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Ben G. Almond
Executive Director-
Federal Regulatory

Suite 900
1133-21st Street, N.W.
Washington, D.C. 20036
202 463-4112
Fax: 202 463-4198

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March 20, 1996

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MAR 20 1996

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, NW, Room 222
Washington, DC 20554

RE: CC Docket 95-185 Interconnection Between Local Exchange Carriers and Commercial Mobile Radio Services Providers Ex Parte

Dear Mr. Caton:

Attached is a study by PNR & Associates addressing issues related to the Commission's "Bill and Keep" proposal.

Please associate this document with the above referenced proceeding. Some of the accompanying charts are in color.

If there are questions or comments about this study, please contact the undersigned.

Sincerely,

Ben G. Almond

Ben G. Almond
Executive Director-Federal Regulatory

Attachment

cc: Michele Farquhar
Lauren "Pete" Belvin
Todd Silbergeld
Jim Coltharp
Barbara Esbin
Dan Grosh
Jay Markley
Suzanne Toller
Regina Keeney
Robert M. Pepper
John Nakahata
Jim Casserly
Jackie Chorney

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Robert T. Blau, Ph.D, CFA
Vice President - Executive and
Federal Regulatory Affairs

Suite 900
1133-21st Street, N.W.
Washington, D.C 20036-3351
202 463-4108
Fax: 202 463-4631

March 20, 1996

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Michele Farquhar, Esq.
Chief, Wireless Telecommunications Bureau
Federal Communications Commission
2025 M Street, N.W.
Room 5002
Washington, DC 20554

Michele

Dear ~~Ms. Farquhar~~:

Since releasing its Notice of Proposed Rulemaking in CC Docket 95-185, the Commission has expressed an interest in seeing hard data addressing various policy issues raised in the NPRM. The enclosed study from PNR Associates, a telecommunications market research firm based in Philadelphia, is responsive to that request.

The study analyzes *per call* information derived from individual billing records of 645 residential cellular telephone customers and a database of wireline calling statistics covering 22 million local and toll calls made at several LEC central office locations. It contains three findings that address the basis for the Commission's "bill & keep" proposal.

First, 82 percent of the nearly 16,000 cellular calls contained in the PNR database originated on cellular systems, while only 18 percent originated on wireline networks and terminated on the cellular systems. Thus, the PNR study discredits the first of two assumptions on which the Commission's "bill & keep" proposal is based; namely, that outgoing and incoming cellular telephone traffic is balanced in which case there would be no need for cellular and wireline carriers to bill one another for interconnection arrangements since their respective costs would be comparable.

Second, the study shows that peak usage of cellular and wireline telephone networks generally occur during the same periods. For instance, peak demand for wireline capacity occurs during the late morning (10:00 am to 12:00 pm), and late afternoon (3:00 pm to 5:00 pm) on weekdays when about 31.6 percent of all minutes of use occur. By comparison, 31.9 percent of the 32,000 outgoing minutes of cellular telephone usage analyzed by PNR occurred during these same hours. As such, the study refutes the assumption that the LECs' costs of providing interconnection arrangements for cellular systems are *de minimis* because most cellular traffic is presumed to occur during periods when usage of wireline networks is off peak.

Third, the PNR study indicates that incoming cellular calls do not add significantly to peak capacity requirements of cellular systems. Indeed, only 14 percent of all minutes of use handled by cellular systems during the peak usage hour of 4:00 pm to 5:00 pm resulted from incoming calls versus 86 percent which resulted from outgoing calls. These data are relevant because they discredit the argument that differences in interconnection costs incurred by wireline and cellular carriers may justify a "bill & keep" arrangement even if outgoing and incoming calls are not balanced.

In short, the PNR study conclusively demonstrates that the Commission "bill & keep" proposal is clearly at odds with the public interest. In addition to being patently unfair and arguably confiscatory to the LECs, their customers, and shareholders, preempting negotiated settlements with a mandatory "bill & keep" arrangement will result in a far less efficient system of interconnection arrangements than those currently in place. It also will create a new set of distorted incentives for full service telecommunications companies like AT&T to use their wireless networks to bypass interstate access services as well as other LEC service features.

I would very much appreciate an opportunity to discuss the results and implications of the PNR study in the near future.

Sincerely yours,

Bob

Cellular Telephone Calling Patterns for Residential Customers

Prepared by:
PNR & Associates

March 1996

Cellular Telephone Calling Patterns for Residential Customers

INTRODUCTION AND SUMMARY

In January, the Federal Communications Commission initiated a rulemaking proceeding in which it proposed to replace negotiated network interconnection agreements between commercial mobile radio service (CMRS) providers and local exchange carriers (LECs) with a mandatory "bill and keep" pricing policy. Under the Commission's proposal both the LEC and the CMRS provider would terminate calls on their respective networks at no charge to the originating carrier.

The Commission's proposal is intended to encourage the development of CMRS as a competitive alternative to local wireline telephone networks. It would accomplish this, presumably, by reducing the cost of providing wireless relative to wireline services. The "bill and keep" proposal is predicated on one of two conditions being satisfied: 1) traffic between wireless and wireline carriers is balanced, in which case there would be no reason to bill for terminating one another's calls; or 2) the cost of terminating cellular telephone calls on LEC networks is negligible because most cellular calling occurs during the off-peak hours of the wireline network. If this were true, carriers might elect to forego the expense associated with charging for network interconnections even if traffic is not balanced.

This study addresses each of these assumptions using per-call information derived from actual monthly billing records of 645 residential cellular telephone customers and a database of wireline calling statistics covering 22 million local and toll calls made at several LEC central office locations. Among other things, these data show that:

- *Cellular telephone traffic that terminates on cellular and LEC networks is not balanced.* Approximately 82 percent of all residential customers' cellular telephone calls are "outgoing" in that they originate on cellular systems and terminate on wireline telephone networks or another cellular system. The remaining 18 percent of all residential customers' cellular calls are "incoming" in that they are received by the cellular customer in question. Approximately 98 percent of all "outgoing" cellular calls terminate on a local telephone network while the remaining 2 percent terminate on a cellular system and, therefore, may not traverse the local wireline network.

- *Peak usage of wireline and cellular networks generally occurs during the same periods of the day.* Peak LEC demand among residential customers generally occurs during late morning (i.e., 10:00 am to 12:00 pm) and late afternoon (i.e., 3:00 pm to 5:00 pm) hours. These are also hours of high demand on cellular networks. Approximately 31.6 percent of all minutes of traffic carried on LEC networks occurs during these hours, compared with 31.9 percent of all outgoing cellular minutes placed by residential customers.

- *Incoming cellular calls do not add significantly to capacity requirements of cellular networks.* Only 14 percent of all minutes of use handled by cellular systems during the peak usage hour of 4:00 pm to 5:00 pm resulted from incoming calls versus 86 percent which resulted from outgoing calls.

CELLULAR CALLING DATA

The cellular calling data used in this study were derived by PNR and Associates from a proprietary PNR database. This database contains monthly billing information for local telephone, long distance, cellular telephone, and cable television services. The billing information for over 10,000 households was supplied voluntarily by a randomly selected sample during the Spring of 1995. These households are members of a national consumer panel and are surveyed as a group once a year.

Cellular telephone bills were collected from most of those households subscribing to cellular service, which comprised nearly 1,000 of the 10,000 participating households. Because these bills are obtained from households, rather than from business entities, the data in the billing database generally reflects cellular usage of residential cellular subscribers rather than business subscribers. These residential customer accounts may be used in whole or in part for business purposes, however. The billing data was not screened to exclude business-related calls from these accounts. Accordingly, the billing data may reflect a mix of business and personal calling patterns occurring on residential customer accounts.

The database compiled from the 1,000 cellular participants' cellular telephone bills contains specific telephone call information from 645 households and for over 16,000 calls, including the time, date, and duration of calls, whether calls are incoming or outgoing, and whether the called number is a landline or cellular telephone number. (The remaining cellular bills are from carriers not providing call detail or from households that made no cellular calls during that billing period.) These data were used to determine the proportion of cellular calls that are incoming (i.e., cellular-terminated) versus outgoing (i.e., cellular-originated), and the proportion of outgoing calls that are made to wireline versus cellular telephone numbers. In addition, these data were used to construct a time-of-day distribution of weekday cellular calling, which accounts for 80 percent of the total cellular calls and minutes of use.

WIRELINE CALLING DATA

Wireline time-of-day calling data were derived from a proprietary PNR database of 22 million local and toll calls made at several different central office switch locations. All calls made at those switch locations (local, toll, business, and residence) are included. The switch locations include urban, suburban, and rural areas.

RESULTS OF THE STUDY

"Outgoing" versus "Incoming" Cellular Calls

Table 1 below highlights the distribution of cellular telephone calls by whether they originate or terminate on cellular systems. Approximately 82 percent of all cellular calls in the database were "outgoing" in that they originated on the customers' cellular network, while 18 percent of all cellular calls in the database were incoming calls terminated on the customers' cellular network. Of the "outgoing" calls, approximately 98 percent terminated on a wireline telephone network, while 2 percent were terminated on a cellular telephone network.

Table 1

Distribution of Incoming and Outgoing Cellular Telephone Calls

Time of Day	Incoming Calls	Outgoing Calls
8 am to 6 pm	19%	81%
Other Hours	16%	84%
Total Calls	**18%**	**82%**

Cellular versus Wireline Time-of-Day Traffic Distributions

Table 2 and Charts 1 and 2 show the weekday call distributions and minutes-of-use distributions for both outgoing cellular and wireline calling hour by hour throughout the day. Both charts show that the time-of-day distribution of cellular calling is similar to that of wireline calling. For instance, peak usage of local wireline networks occurs between 10:00 am and 12:00 pm, when 16.3 percent of all minutes-of-use occur and between 3:00 pm and 5:00 pm when 15.3 percent of all minutes-of-use occur. Peak usage of cellular systems is very similar. By comparison, 13.8 percent of all minutes of cellular traffic occur between 10:00 am and 12:00 pm and 18.1 percent of all minutes of cellular traffic occur between 3:00 pm and 5:00 pm. The call distribution figures (i.e., number of calls per hour) yield similar results.

Table 2

Wireline versus Outgoing Cellular
Call Distribution and Minutes of Use Distribution
(Weekday Calls/Minutes by Hour)

TIME OF DAY	WIRELINE			CELLULAR		
Beginning Hour	% of Total Calls This Hour	% of Total Minutes This Hour	Average Minutes/Call	% of Total Calls This Hour	% of Total Minutes This Hour	Average Minutes/Call
8:00 am	5.28%	5.05%	2.94	4.25%	3.89%	1.99
9:00 am	7.81%	7.78%	3.07	6.02%	6.10%	2.20
10:00 am	8.74%	8.49%	2.99	7.14%	7.55%	2.29
11:00 am	8.70%	7.85%	2.78	6.46%	6.26%	2.10
12:00 pm	7.39%	6.57%	2.74	6.07%	5.72%	2.05
1:00 pm	7.71%	7.38%	2.94	7.45%	7.58%	2.21
2:00 pm	7.84%	7.31%	2.87	7.78%	8.57%	2.39
3:00 pm	8.59%	7.74%	2.77	8.64%	8.42%	2.12
4:00 pm	8.15%	7.51%	2.84	9.15%	9.63%	2.29
5:00 pm	6.53%	6.80%	3.20	9.91%	8.68%	1.90
6:00 pm	5.84%	6.49%	3.42	6.34%	6.14%	2.10
7:00 pm	4.42%	5.95%	4.14	4.57%	3.99%	1.89
8:00 pm	3.17%	4.37%	4.25	4.24%	4.99%	2.56
9:00 pm	2.01%	2.85%	4.36	3.76%	4.08%	2.36
10:00 pm	1.53%	2.39%	4.81	1.81%	2.13%	2.56
11:00 pm	0.75%	1.21%	4.90	0.67%	0.74%	2.40
Other Hours	5.52%	4.26%	2.37	5.75%	5.52%	2.08
Total	100.0%	100.0%		100.0%	100.0%	

Cellular Traffic Distributions by Type of Call and Time-of-Day

Tables 3 and 4 and Charts 3 and 4 highlight the weekday call distribution and minutes-of-use distribution for incoming, outgoing, and total cellular traffic. Both charts show that incoming calls and minutes-of-use account for a relatively small percentage of total usage and do not add significantly to network capacity requirements. For example, data depicted in Table 4 indicate that minutes-of-use of incoming cellular calls constitute only 14 percent of all cellular traffic during the hour of 4:00 pm to 5:00 pm when total usage of cellular capacity is at its peak. The remaining 86 percent of all total minutes of use during the peak cellular calling hour were occupied by outgoing calls.

Chart 1

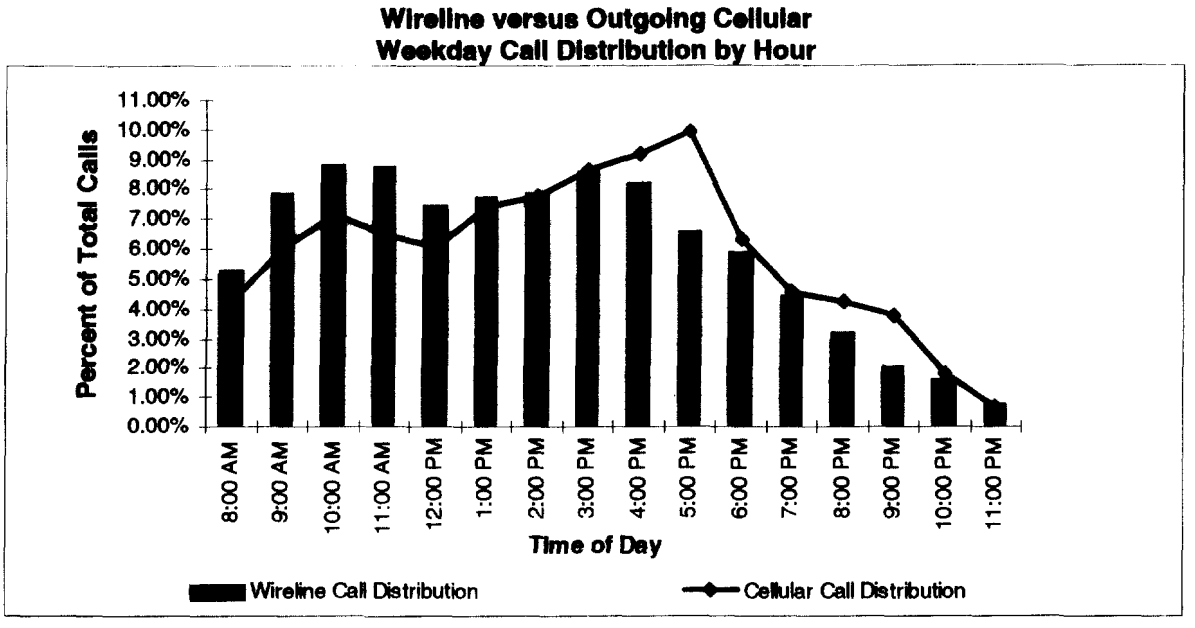


Chart 2

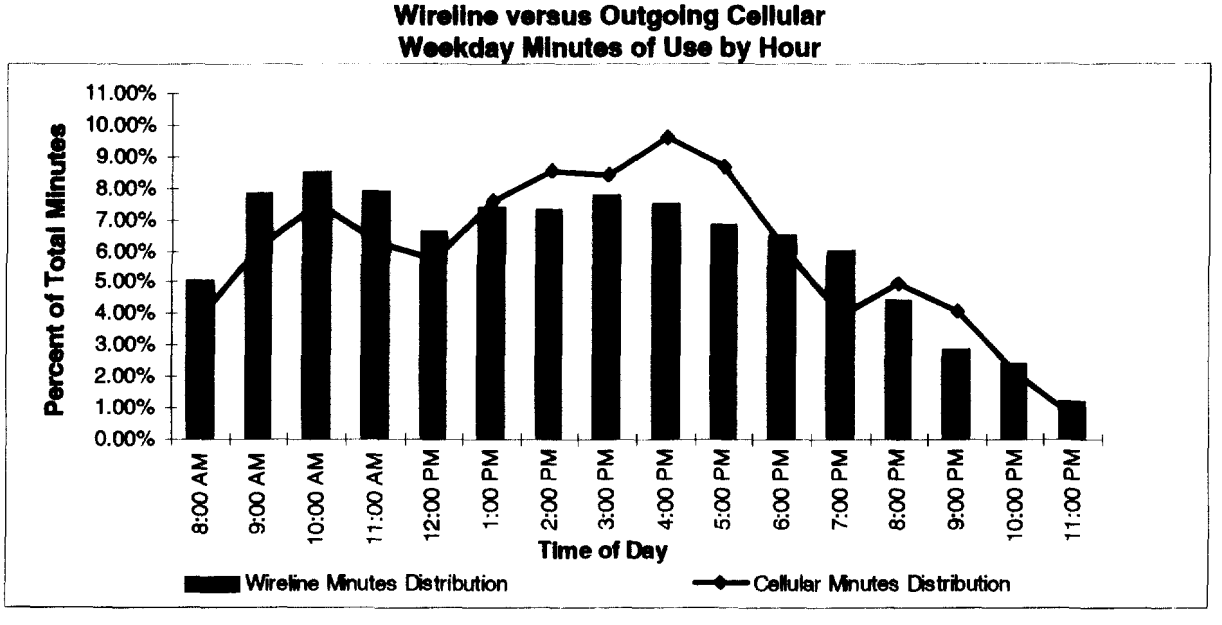


Table 3
Distribution of Cellular Calls by Time of Day
(Weekday Calling)

TIME OF DAY	INCOMING CALLS			OUTGOING CALLS			TOTAL CALLS	
Beginning Hour	Number of Calls	Percent This Hour	% of Total This Hour	Number of Calls	Percent This Hour	% of Total This Hour	Number of Calls	Percent This Hour
8:00 am	110	4.56%	19.10%	466	4.25%	80.90%	576	4.31%
9:00 am	141	5.85%	17.60%	660	6.02%	82.40%	801	5.99%
10:00 am	196	8.13%	20.04%	782	7.14%	79.96%	978	7.32%
11:00 am	192	7.96%	21.33%	708	6.46%	78.67%	900	6.73%
12:00 pm	214	8.87%	24.35%	665	6.07%	75.65%	879	6.58%
1:00 pm	200	8.29%	19.69%	816	7.45%	80.31%	1016	7.60%
2:00 pm	166	6.88%	16.31%	852	7.78%	83.69%	1018	7.62%
3:00 pm	180	7.46%	15.99%	946	8.64%	84.01%	1126	8.42%
4:00 pm	198	8.21%	16.50%	1002	9.15%	83.50%	1200	8.98%
5:00 pm	229	9.49%	17.41%	1086	9.91%	82.59%	1315	9.84%
6:00 pm	155	6.43%	18.26%	694	6.34%	81.74%	849	6.35%
7:00 pm	106	4.39%	17.46%	501	4.57%	82.54%	607	4.54%
8:00 pm	69	2.86%	12.95%	464	4.24%	87.05%	533	3.99%
9:00 pm	66	2.74%	13.81%	412	3.76%	86.19%	478	3.58%
10:00 pm	25	1.04%	11.21%	198	1.81%	88.79%	223	1.67%
11:00 pm	18	0.75%	19.78%	73	0.67%	80.22%	91	0.68%
Other Hours	147	6.09%	18.92%	630	5.75%	81.08%	777	5.81%
Total	2,412	100.0%		10,955	100.0%		13,367	100.0%

Chart 3

Distribution of Cellular Calls by Time of Day

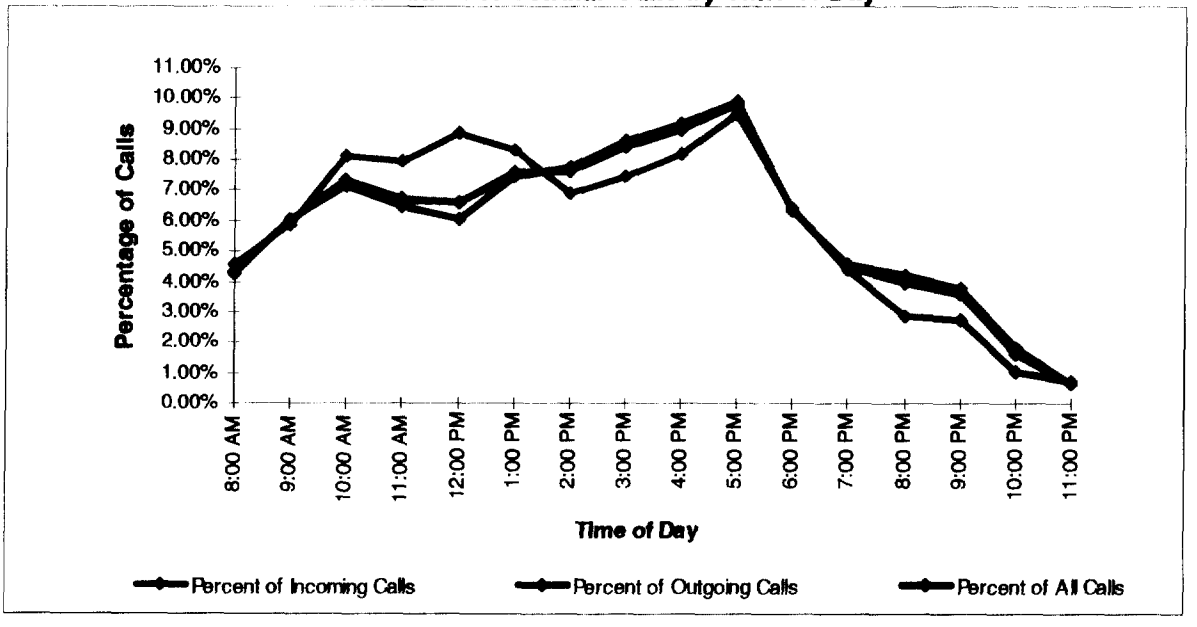
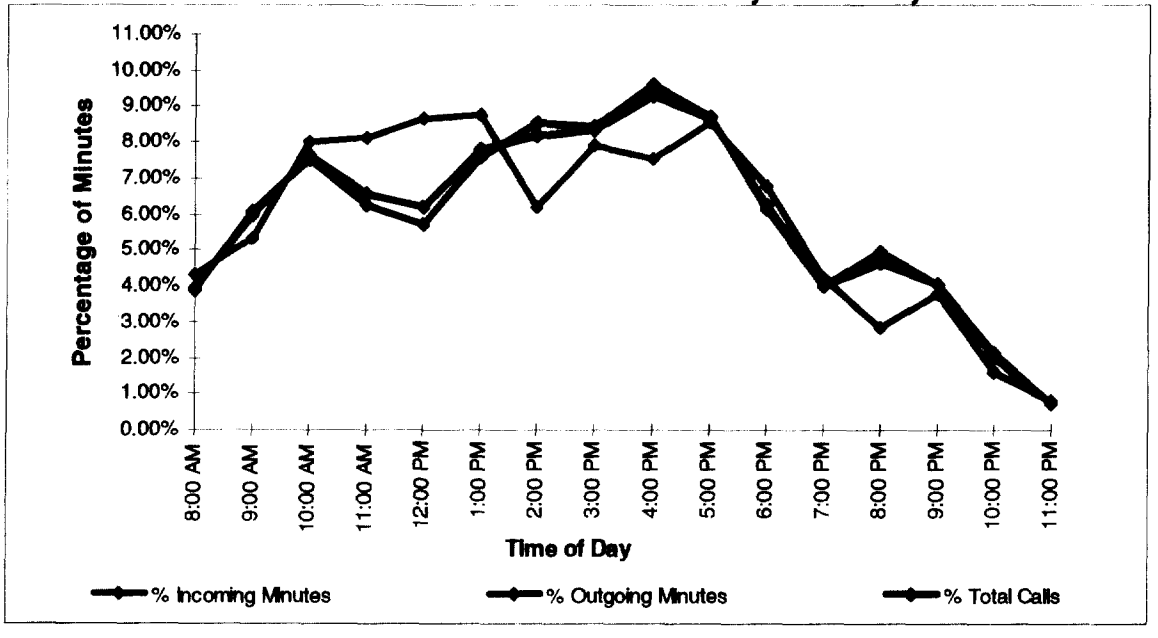


Table 4
Distribution of Cellular Minutes-of-Use by Time of Day
(Weekday Calling)

TIME OF DAY	INCOMING MINUTES			OUTGOING MINUTES			TOTAL MINUTES	
Beginning Hour	Number of Minutes	Percent This Hour	% of Total This Hour	Number of Minutes	Percent This Hour	% of Total This Hour	Number of Minutes	Percent This Hour
8:00 am	208	4.32%	18.34%	926	3.89%	81.66%	1134	3.97%
9:00 am	258	5.36%	15.11%	1450	6.10%	84.89%	1708	5.97%
10:00 am	386	8.02%	17.71%	1794	7.55%	82.29%	2180	7.63%
11:00 am	391	8.13%	20.80%	1489	6.26%	79.20%	1880	6.58%
12:00 pm	415	8.63%	23.37%	1361	5.72%	76.63%	1776	6.21%
1:00 pm	421	8.75%	18.93%	1803	7.58%	81.07%	2224	7.78%
2:00 pm	298	6.19%	12.76%	2038	8.57%	87.24%	2336	8.17%
3:00 pm	379	7.88%	15.91%	2003	8.42%	84.09%	2382	8.33%
4:00 pm	363	7.55%	13.68%	2290	9.63%	86.32%	2653	9.28%
5:00 pm	410	8.52%	16.57%	2064	8.68%	83.43%	2474	8.65%
6:00 pm	327	6.80%	18.31%	1459	6.14%	81.69%	1786	6.25%
7:00 pm	203	4.22%	17.62%	949	3.99%	82.38%	1152	4.03%
8:00 pm	136	2.83%	10.29%	1186	4.99%	89.71%	1322	4.62%
9:00 pm	183	3.80%	15.86%	971	4.08%	84.14%	1154	4.04%
10:00 pm	76	1.58%	13.06%	506	2.13%	86.94%	582	2.04%
11:00 pm	38	0.79%	17.84%	175	0.74%	82.16%	213	0.75%
Other Hours	319	6.63%	19.56%	1312	5.52%	80.44%	1631	5.71%
Total	4,811	100.0%		23,776	100.0%		28,587	100.0%

Chart 4

Distribution of Cellular Minutes-of-Use by Time of Day



CONCLUSIONS

The data presented above provide a quantitative basis for evaluating the assumptions underlying the Commission's "bill and keep" proposal. The data show that neither of the conditions predicated by the Commission for utilization of a mandatory "bill and keep" scheme is satisfied.

With respect to the first predicate on which "bill and keep" could be based -- that LEC-interconnected CMRS traffic is balanced between incoming and outgoing -- the data show that this is not the case. Instead, the data indicate a substantial imbalance between cellular-originated and wireline-originated traffic. Specifically, the data demonstrate that for residential cellular customers the ratio of outgoing to incoming calls is 82 to 18. The study further indicates that the proportion of outgoing cellular traffic that does not utilize LEC interconnections (i.e., calls between cellular telephone numbers) is less than 2 percent.

With respect to the second predicate on which "bill and keep" could be based -- that the cost of terminating CMRS calls on LEC networks is negligible -- the data indicate that this too is not the case. The analysis underlying the Commission's tentative belief that the second condition could be true is premised on the assumption that the peak hours of CMRS traffic are different from the peak hours for wireline traffic, and that accordingly the LEC's termination of peak-hour CMRS-originated traffic occurs during the LEC's off-peak hours, thereby imposing *de minimis* incremental costs on the LEC. The data suggest that this assumption is not valid because the peak hours for both cellular and wireline traffic are similar. The termination of the cellular carrier's peak-hour traffic on the LEC's network occurs during the hours of peak wireline network usage. Accordingly, the termination of cellular-originated traffic by the LEC will cause the LEC to incur incremental costs that cannot be assumed to be *de minimis*.

Finally, because cellular minutes-of-use for incoming calls represents such a small portion (e.g., 14 percent) of total traffic handled by cellular providers during the peak calling hour of 4:00 pm to 5:00 pm, the incremental cost of terminating LEC originated traffic on cellular systems appears to be relatively low, albeit not zero.

Attachment A

A. Wireline versus Outgoing Cellular Weekday Average Minutes per Call

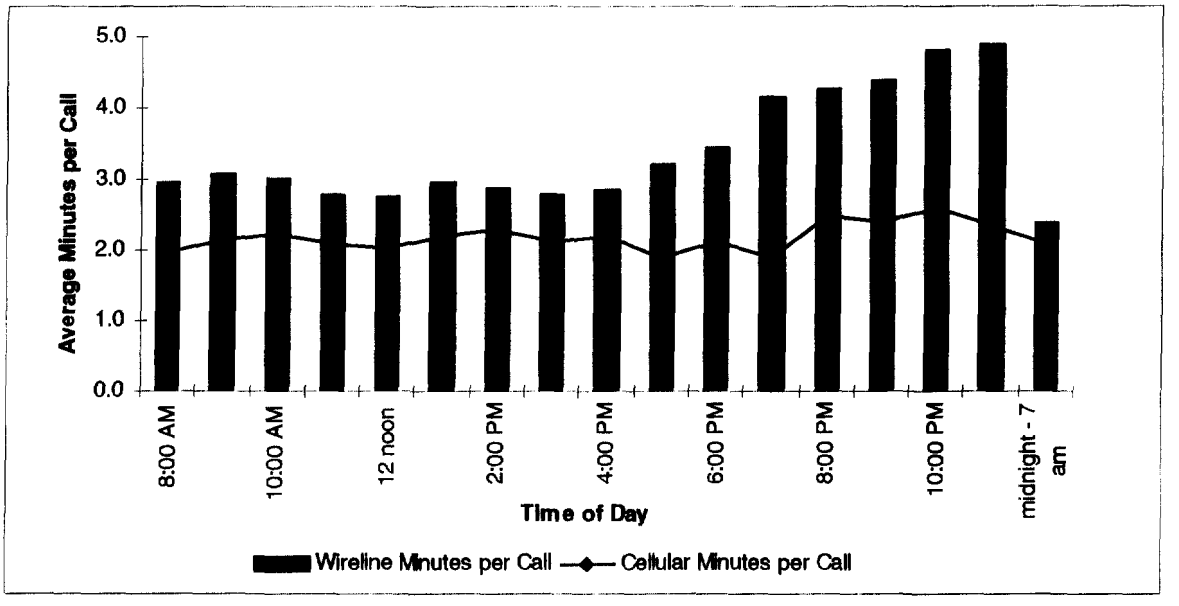
B. Outgoing Cellular Calling Patterns - Weekday versus Weekend

C. Outgoing Cellular Calling Patterns by Income - Call Distribution by Time of Day

D. Outgoing Cellular Calling Patterns by Income - Minutes-of-Use Distribution by Time of Day

Chart A

Wireline versus Outgoing Cellular Weekday Average Minutes per Call



Charts B.1-3

Outgoing Cellular Calling Patterns
Weekday versus Weekend

Chart B1 - Cellular Calls

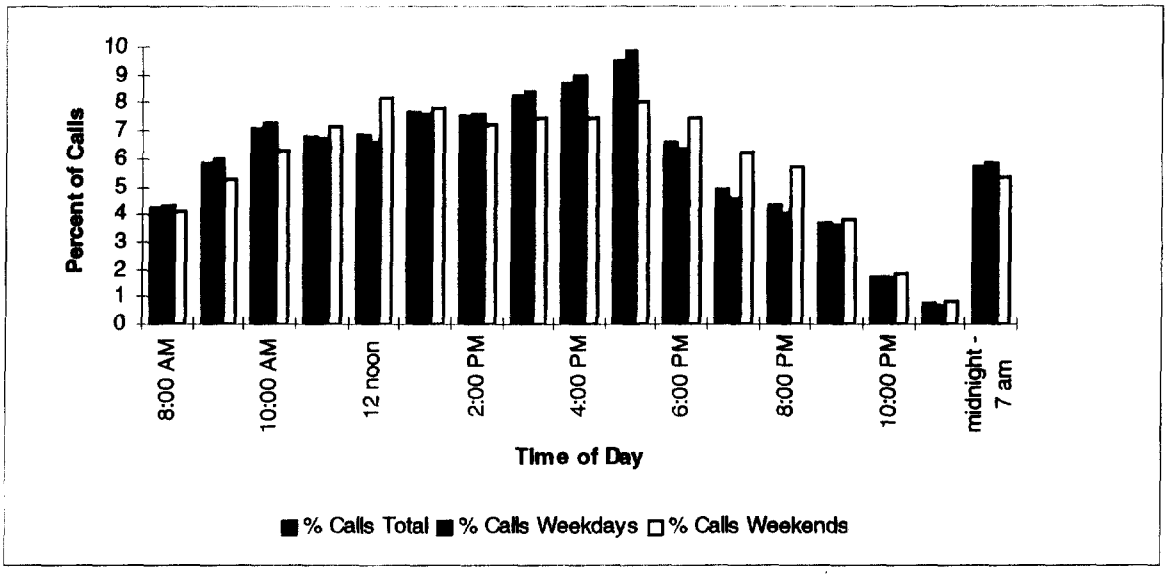


Chart B2 - Cellular Minutes of Use

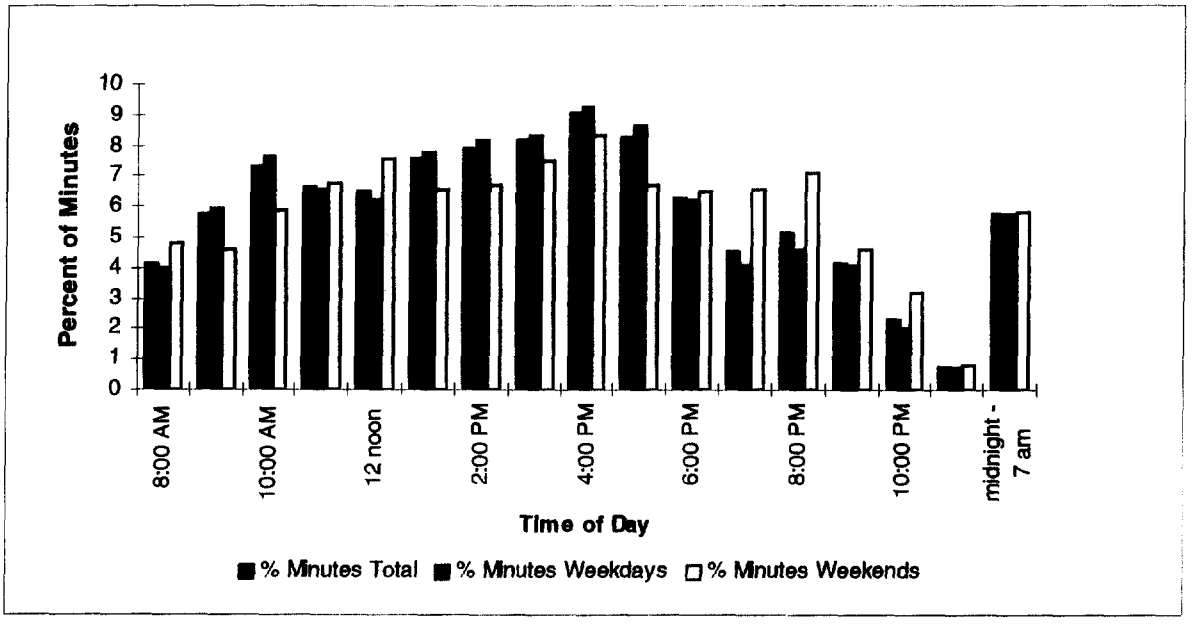


Chart B3 - Cellular Minutes per Call

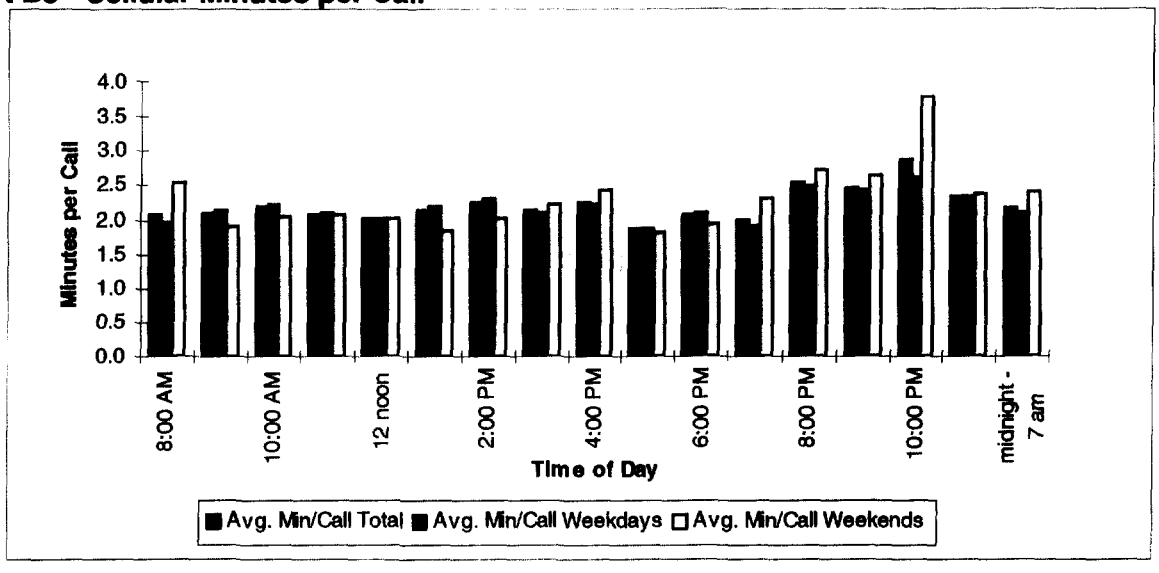
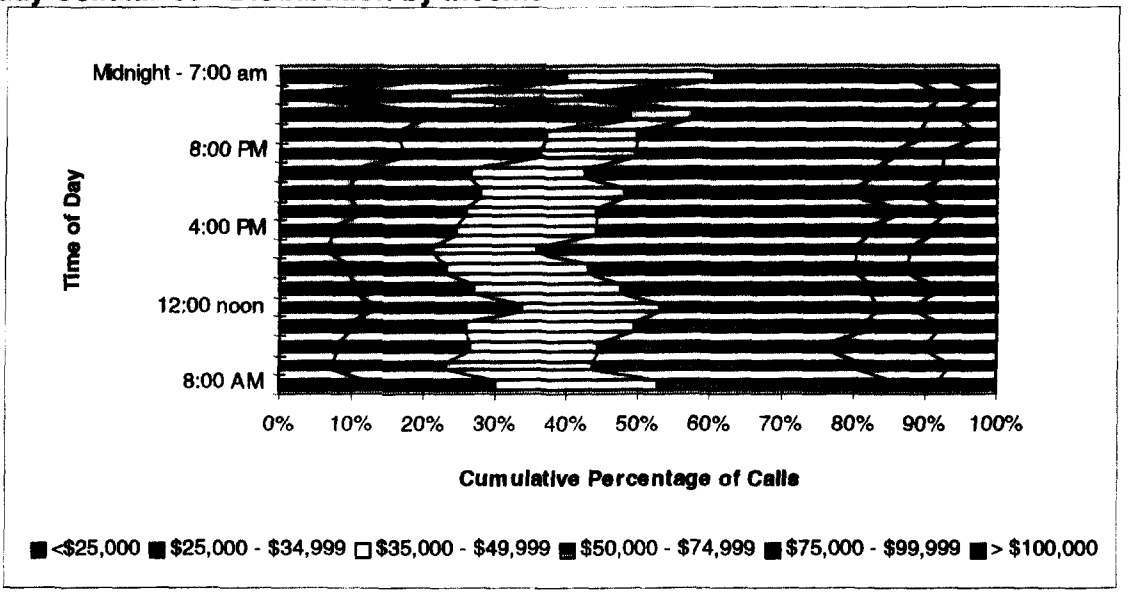


Chart C

Outgoing Cellular Calling Patterns by Income
Call Distribution by Time of Day

Weekday Cellular Call Distribution by Income



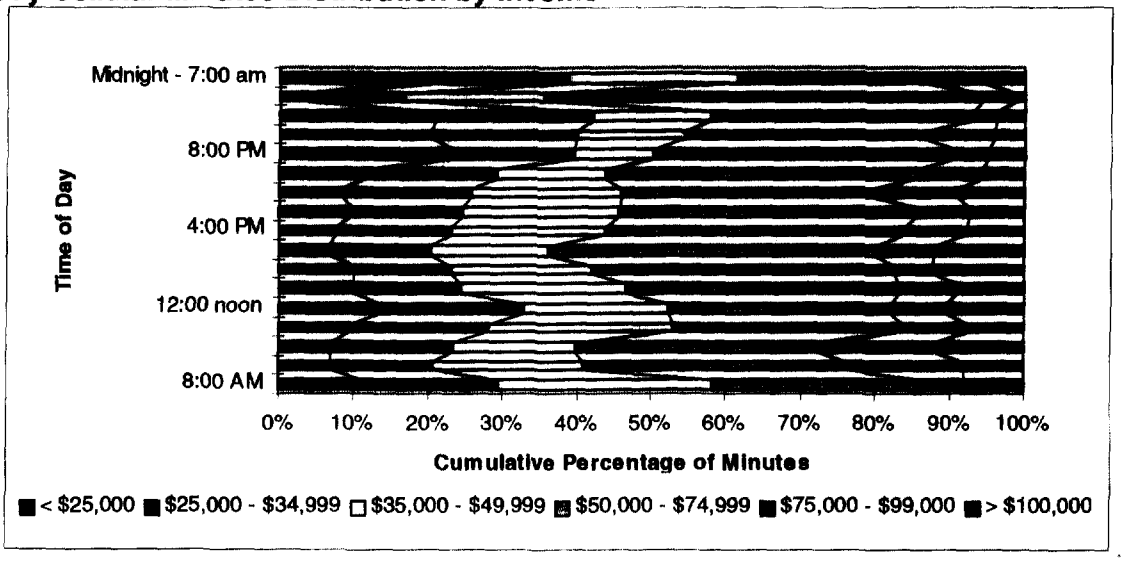
Weekday Cellular Call Distribution (percent) by Time & Income

At Least / Less Than							
	10.59	17.32	18.75	36.04	8.43	8.88	100
	12.02	18.03	22.75	32.4	6.65	8.15	4.25
	7.27	15.91	20.45	36.82	12.73	6.82	6.02
	8.06	18.41	17.9	32.23	13.81	9.59	7.14
	9.75	16.1	23.73	32.2	9.89	8.33	6.46
	12.78	20.75	19.55	29.92	6.02	10.98	6.07
	10.54	16.42	20.59	34.56	9.07	8.82	7.45
	9.39	13.73	20.07	36.97	7.28	12.56	7.78
	6.55	14.69	14.69	44.4	7.4	12.26	8.64
	7.19	17.27	19.66	37.82	8.98	9.08	9.15
	10.87	14.92	18.42	41.62	6.72	7.46	9.91
	9.51	18.3	20.32	32.13	9.22	10.52	6.34
	10.18	16.17	16.17	39.92	9.78	7.78	4.57
	16.81	19.4	13.15	36.21	6.9	7.54	4.24
	16.26	20.63	12.86	39.32	7.52	3.4	3.76
	19.7	28.79	9.09	32.32	4.55	5.56	1.81
	4.11	19.18	19.18	49.32	5.48	2.74	0.67
	18.57	21.11	20.95	27.62	5.08	6.67	5.75

Chart D

Outgoing Cellular Calling Patterns by Income
Minutes-of-Use Distribution by Time of Day

Weekday Cellular Minutes Distribution by Income



Weekday Cellular Minutes Distribution (percent) by Time & Income

At Least / Less Than							
	11.08	16.08	19.49	36.18	8.71	8.47	100
	11.34	18.03	28.94	27.75	5.94	7.99	3.89
	6.83	13.86	20.14	35.24	15.79	8.14	6.1
	6.86	16.5	16.56	32.44	15.61	12.04	7.55
	9.67	18.4	24.85	30.69	9.07	7.32	6.26
	13.59	19.32	19.4	29.9	7.05	10.73	5.72
	9.98	14.25	22.41	36.38	8.15	8.82	7.58
	9.81	13.2	18.84	40.73	5.2	12.22	8.57
	6.59	13.68	15.83	43.98	7.84	12.08	8.42
	7.42	15.63	20.92	39.96	8.43	7.64	9.63
	9.74	14.73	21.27	39.92	7.12	7.22	8.68
	8.29	17.41	20.29	33.31	11.65	9.05	6.14
	11.38	17.7	14.86	41.52	8.96	5.58	3.99
	23.61	15.85	10.88	40.3	4.64	4.72	4.99
	20.39	19.36	14.73	32.23	9.17	4.12	4.08
	20.95	20.95	16.01	35.18	3.16	3.75	2.13
	2.29	14.29	18.86	58.86	4.57	1.14	0.74
	21.27	17.53	22.64	25.15	7.77	5.64	5.52