Population density range, per sq km	*Population*
0 - 10	14,279,007
10 - 100	48,427,612
100 - 500	43,805,453
500 - 1000	31,532,456
1000 - 5000	89,859,807
greater than 5000	20,802,119
total	*248,706,454*

Table 3

We then used other Census data[6] to estimate the average number of inhabitants per dwelling. We obtained residential telephone penetration levels from the FCC's *Statistics of Communications Common Carriers* to estimate the total number of residential lines per density class, and we applied single- and multiple-line business access line percentages from the FCC document to the residential figures to obtain total business lines.

The Census Bureau reports its data according to "tracts," some of which may be quite small, possibly a city block or smaller. Some tracts, those in very sparsely populated areas, may be quite large. Our density computations sorted the census tract data state-by-state into total population for each density class.

As a general rule, we classified the lower density ranges as rural and the high ranges as urban. The middle ranges are typically suburban areas and small-to-medium-size towns. Some of the "rural" tracts may not in fact be as rustic as their overall densities imply: residential areas with large lots obviously exhibit low densities, and such areas, given the typically small size of the tracts, may fall into our rural classification. Similarly, small tracts in small but densely-populated neighborhoods in small towns may wind up in one of the "urban" density classes. One may reasonably assume, however, that the effects of this are minor and that the nationwide averaging process renders overall density classifications as generally accurate. Furthermore, the model

[6] See *Statistical Abstract of the United States – 1993*, U. S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census, 113th ed.

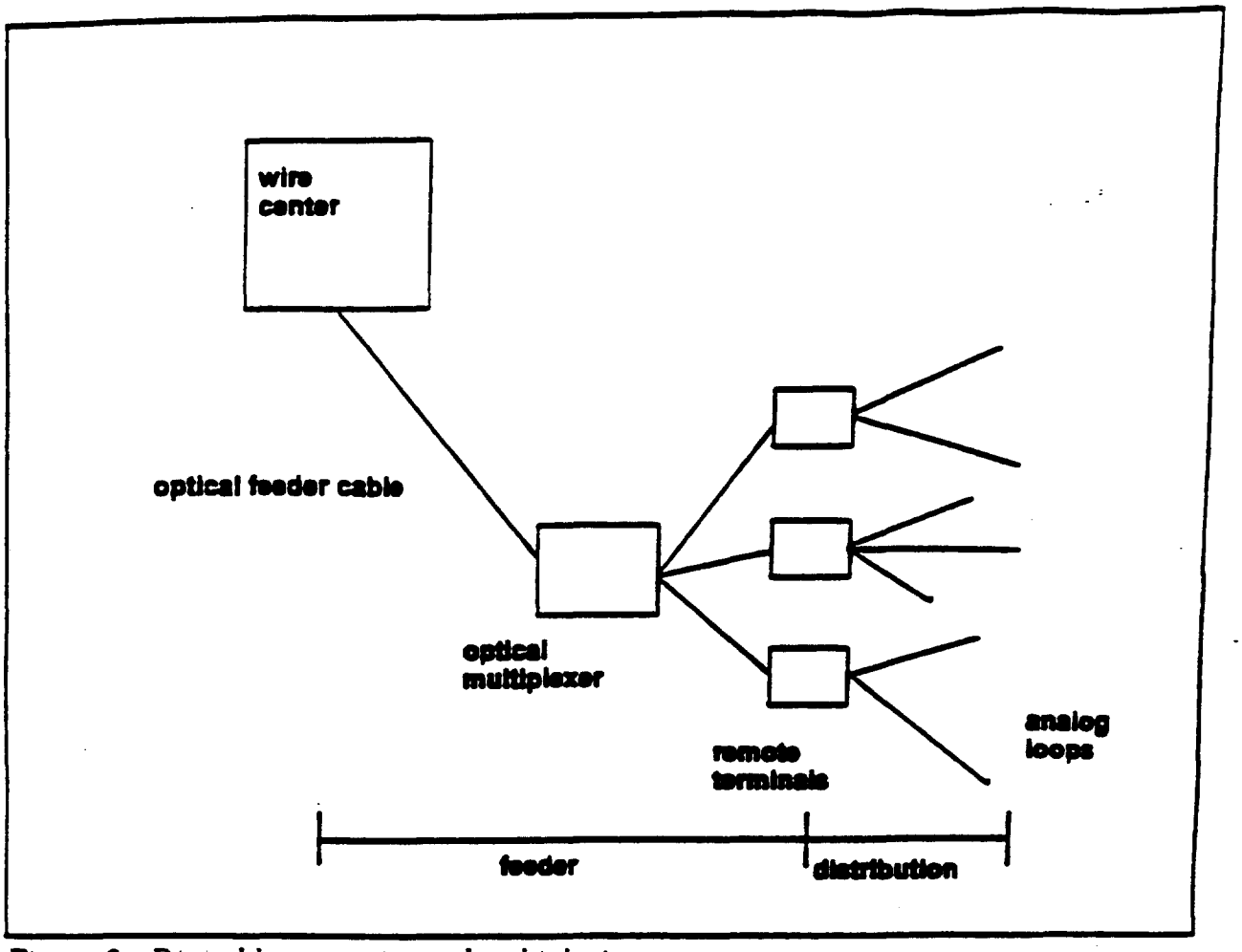

Figure 2 - Digital loop carrier and multiplexing components

In the cases where DLC technology was used, we assumed that the carrier terminal equipment interfaced with the feeder facilities using optical multiplexers, as shown in Figure 2. The optical multiplexers separate the high-speed (typically about 150 Mbps) feeder transmissions into individual T1s for use by the DLC remote terminals. Investment costs for this equipment are those used in the Enduring Local Bottleneck study.[10]

We determined the number of remote terminals and multiplexers required in each density class by computing the number of lines per serving area based on population density, residential penetration, and a ratio of business lines per residential line. We equipped the serving area with a sufficient number of remote terminals and multiplexers to serve the access line requirements.

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[10] *Supra*, note 7.

tion, because residential traffic typically peaks during the early evening, and business traffic peaks in the morning and afternoon. Coincident traffic peaks lead to overstated switching and interoffice facilities investment.

The following table summarizes the per-line investments for each density class for the wireline and wireless approaches. Under our technology assumptions, wireless distribution leads to reduced investment only in the two lowest density ranges; there are therefore no wireless entries for the four high ranges.

Population density range per sq km	*0 - 10*	*10 - 100*	*100 - 500*	*500 - 1000*	*1000 - 5000*	*Greater than 5000*
total lines	5,864,232	20,105,709	23,407,335	17,200,110	48,496,905	18,338,035
residential lines	4,866,708	16,565,081	16,473,132	12,112,035	34,150,858	7,335,214
investment per line wireline	$3,351	$1,925	$764	$726	$738	$1,001
investment per line wireless	$1,557	$1,422	-	-	-	-

Table 4

C. Model structure

The following subsections contain descriptions of the local network structures and technologies assumed for the investment model. The model addresses only basic business and residential local exchange switched services, including local switching, distribution, and interoffice transport. The model does not deal with switching or interoffice transmission investment required for toll access. It includes both residential and business access lines, because the network must be developed with sufficient capacity to serve all access lines. The subsidy, however, applies only to residential lines.

C.1 Loop plant

The "loop plant" term applies to the facilities on the subscriber "side" of the end office switches (those supplying dial tone to end users) in the network. Figure 1 provides

USOA Accounts	*Assignment*	*USOA Accounts*	*Assignm*
PLANT SPECIFIC		PLANT NON-SPECIFIC	
Motor Vehicle (6112)	Local Service	Provisioning (6512)	Local Service
Aircraft (6113)	Overhead	Power (6531)	Local Service
Spec. Purpose Vehicle (6114)	Local Service	Network Administration (6532)	Local Service
Garage Work Equipment (6115)	Local Service	Testing (6533)	Local Service
Other Work Equipment (6116)	Local Service	Plant Operations Administration (6534)	Local Service
Land and Building (6121)	Local Service	Engineering (6535)	Local Service
Furniture and Artworks (6122)	Overhead	Access (6540)	Other Services
Office Equipment (6123)	Overhead	CUSTOMER OPS-MARKETING	
General Purpose Computers (6124)	Overhead	Product Management (6611)	Other Services
Analog Electronic Switching (6211)	Local Service	Sales (6612)	Other Services
Digital Electronic Switching (6212)	Local Service	Product Advertising (6613)	Other Services
Electro-mechanical Switching (6215)	Local Service	Marketing (6610)	Other Services
Operator Systems (6220)	Other Services	CUSTOMER OPS-SERVICE	
Radio Systems (6231)	Local Service	Call Completion (6621)	Local Service
Circuit Equipment (6232)	Local Service	Number Services (6622)	Other Service
Information (6310)	Other Services	Customer Services (6623)	Local Services*
Station Apparatus (6311)	Overhead	CORPORATE OPERATION	
Large Private Branch Exchange (6341)	Overhead	Executive (6711)	Overhead
Public Telephone Equipment (6351)	Other Services	Planning (6712)	Overhead
Other Terminal Equipment (6362)	Overhead	Accounting and Finance (6721)	Overhead
Poles (6411)	Local Service	External Relations (6722)	Overhead
Aerial Cable (6421)	Local Service	Human Resources (6723)	Overhead
Underground Cable (6422)	Local Service	Information Management (6724)	Overhead
Buried Cable (6423)	Local Service	Legal (6725)	Overhead
Submarine Cable (6424)	Local Service	Procurement (6726)	Overhead
Deep Sea Cable (6425)	Local Service	Research and Development (6727)	Overhead
Intrabuilding Network Cable (6426)	Local Service	Other and General (6728)	Overhead
Aerial Wire (6431)	Local Service		
Conduit Systems (6441)	Local Service		

Table 7

* This account includes both the expenses associated with opening an account and billing and collection expenses. The former is not a part of Basic Universal Service.

digital loop carrier (DLC) system.[9] The maximum loop length in a CSA is 12,000 feet, and each CSA in an exchange area then connects with the local wire center using a feeder cable consisting of either copper wire or optical fiber.

Most of the density classes in this study assumed the CSA as the basic definition for distribution, with fiber feeder routes for the connection to the wire center. In the lowest density class, we assumed larger serving areas with radii of 40,000 feet. In all classes but the largest, we assumed distribution would use DLC-based equipment. This technology is well-proven, and typical DLC equipment has been commercially available for well over a decade.

In the highest density class, we assumed analog feeder and distribution facilities. Because the average distances between subscribers and wire centers were so short, investment in digital transmission facilities was deemed unnecessary in this case. In all classes, the model allows a mixture of aerial and underground feeder and distribution facilities. Aerial plant consists of cables mounted on poles, and underground plant consists of cables buried underground in conduit. We assumed a fairly small percentage -- 10 percent -- of aerial cables in the higher density classes, and 90 percent in the lower ranges.

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[9] In a DLC system, remote T1 terminals located in each CSA provide interfaces with subscriber loops. Standard T1 transmission facilities then connect these remote terminals with central office equipment; this design reduces the number of wire pairs in the loop plant by combining many loops on a few pairs of wire or optical fiber. See *BOC Notes on the LEC Networks -- 1994*, Bell Communications Research, SR-TSV-002275, Issue 2, April, 1994.

investment in USOA Account 2411, Poles, to derive a poles expense factor. The investment and expense data were drawn from 1993 ARMIS reports. This factor was then applied to the pole investment in our model to generate an expense estimate. Regional Bell Operating Company totals were used on the assumption that the RBOCs are large enough to capture all available economies of scale and scope, while some of the smaller operating companies may not be.

The switching factor derived through the method described above is suspect. The calculated expense for switch expense per line varies widely among operating companies. However, the company with the lowest relative deployment of digital switching has the lowest switch expense per line. This is despite the fact that, as New England Telephone (NET) reported in a recent cost study, "...incremental costs are greatly influenced by the newer, lower cost electronic and optical technologies."[17] It is possible that the expenses of the telephone companies are biased upwards by the expensing of switch software. Software costs are captured in our investment numbers. Consequently, we used the digital switch maintenance expense factor of .0269 reported by NET rather than the figure computed from ARMIS data.

Network Operations are a significant portion of current local telephone company expenses. These expenses include power, network administration, testing, plant operations, and engineering. We derived a factor by relating these expenses to total switching and transmission investment. The result was a substantial reduction in Network Operations expenses compared to current levels. However, advances in digital switching and signaling technology should have the effect of significantly reducing network operations expenses, so this result seems appropriate.

Three categories of cost are not appropriately estimated using investment factors. We used an estimate for billing expenses from the NET New Hampshire Incremental Cost Study.[18] The "Other Tax" expense category, which appears to include franchise taxes, was estimated by grossing up costs based on the current ratio of such expenses to revenue. Finally, call completion costs were estimated by a per line cost computed from ARMIS data.

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[17] See New England Telephone Company, *New Hampshire Incremental Cost Study*, 1993, p. 7.

[18] *Id.* We relied on these results because most telephone company cost studies are proprietary. This is one of the few studies of which we are aware that is non-proprietary. We used the higher embedded rather than the lower incremental billing cost.

The following table summarizes the loop-related investment per density class.

	Density class					
Investment category	*0 - 10*	*10 - 100*	*100 - 500*	*500 - 1000*	*1000 - 5000*	*greater than 5000*
installed cable ($ million)	$6,300	$10,200	$7,200	$5,500	$14,800	$15,300
poles ($ million)	$5,900	$3,200	$60	$13	$13	$0.7
multiplexers and remote terminals ($ million)	$5,900	$19,200	$7,000	$4,500	$10,900	$240

Table 5

C.2 Switching

Figure 3 shows the switching arrangement used in the model; it includes end office and tandem switches, with the end office machines supporting subscriber connections, and the tandem offices interconnecting the end offices. As noted earlier, the model does not address transmission or switching beyond the local exchange level. We assume current-technology digital switches for both levels of the local switching hierarchy.

Our model uses Bellcore-supplied traffic estimates per subscriber line, as discussed earlier. Switching machines have different capacity limits: they may run out of processor or "real-time" capacity, or they may reach a line limit imposed by the number

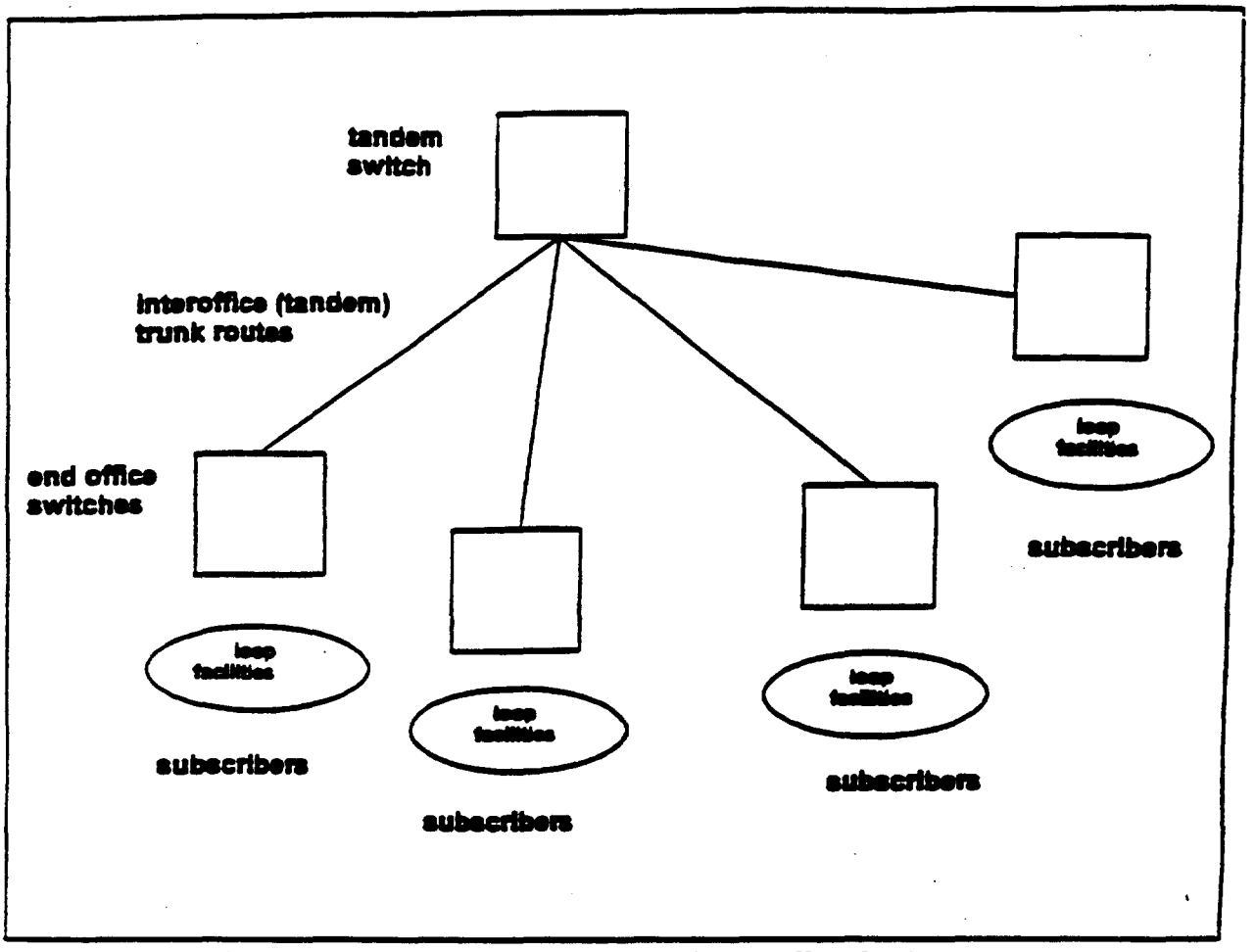

Figure 3 - Local exchange switching hierarchy and interoffice facilities

of line interfaces available or by the overall traffic presented to the switch. We assumed that the largest end office switches could support up to 1,000,000 busy hour call attempts (the real-time limit) and 100,000 lines; we then "derated" these figures to assume operation at 80 percent of maximum capacity. We used smaller switches for the lower density ranges as shown in the following table. Switch investments were based on the figures used in the ELB study cited earlier; these numbers were originally supplied by major switch manufacturers and include software fees as well as typical discounts given to large carriers.

USOA Accounts	*Factor*	
PLANT SPECIFIC		
Motor Vehicle (6112)	Network Support Factor	.025
Spec. Purpose Vehicle (6114)	Network Support Factor	.025
Garage Work Equipment (6115)	Network Support Factor	.025
Other Work Equipment (6116)	Network Support Factor	.025
Land and Building (6121)	Land and Building Factor	.027
Digital Electronic Switching(6212)	Central Office Switching Factor	.027
Radio Systems (6231)	Central Office Switching Factor	
Circuit Equipment (6232)	Central Office Switching Factor	.027
Poles (6411)	Pole Factor	.051
Aerial Cable (6421)	Aerial Cable Factor	.102
Underground Cable (6422)	Underground Cable Factor	.024
Conduit Systems (6441)	Conduit Factor	.013
PLANT NON-SPECIFIC		
Provisioning (6512)	Network Operations Factor	.067
Power (6531)	Network Operations Factor	.067
Network Administration (6532)	Network Operations Factor	.067
Testing (6533)	Network Operations Factor	.067
Plant Operations Administration (6534)	Network Operations Factor	.067
Engineering (6535)	Network Operations Factor	.067
CUSTOMER OPS-SERVICE		
Call Completion (6621)	Intercept Factor	$5.75 per line/year
Customer Services (6623)	Billing and Collection Factor	$1.22 per line/month

Table 8

V. Next Steps

We have modeled the TS-LRIC of Basic Universal Service based on hypothetical density zones, using our best estimates of the cost of building local telephone networks. The next step would be to gather and use actual telephone company data on the cost of constructing and operating networks using modern technology. The model could be made more sophisticated by adding additional variables that might influence costs. For example, factors such as terrain will influence the cost of network construction, and perhaps maintenance; therefore, separate terrain variables could be estimated. The Joint Board assigned to oversee the construction of the actual cost models used to compute the Basic Universal Service Subsidy will have to make decisions on what cost of capital and depreciation assumptions should be used.

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Statement of Qualifications

Hatfield Associates, Inc. (HAI) is an interdisciplinary consulting and research firm serving a wide range of clients with stakes in the telecommunications field. In the more than one decade of its existence, the firm has provided consulting services in nearly all aspects of the telecommunications field including long haul terrestrial and satellite communications, land mobile and personal communications, data communications, cable television systems, local exchange networks, competitive access services, and customer premises equipment.

Principals of the firm include consultants with graduate degrees and decades of senior level experience in engineering, economics, business, and policy/regulation. HAI's services include, among others, regulatory filings and policy studies, engineering studies, expert testimony, market research, economic studies, "due diligence" support, business planning, and system development.

Examples of recent consulting assignments include

- Analyzing the potential for competitive entry into the local exchange telecommunications business, presented in a paper entitled "The Enduring Local Bottleneck: Monopoly Power and the Local Exchange Carriers";

- Developing material on telecommunications technology for inclusion in a report on international telecommunications prepared by the Office of Technology Assessment of the U.S. Congress;

- Preparing a report entitled "Cross-Subsidy Concerns Raised by Local Exchange Company Provision of Video Dialtone Services" that was attached to a petition filed with the Federal Communications Commission (FCC) by the National Cable Television Association and the Consumer Federation of America;

- Managing the regional hub field testing program for Cable Television Laboratories; and

- Analyzing the technical aspects of switched multi-media and other broadband services on a long-haul fiber optic network.

Hatfield Associates also has extensive experience in international communications consulting, with a particular emphasis on privatization and regulation in developing nations. The firm has undertaken consulting projects for public or private sector clients in Bulgaria, the Czech Republic, Chile, Ecuador, Hungary, Indonesia, Korea, Mexico, Micronesia, Poland, Romania, the Slovak Republic and Slovenia.

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	CC Docket No. 96-98
Implementation of the Local Competition Provisions in the Telecommunications Act of 1996	)	

Declaration of Alfred E. Kahn and Timothy J. Tardiff

Dated: May 30, 1996

I. INTRODUCTION

1. The purpose of this submission is to respond to certain arguments made in the comments on the pricing of inputs sold by incumbent LECs to other carriers—unbundled network elements, termination of local traffic, toll carrier access and the sale of retail services for resale—by expounding what we see as the main applicable economic and regulatory principles. In this commentary, we are guided by two major considerations.

2. The first is the overriding purpose of the Act, to establish "a pro-competitive, de-regulatory national policy framework" for the telecommunications industry. We agree unreservedly with the Commission's own interpretation of that purpose, namely, that it

> is not to ensure that entry shall take place irrespective of costs, but to remove... barriers...that inefficiently retard entry, and to allow entry to take place where it can occur efficiently. (NPRM, par. 12)

3. The second is a recognition—clearly reflected in the Act and in the NPRM—that encouragement and achievement of efficient competition must take into account the fact that the industry is in transition from a regime of comprehensive regulation. Entirely apart from considerations of equity, the promotion of efficient competition itself requires—and the Act itself explicitly provides for—a reconciliation of that regulatory heritage with the ultimate goal of deregulated competition.

II. EFFICIENT PRICING OF INPUTS MUST RECOVER MORE THAN TSLRIC—AND TSLRIC MUST BE CORRECTLY DEFINED

4. Some parties here—notably the interexchange carriers and some competitive LECs (CLECs)—have flatly asserted that the rates for inputs provided by the LECs to other carriers should recover only "direct economic cost," which they equate to total service long-run incremental cost, or TSLRIC. These parties generally define TSLRIC as the total ongoing and future costs that would have to be incurred to provide a given service or network element using a hypothetical network that might be constructed today by a carrier starting with a completely blank slate (which we will therefore refer to as TSLRIC-BS). In view of their contention also that prices equal to TSLRIC already "include a reasonable profit," it is clear that they would permit no contribution over and above TSLRIC to be included in the rates for unbundled

network elements and terminations. In our view, that position is incorrect both on purely economic grounds and, in the present situation, in terms of good regulatory policy.

5. The failure to include contribution above TSLRIC-BS would exclude from recovery at least four other categories of costs:

a. Ongoing costs or burdens asymmetrically borne by the LECs but not their challengers by virtue of such public utility obligations as providing services—particularly basic telephone service to residential customers and particularly in rural areas—at rates below economically efficient levels, the consequent revenue deficiencies of which have heretofore been made good by contributions incorporated in the prices of such services as interexchange access, toll and vertical services such as local usage and custom calling;

b. ongoing costs of the LECs to the extent their actual, prudently incurred incremental costs of providing individual services or unbundled network elements exceed those of a hypothetical network;

c. ongoing fixed and common costs, including overheads, such as, in industries characterized by widespread economies of scale and scope, efficient competitors must recover in charges above incremental costs if they are to continue in business; and

d. sunk costs, taking the form of a return on and of assets whose costs have not yet been fully recovered.

6. The ongoing costs of ubiquity. The Commission requires no reminder of the first of these cases for permitting LECs to incorporate a markup above incremental costs in their charges to competitors for use of their essential facilities. It has historically clearly recognized the underpricing of basic residential service and corresponding overpricing of such services as interexchange access and toll, which it took a substantial step to redress by imposing the subscriber line charge on end-users. And it has also recognized that so long as these rates are not fully rebalanced those distorted charges justify incorporation of a markup (such as its own

carrier common line charges) in the LECs' switched carrier access charges—a case applicable equally to the their charges for unbundled network elements.[1]

7. The parity of the cases for incorporating a contribution in the LECs' charges for the basic network elements, on the one side, and (interexchange carrier) access, on the other, is not one of logic alone; the two are inextricably linked functionally as well. If there is continued legitimacy in incorporating a markup in the latter charge—and we believe there is until the LECs' prices can be fully rebalanced to recover any necessary contribution currently provided by access charges and other rates—it becomes essential to incorporate it also in the charge for network inputs. Otherwise, the IXCs could readily bypass the FCC-legitimized carrier access charges by buying all the requisite network inputs at incremental cost, in this way bypassing the LECs' initiation and termination of interexchange calls.

8. The basic fallacy of the proposed TSLRIC-BS standard. Some commentors have insisted that the proper basis for the pricing of LEC services sold to competitors (and also for calculating any required universal service subsidies) is the TSLRIC—the total forward-looking cost of a hypothetical, ideally efficient system built by either the incumbent or some other carrier starting with a blank slate, using the most efficient current technology. In our judgment, the only correct basis is the TSLRIC of the incumbent telephone companies themselves. This is for so the following reasons:

a. The rationale of its proponents is that TSLRIC-BS is the level to which competition would drive prices. They are mistaken. In a world of continuous technological progress, it would be irrational for firms constantly to update their facilities in order completely to incorporate today's lowest-cost technology, as though starting from scratch: investments made today, totally embodying today's most modern technology, would instantaneously be outdated tomorrow and, in consequence, never earn a return sufficient to justify the investments

[1] Presumably this deficiency in basic residential service rates could be made good by the constitution of a separately-financed universal service fund; but as the NPRM recognizes, the later statutorily-scheduled completion of the universal service reform proceeding clearly suggests, as we would strongly affirm, the legitimacy of the LEC's continuing to recover the requisite contribution in their charges for inputs during the transition period (par. 145).

in the first place. For this reason, as Professor William J. Fellner pointed out many years ago,[2] firms even in competitive industries would systematically practice what he calls "anticipatory retardation," adopting the most modern technology only when the progressively declining real costs had fallen sufficiently below currently prevailing prices as to offer them a reasonable expectation of earning a return on those investments over their entire economic life. In consequence even perfectly competitive prices would not be set at the level of these (totally) current costs—unless, to put it another way, the calculated costs of the new plan included an extremely high rate of return and of depreciation, in reflection of the exposure of any such investments to costs and prices progressively declining in real terms over their life.

b. The Commission is not writing on a blank slate. The LECs already have a ubiquitous network serving their entire franchise territories and are constantly providing service to new customers within those territories. The economic purpose of having prices set at incremental cost is to inform buyers—and make them pay—the cost that society will actually incur or would actually save in these several circumstances: these can only be the costs of the supplier whose prices are being set.

c. The proponents of the TSLRIC-BS standard clearly imply that it will provide a cost basis for LEC charges lower than their own TSLRICs—that is, that the latter costs embody inefficiencies that would be avoided by a hypothetical totally new network. We have already cited reasons for doubting that inference: indeed, if that factual premise of the TSLRIC-BS proponents were valid, efficiency would require that the incumbent company be totally replaced, instantaneously, by a wholly new venture or scrap its entire existing plant and start over from the ground up. For this very reason, considerations of economic efficiency <u>require</u> that the prices charged to competitors be based upon the LECs' <u>actual</u> costs; to the extent competitors can provide these inputs more efficiently than the LECs, this will fully preserve their incentive to do so and thereby promote efficient facilities-based entry. In any event, it has always been their actual costs that the incumbent LECs have traditionally been entitled to

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[2] William J. Fellner, "The Influence of Market Structure on Technological Progress," in Amer. Econ. Ass'n. *Readings in Industrial Organization and Public Policy* (Homewood: Richard D. Irwin, 1958), as described also in Kahn, *The Economics of Regulation*, Vol. 1, pp. 199-20, note 91.

recover—if not fully in rates for underpriced services, then in the regulatorily-approved inefficiently high rates for other services, including carrier access. And where states have moved from rate base/rate of return to price cap regulation, they have typically set the initial caps and indexation formulas in such a way as to give the regulated companies a fair opportunity to recover their actual prudently incurred costs, provided they achieve the productivity goals implicit or explicit in the indexation formulas.

d. Proponents of the TSLRIC-BS standard contend that basing prices and revenue recoveries on the actual TSLRICs of the incumbent LECs imposes on consumers the costs of inefficient existing network configurations and operations. As critics of traditional cost-plus regulation, we cannot deny the likelihood of inefficiencies under such schemes. On the other hand, assertions about their existence by critics of the LECs (1) are pure assertion; (2) ignore the fact that in the majority of states the LECs are now subject to price cap regulation—and have been for some five years in the federal jurisdiction—which has given them strong incentives to improve their efficiency; and (3) in any event, if, in departure from past regulatory practice, costs are to be disallowed on grounds of inefficiency, it surely would be up to the state regulators to do so.

e. Finally, it is prices based on the actual incremental costs of the incumbent LEC that are the proper target for comparison by rivals contemplating entering the market. If, as its proponents seem to assume, the TSLRIC-BS were lower than the TSLRIC of the incumbent LEC, basing the LEC's charge for network elements—below its own costs—on the former measure would offer rivals a smaller reward for deploying their own facilities than the superiority of their costs would justify. If, instead, the TSLRIC of the incumbent LEC were lower than TSLRIC-BS (correctly measured, as we have explained, to take into account future obsolescence), then LEC charges based on the latter measure would overcompensate entrants—that is to say, would encourage entry of firms imposing incremental costs on society greater than are imposed by the incumbent suppliers.

9. The recovery of joint, common and overhead costs. The Commission explicitly recognizes the third possible justification we have listed for incorporating a markup in these several charges for unbundled elements and call terminations—the fact that in industries characterized by ubiquitous economies of scope and scale, giving rise to costs common to or

shared by a variety of services or products, prices for each of them set at bare incremental cost will in the aggregate fail to recover total costs, even when the latter are defined in purely economic (ongoing and future) terms (par. 129).

10. AT&T purports to refute this case for a markup above incremental cost by asserting that such network elements as loops, switching, transport and signaling are discrete physical elements of local networks, which, if costed separately, would leave "few if any shared facilities costs" that would not be recovered in their TSLRIC prices. That is to say, without denying that charges for such end services as toll or local calling at bare incremental costs would fail to recover such costs common to those two services as switching and transport—the sharing of which among such services is the primary source of economies of scope—AT&T is saying that there are virtually no such costs shared by the several network elements that LECs would be required under the new law to offer and therefore no problem of charges at bare TSLRIC failing to recover them. We are not in a position to appraise that factual contention; but we point out that even if it is correct, it fails to respond to the (a) undeniable presence of economies of scope among the LECs' own retail services; (b) the necessity of their recovering those costs—confining our attention to strict economic costs—via varying markups above incremental costs in their charges for those services—just as AT&T does itself[3] and (c) the certainty that if competitors such as AT&T were free to acquire network elements at bare incremental costs, they could confidently be expected to use those loops to compete away LEC sales of the high-margin services and so undermine the rate structure that enables the incumbent companies to recover their total costs, as we observe more fully at pars. 7 and 19.

11. There is another way in which a requirement that LECs sell unbundled network elements to their competitors could distort competition—this time competition with facilities-

[3] AT&T uses its network to produce and sell services to high- and low-volume users of long-distance service. The latter pay rates several times incremental cost; large users pay rates much closer to incremental cost. AT&T recovers the costs shared across these services (low and high volume customers) on the basis of what the respective markets will bear. This example directly contradicts the assertion of Professors Baumol, Ordover and Willig that "prices in competitive markets converge to incremental cost" (par. 12). While this statement describes hypothetically *perfectly* competitive markets, it certainly does not describe telecommunications. For example, when AT&T's incremental cost (including access charges) was about $0.07 per minute, its average revenue per minute was about $0.18.

based third party rivals. There will inevitably be a great deal of cost averaging in measures of TSLRIC for individual network elements: loops as a group presumably share the costs of poles, trenching, loop testing equipment and excess loop capacity to allow for growth (such as the growth in demand that might result from entry of competitors using unbundled loops). Presumably those shared costs could be fully recovered by charges equal to average TSLRIC—that is to say, by charges embodying a proportionate share of those shared costs. If then an LEC were required to sell those elements to AT&T—let us say—at that average TSLRIC and were in addition subjected to an imputation rule, requiring it to impute that average to its own retail services, in order to ensure competitive parity, it could then be undercut by a facilities-based competitor that, for competitive reasons, chose to charge retail prices that recovered a lower-than-average markup on sales in particular markets. This is by no means a remote possibility: AT&T of course obtains lower markups on toll service to high-volume than to low-volume users. Yet an incumbent LEC would be precluded from meeting the competition for such customers from CLECs, who would not be bound by the cost-averaging rule implicit in AT&T's demanded TSLRIC pricing of network elements. The mixing together of average cost pricing in the mandated charge by LECs to some competitors for unbundled network elements and market-based pricing such as is routinely practiced by facilities-based competitors would thus be another source of distortion.

12. The recovery of sunk costs. The NPRM explicitly recognizes also the possible legitimacy of a markup contribution to the recovery of the sunk costs of incumbent LECs—item (d) on our list above—in par. 144. The answers to the questions it raises there, we suggest, are best supplied by the state regulatory commissions. It is they that have determined the revenue entitlements of the several LECs under their jurisdiction, in conjunction with the FCC, prescribed the depreciation policies that have determined the residual amount of embedded costs legitimately recoverable and specified the mechanisms for their recovery—whether, as has been the historical practice, in cost-of-service, rate base/rate of return proceedings or, more recently, in determining the structure of "just and reasonable rates" serving as the beginning point for price caps, rate freezes, indexations and other kinds of incentive regulation. And it is their responsibility to ensure that the markups above incremental costs that they allow are no more than sufficient to recover these costs that constitutes the full

response to the demagogic contention by Professors Baumol, Ordover and Willig that such markups would "lock in the ILECs' monopoly profits...." (par. 23).

13. It would be difficult to measure the costs (in the form of the disincentive it creates for the LECs to invest futher in their networks and the higher costs of capital in the future if investors are to make their funds available) of any such denial by government regulators of the entitlement of investors to recovery of costs prudently incurred and recoverable under previously prevailing regulatory policies. These costs are real, however, and cannot be ignored. Entirely apart from the inescapable question of equity that such denials would raise, it is a reasonable economic (as well, perhaps, as constitutional) question whether a market system can survive if governments feel free opportunistically to change the rules of the regulatory game at the expense of investors, when it is temporarily to the advantage of consumers to do so. Indeed, AT&T's lead witness here has suggested that regulated companies must be allowed to recover their historical costs during the transition to competition for these very reasons.[4]

14. It would indeed be preferable on grounds of pure economic efficiency if these several justified costs were made good not by markups in the charges for inputs but in the prices of final products or services only. The reason is that markups above incremental cost in the prices of inputs introduce the possibility of productive inefficiencies: so long as the demand for these inputs is not totally inelastic, the markups will result in some inefficient substitution of other inputs (with higher incremental costs) for the marked-up ones.

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[4] On page 10 Baumol, Ordover and Willig state: "Book costs are unlikely to reflect economic costs accurately, and basing the prices of network elements on book cost would be dangerously counterproductive." (See their many other such statements—e.g., in pars. 5, 7, and 8.)

To the extent that book costs exceed forward-looking costs, the difference between the two measures would be "stranded." Unless these witnesses have in mind some vehicle for recovery of historical costs other than the prices of inputs sold to competitors, their position here is starkly inconsistent with the position that Professor Baumol has taken in the electric industry. For example, in association with Professors Joskow and Kahn, he has asserted forthrightly: "A failure now of policy makers to ensure the companies at least some reasonable level of recovery of their regulatorily approved costs in any transition to competition would leave investors, in effect, with part ...of the value of their property expropriated by the change in the rules of the game. "The Challenge for Federal and State Regulators: Transition from Regulation to Competition in Electric Power," December 9, 1994, p. 34. Similarly, in collaboration with Sidak, he said: "Failure to allow recoupment of stranded costs will clearly violate this implicit regulatory compact. And aside from inequity, the failure to recoup could also deter capital investment." "Stranded Cost Recovery: Fair and Reasonable," *Public Utilities Fortnightly*, May 15, 1995, p. 22.

15. So long, however, as governments or regulatory agencies (1) feel bound, as we believe they should, to respect their commitments to afford public utility companies a reasonable opportunity to recover their legitimately-incurred costs, past and ongoing, and (2) are unwilling to do so by rebalancing final product or service prices, markups on inputs may be the best method available—at least during the interval (as brief as possible) over which high book values are written down and either rates are rebalanced or alternative methods of universal service funding installed.

16. The meaning of "a reasonable profit." We interpret the provision of the Telecommunications Act that charges for network elements must be based on cost but may include a "reasonable profit" as, at the very least, consistent with the foregoing statements of economic and regulatory principle, if not explicitly endorsing them. Some parties have argued, on the contrary, that the statutory standard is satisfied where the prices of inputs provided to other carriers are priced at bare TSLRIC, on the ground that economic cost already includes a "reasonable profit."

17. Entirely apart from the justifications we have already provided for the recovery of contribution there are the following responses to these assertions:

a. The Act says that these charges must be "based on costs." This clearly does not mean that they must be equated to cost.

b. In strict economic terms, the requisite return on incremental investments that is indeed included in measures of LRIC is a cost—the cost of capital—emphatically not a "profit."[5] In strict economic logic, therefore, the permissibility of incorporating a "reasonable profit" contemplates charges above pure LRIC or TSLRIC.

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[5] A typical statement of this elementary proposition is, from Professor Paul A. Samuelson's standard and celebrated text:

> We have already encountered...examples of true economic costs that do not show up in business accounts. The return to an owner's effort, the normal return on contributed capital to a firm, a risk premium on highly leveraged owner's equity—these are all elements that should figure into a broadly conceived set of economic costs but do not enter business accounts. An economist would insist that the wages of management or the return on contributed capital are real economic costs: They use real, live managers and tangible capital. Samuelson and Nordhaus, *Economics*, Twelfth edition, New York: McGraw-Hill, 1985, p. 469.

c. "Profit" has no economic meaning as applied to the price or revenues from any single service—or network element—supplied in common with other services. It has economic meaning only as the difference between total revenues and total costs (including in the latter the cost of capital) for an entire firm or accounting entity.

d. In the presence of economies of scope and scale, the sum total of revenues flowing from prices uniformly set at TSLRIC will—as the NPRM explicitly recognizes (par. 129) and as we have already pointed out—fall short of total economic costs. This is precisely why second-best pricing, with markups above TSLRIC, are required.

e. The costs of regulatorily-prescribed underpricing of basic residential service would clearly have to be recovered if the LEC were to show a profit in purely economic terms: if the prices of some of its services are prevented by regulation from recovering their incremental cost, firms will not earn a profit if all other charges are at incremental cost.

f. Finally, if the "reasonable profit" that the Act permits is intended to be understood in traditional accounting terms, rates would have to recover book as well as purely economic costs. These are, after all, the costs that the carrier actually has incurred in order to provide service.

18. The relationship between charges for unbundled inputs and the present rate structure. We have already cited the fact that the present rate structures of the LECs embody long-standing regulatory policies of deliberately pricing some services markedly above incremental costs in order to hold the prices of other services either at or below those costs and the FCC's acknowledgment of the consequent constraint on it to permit the LECs to incorporate a carrier common line charge and other public policy rate elements in their access charges to long-distance carriers. It has of course not been mere coincidence that the former services—incorporating these public policy add-ons—are the very ones that have become subject to increasing competition.

19. In these circumstances, the NPRM's "tentative conclusion that carriers can request unbundled elements for purposes of originating and terminating interexchange toll traffic" (par. 163) could not be intended to give them the right to obtain those elements at bare cost unless the Commission were intending now to abandon the existing access charge regime. If the long-distance carriers were now free to purchase and assemble all the network elements necessary to

originate and terminate their calls at incremental cost, they could and would circumvent those charges and undermine the present balance between over- and under-priced retail services, by reducing the market prices of the former.

20. The NPRM poses the same question in another way (par. 85): Do the unbundling requirements in effect provide entrants with an alternative way to "resell" the various retail services of the incumbent LECs, apart from the specific statutory rules for resales? If a competitor could order and combine network elements at bare incremental cost in such a way as to offer the same or similar retail services as it is entitled to purchase under the resale provision, there would be no point to the resale provision as it might apply to retail services (such as toll) that are compensatory or supercompensatory.

21. Other things equal, such a charge for inputs would conduce to economic efficiency, for reasons we have already expounded. But until the pertinent rates are fully rebalanced or some alternative method devised for supplementing revenues from the underpriced services, the recommendation of the IXCs here with the respect to pricing of unbundled inputs would undermine long-established regulatory policies, including the FCC's own carefully balanced interexchange carrier access charges.

III. RECOVERY OF THESE COSTS WOULD NOT PRECLUDE EFFICIENT COMPETITION

22. The final argument of the parties who insist that the rates for unbundled network elements or other inputs provided to competitors must be set at TSLRIC is that any rates in excess of that level would impede competition. What these parties fail to recognize is that the incorporation of markups in the charges for inputs has in itself only an indirect bearing on whether efficient competitors are able to challenge the incumbent firms.[6]

23. The rules of competitive parity. The relationship between the charges for inputs and the opportunities for efficient competitive entry—it is essential to understand—has two vital aspects. One—which is totally ignored by the comments—is that in the present circumstances in the telephone business, markups in the charges for essential LEC network services are

[6] We explain this indirect effect at note 8, below.

necessary in order to ensure that competition is efficient. So long as the present regulatorily-imposed rate structures of the LECs, reflecting the historical practices of pricing basic residential service residually and averaging costs geographically, necessarily embody charges for some services above incremental costs, there is absolutely no assurance that the competition that the latter rates have attracted—and continue to attract—is efficient. Those rates indisputably create an opportunity for entry by rivals less efficient—that is, with incremental costs higher—than the incumbents. We see no recognition in the comments of the necessity for markups to equalize the competition that would otherwise be to the disadvantage of the incumbent LECs.[7]

24. The other side of the coin, assertedly, is of course the one emphasized by the proponents of setting rates at incremental cost—that if rates are too high, efficient competitive entry may be deterred. This second view, we respectfully suggest, reflects a failure to comprehend the simple but absolutely fundamental fact that the critical determinant of the opportunity for competitive entry is not the level of the charge entrants pay incumbents for an essential input but the margin between it and the prices of the competitive services.[8] Consequently, a pricing method that permits markups in the charges for network elements or other inputs could not in itself constitute a barrier to efficient entry.

25. Essential to the conception of an entry barrier is that it confer on incumbents a competitive advantage over would-be rivals. As Professor George J. Stigler put it:

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[7] To be sure, that competition could be equalized also—and inefficient entry discouraged—by the incumbent companies reducing those subsidizing rates down to incremental costs. But that would involve a renunciation on their part of their historical entitlement to recovery of those unique costs and a violation of their obligations to their own shareholders. The more likely consequence of giving them freedom to reduce those rates would be that they would set them at levels holding an artificial umbrella over less efficient competitors, so long as it appeared that the benefits to their shareholders of retaining the margins outweighed the consequent losses in market share.

[8] The level of the charges does, because of the elasticity of demand for the final products, determine the size of the total market and therefore the number of minimally efficient competitors that it will support. This is one reason why that absolute level is by no means a matter of indifference; and it argues, specifically, that the level be subject to regulatory determination that such markups as they contain are no more than necessary to fulfill regulatory obligations to the incumbent companies and to guard against inefficient entry that would otherwise be attracted by the inflated prices of the end services. Transferring the burden of recovery of these contributions from those end service prices to the charges to competitors for essential inputs in no way constricts the market additionally, however.

> a barrier to entry may be defined as a cost of producing...which must be borne by a firm which seeks to enter an industry but is not borne by firms already in the industry.[9]

The markups above incremental cost in the charges to competitors for network elements would confer no such advantage. Far from imposing a cost on would-be rivals that would not be borne by the incumbents, permitting the latter to recover embedded and ongoing costs associated with their unique service obligations would restore a balance in a situation in which it is the incumbents that have incurred and/or continue to incur costs that are not borne by their challengers.

26. In the most famous case involving an asserted use of market power in the supply of an essential input to deny rivals a fair opportunity to compete, the antitrust suit under Section 2 of the Sherman Act against the Aluminum Company of America, the condemnation of Alcoa for exclusionary practices directed against competing fabricators depended not to the slightest extent on the level of its charge for the ingot that they had to purchase from it. It was based, instead, on the courts' finding that the margin between Alcoa's charges for ingot and for fabricated products—within which competing fabricators had to survive—was narrower than Alcoa's own incremental costs of fabrication. The rules of competitive parity explicitly preclude that possibility. By requiring—other circumstances being equal—that the prices charged for the competitive services by incumbent LECs be high enough to recover both the charges for the basic network elements that their rivals pay and their own incremental costs, they ensure that competitors with incremental costs equal to or lower than those of the incumbent will indeed be able to enter and survive.

27. The inapplicability of competitive parity rules to non-compensatory services. As the NPRM clearly recognizes, application of such a competitive parity rule to the relationship between (wholesale) charges for unbundled inputs and the retail prices of services that are priced below cost is unnecessary to permit efficient competition. This is so because the

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[9] The Organization of Industry (Homewood: Richard D. Irwin, 1968, p. 67. See the fuller discussion in W. Kip Viscusi, John M. Vernon and Joseph E. Harrington, Jr., *Economics of Regulation and Antitrust*, 2d ed., Cambridge: The MIT Press, 1995, p. 159; see also pp. 158-62.