services. It does not appear that wireless will be able to replace wireline services in the foreseeable future, and even if some replacement were to occur, wireless services probably would not be capable of entirely replacing all wireline services. The primary drawbacks to any large-scale replacement potential are bandwidth shortages, technology development, and capital limitations. Over time, we may see some situations where wireless could be a reasonable technological substitute for some customers or certain applications, but whether it would ultimately be a cost effective alternative remains to be seen."

d. From AT&T Wireless Services: "Wireless services will impact the LECs primarily through interconnection and wholesale service opportunities. For the

foreseeable future, most wireless calls will either originate or terminate on wireline network, or transit the PSTN network, thus making interconnection services critically important. As for wholesale services, the LECs have continued opportunities to provide point-to-point facilities and ancillary services . . . that provide additional revenues and profit opportunities.” “Wireless services provide subscribers with the ability to communicate anytime, anywhere. . . there is a positive effect of landline subscribers as well. As more and more consumers sign up for wireless services, landline subscribers have more and more opportunities to communicate. There are approximately 70 million Cellular and PCS customers today . . . (therefore) landline subscribers have 70 million more ways to potentially communicate.”

e. From AT&T Wireless Services: “. . . this Commission's role should be limited to issues associated with interconnection services provided by the LEC networks as are currently authorized by Florida and federal law.” Wireless companies are, in fact, large business customers for LEC network services.

f. From BellSouth: Wireless should not be regulated due to the success of wireless competition. In fact, the Commission should provide flexible regulation to LECs so they can better compete with wireless companies.

g. From GTE: In the intensely competitive wireless marketplace, anything that regulates slows competition.

3. Lawrence Kenny, a Partner with PricewaterhouseCoopers and head of its telecommunications group, wrote in the February 22, 1999 issue of *Telephony* that “We can view the future in terms of three possible scenarios: a substitute model, in which the wireless network largely supplants the wireline network; a convergence model; and a model in which mobile continues as a distinct sector . . . Although increased substitution and eventually some level of convergence will occur, mobile providers will remain a sector in their own right for at least the next five years.”

4. BellSouth Telecommunications, Inc. in its *Brief in Support of Second Application . . . for Provision of In-Region, InterLATA Services in Louisiana*, dated July 9, 1998, argued before the FCC that “Substitution of PCS for wireline telephony has increased significantly since BellSouth's first section 271 application for Louisiana. This is not surprising, because for a greater number of BellSouth residential customers, PCS offerings are now a viable substitute for comparable wireline service on the basis of price alone (that is, even ignoring the convenience and other advantages of wireless telephony).”

5. Harry Shooshan, a principal in the economics and public policy consulting firm, Strategic Policy Research, wrote in the June 8, 1998 issue of *Wireless Week* that “Wireless already is a substitute for wireline!” He reasoned that a “substantial amount of wireless traffic involves substitution of wireless for wireline usage, including what

would otherwise be "residential usage."

6. Peter D. Hart Research Associates wrote in February 1998 that "The expansion of wireless phone use to all segments of society has created a market that demographically resembles the American population. Wireless phones are no longer a product available to and used only by an elite, wealthy, and educated segment of the population. . . the cost of owning a wireless phone has become affordable and matches up with people's desire to own." "Consumers' strongly believe that more competition-not more government regulation- is what most effectively will ensure that the Public is well-served by the wireless industry. By a significant 71%-to-13% margin, wireless users favor doing things that would increase competition among wireless companies, rather than doing things that would increase government oversight, in order to best serve the public." ". . . consumers . . . also expect wireless prices to continue to decrease over time. In fact, as the wireless telephone industry becomes a more mature industry in the marketplace, fully 63% of consumers believe that it will be more like the long distance telephone industry in which prices have continued to drop over time . . ."

7. International Data Corporation wrote in December 1998 that "Clearly, wireless replacement is not good for the landline side of the business. . . In fact, wireless service generates some additional minutes of use, simply by giving subscribers the ability to make calls they might not otherwise make. One thing that even carriers who provide both landline and wireless service should be concerned about is the loss in profitability. On the local landline side, revenues from additional lines are primarily profit. CLASS services, such as caller ID, voice mail, and three-way calling, are also very profitable to local landline carriers."

8. The Public Utility Research Center (PURC) University of Florida presented a *Telecommunications Industries Analysis Project* report at the February 1999 NARUC Meeting. PURC answered the question: "Can wireless services be a substitute for wireline services? Yes, this is true for some wireless services. For example, it is possible to substitute wireline voice services with Cellular and PCS services. However, while wireless provides mobility, not all the features and capabilities of a traditional voice-grade wire are possible."

9. Mr. Webb wrote in his 1998 book titled *Introduction to Wireless Local Loop* that (for price reasons) ". . . it now appears clear that Cellular will not be a substitute for the fixed network but a complement when mobile."

10. The Federal Communications Commission (FCC) reported in June 1998 in its *Third Annual CMRS Competition Report* that "Historically, mobile telephony has been thought of as a complement to wireline services with each product competing for a different pool of customer minutes-of-use. Now, however, many believe that wireless and wireline technologies are increasingly competing for a single pool of minutes-of-use. . . as mobile telephone competition decreases this price difference (between wireless

and wireline services), analysts believe that increasing numbers of customers will transfer telephone usage from wireline to wireless networks." "While many analysts concur that a transfer of usage between wireline and wireless systems will occur, it is hard to say exactly how long it will take or how much substitution will occur. One key variable is the sensitivities of consumer demand to the relative prices of wireless and wireline telephone service as the difference in prices narrows. However, it is difficult to make accurate predictions because there is no relevant behavioral history from which we can draw guidance."

11. The FCC released its *"Fourth (CMRS Competition) Report* In June 1999. While not addressing the complementary versus substitution question directly, the FCC reported (a) that the average local monthly wireless bill decreased from \$39.88 in December 1997 to \$39.43 in December 1998, (b) that the wireless industry is targeting wireline second lines and is providing immediate service where the LEC experiences construction delays when providing new wireline service, and (c) that the wireless industry is promoting the sale of prepaid wireless calling cards to credit-risk customers and to those customers who want to closely manage their wireless expenses. The FCC also reported that "Currently, BTAs containing approximately 74 percent of the population have at least five mobile telephone operators . . . up from 54 percent at the time of the *Third Report.*"

12. In June 1999, the Yankee Group (sponsor unknown) released survey results of 3,301 wireless users, finding (1) that two percent of the respondents have only wireless service; that 65 percent believe their wireless service is complementary to wireline service; and that 24 percent use their wireless handset to displace wireline usage; and (2) that only four percent of the respondents expect their wireless service to replace their wireline service, with 88 percent expecting to keep both services.

## **Module VII. Conclusions**

### **A. Is wireless a complementary, competing, or replacement service?**

### **B. How will price affect the services?**

Wireless is a viable communications option in the Florida telecommunications marketplace. While LECs still dominate the local residential service arena, there are multiple wireless competitors in most markets.

Wireless is a "complementary" service to traditional wireline local service. It allows customers to communicate beyond their homes or offices. Module III B reviewed the advantages and disadvantages of wireless versus wireline service. Several wireless disadvantages work against substitution: cost and type of service, less capacity, slower transmission speeds, and lower voice transmission quality and system reliability. These need to be improved or increased to encourage substitution. The most significant reason for wireless's "complementary" nature is the higher cost of wireless service, caused primarily by wireless's measured charges for airtime used as opposed to wireline's unlimited local usage for a flat monthly fee; this difference in type of service inhibits wireless's ability to compete effectively against traditional wireline service. The cost premium for choosing wireless over wireline service is, at best, *3 to 1* for high volume, business users. While we recognize that some wireless subscribers will pay a cost premium for the "mobility" and "convenience" of wireless service, we expect that they will not replace their wireline service at today's rates and rate structure. The 1999 Yankee Group's wireless user survey found that only four percent of the 3,301 respondents expect their wireless service to replace their wireline service. As mentioned in Module VI, B 1, the Yankee Group believes that a *3 to 1* premium marks the start of new wireless growth and wireline displacement; such a premium is currently unavailable to all but the high volume user. The cost premium paid by wireless subscribers may decline further, but wireline's flat-rated service will continue to impede substitution for wireline services. We are aware that, because of declining wireless costs and new rate plans and features, the wireless subscriber growth continues strong.

### **C. Can wireless provide adequate Internet access?**

While wireless transmission rates are generally limited to 9.6 KB/sec, special private networks are working at higher speeds that still fall short of wireline's commonly-available 28.8 KB/sec. Therefore, wireless's offerings of data, fax, and Internet services are still limited. The slower transmission rates deter subscribers from choosing wireless for fax and Internet second lines. Since wireless systems are also capacity-limited as described in Module II E, widespread wireless provision of adequate Internet access might prove difficult.

**D. Consumer protection: what impact will wireless have on service quality, 9-1-1, etc.?**

Wireless services will probably have a small impact on service quality. Its voice quality and system reliability are somewhat inferior to wireline voice quality (digital voice quality improved over analog voice quality); there are still areas where service is not provided; and calls are sometimes dropped between Cellular towers, etc. On the other hand, wireless companies provide immediate service as compared with the wireline (LEC) standard of 90 percent service within three working days. A wireless user's ability to reach 9-1-1 services will be improved by recent Federal legislation that required Cellular companies to complete all analog 9-1-1 calls, not just calls from their subscribers.

**E. What impact will wireless have on local service competition & on providers?**

Wireless has had little impact on local service competition as only a small percentage of wireless users have replaced their wireline service. This is due primarily to its "complementary" nature; its higher costs and "measured" service type have not induced customers to substitute wireless for wireline local service. While continued decreases in wireless costs, new "lower cost" rate plans, and new free or low cost features may lead to some substitution, we expect wireless to continue as a "complementary" service for many years. We are mindful of the Commission's February 1999 "Fair and Reasonable Rate" report to the Florida Legislature that found the following: (a) 36.7% of the surveyed households already subscribe to Cellular service and (b) "Some 52.4% of respondents indicated that if the price of local telephone service rose to a level they found unacceptable, they would switch to Cellular service. . . As the rates for Cellular and wireline service come closer together, more customers may view Cellular and other wireless services as a reasonable substitute for traditional telephone service."<sup>21</sup>

Wireless has increased the Florida resident's "choices" for local service. Yet, the cost premium for selecting wireless over wireline is at best 3 to 1 (for the high volume or business user). We can expect some increase in "substitution" from the business user as his wireless costs continue to decrease and he learns to take fuller advantage of the features of his rate plan. The security and typical user will continue to view wireless as a "complementary" service for some indeterminate number of years. However, as wireless rates decrease, more residential subscribers may choose wireless to replace their second lines for voice service. Understanding that today's data transmission rates are slow, subscribers would probably not choose wireless for second lines to fax machines and Internet access.

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<sup>21</sup>The Florida Public Service Commission. *Report of the Costs and Charges Provided by Local Exchange Companies and Conclusions as to the Fair and Reasonable Florida Residential Basic Local Telecommunications Service Rate*. February 1999. pg. 119.

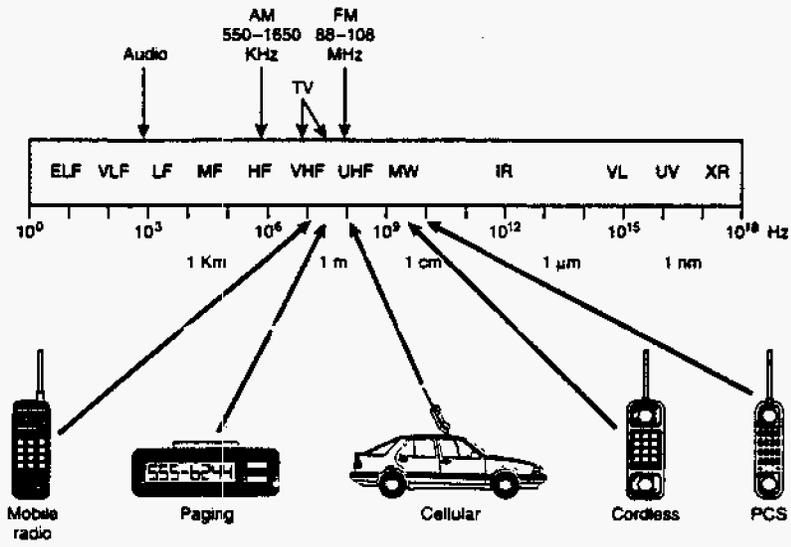
Greater awareness of wireless competition may make Florida residents more receptive to ALECs' attempts to enter the wireline local service market. The wireless providers, advertising heavily, are delivering messages of lower costs, larger coverage areas, free long distance, unlimited weekend calling, and so on. Residents can hardly escape these messages. As a resident chooses to buy (and is satisfied with) wireless service, he becomes more likely to consider an ALEC's offer of local service- or to substitute the "complementary" wireless service for his wireline service. Therefore, increased wireless competition may enhance the potential for local service competition.

The LECs can expect increased service demands and revenues from wireless companies. As the number of wireless subscribers grows, so should the wireless company's purchases of network service and service opportunities from the LECs. On the other hand, LECs may be harmed by a loss of revenues from profitable Custom Calling services and displacement of minutes-of-use to wireless services. We expect this displacement to increase as wireless subscribers increase, as the average local monthly wireless bill decreases below \$39.43 at the end of 1998, as wireless provides new services and second lines more quickly than the LEC, and as wireless's prepaid services reach out to credit-risk and budget-conscious customers.

**F. What should the role of the Commission be regarding wireless service?**

The Commission should continue our role in reviewing, approving, and arbitrating interconnection agreements between wireless companies and LECs. Wireless companies, while being potential and future competitors for LEC local service revenues, are also large business customers for LEC network services.

Staff will continue to monitor the wireless marketplace and technological developments, assessing their effects on local service competition in Florida.



The Electromagnetic Spectrum.

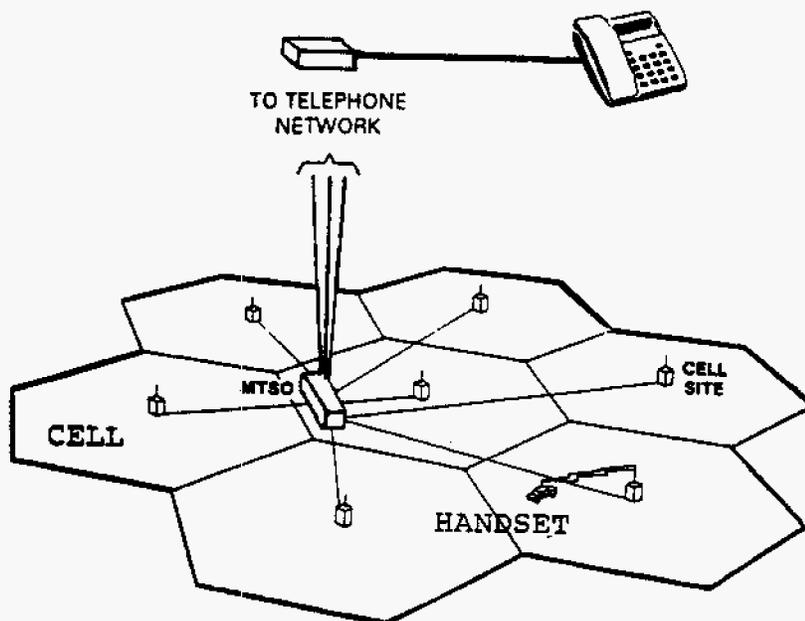


Figure 2

COMPOSITE OF ALL 0-50 MINUTE RATE PLANS							06/30/99
Company	MRC	Free Min.	Addtl. Min.	Type of Service	Analog or Digital	Activation Fee	
US Cellular (Tally)	\$24.95	30	\$0.40	Cellular	Digital	\$30.00	
Alltel (Tally)	\$15.95	10	\$0.40	Cellular	Both	\$10.00	
OmniRate (Miami)	\$19.99	30	\$0.34	Cellular	Digital	None	
BellSouth (Miami)	\$18.99	15	\$0.35	PCS	Digital	None	
BellSouth (Miami)	\$25.00	50	\$0.35	PCS	Digital	None	
AT&T (Miami/Tampa)	\$19.95	30	\$0.35	Cellular	Digital	None	
GTE (Tampa)	\$20.00	30	\$0.35	Cellular	Digital	\$25.00	
Sprint PCS (all 3)	\$16.99	15	\$0.35	PCS	Digital	None	
Features	US Cellular	Alltel	OmniRate	BellSouth	AT&T	GTE	Sprint PCS
Voice Mail	\$5.95	\$3.95	Free			\$3.95	\$4.99
Enhanced V. Mail	\$9.95		\$2.99			\$6.95	
Caller ID	Free	\$3.95	Free	\$4.95	Free	Free	Free
Caller ID block							Free
Call Waiting	\$2.00	Free	Free	Free	Free	\$1.95	Free
Call Forwarding	\$2.00	\$2.95	Free	Free	Free	Free	10 cents/min
Conference Calling	\$2.00	Free	Free	Free	Free	Free	Free
Call Diversion		Free					
Numeric Paging			Free				n/a
911 Emerg.							Free
1st Incoming Min.			not included	not included	not included	Free	not included
611 Cust. Serv.							Free
Roadside Assis.	\$2.99	\$2.95				\$2.95	\$2.99
Directory Assis.			\$0.69/call	\$0.85/call	\$0.75/call	\$0.95/call	\$0.75/call
Operator Assis.							Free
Detailed Billing	\$3.00	Free				\$2.50	Free
Internet Access							
Fax/Message Receive						\$3.95	\$1.99
Fax/Message Send							
Phone Insurance	\$2.95	\$2.95				\$2.95	\$3.25
Unlimited Weekends	\$9.95	\$9.95	\$5 & \$0.01/min	\$9.95	\$4.95	\$5/1000 min	n/a
Toll Free Calling Area	Home Area	Home Area	Florida	Home Area	Home Area	Home Area	Home Area
Phone Purchase Required	not required	\$69.00		\$79.95	\$69.00	\$99.99	\$59.99
Long Distance			\$0.69/min	\$0.19-\$0.21/min	\$0.15	\$0.14	\$0.15
Roaming Charges			0/\$0.49	\$0.35/\$0.59	\$0/\$0.60	\$0/\$0.50	\$0.39/\$0.69
Second Phone Line	\$12.95	\$11.95					n/a
Contract Required	12 months	12 months	None	12-24 months	12 months	12 months	None
GTE offers unlimited nights and weekends; others offer unlimited weekends only.							

COMPOSITE OF ALL 51-150 MINUTE RATE PLANS										06/30/99
Company	MRC	Free Min.	Addl. Min.	Type of Service	Analog or Digital	Activation Fee				
Powertel (Tally)	\$20.00	100	\$0.35	PCS	Digital					
Alltel (Tally)	\$24.95	60	\$0.27	Cellular	Both	\$10.00				
Sprint PCS (Tally)	\$29.99	120	\$0.30	PCS	Digital	None				
US Cellular (Tally)	\$24.95	150	\$0.30	Cellular	Digital	None				
BellSouth (Miami)	\$35.00	125	\$0.25	PCS	Digital	None				
PrimeCo (Miami)	\$19.99	100	\$0.35	Cellular	Digital	None				
Aerial (Tampa)	\$19.95	80	\$0.29	PCS	Digital	None				
BellSouth (Tampa)	\$24.95	120	\$0.30	PCS	Digital	None				
PrimeCo (Tampa)	\$19.99	100	\$0.35	PCS	Digital	None				
AT&T (Miami/Tampa)	\$24.99	100	\$0.32	Cellular	Digital	None				
AT&T (Miami)	\$39.99	150	\$0.32	Cellular	Digital	None				
GTE (Tampa)	\$25.00	100	\$0.25	Cellular	Digital	\$25.00				
Sprint PCS (Tampa)	\$29.99	150	\$0.30	PCS	Digital	None				
Features	Powertel	Alltel	BellSouth	PrimeCo	Aerial	AT&T	GTE	Sprint PCS	US Cellular	
Voice Mail	Free	\$3.95		Free	Free		\$3.95	Free		
Enhanced V. Mail	\$5				\$6.95		\$6.95	\$4.99		
Caller ID	Free	\$3.95	\$4.95	Free	Free	Free	Free	Free	Free	
Caller ID block	Free							Free		
Call Waiting	Free	Free	Free	Free	\$1.95	Free	\$1.95	Free	Free	
Call Forwarding	\$2.00	\$2.95	Free	\$1.00	\$1.95	Free	Free	10 cents/min	\$2.00	
Conference Calling	\$3.00	Free	Free	\$1.00	\$1.95	Free	Free	Free	\$2.00	
Call Diversion		Free								
Numeric Paging	Free				Free			Free		
911 Emerg.	Free			Free				Free		
1st Incoming Min.	Free		not included	Free	Free	not included	Free	Free		
611 Cust. Serv.	Free			Free	Free			Free		
Roadside Assis.		\$2.95		\$3.00			\$2.95	\$2.99		
Directory Assis.	\$0.50/call		\$0.83/call	\$0.75/call	\$0.85/call	\$0.75/call	\$0.95/call	\$0.75/call		
Operator Assis.								Free		
Detailed Billing	\$3	Free			Free		\$2.50	Free		
Internet Access	\$5									
Fax/Message Receive	\$4				\$4.95		\$3.95	\$1.99		
Fax/Message Send	\$5				Free					
Phone Insurance		\$2.95			\$2.95		\$2.95	\$3.25		
Unlimited Weekends	n/a	\$9.95	\$9.95	\$5/300&10/1000 min	\$4.95	\$4.95	\$5/1000 min	\$4.99	\$9.95	
Toll Free Calling Area	Home Area	Home Area	Home Area	Florida	Florida	Home Area	Home Area	On Network	Home Area	
Phone Purchase Required	\$99.95	\$69.00			\$69.95	\$69.00	\$99.99	\$59.99		
Long Distance	\$15.00**		\$0.19-\$0.21	\$0/\$0.19	\$0/\$0.15	\$0.15	\$0.14	\$0.15		
Roaming Charges			\$0/\$0.59	\$0/Various	\$0/\$0.49	\$0/\$0.60	\$0/\$0.50	\$0.39/\$0.69		
Second Phone Line		\$11.95			\$9.95			n/a		
Contract Required	none	12 months	12 months	None	12 months	12 months	12 months	None		
**Powertel plan is unlimited long distance to FL, GA, MS, AL, TN, KY, SC, AR, MO, IN, IL, LA.										
GTE offers unlimited nights and weekends; others offer unlimited weekends only.										

Figure 4

COMPOSITE OF ALL 151 - 250 MINUTE RATE PLANS							06/30/99		
Company	MRC	Free Minutes	Addtl. Min.	Type of Service	Analog or Digital	Activation			
Powertel (Tally)	\$30.00	200	\$0.35	PCS	Digital				
US Cellular (Tally)	\$39.95	190	\$0.33	Cellular	Digital	\$30.00			
Alltel (Tally)	\$39.95	180	\$0.25	Cellular	Both				
BellSouth (Tally)	\$30.00	200	\$0.40	PCS	Digital	None			
Sprint PCS (Tally)	\$49.99	240	\$0.25	PCS	Digital	None			
OmniRate (Miami)	\$39.99	200	\$0.30	Cellular	Digital	None			
Sprint PCS (Miami)	\$29.99	180	\$0.34	PCS	Digital	None			
Aerial (Tampa)	\$34.95	250	\$0.27	PCS	Digital	None			
PrimeCo (Tampa)	\$34.99	250	\$0.30	PCS	Digital	None			
BellSouth (Tampa)	\$34.95	250	\$0.30	PCS	Digital	None			
GTE (Tampa)	\$35.00	250	\$0.25	Cellular	Digital	\$25.00			
Features	Powertel	US Cellular	Alltel	Bellsouth	Sprint PCS	OmniRate	Aerial	GTE	PrimeCo
Voice Mail	Free	\$5.95	Free		Free	Free	Free	\$3.95	Free
Enhanced V. Mail	\$5	\$9.95			\$4.99	\$2.99	\$6.95	\$6.95	
Caller ID	Free	Free	\$3.95	Free	Free	Free	Free	Free	Free
Caller ID block	Free				Free				
Call Waiting	Free	Free	Free	Free	Free	Free	\$1.95	\$1.95	Free
Call Forwarding	\$2.00	\$2.00	Free	Free	10 cents/min	Free	\$1.95	Free	\$1.00
Conference Calling	\$3.00	\$2.00	Free	Free	Free	Free	\$1.95	Free	\$1.00
Call Diversion			Free						
Numeric Paging	Free				Free	Free	Free		
911 Emerg.	Free			Free	Free				Free
1st Incoming Min.	Free				Free	not included	Free	Free	Free
611 Cust. Serv.	Free			Free	Free		Free		Free
Roadside Assis.		\$2.99	\$2.95		\$2.99			\$2.95	\$3.00
Directory Assis.	\$0.50/call			\$0.15/call	\$0.75/call	\$0.69/call	\$0.85/call	\$0.95/call	\$0.75/call
Operator Assis.					Free				
Detailed Billing	\$3	\$3	Free		Free		Free	\$2.50	
Internet Access	\$5								
Fax/Message Receive	\$4				\$1.99		\$4.95	\$3.95	
Fax/Message Send	\$5						Free		
Phone Insurance		\$2.95	\$2.95		\$3.25		\$2.95	\$2.95	
Unlimited Weekends	n/a	\$9.95	\$9.95	\$9.95	\$4.99	\$5-\$0.01/min	\$4.95	\$5/1000	\$5/300&10/1000
Toll Free Calling Area	Home Area	Home Area	Home Area	Home Area	On Network	Florida	Florida	Home Area	Florida
Phone Purchase Required	\$99.95	not required	\$69.00		\$59.99		\$69.95	\$99.99	
Long Distance	\$15.00**			\$0.19/\$0.21	\$0.15	\$0.49	\$0/\$0.15	\$0.14	\$0/\$0.19
Roaming Charges				\$0/\$0.59	\$0.39/\$0.69	\$0/\$0.49	\$0/\$0.49	\$0/\$0.50	\$0/variou
Second Phone Line		\$12.95	\$11.95		n/a		\$9.95		
Contract Required	None	12 months	12 months	12 months	None	None	12 months	12 months	None

\*\*Powertel plan is unlimited long distance to FL, GA, MS, AL, TN, KY, SC, AR, MO, IN, IL, LA.  
GTE offers unlimited nights and weekends; others offer unlimited weekends only.

COMPOSITE OF ALL 251 - 504 MINUTE RATE PLANS											06/30/99
Company	MRC	Free Min.	Addl. Min.	Service	Analog or Digital	Activation Fee					
Powertel (Tally)	\$40.00	400	\$0.25	PCS	Digital						
US Cellular (Tally)	\$65.95	500	\$0.24	Cellular	Digital	\$30.00					
Alltel (Tally)	\$49.95	300	\$0.24	Cellular	Both	\$10.00					
BellSouth (Tally/Miami)	\$45.00	450	\$0.25	PCS	Digital	None					
OmnIRate (Miami)	\$49.99	300	\$0.26	Cellular	Digital	None					
PrimeCo (Miami)	\$34.99	500	\$0.25	PCS	Digital	None					
PrimeCo (Miami)	\$39.99	300	\$0.30	PCS	Digital	None					
Sprint PCS (Miami)	\$49.99	500	\$0.28	PCS	Digital	None					
Aerial (Tampa)	\$49.95	500	\$0.21	PCS	Digital	None					
BellSouth (Tampa)	\$49.95	500	\$0.25	PCS	Digital	None					
PrimeCo (Tampa)	\$49.99	500	\$0.28	PCS	Digital	None					
Sprint PCS (Tampa)	\$49.99	400	\$0.27	PCS	Digital	None					
AT&T (Tampa)	\$39.99	300	\$0.29	Cellular	Digital	None					
AT&T (Miami/Tampa)	\$49.99	500	\$0.25	Cellular	Digital	None					
GTE (Tampa)	\$90.00	500	\$0.25	Cellular	Digital	\$25.00					
Features	Powertel	US Cellular	Alltel	BellSouth	OmnIRate	PrimeCo	Sprint PCS	Aerial	AT&T	GTE	
Voice Mail	Free	\$5.95	Free		Free	Free	Free	Free		\$3.95	
Robocall V. Mail	\$5	\$9.95			\$2.99		\$4.99	\$6.95	Free	\$6.95	
Caller ID	Free	Free	\$3.95	Free	Free	Free	Free	Free	Free	Free	
Caller ID block	Free						Free				
Call Waiting	Free	Free	Free	Free	Free	Free	Free	\$1.95	Free	\$1.95	
Call Forwarding	\$2.00	\$2	Free	Free	Free	\$1.00	10 cents/min	\$1.95	Free	Free	
Conference Calling	\$3.00	\$2	Free	Free	Free	\$1.00	Free	\$1.99	Free	Free	
Call Diversion			Free								
Numeric Paging	Free				Free		Free	Free			
911 Emerg.	Free					Free	Free	Free		Free	
1st Incoming Min.	Free			not included	not included	Free	Free	Free		Free	
611 Cust. Serv.	Free					Free	Free	Free			
Roadside Assis.		\$2.99	\$2.95			\$3.00	\$2.99			\$2.95	
Directory Assis.	\$0.50/call			\$0.85/call	\$0.69/call	\$0.75/call	\$0.75/call	\$0.85/call	\$0.75/call	\$0.95/call	
Operator Assis.							Free				
Detailed Billing	\$3	\$3	Free				Free	Free		\$2.50	
Internet Access	\$5										
Fax/Messg Receive	\$4						\$1.99	\$4.95		\$3.95	
Fax/Messg Send	\$5							Free	Free		
Phone Insurance		\$2.95	\$2.95				\$3.25	\$2.95		\$2.95	
Unlimited Weekends	n/a	\$9.95	\$9.95	\$9.95	\$5/\$0.01/min	\$3/1000/\$10/1000 min	\$4.99	\$4.95	\$4.95	\$5/1000 min	
Toll Free Calling Area	Home Area	Home Area	Home Area	Home Area	Florida	Florida	On Network	Florida	Home Area	Home Area	
Phone Purchase Required	\$99.95	not required	\$49.00				\$59.99	\$69.95	\$69.00	\$99.99	
Long Distance	\$15.00**			\$0.19/\$0.21	\$0.49	\$0(in)/0.19(out)	\$0.15	\$0/\$0.15	\$0.15	\$0.14	
Roaming Charges				\$0.35/\$0.39	\$0/\$0.49	\$0/various	\$0.39/\$0.69	\$0/\$0.49	\$0/\$0.60	\$0/\$0.50	
Second Phone Line		\$13.95	\$11.95				n/a	\$9.95			
Contract Required	none	12 months	12 months	12 months	None	None	None	12 months	12 months	12 months	

\*\*Powertel plan is unlimited long distance to FL, GA, MS, AL, TN, KY, SC, AR, MO, IN, IL, LA.  
 GTE offers unlimited nights and weekends; others offer unlimited weekends only.

Figure 6

COMPOSITE OF ALL 900-1200 MINUTE RATE PLANS									06/30/99
Company	MRC	Free Min.	Addl. Min.	Type of Service	Analog or Digital	Activation Fee			
Alltel (Tally)	\$99.95	1000	\$0.22	Cellular	Both	\$10.00			
BellSouth (Tally)	\$95.00	1100	\$0.20	PCS	Digital	None			
Sprint PCS (Tally)	\$99.99	1000	\$0.20	PCS	Digital	None			
OmniRate (Miami)	\$99.99	900	\$0.22	Cellular	Digital	None			
BellSouth (Miami)	\$95.00	900	\$0.25	PCS	Digital	None			
Sprint PCS (Miami/Tampa)	\$99.99	1200	\$0.18	PCS	Digital	None			
GTE (Tampa)	\$100.00	1200	\$0.25	Cellular	Digital	\$25.00			
Aerial (Tampa)	\$69.95	900	\$0.19	PCS	Digital	None			
BellSouth (Tampa)	\$94.95	1200	\$0.20	PCS	Digital	None			
PrimeCo (Miami/Tampa)	\$89.99	1000	\$0.20	PCS	Digital	None			
AT&T (Miami/Tampa)	\$99.99	1000	\$0.21	Cellular	Digital	None			
Features	Alltel	BellSouth	Sprint PCS	OmniRate	GTE	Aerial	PrimeCo	AT&T	
Voice Mail	Free		Free	Free	\$3.95	Free	Free		
Enhanced V. Mail			\$4.99	\$2.99	\$6.95	\$6.95		Free	
Caller ID	\$3.95	Free	Free	Free	Free	Free	Free	Free	
Caller ID block			Free						
Call Waiting	Free	Free	Free	Free	\$1.95	\$1.95	Free	Free	
Call Forwarding	Free	Free	10 cents/min	Free	Free	Free	\$1.00	Free	
Conference Calling	Free	Free	Free	Free	Free	Free	\$1.00	Free	
Call Diversion	Free								
Numeric Paging			Free	Free		Free			
911 Emerg.			Free				Free		
1st Incoming Min.		not included	Free	not included	Free	Free	Free	not included	
611 Cust. Serv.			Free			Free	Free		
Roadside Assis.	\$2.95		\$2.99		\$2.95		\$3.00		
Directory Assis.		\$0.85/call	\$0.75/call	\$0.69/call	\$0.95/call	\$0.85/call	\$0.75/call	\$0.75/call	
Operator Assis.			Free						
Delayed Billing	Free		Free		\$2.50	Free			
Internet Access									
Fax/Message Receive			\$1.99		\$3.95	\$4.95			
Fax/Message Send						Free		Free	
Phone Insurance	\$2.95		\$3.25		\$2.95	\$2.95			
Unlimited Weekends	\$9.95	\$9.95	\$4.99	\$5.8-\$0.01/min	\$5/1000 min	\$4.95	\$5/3000-\$10/1000 min	\$4.95	
Toll Free Calling Area	Home Area	Home Area	On Network	Florida	Home Area	Florida	Florida	Home Area	
Phone Purchase Required			\$59.99		\$99.99	\$69.95		\$69.00	
Long Distance		\$0.19-\$0.21	\$0.15	\$0.49	\$0.14	\$0/\$0.15	\$0/\$0.19	\$0.15	
Roaming Charges		\$0/\$0.59	\$0.39/\$0.69	\$0/\$0.49	\$0/\$0.50	\$0/\$0.49	\$0/Various	\$0/\$0.60	
Second Phone Line	\$11.95		n/a			\$9.95			
Contract Required	12 months	12 months	None	None	12 months	12 months	None	12 months	
GTE offer unlimited nights and weekends; others offer unlimited weekends only.									

Figure 7

COMPOSITE OF ONE RATE PLANS						06/30/99
Company	MRC	Free Min.	Addtl. Min	Type of Service	Analog or Digital	Activation Fee
Powertel (Tally)	\$50.00	500	\$0.15	PCS	Digital	
Powertel (Tally)	\$70.00	700	\$0.12	PCS	Digital	
Powertel (Tally)	\$90.00	1000	\$0.10	PCS	Digital	
OmniRate (Miami)	\$99.99	700	\$0.39	Cellular	Digital	None
BellSouth (all 3)	\$89.95	600	\$0.25	PCS	Digital	\$25.00
BellSouth (all 3)	\$119.95	1000	\$0.25	PCS	Digital	\$25.00
AT&T (Miami/Tampa)	\$89.99	600	\$0.25	Cellular	Digital	None
AT&T (Miami/Tampa)	\$119.99	1000	\$0.25	Cellular	Digital	None
AT&T (Miami/Tampa)	\$149.99	1400	\$0.25	Cellular	Digital	None
GTE (Tampa)	\$95.00	650	\$0.25	Cellular	Digital	\$25.00
GTE (Tampa)	\$125.00	1100	\$0.25	Cellular	Digital	\$25.00
GTE (Tampa)	\$155.00	1500	\$0.25	Cellular	Digital	\$25.00
Sprint PCS (all 3)	\$29.99	120	\$0.35	PCS	Digital	None
Sprint PCS (all 3)	\$49.99	400	\$0.30	PCS	Digital	None
Sprint PCS (all 3)	\$69.99	600	\$0.25	PCS	Digital	None
Sprint PCS (all 3)	\$99.99	1000	\$0.25	PCS	Digital	None
Sprint PCS (all 3)	\$149.99	1500	\$0.25	PCS	Digital	None
Features	Powertel	OmniRate	BellSouth	AT&T	GTE	Sprint PCS
Voice Mail	Free	Free	Free		Free	Free
Enhanced V. Mail	\$5.00	\$2.99		Free	Free	\$4.99
Caller ID	Free	Free	Free	Free	Free	Free
Caller ID block	Free					Free
Call Waiting	Free	Free	Free	Free	Free	Free
Call Forwarding	\$2.00	Free	Free	Free	Free	10 cents/min
Conference Calling	\$3.00	Free	Free	Free	Free	Free
Call Diversion						
Numeric Paging	Free	Free				Free
911 Emerg.	Free					Free
1st Incoming Min.	Free	not included	not included		Free	Free
611 Cust. Serv.	Free					Free
Roadside Assis.					\$2.95	\$2.99
Directory Assis.	\$0.50/call	\$0.69/call	\$0.85/call	\$0.75/call	\$0.95/call	\$0.75/call
Operator Assis.						Free
Detailed Billing	\$3.00			Free	Free	Free
Internet Access	\$5.00					
Fax/Message Receive	\$4.00			Free	\$3.95	\$1.99
Fax/Message Send	\$5.00					
Phone Insurance					\$2.95	\$3.25
Unlimited Weekends	n/a	n/a	n/a	n/a	n/a	n/a
Toll Free Calling Area	U.S.	U.S.	U.S.	U.S.	U.S.	U.S.
Phone Purchase Required	\$99.95			\$69.00	\$99.99	\$59.99
Long Distance	Free	Free	Free	Free	Free	Free
Roaming Charges		None	None		None	\$0.39/\$0.69
Second Phone Line						n/a
Contract Required	None	None	12 months	12 months	12 months	None

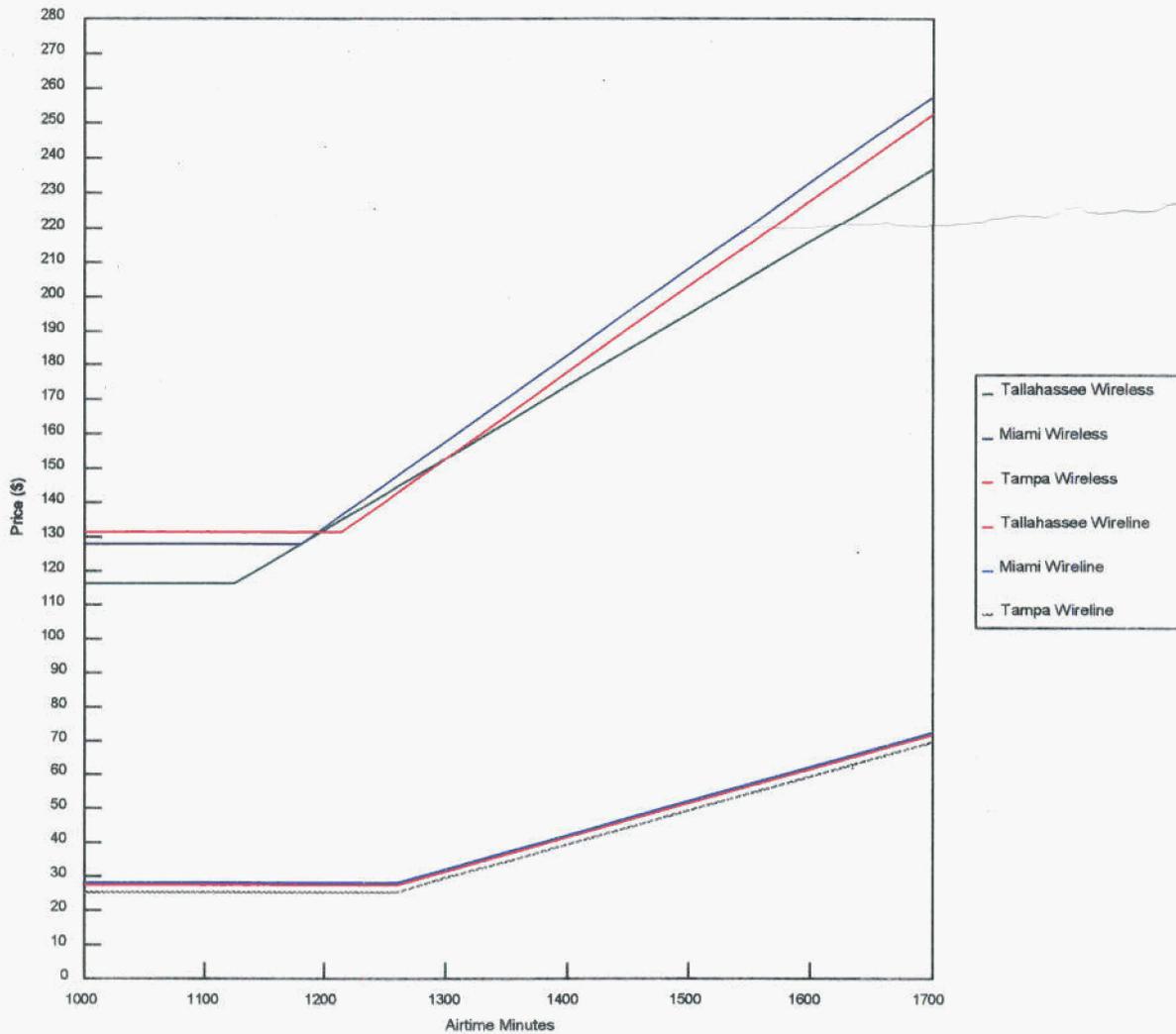
<b>AVERAGE COSTS OF WIRELESS SERVICE</b>				
<b>Tallahassee</b>				
Category	MRC for X included Minutes*	Included Minutes	Additional Airtime/Minute	Cost for 1260 Minutes of Airtime
0-50	\$23.61	18	\$0.38	\$495.57
51-150	\$28.95	93	\$0.31	\$390.72
151-250	\$40.57	202	\$0.32	\$379.13
251-500	\$58.47	463	\$0.27	\$273.66
900-1200	\$99.63	1033	\$0.21	\$147.30
<b>Miami</b>				
Category	MRC for X included Minutes*	Included Minutes	Additional Airtime/Minute	Cost for 1260 Minutes of Airtime
0-50	\$22.16	28	\$0.35	\$453.36
51-150	\$31.73	91	\$0.31	\$394.12
151-250	\$34.99	190	\$0.32	\$377.39
251-500	\$50.64	425	\$0.28	\$284.44
900-1200	\$97.39	1000	\$0.21	\$151.99
<b>Tampa</b>				
Category	MRC for X included Minutes*	Included Minutes	Additional Airtime/Minute	Cost for 1260 Minutes of Airtime
0-50	\$19.63	25	\$0.35	\$451.88
51-150	\$26.61	108	\$0.30	\$372.21
151-250	\$37.43	250	\$0.28	\$320.23
251-500	\$51.09	457	\$0.26	\$259.87
900-1200	\$93.47	1083	\$0.21	\$130.64
<b>AVERAGE COST OF ONE RATE PLANS FOR TALLAHASSEE, MIAMI, AND TAMPA</b>				
<b>Tallahassee</b>				
Category	MRC for X included Minutes*	Included Minutes	Additional Airtime/Minute	Cost for 1680 Minutes of Airtime
One Rate	\$116.23	1125	\$0.21	\$232.78
<b>Miami</b>				
Category	MRC for X included Minutes*	Included Minutes	Additional Airtime/Minute	Cost for 1680 Minutes of Airtime
One Rate	\$127.98	1180	\$0.25	\$252.98
<b>Tampa</b>				
Category	MRC for X included Minutes*	Included Minutes	Additional Airtime/Minute	Cost for 1680 Minutes of Airtime
One Rate	\$131.42	1214	\$0.25	\$247.92
*The monthly charge is inclusive of the four calling features: caller ID, call waiting, call forwarding, and conference calling				

Figure 9

LEC CHARGES FOR TALLAHASSEE, MIAMI, AND TAMPA						06/30/99
	Residential Rate	Business Rate	Subs. Line Charge	Touchtone Charge	Total Res.	Total Bus.
Sprint (Tallahassee)	\$9.65	\$21.75	\$3.50	\$1.00	\$14.15	\$26.25
BellSouth (Miami)	\$10.65	\$29.10	\$3.50	\$0.00	\$14.15	\$32.60
GTE (Tampa)	\$11.81	\$29.90	\$3.50	\$0.00	\$15.31	\$33.40
Features	Sprint Res.	Sprint Bus.	BellSouth Res.	BellSouth Bus.	GTE Res.	GTE Bus.
Voice Mail	non-basic	non-basic	non-basic	non-basic	non-basic	non-basic
Enhanced V. Mail	non-basic	non-basic	non-basic	non-basic	non-basic	non-basic
Caller ID	\$8.00	\$10.00	\$6.00	\$10.00	\$7.00	\$10.00
Caller ID block	non-basic	non-basic	non-basic	non-basic	non-basic	non-basic
Call Waiting	\$5.00	\$6.00	\$4.10	\$5.80	\$4.00	\$5.00
Call Forwarding	\$3.00	\$4.50	\$3.00	\$4.00	\$2.50	\$4.00
3-Way Conferencing	\$3.00	\$4.00	\$4.00	\$4.00	\$3.50	\$4.00
Combination Package (all 4 features)	\$14.50	\$16.00	\$14.10	\$22.90	\$10.20	\$13.80
Call Diversion	non-basic	non-basic	non-basic	non-basic	non-basic	non-basic
6-Way Conferencing	non-basic	non-basic	non-basic	non-basic	non-basic	non-basic
Numeric Paging	non-basic	non-basic	non-basic	non-basic	non-basic	non-basic
911 Emerg.	Free	Free	Free	Free	Free	Free
1st Incoming Min.	Free	Free	Free	Free	Free	Free
611 Cust. Serv.	Free	Free	Free	Free	Free	Free
Roadside Assis.	non-basic	non-basic	non-basic	non-basic	non-basic	non-basic
Directory Assis.	\$0.45/call	\$0.45/call	\$0.30/call	\$0.30/call	\$0.40/call	\$0.40/call
Operator Assis.	Free	Free	Free	Free	Free	Free
Detailed Billing	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable
Internet Access	non-basic	non-basic	non-basic	non-basic	non-basic	non-basic
Fax/Message Receive	Free	Free	Free	Free	Free	Free
Fax/Message Send	Free	Free	Free	Free	Free	Free
Phone Insurance	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable
Unlimited Weekends	non-basic	non-basic	non-basic	non-basic	non-basic	non-basic
Phone Purchase Required	Yes	Yes	Yes	Yes	Yes	Yes
Long Distance						
Roaming Charges	not applicable	not applicable	not applicable	not applicable	not applicable	not applicable
Second Phone Line						
Contract Required	None	None	None	None	None	None
<b>Cost of Basic Service, SLC, TT</b>	<b>Residential</b>	<b>Business</b>				
Sprint (Tallahassee)	\$14.15	\$26.25				
BellSouth (Miami)	\$14.15	\$32.60				
GTE (Tampa)	\$15.31	\$33.40				
<b>Cost of Basic Service, SLC, TT, CC Features</b>	<b>Residential</b>	<b>Business</b>				
Sprint (Tallahassee)*	\$27.65	\$41.25				
BellSouth (Miami)	\$28.25	\$55.50				
GTE (Tampa)	\$25.51	\$47.60				
*Sprint waves the \$1.00 touchtone fee with purchase of a custom calling package.						

<b>Cost of Basic Local Residential Service, Calling Features, and Long Distance</b>				06/30/99
<b>LEC</b>	<b>Local Residential Service</b>	<b>Custom Calling Package</b>	<b>Cost of Service and Features</b>	
Sprint (Tallahassee)	\$14.15	\$13.50	\$27.65	
BellSouth (Miami)	\$14.15	\$14.10	\$28.25	
GTE (Tampa)	\$15.31	\$10.20	\$25.51	
	<b>Long Distance Use/Month</b>	<b>Long Distance Cost/Minute</b>	<b>Long Distance Bill</b>	
Sprint (Tallahassee)	420	\$0.10	\$42.00	
BellSouth (Miami)	420	\$0.10	\$42.00	
GTE (Tampa)	420	\$0.10	\$42.00	
	<b>Local Service Bill</b>	<b>Long Distance Bill</b>	<b>Total Phone Bill</b>	
Sprint (Tallahassee)	\$27.65	\$42.00	\$69.65	
BellSouth (Miami)	\$28.25	\$42.00	\$70.25	
GTE (Tampa)	\$25.51	\$42.00	\$67.51	

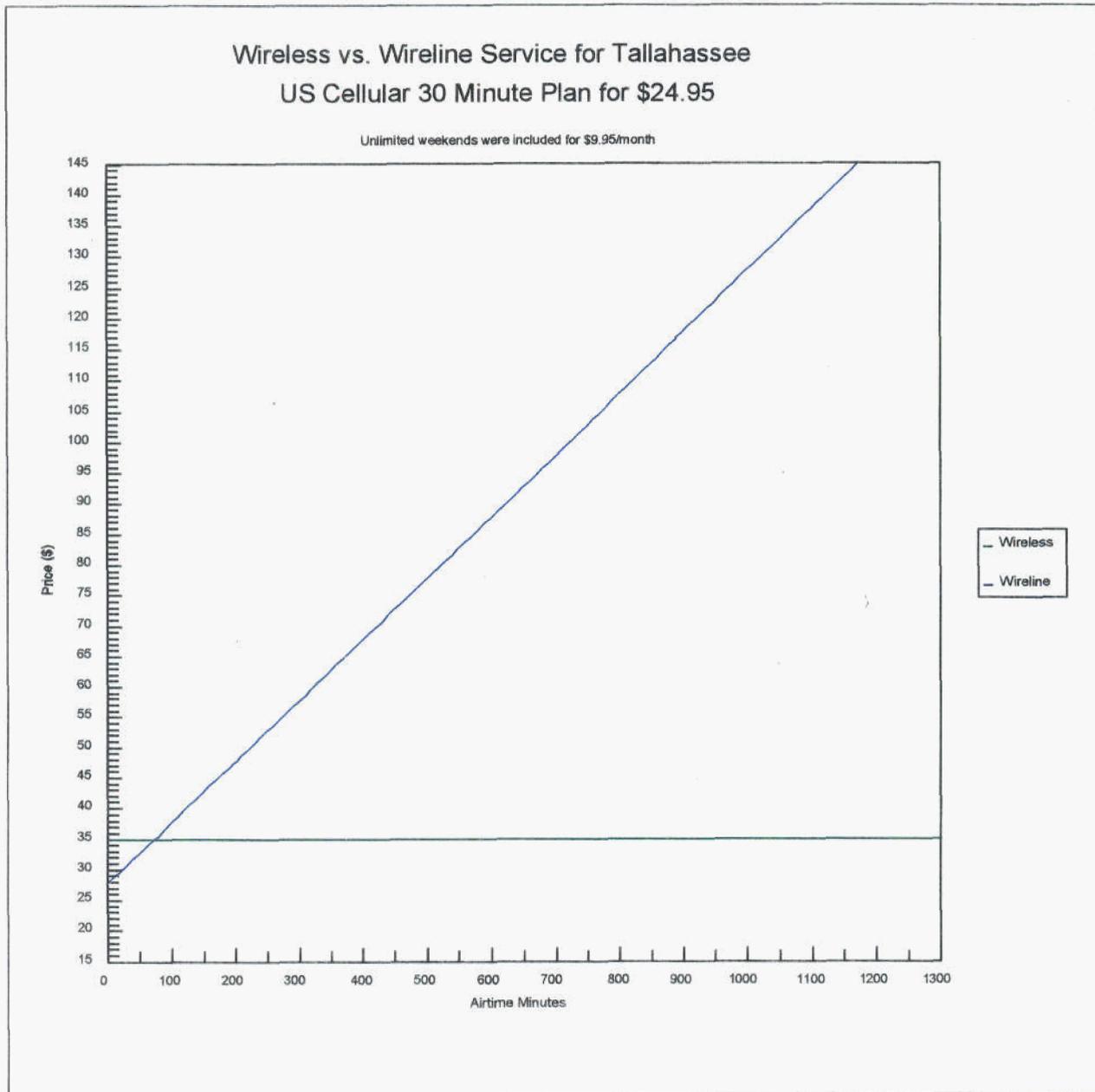
### Cost of Wireless vs. Wireline Service One Rate Plans



City	Cost of Wireline excluding long distance (residential)	Cost of Wireline for the average number of minutes (including residential long distance)	Cost of Wireless for the number of included minutes	Cost of Wireless for the average number of minutes
Tallahassee	\$27.65	\$69.65/1680 minutes	\$116.23/1125 minutes	\$232.78/1680 minutes
Miami	\$28.25	\$70.25/1680 minutes	\$127.98/1180 minutes	\$252.98/1680 minutes
Tampa	\$25.51	\$67.51/1680 minutes	\$131.42/1214 minutes	\$247.92/1680 minutes

Note that the cost of wireless service is an average among all the one rate plans offered in each city.

### Wireline Service Compared to Wireless Service with Unlimited Weekends



This graph reflects calls placed from Tallahassee to Gainesville, FL. Further, the two curves intersect at 73 minutes.

Figure 2: Potential Range of Competitors and Technologies Providing Wireless Services, 1998

What is the Service?	What Type of Service is It?	Is It a Potential Competitor to Wireline?	Is It Analog or Digital?	How is It Licensed?	What are Some Characteristics and Observations?	Who Pays for the Technology/Service?	What is Its Availability to Consumers?
Air-Ground Radiotelephone	Wireless	No	Analog and Digital	Licensed by application	Expensive Convenient Limited bandwidth	Company builds network; customer pays per call and per minute of use	Available
AM and FM Radio	Broadcast	No	Analog and Digital	Licensed by application	Mature market	Advertising	Widely available
Cellular	Wireless	Yes	Analog and Digital	Licensed by application	Limited bandwidth; limited reliability for data and capability Transition from analog to digital in major markets With use of Cellular Digital Packet Data (CDPD) technology, data packet messaging and fax are possible	Company builds and operates the cellular network; customer pays for service with a choice of plans using monthly flat rates and minutes of use	Widely available
Cordless Telephones; Wireless Appliances; Industrial, Scientific, and Medical (ISM) Equipment; Unlicensed Equipment (Non-Licensed)	Cordless	No, this is wireline	Analog and Digital	Unlicensed with specific spectrum bands	Limited range from base station at customer location	Consumer purchase	Available

What is the Service?	What Type of Service is It?	Is It a Potential Competitor to Wireline?	Is It Analog or Digital?	How is It Licensed?	What are Some Characteristics and Observations?	Who Pays for the Technology/Service?	What is Its Availability to Consumers?
DARS (Digital Audio Radio Satellite)	Satellite Broadcast	No	Digital	Licensed by auction	Not Applicable (N/A)	N/A	Available after the year 2000
DBS (Direct Broadcast Satellite); BSS (Broadcast Satellite Service)	Satellite Broadcast	No	Digital	Licensed by auction	Broadband	Advertising customers	Available
DEMS (Digital Electronic Message Service)	Broadcast and Point-to-Multipoint	Yes	Digital	Licensed by application	Antenna placement; two-way broadband	Customers	Available only in major markets
FSS (Fixed Satellite Service); GSO (Geostationary Orbit) Mobile Satellite	Satellite	Yes, when used as transport for voice and other services	Digital	Licensed by application	High-cost deployment	Customers	Available
GWCS (General Wireless Communications Service)	Wireless		Digital	Will be auctioned	Limited bandwidth	N/A	Not available
IMTS (Improved Mobile Telephone Service)	Wireless	No (cost and limited capacity prevent this)	Analog	Licensed by application	Limited capacity	Company builds radio system Customer pays monthly flat rate and per minute of use	Limited Not many systems left because of replacement by cellular systems
IVDS (Interactive Video and Data Services)	Wireless	No	Digital	Licensed by auction	Not implemented	N/A	Not Available

What is the Service?	What Type of Service is It?	Is It a Potential Competitor to Wireline?	Is It Analog or Digital?	How is It Licensed?	What are Some Characteristics and Observations?	Who Pays for the Technology/Service?	What is Its Availability to Consumers?
LEO (Low-Earth Orbit) Satellites, Big	Satellite	Yes	Digital	Licensed by application	Varies from wideband to Narrowband	N/A	Available after the year 1999
LEO (Low-Earth Orbit) Satellites, Broadband	Satellite	Yes	Digital	Licensed by application	Broadband	N/A	Available after the year 1999
LEO (Low-Earth Orbit) Satellites, Little	Satellite	No	Digital	Licensed by application	Narrowband	Customers	Available
LMDS (Local Multipoint Distribution Service); Cellular Cable; Cellular TV	Wireless	Yes	Digital	Licensed by auction	Technology at trial stage Deployment costs unpredictable	N/A	Not available
MAS (Multiple Address Systems)	Point-to-Multipoint Wireless	No	Analog and Digital	Licensed by application, moving to license by auction	Low-speed data	Network providers/customers	Widely available
MDS (Multipoint Distribution Service); MMDS (Multichannel Multipoint Distribution Service); Wireless Cable TV; ITFS (Instructional Television Fixed Service)	Wireless	Yes	Analog	Licensed by application, then licensed by auction	Broadband	Network providers/customers	Not available

What is the Service?	What Type of Service is It?	Is It a Potential Competitor to Wireline?	Is It Analog or Digital?	How is It Licensed?	What are Some Characteristics and Observations?	Who Pays for the Technology/Service?	What is Its Availability to Consumers?
MSS (Mobile Satellite Service)	Satellite	Yes, when used as transport for voice and other services	Digital	Licensed by application	High-cost deployment Untested technology for wireless application Envisioned as voice/data services	Customers	Currently available to companies and government for TV and Radio above 1 GHz range
Offshore Radiotelephone Service	Wireless	No	Analog	Licensed by application	Limited applicability for communication to ships or sites	Customers	Available off the U.S. coast only
Paging	Wireless	No	Analog and Digital	Licensed by application	Generally, one-way paging	Customers	Widely available
PCS, Broadband	Wireless	Yes	Digital	Licensed by auction	Voice and data	Customers	Available
PCS, Narrowband; PCS, Unlicensed	Wireless	No	Digital	Licensed by auction	Narrowband data applications Some two-way response paging	Customers	Limited availability
Rural Radiotelephone Service	Wireless	No	Analog and Digital	Licensed by application	Extension of wireline service in some areas	Customers	Available in some rural areas

What is the Service?	What Type of Service is It?	Is It a Potential Competitor to Wireline?	Is It Analog or Digital?	How is It Licensed?	What are Some Characteristics and Observations?	Who Pays for the Technology/Service?	What is Its Availability to Consumers?
BETRS (Basic Exchange Telephone Radio Service)	Wireless	No	Digital	Licensed by application	Extension of wireline service in some areas  Splits a single channel into four subscriber lines  Limited Application  Poor voice quality  Small amount of available spectrum	Customers	Available in some rural areas
SMR (Specialized Mobile Radio); CSMR (Covered Specialized Mobile Radio); ESMR (Enhanced Specialized Mobile Radio)	Wireless	Yes	Digital	Licensed by application, then by auction	Narrowband Voice	Customers	Available
TV (Television), Broadcast:							
Analog	Broadcast	No	Analog	Licensed by application	Mature market Wide penetration	Advertising	Available
Digital TV (DTV)	Broadcast	No	Digital	Licensed by application	Broadband	Advertising	Not available

What is the Service?	What Type of Service is It?	Is It a Potential Competitor to Wireline?	Is It Analog or Digital?	How is It Licensed?	What are Some Characteristics and Observations?	Who Pays for the Technology/Service?	What is Its Availability to Consumers?
220 MHz Radio Service	Wireless	No	Analog and Digital	Licensed by application, then by auction	Data Commercial dispatch Point-to-point communications	N/A	Not implemented
WCS (Wireless Communications Service)	Wireless	Yes	N/A	Licensed by auction	N/A	N/A	Not implemented
WLL (Wireless Local Loop); FWA (Fixed Wireless Access)	Wireless	Yes	Digital	Spectrum not allocated in the United States  Available internationally on a large scale	Voice and Data	Customers	Limited Availability

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