Since the business line rate *includes* a dedicated subscriber loop to the central office for each line, ordering 24 analog business lines requires, in theory, that the telephone company provide 24 individual loops to the central office, 24 line cards at the central office, and 24 line ports (for example, in the line concentration module (LCM) of the DMS-100 switch, Option 3 in Figure 3). In contrast, the use of T-1 capacity requires only two (2) loops for all 24 channels, no line cards or ports, and a single trunk port in the digital trunk controller (DTC) (Option 1 in Figure 3) and is therefore far less costly, in terms of network resources, for the telephone company to provide than standard analog service. Nevertheless, rather than reflect this efficiency, BOC tariffs (such as the previously discussed) typically charge more for the T-1 arrangement than for the less efficient analog service. Consequently, many PBX and other high-volume users who *should be served via T-1 lines and trunk port connectivity* are induced to order the less expensive (but potentially more costly to provide) analog service with LCM termination.[26]

Disproportionate growth in off-peak demand by Internet and other on-line services users has the effect of reducing the average per-minute cost of local telephone network traffic for all PSTN users.

Finally, an understanding of the potential impact of increased network use upon ILEC costs requires a brief review of some of the basic arithmetic characteristic of capital-intensive industries such as local telephone networks. For this purpose, we offer the following numerical exercise. The average cost of PSTN usage (e.g., calls, minutes) can be calculated for any given PSTN resource by dividing the busy hour capacity cost of the resource by the *total usage* of the component. Thus, a switch with a busy hour capacity of 500,000 minutes may carry 150-million minutes over the course of a month.[27] If the total (capital and operating) cost of the switch is $250,000,[28] then the per-minute cost for the switch is $250,000/150-million, or $0.0017.

26. The use of trunk port connections by high-volume end users, such as large PBXs and ISPs, will largely eliminate the kind of switch congestion problems that some ILECs have reported. However, network congestion can still occur if the ILEC has failed to provide an adequate number of interoffice trunks to handle the traffic in and out of a given end office switch. This is a question of planning, and is a problem that can be readily avoided simply by providing adequate interoffice trunk capacity over all routes. As we discuss below in Section 3, ILECs receive compensatory revenues for the calling services they provide to and for ISPs that are more than sufficient to cover the costs incident to any required capacity expansion.

27. This relationship is based on the following assumptions: The busy hour represents 10% of the total daily use, and there are 30 business days per month.

28. This assumes a purchase cost for the switch of $10-million and a 0.30 annual composite carrying cost (i.e., $3-million per year, $250,000 per month).

Now, suppose that, as a result of increased off-peak (primarily residential) use of on-line services and the Internet, the total monthly use of the switch increases to 165-million minutes, but with no change in peak-hour demand. The average cost per minute will now be $0.0015 (i.e., $250,000/165-million), with no change in the total operating cost of the PSTN.

Finally, assume a "worst case" scenario under which most of the increased use was during the late evening hours, so that the office busy hour actually shifted from mid-afternoon to 10 pm, and the peak capacity demand increased from 500,000 minutes to 550,000. This will lead to a less-than-proportionate increase in capacity cost[29] (let's use 5% in this example), such that the monthly cost of the switch will be $262,500. However, at the new, increased monthly traffic volume of 165-million minutes, the average cost per minute will be $0.0016, *again less than the $0.0017 cost per minute prior to the growth in on-line traffic*. As discussed below, this usage also produces significant additional revenues from second lines. Thus even where the growth in Internet use, and additional lines ordered by the customer to support that use, causes the LEC to incur additional capacity costs, the incremental revenue gained will be more than sufficient to recover any modest increase in total network costs.

Any physical or functional similarity between PSTN use by interexchange carriers and by ISPs is both coincidental and immaterial, because such similarities also exist between IXC use and that of any number of other end users of local network applications.

One justification for the imposition of an access charge regime involves a perceived similarity between ESPs and IXCs in their usage of the PSTN. However, that there may be similarities in the concentration of local network traffic by IXCs and ISPs is neither surprising nor relevant. ISPs, like IXCs, use the ILEC network to aggregate traffic throughout a LATA for delivery to one, or at most a few, points of presence (POPs). But the use of the local network for traffic aggregation to a single point of collection is also done by any number of other large end users. Central office trunks serving large PBXs, automatic call distributors (ACDs), banks or other financial institutions, local radio station talk shows or call-in contests all exhibit traffic patterns and properties that are similar to those characteristic of IXC switched access trunks — i.e., high use at the point of concentration requiring transport over the local network between the PBX or ACD and the calling or called party.

29. Because the costs of many switch and network components are fixed, only *variable* costs will increase with an increase in peak demand. Hence, total network costs (i.e., fixed plus variable costs) will tend to rise proportionately less than the relative increase in total traffic-sensitive capacity.

For example, a medium-sized business might have a PBX that serves 900 individual station lines. Assuming a typical average busy hour use per PBX station line of 3 CCS, such a customer would require 97 PBX trunks in order to maintain a P.01 grade of service (i.e., one blocked call per 100 attempts).[30] Each of those PBX trunks would then carry, on average, approximately 28 CCS of traffic in the busy hour — a traffic volume that is comparable to those attributed to ESP/ISP use in the BOC studies and the Bellcore study.[31] Larger PBXs, with correspondingly greater numbers of station lines and trunks, can support even more intensive usage of those trunks at any given level of blocking (for example, at the P.01 grade of service mentioned above). A typical PBX system can, and indeed will, support high levels of trunk usage, with a level of blocking well within normal network tolerances. The usage levels for ESP trunks as cited by the BOCs are therefore not particularly noteworthy; indeed, they are found frequently among other large-volume end users.

PBXs are sometimes even designed to support a full 36 CCS per-trunk load. A PBX can be arranged to utilize queuing rather than contention for providing station lines with trunk access. Also, trunk groups designed for very intensive use can be engineered to fill to capacity, then pass overflow calls off to a separate, "final group" of trunks. In this case the high usage trunk group could well have a usage of 36 CCS, but this measurement would not provide the complete picture of how the PBX system in question uses the network. PBX trunk groups that support even full-capacity usage have existed in the context of voice telephony for decades without causing any "meltdown" of the local telephone network. There is no reason why comparable per-trunk traffic loads on lines used for data traffic should have any greater impact.

30. This calculation is derived from a Poisson trunk capacity table at a P.01 grade of service. 900 station lines with an average busy hour use of 3.0 CCS requires 2700 CCS busy hour capacity. 97 trunks would be required to support this level of demand with one blocked call per 100 attempts. Average utilization of each trunk in the group will be 28 CCS (i.e., 2700/97 out of a theoretical maximum utilization of 36 CCS per trunk).

31. The BOC studies claim peak hour traffic levels for ESPs using analog connections of 26 CCS (Bell Atlantic study, at 6); 27 CCS (US West study, based on peak usage of 45 minutes per hour); approximately 32 CCS (NYNEX Study, based on average of peaks for the ISPs for which data was provided in the Attachment); and an average ranging from 13 to 21 CCS, with some individual hunt groups at 30 CCS (Pacific Bell Study, at 2).

3 | BOC INTERNET IMPACT STUDIES: GENERAL ASSESSMENT

The BOC studies that have been submitted to the FCC, as well as several recent claims made by senior BOC officials, overstate the severity of the congestion that may be caused by data traffic on the PSTN and ignore significant sources of revenue.

The primary evidence that the BOCs have offered regarding the impact of data traffic on the public switched telephone network is encapsulated in the studies that four of them (US West, Pacific Telesis, Bell Atlantic, and NYNEX) and Bellcore, have submitted to the FCC. These studies vary considerably both as to their length and level of detail, but all contend that Internet use causes congestion on their local telephone networks without compensating revenues to fund network changes needed to relieve this congestion.

None of the BOC studies, however, offers a comprehensive picture of the impact of ESP/ISP use on their networks and resources. Instead, the four BOC studies rely upon isolated, worst-case situations in which the specific central offices that were selected for examination happen in each case to directly serve one or more on-line service providers. In this section, we review the key features common to all of the BOC studies, detailing general flaws that, when corrected, refute BOC claims of any widespread congestion problem, and BOC assertions that they are not being compensated for ESP traffic.

The BOC studies rely entirely upon anecdotal evidence gleaned from a few isolated, worst-case central offices that were specifically selected because of their unusual traffic conditions.

The four BOC studies were highly selective in the exchanges and central office switches they examined. Of the approximately 5,200 central office switches in the territories of U S West, Pacific Telesis, NYNEX, and Bell Atlantic,[32] the BOCs selected only some 127 central office switches (or 2.4%) for inclusion in their studies. Moreover, of those central offices selected for study, only a very few had traffic patterns the might be

32. FCC, *Preliminary Statistics of Common Carriers*, 1995, Table 2.1).

considered problems. For example, Pacific Bell operates 790 central office switches in California.[33] However, only 29 central offices were selected for examination in the Pacific Telesis study, and of those only one was mentioned specifically as an example where data traffic constituted a significant fraction of total switch traffic.[34] Moreover, that central office was located in Silicon Valley, where Internet, ESP, and telecommuting usage patterns are in all probability far above average. Thus, while the Pacific Telesis study cites a general trend of longer holding times and later busy hours for ESPs in the state, it only points to specific data traffic conditions at a single switch that happens to be located in the midst of what may well be the largest concentration of computer industry professionals in the nation. Indeed, Pacific Telesis itself has recently started to adjust its position on the issue. According to John Britton, a Pacific Bell spokesman, the media reports of an impending meltdown are greatly exaggerated:

> The prospect of the network being overjammed would never happen. . . . The problem is only that one location [i.e., the Silicon Valley switch] during the evening. The state's phone network is not in trouble because of the Internet.[35]

As further evidence of Pacific Bell's recent retreat from claims of impending doom, in comments to the California Public Utilities Commission filed in November, the company stated:

> There has been no deterioration of service in our network. In fact, except for a temporary situation at one switching center which we corrected, we have maintained our usual standard of more than 99% of calls going through on the first attempt. We are committed to maintaining the quality of our network.[36]

Indeed, the fact that the network has *not* been placed in any sort of jeopardy by Internet and other data applications was underscored in November by Raymond F. Albers, the Chair-

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33. FCC, *Preliminary Statistics of Common Carriers*, 1995, Table 2.10.

34. Pacific Telesis study at 2. Although Pacific's study also claims that it has experienced incremental expenses addressing ESP network impacts (*Id.*), how those expenses relate to the 29 central offices, or the single switch discussed, is ambiguous. However, later statements by the company (quoted subsequently in this study) make clear that from Pacific's perspective, only a single specific switch was considered a "problem."

35. "Out of a Jam: Pacific Bell's Answer to Congestion on the Net has some Competitors Skeptical," *San Jose Mercury News*, Friday, November 8, 1996 at 1C. The article makes clear that Mr. Britton is referring to the aforementioned Silicon Valley switch.

36. Reply Comments of Pacific Bell to Comments in Response to the Managing Commissioner's Ruling Concerning Market and Technical Conditions, California PUC, R.93-04-003, I.93-04-002, R.95-04-043, I.95-04-044, dated November 14, 1996, at 42.

man of the Network Reliability Steering Committee of the Alliance for Telecommunications Industry Solutions (ATIS), an organization of incumbent LECs. In a statement in response to BOC reports on the ISP issue, Albers stated that it was unlikely that Internet usage could cause "reportable" PSTN outages.[37]

In general, the BOC/Bellcore studies focus largely or entirely on the *terminating* end of the end-user-to-ESP connection. Costs, to the extent that they are attributable specifically to calls to ESPs and ISPs, are most easily measured at the terminating end, as the BOC studies attempt to do. However, *revenues* are almost entirely generated at the *originating* end of the call, which the studies essentially ignore. Hence, as the following simple diagram illustrates, it is not surprising that the studies reach the incorrect conclusion that costs exceed revenues.

	Origination	**Termination**
Revenues	High	Low
Costs	Low	Moderate

Table 2. Sources of BOC Costs and Revenues From Calls to ESPs.

It seems clear that when both the originating and terminating ends of ESP calls — and all relevant costs and revenues — are included, the BOC studies' conclusion can be soundly rejected.

37. "Internet 'Not to Blame' for Network Outages," *Telecommunications Reports*, November 4, 1996, at 32.

A careful examination of the various BOC impact studies compels the following specific conclusions.

While this report will in a later section identify the critical flaws in each of the BOC and Bellcore studies individually, analysis of the data presented in the studies collectively leads to two key conclusions.

Internet use is not responsible for disproportionately increased PSTN costs. The BOC studies all present a view of the impact of on-line service usage on their facilities at an anecdotal level, and offer no statistical or other support for the proposition that these isolated experiences can be extrapolated to the local network as a whole. The studies all focus upon specific cases of switches that serve ESPs/ISPs, and Bell Atlantic and Pacific Bell both quantify the expenses associated with modifications made to specific switches allegedly because of ESP traffic.[38] This overly narrow view of the PSTN fails to give an accurate picture of the broader impact of data traffic on the BOC networks as a whole.

Bell Atlantic, for example, discusses specific switch-related investments it claims were caused by ISP traffic, including estimated expenses in three instances.[39] Those expenditures ranged from $200,000 to some $2-million for a single switch. However, even if Bell Atlantic has spent as much as $2-million to upgrade a specific 5ESS switch that happens to serve an ISP (which, the Bell Atlantic study itself admits was an exceptionally high figure for such an upgrade),[40] the study offers no information as to how much the Company would have otherwise spent *on that same switching entity* for routine upgrades and capacity expansion *even if no consequential data communications traffic were present.* Central office switches are highly modular in their design. LECs typically configure a new switch with capacity sufficient to handle the initial demand, and periodically expand that capacity by adding line and trunk ports and other components as demand grows over time. In 1995 alone, Bell Atlantic spent more than $409-million on central office switch acquisitions and upgrades,[41] and the annual rate of expenditure on switching and other local network resources does not appear to have any direct relationship with the recent growth of the Internet. Hence, the $2.5-million in total expenditures that the Bell Atlantic

38. Pacific Telesis study, at 2; Bell Atlantic study, at 15.

39. Bell Atlantic study, at 9-13.

40. *Id.*, at 9-10.

41. ARMIS 43-02 Reports, 1995.

study ascribed to Internet demand for the specific cases that were described constitutes little more than statistical noise.[42]

Internet and other data communications users are major sources of increased BOC revenues. A second key flaw that is common to the BOC studies is that they have each ignored altogether the significant amount of revenue that these companies currently derive from the growth of Internet and on-line traffic. As we discuss in greater detail below, the BOCs are uniformly incorrect in their claim that they derive no revenues from calls placed to ISPs and ESPs — that such calls are "free" to the calling party. This attempt to disclaim the presence of substantive revenues fails to acknowledge the fact that the local rate structures applicable for these calls impose the responsibility for payment upon the *calling party* rather than on the *recipient* of the call.[43] Thus, the mere fact that the ESP that *receives* an incoming call from an Internet user does not pay for its receipt does not make the call "free" or non-revenue-producing to the ILEC.

The fact that calls that are *sent paid* by their originators are delivered without charge to their intended recipients is entirely analogous to the case of a large-volume mail recipient. One example of such a recipient is a local telephone company, which receives massive amounts of mail from customers containing checks in payment of monthly telephone bills. Each envelope received by the local telephone company carries a 32-cent stamp affixed by the sender, which covers the costs of sorting, routing, and delivering the envelope and its contents. Although the Postal Service undeniably does incur costs to physically deliver the mail, it does not charge the recipient for such deliveries, because the 32-cent stamp on each envelope is fully compensatory. Indeed, no one has ever seriously suggested that large volume mail recipients should pay an *additional* fee for receiving such mail.

If the Postal Service were to adopt the methodology of the BOCs in examining the costs of large volume mail deliveries, it would have to confine its examination solely to the

42. Bell Atlantic's total 1995 additions to plant in service was approximately $2.39-billion, the vast majority of which was spent to expand and upgrade circuit-switched network capacities to accommodate general growth in subscriber access lines and in public switched network usage. Between 1990 and 1994, Bell Atlantic's annual construction budget varied between $2.13-billion and $2.39-billion. (Sources: ARMIS, 43-02 Report, 1995; Annual Reports Form M and 10K of Bell Atlantic-Delaware, C&P of D.C., C&P of Maryland, New Jersey Telephone, Bell of Pennsylvania, C&P of Virginia and C&P of West Virginia.) Indeed, these figures dwarf even the $30-million that the Bell Atlantic study estimates is its total annual cost, including upgrades and all other expenses, of serving ISPs. (Bell Atlantic study at 15.)

43. It is important to note that under access charges the originator of the call to an interexchange carrier does not directly pay for the access connection. Instead, the charge for access is billed to the IXC, which then bills its customer for the end-to-end long distance call. The BOC studies are unclear as to whether they would forego the charges they derive from what are currently local calls to ESPs under an access charge scenario, although that would certainly seem to follow. Note also that the reclassification of ISP/ESP calling from the state to the interstate jurisdiction will affect jurisdictional cost allocations under Part 36 of the FCC's Rules, and may require adjustments in the authorized revenues of ILECs at both the state and federal levels.

delivery activity (i.e., to the costs of the trucks that are used to transport the incoming mail) and, like the BOCs, would have to ignore entirely both (a) the fact that the postage has already been paid, and (b) costs are incurred when delivering first-class mail to "ordinary" (i.e., non-bulk) mail recipients by letter carriers.[44] Such a study would reach the erroneous conclusion that the recipients of mail should be charged in order to cover the cost of delivery, for precisely the same reason that the BOC studies reached their own similarly erroneous conclusions. As the postal service analogy demonstrates, this methodology requires that one ignore material facts, limit measurements to selected situations, and fail to provide a comprehensive examination of all elements of the service provisioning and delivery processes.

Local telephone calls are either paid for by the calling party on a per-call basis, or on a "flat-rate" basis, whereby a fixed monthly fee is imposed for unlimited calling on a single subscriber access line. These state-regulated rates typically exceed the underlying incremental cost of local network usage, and are thus compensatory to the ILEC.[45] Moreover, while it is often claimed that residential exchange access service is priced below cost, such claims go to the *access line* (i.e., loop) portion of the service, not to local usage. Local usage, whether provided on a measured- or flat-rate basis, is almost invariably priced well in excess of incremental cost.[46] Moreover, to the extent that the demand for *additional residential access lines* is being satisfied through the use of capacity that is already in place (most ILECs have for many years been providing a minimum of two pairs per residential premises, sometimes as many as four distribution pairs in upscale neighborhoods[47]), the out-of-pocket cost of furnishing additional lines to existing residential premises is extremely low.

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44. Indeed, such costs are likely *higher*, on a per-piece basis, than for bulk deliveries.

45. While it may be possible to identify isolated cases of extremely high-use flat-rate subscribers, these are rare and certainly not confined to data communications users. Minutes of use from ESP users and all other users are included in the calculation of average usage to determine flat rates, so the fact that a particular high usage telephone customer pays a flat rate does not mean that, on the whole, the rate is not compensatory. As a result, the costs incident to supporting average use levels are well below the monthly flat-rate usage charges that may be paid by residential (or, in certain states, business) subscribers.

46. In its recent *Interconnection Order I* in CC Docket 96-98, the FCC estimated "proxy costs" on a Total Element Long Run Incremental Cost (TELRIC) basis for local end office and tandem switching at 0.2 to 0.4 cents and 0.15 cents per minute, respectively. *See Interconnection Order I* at para. 811 and para. 824. A typical interoffice call will involve two switching operations (0.4 to 0.8 cents) and sometimes (but usually in a minority of cases) a tandem switching operation as well. Thus, the *maximum* switching cost for a local call is 0.95 cents per minute, with more typical costs running in the 0.4 to 0.8 cent range. In some cases, a 0.10 cent local transport cost may also apply. Local usage charges, whether measured or flat-rated, average between 2 and 3 cents per minute. See also footnote 14, *supra*.

47. *See, e.g.*, Deposition of William L. Vowell, March 11, 1996, California PUC, R.93-04-003/I.93-04-002, vol. 1, at 143.

Business access lines are not priced below cost. Hence, the monthly fees that ESPs and ISPs pay for their business lines cover the costs of providing and maintaining those lines. Additionally, the BOC studies ignore the fact that even ESPs that provide their service via analog business lines (Option 3 of Figure 3), generally do *not* subscribe to business service alone. Rather, in order to provide their on-line services via the circuit-switched network, ESPs must order from the ILECs a variety of special features in addition to basic business service, features that in most instances bring the total charges paid by ESPs substantially above the basic business rates cited in the Bell Atlantic and Pacific Telesis studies. For example, ESPs and other data services that maintain a modem pool accessible via a single dial-up number will in most cases have to subscribe to a additional features like hunting or direct inward dialing (DID), which may carry charges in addition to that for basic business dial-tone service.

The growth of ESPs/ISPs has created significant revenue streams for the BOCs directly attributable to data traffic on the PSTN.

While their studies have told one story about the impact of on-line service use on the PSTN, recent BOC statements tell quite a different one. Pacific Bell has announced that it plans to hire 2,500 new employees in 1997, in part to meet what John Britton, a Pacific Bell spokesman, calls "an incredible cultural demand that has developed for additional phone lines."[48] This demand is evident nationwide. In a 1995 Company Profile, for example, NYNEX reported that it had experienced "record growth" in its core telecommunications business.[49] A significant fraction of that growth has occurred as a result of a tremendous increase in demand for additional residential access lines. Indeed, within the NYNEX region, additional residential lines increased 9.6% in 1995, and 10.1% in 1994, compared with the average annual growth rate for all residential lines, which remained constant at approximately 3.4% in both years. Even business line growth rates, which were 4.5% in 1995 and 4.4% in 1994, lagged well behind the growth in additional residential lines.[50] On a national level, the statistics for additional line growth are even more striking.

Before 1990, additional residential lines were subscribed to by between 2.5% and 3.0% of the total number of households with telephone service in the United States. Since 1990,

48. "Demand for Lines Spurs Pacific Bell Hiring," Knight-Ridder/Tribune Business News, reported by George Avalos, *Contra Costa Times*, Walnut Creek, California, January 11, 1997.

49. NYNEX, *1995 Profile & Statistics*, NYNEX Corporation, 1996, at 6.

50. *Id.*, at 33.

however, that number has skyrocketed, increasing to 9.2% by 1992, and 14.7% by 1995.[51] Recent BOC earnings reports suggest that further growth was experienced in 1996, suggesting that the 1996 second line penetration rate may well have reached 16% or higher.[52] Since the growth in additional access lines has roughly paralleled the growth in the number of Internet users (see Figure 4), at least a portion of those additional lines (and the revenues derived therefrom) are attributable to subscribers who use them exclusively or primarily for calling ESPs/ISPs. ETI's analysis indicates that the incremental revenues inuring to the ILECs from these additional residential access lines for the 1990-95 period *have exceeded $3.5-billion nationally.*[53]

In 1995 alone, this analysis (see Table 3, following) shows that some 6-million residential subscriber lines nationally were used exclusively or primarily for on-line access. Total (nation vide) revenues from additional residential access lines whose installation was driven by the subscriber's use of on-line services reached $1.4-billion (see Table 4, following). Thus, even putting aside for a moment the revenues that the ILECs receive directly from ESPs/ISPs as well as any additional local usage charges that are paid by ISP/ESP users, the second residential access line revenues alone *far exceed* even the inflated costs that the BOCs seek to attribute to data traffic. Indeed, accepting Bellcore's own estimate that reinforcing the PSTN will cost some $35-million per year per RBOC (for a total of $245-million, nationally),[54] additional access line sales stimulated by the growth of on-line services *alone* generated revenues that exceed this figure by a factor of six.

The authors of this Study have performed an analysis of proprietary 1996 ESP usage data which indicates that on average approximately 10% of ESP users account for between 60% and 70% of total ESP hours of use. The data further indicate that the majority of ESP users fall into the range of 0 to 10 hours per month. Because they spend so much time on-line, users in the top 10% are much more likely to have second lines for their on-line usage. These heavy users are therefore a direct source of revenues for the ILECs, through the monthly telephone bills for their second lines.

51. FCC Industry Analysis Division, "Percentage Additional Residential Lines for Households with Telephone Service (End of Year Data)" (chart), December 6, 1996.

52. "Four Baby Bells Report Healthy Results," *Wall Street Journal*, October 18, 1996.

53. This estimate is based upon reported national average rates for residential telephone service (including both recurring and nonrecurring charges). Average rates for each year, 1990-1995, excluding taxes and subscriber line charges, and average installation charge, 1990-1995, from FCC, *Monitoring Report*, CC Docket No. 87-339, May, 1996, Table 5.7. (See Appendix A to this report for the data and calculations that support these values.)

54. Bellcore study, at 4.

Year	Households with telephone service	Additional Residential Lines	Estimated Additional Lines Dedicated to On-Line Use
1990	88,350,000	3,870,325	0
1991	89,379,000	6,537,450	1,311,024
1992	90,997,000	8,355,973	2,174,846
1993	93,036,000	8,845,773	2,385,085
1994	93,694,000	11,499,550	3,697,561
1995	94,2[illegible]3,000	13,890,593	6,043,721

Table 3. Nationally, in 1995 the demand for some 6-million residential subscriber lines can be attributed principally to on-line access. Sources: Households with Telephone Service, Additional Res. Lines: FCC Industry Analysis Division, "Percentage Additional Residential Lines for Households with Telephone Service (End of Year Data), Chart, Dec. 12, 1996; Lines Dedicated to On-Line Use: See Appendix A to this Study.

Year	Monthly Revenues from On-line Lines	Annual Recurring Revenues	Installation Revenues	Total Revenues
1990	$0	$0	$0	$0
1991	$21,841,659	$262,099,905	$73,417,340	335,517,245
1992	$36,254,679	$435,056,151	$65,965,749	501,021,900
1993	$39,997,872	$479,974,469	$41,597,961	521,572,430
1994	$62,229,950	$746,759,400	$105,006,551	851,765,951
1995	$103,951,999	$1,247,423,985	$178,397,610	1,425,821,595
	TOTALS	**$3,171,313,910**	**$464,385,211**	**$3,635,699,121**

Table 4. Cumulative ILEC revenues derived nationwide from residential access lines used for dial-up access to ESPs/ISPs since 1990 total some $3.6-billion. Source: Appendix A to this Study

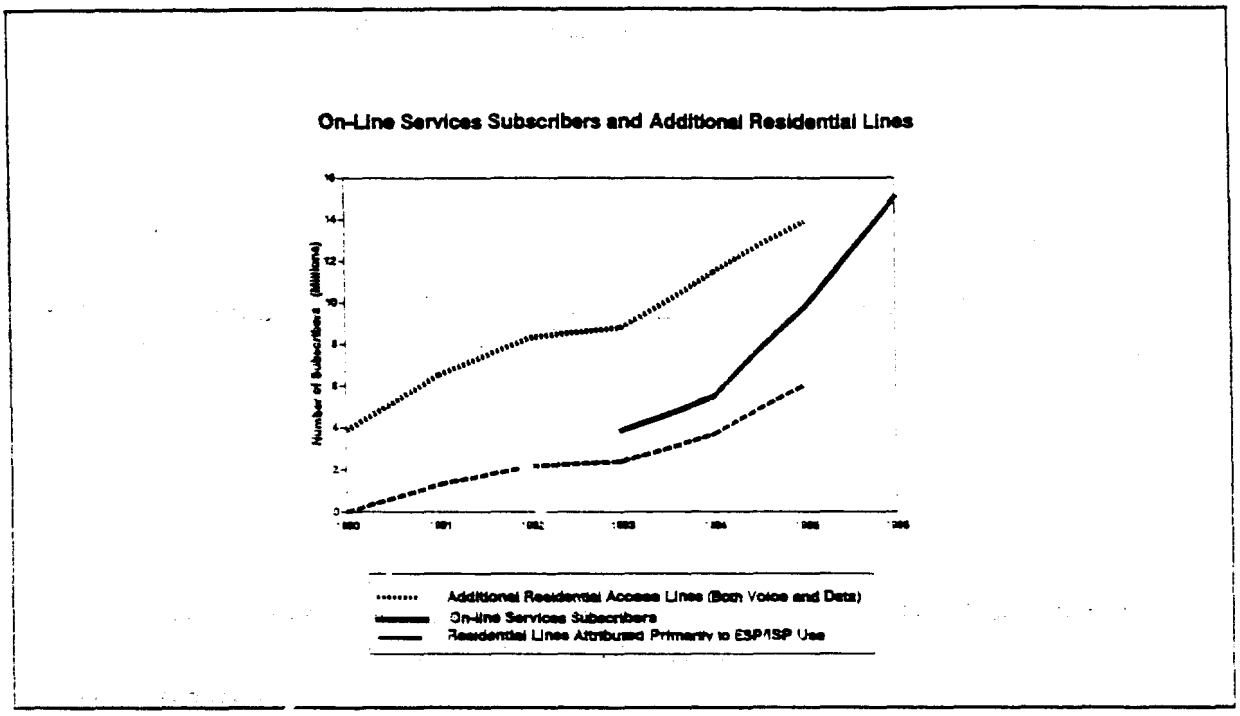

Figure 4. A strong relationship exists between the overall growth of the Internet and other on-line services and the growth in demand for additional residential access lines.

Sources: Additional Residential Access Lines and Residential Lines Attributed Primarily to ESP/ISP Use: See Table 3. On-line Services Subscribers: Information and Interactive Services Report (IISR), Quarterly On-line Census Data, October 25, 1996, October 20, 1995, October 7, 1994, September 24, 1993.

Use of the public telephone network for Internet and on-line service access is not out of proportion to the subscriber access lines that have been installed to support such use.

While the various BOC studies seek to portray users of Internet and other on-line services as somehow contributing disproportionately to the capacity demand on the PSTN, they offer no actual data to support this claim. Use of the PSTN for on-line service access would be disproportionate if the relative proportion of total PSTN local minutes of use (MOU_{PSTN}) associated with ISP/ESP usage (MOU_{ESP}) exceeded the proportion of total PSTN access lines ($ACCLINE_{PSTN}$) that can be associated with lines used for calls to ISPs/ESPs ($ACCLINE_{ESP}$). That is, if

$$MOU_{ESP} / MOU_{PSTN} > ACCLINE_{ESP} / ACCLINE_{PSTN}$$

In fact, no such disproportionate relationship can be identified. As this Study has already shown, through the end of 1995 a total of approximately 6-million additional residential access lines can be specifically attributed to on-line service demand. To these must be added the roughly 4-million ESP/ISP users who gain access via the same telephone line that they use for their voice conversations.[55] These lines represent approximately 6.8% of the total 147-million business and residential access lines in service as of the end of 1995.[56]

While it is difficult to estimate precisely the aggregate amount of ISP/ESP usage that is provided on a dial-up basis (rather than through a direct network access connection to, for example, a university or corporate Local Area Network), a reasonable assumption is that, on average, each of the roughly 10-million on-line service users (as of the end of 1995) accounted for 15 hours per month of local calling to an ISP/ESP.[57] That volume of usage would account for some 108-billion MOUs annually, or 5.4% of the 2-trillion total annual local MOUs for all US ILECs combined.[58] While these data can certainly be refined, there is no specific basis to believe that more precise estimates will yield significantly different results. Overall, end user and ISP/ESP access lines combined appear to impose *less than proportionate demand* on aggregate PSTN capacity.

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55. Estimate based upon ETI analysis (Table 3): "Online Audience at 9.8 Million Users," *Information and Interactive Services Report*, v. 16, n. 21, October 20, 1995, at 1. Note that this overestimates the actual number of dial-up access lines used to connect to on-line services, because it assumes that no individual subscribes to more than one on-line services at a time.

56. For complete accuracy, both the numerator and denominator of this ratio should be adjusted to remove business ESP customers with dial-up connections, since businesses generally pay some form of measured rate, and thus clearly and directly compensate the LEC for their ESP usage. This would be offset by a corresponding effect on the minutes of use figure (see footnote 57, below). Source for total business and residence access lines: FCC, *Preliminary Statistics of Common Carriers*, 1995, Table 2.10.

57. Based upon proprietary 1996 usage data for several ESPs made available to the authors of this Study, which indicate an average usage of between ten and fifteen hours per month per ESP subscriber. In light of the fact that several ESPs shifted from measured-use pricing to flat-rate pricing during 1996, it is highly probable that usage in 1995 would actually have been considerably less than fifteen hours; however, that figure is adopted here only as a very conservative estimate. Moreover, elimination of business users (See footnote 56, *supra*.) would reduce this figure as well, since (a) the 10-million user figure includes dial-up business ESP customers, and (b) the 15-hour average usage also includes business usage, which likely raises the overall average. Moreover, the ESP usage data referred to above indicates that between 30% and 40% of total ESP usage occurs during the business day, and it is likely that the majority of this usage originates from businesses that are subject to measured-rate or demand-sensitive local service pricing.

58. *See* FCC, *Monitoring Report*, CC Docket 87-339, May 1996, at Table 4.5.

The BOC studies fail to distinguish between inefficient LCM and efficient trunk port ISP/ESP serving arrangements, and attribute all ISP/ESP use to the former.

The BOC studies each generally combine all calls to on-line services together, and claim the aggregate level of traffic as a burden on the local network.[59] In reality, calls placed to ESPs and ISPs can be handled by at least two different methods, with very different implications for the burden that will be placed on the end office switch serving an ESP. Calls placed via analog modems to ESPs which are provided with Line Concentration Module (LCM) connectivity to the central office switch (Option 3 of Figure 3) occupy a line port for the duration of the call. This could lead to a potential blocking problem if the switch is not properly engineered and balanced. Many ESPs, however, utilize *trunk port* connectivity that bypasses the LCM. In so doing, they eliminate any possibility of LCM blocking. *All ESPs could be provided with trunk port connectivity*, but some may avoid this arrangement due to the tariff penalties imposed by the LECs themselves, as discussed in Section 2. Indeed, Primary Rate Interface (PRI) ISDN, which Bell Atlantic cites as the connection method used by fully 50% of ISPs in its territory, bypasses the line module, and connects at the DTC (Digital Trunk Controller), via a trunk port (see Option 1, Figure 3). *This means that calls to a PRI ISDN-equipped ISP are non-blocking in the terminating end-office switch, and will not prevent other users of the public network from placing or receiving calls.* Of course, a more accurate measure of the impact of ESP usage on a *typical* ILEC switch (as opposed to the few the BOCs single out for discussion in their studies) is no discernable impact at all.

BOC statements on the congestion issue incorrectly attribute certain service problems internal to the Internet itself as causes of claimed traffic problems on the PSTN.

In addition to their concerns with respect to the growth of on-line service usage, the ILECs also seek to attribute PSTN congestion to various ISP and Internet outages, problems that are endemic to on-line service providers and to the Internet itself and that do not directly affect the PSTN (that is, failure of Elements *6*, *7*, and *8* in Figure 1). An example can be seen in the recent keynote address by Michael Fitzpatrick, the President and CEO of Pacific Telesis Enterprises, at Wescon/96 on October 23, 1996.[60] In that speech, Mr. Fitzpatrick bundled all Internet congestion problems together as a justification for imposing

59. See, for example, the Bell Atlantic study and the Pacific Bell study.

60. "Internet Congestion: Crisis or Come On?" Speech by Michael Fitzpatrick, Wescon/96, October 23, 1996. Downloaded from Pacific Telesis Home Page, http://www.pacbell.com/about/fitz102396.html, November 10, 1996.

carrier access charges on ISP/ESPs — even problems that have nothing to do with the PSTN.

For example, Fitzpatrick cited a list of "high-profile flops" that indicated growing problems with the Internet — service outages of Netcom, AOL, and an unnamed New York ISP (Element *7*), busy signals faced by customers of smaller ISPs (Element *6*), and predictions by Bob Metcalfe of an impending catastrophic Internet meltdown (Element *8*).[61] While all of the items on Fitzpatrick's list *do* signify that the ESPs/ISPs face technical challenges in the months ahead, referring back to Figure 1, not a single one of these situations either caused or was caused by any problems in the PSTN.

The busy signals faced by customers calling ISPs are hardly unique to Internet providers — there are any number of conventional voice PSTN uses that also generate excessive and pervasive busy signals.[62] Busy signals of this sort have nothing to do with traffic congestion reaching the point where blocking occurs at the end office switch. Rather, they occur simply because the entity in question, whether a data or a voice service, has not purchased a sufficient number of exchange access lines for the number of individuals who initiate calls to it. In both cases, this is deliberate. A voice user may only purchase enough lines for the number of operators answering the phone, and a data service will likely only purchase sufficient lines for the number of modems in its modem pool. Clearly, if the number of individual call attempts made at any given time exceeds the number of lines purchased by the service, busy signals result for customers, even though the switch as a whole is *not* experiencing a blocking problem.

To explain this in slightly different terms, there are two different busy signals that a user initiating a call over the PSTN may encounter. One type, the "standard" busy signal, results when the line or lines that correspond to the dialed number are all in use. The other type, the "fast busy signal" or "reorder" tone, results when all lines into the end office *switch* (or paths available to the LCM that serves the dialed number) are in use. The latter case is potentially a far more significant problem, because it means the switch (or every available interoffice trunk) is already being used to capacity and, as a result, no calls may be placed or received until some of that capacity is freed. However, standard busy signals are encountered far more frequently than reorder tones. In those cases, the problem of

61. *Id.*

62. To cite but a single example, radio stations that offer "two free tickets to the twelfth caller" engender hundreds or thousands of call attempts in an extremely short period of time, *the vast majority of which result in a busy signal.* SS7 should significantly reduce the adverse network impact of these and other recurring line busy conditions. However, to the extent that such spikes — which do not occur in the case of Internet use — do adversely impact the public network, they occur at random, making it impossible to anticipate or plan for them. In contrast, steady traffic at a regular time, like ESP traffic (which is heaviest in the late evening), is much more easily taken into account in network and switching design.

congestion is confined to the particular customer (ISP or otherwise) who orders an insufficient number of lines. And such situations are best resolved by marketplace forces: In competitive markets, customers respond to poor service by "voting with their feet." If customers consistently encounter busy signals when trying to reach an inadequately configured ISP modem pool, either they will migrate to competing providers who offer adequate access line capacity, or the ISP will order more lines. Either way, the frequency of busy signals will be reduced. And either way, the impact is limited principally to the ISP, and does not materially impact the PSTN as a whole.

Mr. Fitzpatrick also implies that the introduction of cable modems will *increase* the burden on the PSTN.[63] While there is every reason to expect that cable modems will increase traffic on the Internet, this technology, which provides far greater bandwidth than can be supported by conventional analog dial-up telephone lines, will also *remove* Internet traffic from the local telephone network altogether. It is true that some first-generation cable modems currently being tested do use the PSTN as the 'upstream' channel (i.e., from customer to service provider). However, the firms designing cable modems are certainly aware of the limitations inherent in using the circuit-switched network for data transmission. The technology is evolving away from this method, toward either wireless upstream or the use of cable in both directions. Long before cable modems become widespread, they and the associated cable television-based Internet services will have developed to the point where no PSTN use will be required.

The Internet and on-line services community is well aware of the growing pains and operational problems that have arisen in their operations, and are taking steps to address and resolve them. They need no inducement in the form of per-minute access charges to push these efforts forward. The BOCs have offered no direct evidence that congestion and outages on the Internet itself are propagating onto the telephone network or creating difficulties for the local telephone companies.

BOC efforts to apply access charges to ISPs/ESPs should be considered in the context of the BOCs' own intentions with respect to entry into and development of the Internet service market.

In considering BOC calls for access charges on ESPs and ISPs, it is important to bear in mind that the BOCs themselves are in the process of entering, or expanding their presence in, the market for on-line services. Nearly all the BOCs (Ameritech, Bell Atlantic, Pacific Bell, BellSouth, US West, and SBC Communications, Inc.) have started to provide Internet services. Presumably, any access charges imposed upon their non-affiliated ESP/ISP competitors would also apply to their own Internet businesses. However, as a

63. "Internet Congestion: Crisis or Come On?" *op. cit.* at footnote 60, *supra*.

practical matter, the *effect* of this strategy would be to escalate the costs that competing (non-affiliated) ESP/ISPs will be required to incur in order to remain in business.

In this context, it is noteworthy that ILEC concerns about Internet traffic resulting in a PSTN crisis do not seem to have deterred their own marketing efforts. In their advertising for second residential lines, many of the BOCs mention specifically that such lines are ideal for connecting to Internet services. This is taken to an extreme by a recent Pacific Telesis promotion, which offers customers who subscribe to an additional telephone line free set-up and five months of free *unlimited* Internet usage from Pacific Bell Internet.[64] While complaining that Pacific receives little or no revenue from Internet use, Pacific Telesis seems more than willing to apply the revenues it generates from additional residential access lines to support "unlimited" Internet service. Clearly, a "meltdown" is nowhere near as imminent as Pacific has sought to portray it.

64. *See*, Pacific Telesis promotional materials, downloaded from Pacific Telesis Home Page, http://www.pacbell.com/, November, 1996.

4 | BOC INTERNET IMPACT STUDIES: INDIVIDUAL STUDY ASSESSMENTS

The individual BOC and Bellcore Internet impact studies ignore or exclude relevant facts, producing essentially the same inaccurate conclusions.

In this Section, we examine in detail each of the BOC and Bellcore studies that purport to identify the impact of the Internet on the PSTN. While the individual companies' approaches were each slightly different, all suffer from the general deficiencies that were identified in Section 3 — i.e., a limited examination of selected central offices serving ISPs, failure to address or consider overall network impact, and exclusion of relevant revenue sources.

Pacific Telesis

The Pacific Telesis submission consists of a two-page summary of a study of central offices that serve ESPs in Pacific's service area. Pacific presents figures that compare ESPs' network usage characteristics with the average usage for the central offices that were examined. It also includes an anecdote about one specific central office where a large ESP accounted for a significant fraction of the office's total usage. Pacific concludes with a rough estimate of the costs that serving ISPs imposes upon its network. There are four principal flaws in the Pacific study:

- Pacific looks only at end offices serving enhanced service providers, and provides neither a basis for comparison of ESPs with other end users of its network, nor any evidence that those other end users are in any way affected by data traffic on the PSTN, other than an unsubstantiated mention of "several instances" of slow dial tone and call blocking.

- Pacific's estimate of its revenues derived from on-line services is limited to an understatement of revenues generated solely at the terminating end of calls to ESPs, and thus ignores entirely the substantial revenues that are currently being realized by Pacific Bell from second residential access lines intended for data usage, from ISDN, and from additional features, functionality, and special connectivity arrangements that it provides to the ESPs.

- Pacific cites only one specific switch in its entire network where an ESP constituted a significant fraction of total usage.

- Pacific fails to explain how the expenditures it claims were undertaken specifically because of ESP usage relate or compare to expenditures that the company would have undertaken had the ESP not been there, or that the Company has regularly undertaken in other areas where no ESP is present.

The Pacific Telesis study looks only at on-line service providers, and fails to demonstrate any pervasive impact of the claimed ESP/ISP traffic patterns upon non-ESP business or residential uses of its local exchange service. Indeed, its entire examination of data traffic on its network is limited to 1.8% of its lines, and less than 5.2% of the ESPs in its serving area, and is limited to a period of only two weeks.[65] Impact measurements are made at central offices that serve ESPs rather than at the various points in the Pacific Bell network where calls *to those ESPs* were originated. Thus, the Pacific Telesis study is limited solely to the *terminating end* of ESP/ISP calls.

Pacific's estimate of total revenues from ESPs ($26-million) is derived entirely from very conservative estimates of payments made by the ESPs themselves, and attributes no revenues whatsoever to payments made by *ESP customers* for the Pacific Bell services that they utilize in accessing their on-line service provider. Pacific's calculation consists simply of multiplying the total number of ESP access lines (which Pacific estimates at 110,000) by the monthly business access line rate ($20).[66] Since no charge applies for *incoming* calls to an ordinary business line, no usage revenues are generated *at the ISP end of the call.* That result is then annualized and divided by an estimate of total annual ESP minutes, to produce an estimated revenue of 0.2 cents per minute for calls to ESPs. Even so, in its *Interconnection Order I* in CC Docket 96-98, the FCC found that local switching costs were in fact also in the range of 0.2 to 0.4 cents per minute per end,[67] and that therefore even by Pacific's own estimation its revenues are in the range of its costs.

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65. Pacific Telesis study.

66. *Id.*, at 1.

67. *Interconnection Order I* in CC Docket 96-98, at para. 811. See also footnotes 14 and 46, *supra*.

There are several significant problems with Pacific's calculations. Not the least of these is the fact that Pacific has limited its estimated revenues solely to *recurring* charges; Pacific generates significant revenues from *nonrecurring* charges that must be included in the total ESP/ISP payments for services furnished to them. It should also be noted that Pacific's revenue estimate of $20 per access line per month[68] understates even those revenues generated directly from ESPs. Pacific's assumption that all lines that serve ESPs must be connected via a standard analog voice line does not take into account the varying prices for the varying services ESPs and ISPs require to serve their customers. As a result, Pacific ignores fees that are paid by the ESPs for these additional services, including charges for digital (T-1) connections (discussed in Chapter 2), Direct Inward Dialing (DID), multi-line hunt groups, and other special service arrangements necessary for providing data services. Although the Pacific study does mention these options for ESPs, it does not provide an analysis of ESP usage of these various methods of connecting to the network. Such an analysis is, of course, necessary for developing an accurate estimate of the actual revenues Pacific derives directly from ESPs, as well as to assess the actual burden ESPs could potentially place on the end office switches that serve them (since calls to ESPs served via a trunk-side connection will not block other users from gaining access to the switch).

In addition to understating revenues generated at the ESP end, Pacific ignored entirely the revenue sources associated with the *ESP customer's* end of ESP calls. In fact, Pacific generates far more revenue from end users of on-line services than it receives from the on-line service providers themselves. This is because, under Pacific Bell's local rate structures, all local calls are handled on a "sent paid" basis. Local calls placed from business subscriber lines in California are subject to *measured-use* charges that increase with the duration of the call.[69] Currently, Pacific Bell's local daytime measured-use rates are 3.33 cents for the first minute and 1.05 cents for each additional minute; thus, a 20-minute call to an ISP would result in approximately 23.3 cents in revenue to the telephone company.[70] Most residential subscribers opt for flat-rate service (although measured service is available on an optional basis in most localities). In California, the current flat-rate "usage charge" applicable to urban residential subscribers is $5.25 per month.[71] Assuming an average per-

68. Pacific Telesis study, at 1.

69. Pacific Telesis California Intrastate Tariff, Cal. PUC No. A5, Sec. 5.2.

70. Most business use of the Internet is assumed to occur during the business day rate period. Pacific Bell Tariff, Cal. PUC No. A5, Sec. 5.2.1.A.4, 10th Rev. sheet 210. These rates should be reduced by the applicable surcredit, currently 1.784%. Cal. PUC No. A1, 81st Rev. sheet 135.

71. This is calculated as the difference between the rate for a 1FR (single party flat rate, $11.25) residence line and that for a 1MR (single party measured rate, $6.00) residence access line. This uses the 1MR rate as a proxy for the non-usage-sensitive component of residential service. Because the 1MR rate actually includes an implicit

(continued...)

minute cost of 0.45 cents for transport and switching (within the range of local call costs identified in the FCC's *Interconnection Order I* ruling[72]), a residential subscriber would have to originate 19.44 hours per month of local usage before the $5.25 imputed monthly rate becomes unprofitable to Pacific for that individual customer (and an even greater amount if the usage included within the measured service $3 calling allowance is included). Therefore, to reach a non-compensatory level, flat-rated customers as a group would need to exceed monthly usage levels of at least 19.44 hours. Significantly, there is no evidence that Internet usage has raised overall usage levels to this extent. Based on the structure of Pacific's tariffs, however, a customer would have an incentive to choose the flat-rate pricing option at a lower monthly usage level — at roughly 17 hours.[73] Since ESP/ISP calls average approximately 10-15 hours per month,[74] it becomes apparent that both flat- and measured-rate local calling is fully compensatory to Pacific under existing intrastate tariffs.

According to recent Pacific Telesis earnings reports, the Company has experienced a significant jump in the demand for additional residential access lines, which it attributes particularly to dial-up Internet use.[75] For Pacific Telesis, access line growth was reported at a 4.4% annual rate. As the discussion in Chapter 3 demonstrated, these access lines constitute a source of tremendous amounts of revenue for the BOCs; one which the Pacific Telesis study does not acknowledge.

The Pacific Telesis study addresses what it describes as significant on-line service traffic at only one specific central office switch. That switch, however, is located in Silicon Valley, and cannot be considered typical of the average level of Internet use likely to be found elsewhere. Traffic concentrations at this single, unique point in Pacific Bell's network can hardly be taken as an indicator of an imminent meltdown.

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71. (...continued)
usage allowance (of $3.00), the non-usage-sensitive component is actually less than $6. Assuming evening local rates and a 20-minute average call duration, the calling allowance is equivalent to approximately 6 hours of usage. Pacific Bell Cal. PUC No. A5, Sec. 5.2.1 and Sec. 5.2.4.

72. Based upon estimated switching costs of 0.4 cents per minute and average tandem/transport costs of 0.05 cents per minute, (see footnote 14, *supra.*). These costs reflect the following assumptions: (1) Most residential use of on-line services occurs during off-peak, late evening, night and weekend time periods; (2) minimal use of local tandem switching is required, because most local networks are designed to handle most calls on a direct trunked basis; and (3) half of the FCC's local transport proxy is used to reflect the primarily off-peak use of these services.

73. Based upon $8.25 worth of local calling (the $5.25 flat/measured rate differential plus the $3 measured rate calling allowance), and assuming 20-minute call durations at Pacific Bell's evening rates.

74. See footnote 57, *supra.*

75. On October 18, 1996, the *Wall Street Journal* reported that demand for second phone lines played a significant role in the strong third-quarter profits of Pacific Telesis, noting its report of year-over-year access line growth of 4.4%.

Pacific estimates that it has spent $2.6-million in incremental capital expense in the first quarter of 1996 to address ESP and Internet-related network impacts. However, the study is not clear as to exactly what sort of outlays were involved. But even if it specifically involved re-engineering of switches to increase capacity in situations where an ESP or other large-volume call recipient was present, it would still be incorrect to attribute all such costs to ESP/ISP use. As we have previously noted, ILECs routinely upgrade and expand capacity in their existing switches, for example, to accommodate normal growth in demand telephone lines for new residences and businesses. Pacific's study is silent as to how much of the $2.6-million *would have been spent anyway* on routine upgrades and capacity expansions.

Moreover, the Pacific Telesis study also claims that expenses for the remainder of the year "include another $11-million to meet the forecasted ESP demand for ISDN Primary Rate." The inclusion of expanded ISDN capacity is not legitimately due to ESP-related congestion. Indeed, as we have noted, PRI ISDN is actually a *solution* to a source of potential congestion problem that might otherwise arise. Such expenditures are *investments*, which the Company undertakes based upon the expectation that they will generate revenues, and profits, in the future. Pacific and the other BOCs have delayed introduction of ISDN for years. Even now Pacific seems to be asking the Commission to impose an access charge as a way to avoid having its shareholders bear the cost of a legitimate, and most likely highly profitable, business investment.

In short, Pacific's study presents a collection of incomplete, highly selective, and distorted information that cannot provide a reliable assessment of the actual overall impact of ESP/ISP demands on the PSTN. Revenue sources are ignored and revenues are grossly understated. It is unclear whether the costs identified are appropriately allocated to on-line services, and, in any event, cannot be considered without considering upgrades and expenses Pacific would have made in the normal course of its operations. Finally, by looking at a very narrow subset of its central offices, and citing only one as evidence of serious traffic problems, Pacific's study offers no insights whatsoever as to the overall effect of ESP/ISP demands on the totality of its network.

U S West

U S West's study[76] consists of two pages of conclusions drawn from ten pages of attached charts, generated by data the company collected on a set of 64 ESP hunt groups in four states. The principal conclusion that U S West seems draw from its study is that "the

76. "U S West Communications ESP Network Study - Final Results," October 1, 1996.

usage patterns of the ESPs differ from other end users on the Public Switched Network."[77] How it makes the leap from that conclusion to some of its others (listed below) is unclear, especially given the data that the company has included. Four key problems with the U S West study can be readily identified:

- U S West does not cite any specific instances of trouble that result from ESP usage. It also fails to cite specific investments it has undertaken in order to increase network capacity as a result of purported congestion problems resulting from data traffic.

- U S West makes the claim that the ESP busy hour, which falls in the evening, imposes undue costs on the network. In reality, however, the later peak for ESP usage is actually good for the network, since it results in a more even distribution of calls overall, and uses capacity that would otherwise be idle during the evening hours.

- U S West fails to provide any sort of reasoning behind the figures it calculated for growth of ESPs. Their accuracy should not be accepted without some explanation of the reasoning or the data behind them. The accuracy of some of the other data presented is also open to question.

- U S West's calculation of costs imposed by ESPs is based upon the costs of calls terminated at ESPs, ignoring the fact that those costs are paid for by the originators of those calls.

One of the conclusions drawn by the U S West study is that the busy hour for ESPs most frequently occurs at 10 pm, substantially later than the busy hour for LEC central offices as a whole, which (for U S West) typically takes place around 4 pm.[78] Based upon this finding, U S West claims that "[c]ontinued ESP growth of this nature will drive network reengineering to accommodate evening busy hour usage."[79] U S West does not mention, however, that from a network perspective this usage characteristic is a positive development. If the majority of ESP calls occur during what would otherwise be off-peak hours, those calls take advantage of capacity that would otherwise simply be idle. Even the possibility that ESP traffic will actually cause the office busy hour to *shift* to 10 pm is not

77. U S West study, at 2.

78. *Id.*, at 1.

79. *Id.* at 1.

the Company claims that ESP and ISP use has "impacted our local network,"[83] it provides no real evidence of the degree of that impact, or of the associated costs, if indeed any such impact or cost is large enough to be measurable at all.

U S West's data contain several other serious problems. For example, in support of the oft-repeated BOC claim that ESP usage characteristics are similar to those of IXCs, U S West presents a chart depicting average minutes of use for IXCs and ESPs.[84] However, the data presented in this chart are highly questionable. Indeed, it is apparent from U S West's chart that, while lines terminating at ESPs exhibit usage levels that range between about 20 and 45 minutes per hour per line throughout the day, IXCs seem to have no usage whatsoever between the hours of 9 p.m. and 7 a.m. This unlikely result makes an accurate assessment of the resemblance (or lack thereof) between IXC usage and ESP usage impossible. If anything, the U S West study fails to support this asserted relationship.

Moreover, in its chart entitled "Costs per Line,"[85] U S West presents its comparison of incremental costs per line, apparently for analog business lines, for various types of ESP and basic business access line customers. The fallacious assumption inherent in this calculation is clearly demonstrated by considering the derivation of the "incremental cost" of a business line. U S West attributes a non-usage cost of approximately $18 to the line (this amount is depicted as constant for the ESPs as well). For (non-ESP) business lines, it then adds approximately $4 in usage charges, for a total incremental cost of approximately $23. However (assuming it is using a consistent methodology for all services on the chart), U S West develops the "usage cost" of a business line in a unique manner. "Usage" in this case refers not to calls *originated* on that business line, but to calls *terminated* thereon. This definition of cost causation has no support, and is fundamentally at odds with the structure of U S West's tariffs and with the principle of "sent paid" pricing. U S West's mistaken assumption here is its notion that terminating use is the element for which a charge is to apply, and using this logic it readily attributes proportionately higher costs to ESPs than it does to business lines used for voice communications alone. Unless U S West can demonstrate that calls placed *to* business lines are uncompensated by the calling party — which it did not and clearly cannot do — there is simply no basis for this perversion of the cost causation principle.

NYNEX

83. U S West study, at 2.

84. *Id.* at Attachment #6.

85. *Id.* at Attachment #10.