regarding competitive LECs' actual ability to deploy alternative high-capacity loops. Instead, he tries to "model" the economics of extending competitive fiber to potential high-capacity customers.

In order to undertake this thought experiment, Dr. Crandall developed a series of largely undocumented models intended to estimate (i) the location of possible high-capacity customers; (ii) the revenues to be gained by serving them; and (iii) the incremental costs of extending existing competitive LEC fiber facilities to reach these customers. In particular, he developed a "Probit" model to estimate (for six allegedly "representative" cities) whether a particular telecommunications user is a likely high-capacity customer, and an ordinary least squares ("OLS") regression model to estimate expected telecommunications revenues available for individual buildings that contain such high-capacity customers. Crandall Dec. at 19-22, 36- 41. To locate these high-capacity customers, he uses iMap data to build a model that purports to determine the "as the crow flies" distance between competitive LEC fiber and buildings assumed to have special access customers. *Id.* at 23-28.

Dr. Crandall then uses these models as inputs for yet a third model, a cost study developed by the Cambridge Strategic Management Group ("CSMG"). *Id.* at 28-31, 42-44. This CSMG model purports to calculate (i) the "incremental" costs of extending existing fiber a particular distance and (ii) the revenues required to recoup these costs. *Id.* *See generally* CLEC Network Extension Cost Model (dated April 26 2001) (hereinafter "CSMG Report") (submitted by USTA on June 1, 2001). Based on this series of models, Dr. Crandall concludes that where the "potential" revenues attributable

from all customers within a building exceed the "break even" level of revenues required to recover the incremental costs of extending fiber the distance necessary to reach the customer, a competitive LEC could always construct alternative facilities (and would therefore not be impaired if it could not purchase UNEs to provide special access service). Crandall Dec. at 28-33.

The *UNE Remand Order* made clear that the Commission would give no weight to such theoretical constructs. Instead, the Commission stated that the "impairment" inquiry turns on the availability of alternatives in the *real world*.

> Although we find it reasonable to consider cost, time, quality, ubiquity, and other factors associated with self-provisioning or acquiring an element from a third party provider, we do not base our decision on *cost models or on the theoretical availability* of alternatives from other sources. Rather, we find the *marketplace* to be the most persuasive evidence of actual availability of alternatives as a practical, economic and operational matter. As the Texas PUC stated, the Commission and the states should "base their decisions on *marketplace information* . . . ."

UNE Remand Order ¶ 66 (emphasis added).

Dr. Crandall does not offer any marketplace evidence to rebut the showing by AT&T and other competitors that – in the real world – competitive LECs would be impaired without access to the incumbents' high-capacity loops and transport facilities. In its reply comments, for example, AT&T attached expert testimony from network planners that showed the very limited extent to which AT&T has been able to self-provide or obtain alternative access to high-capacity loops and transport facilities, despite its significant incentives and efforts to use such facilities. *See* Declaration of Anthony Fea and William Taggart ("Fea-Taggart Dec.") ¶¶ 3-31 (attached as Exhibit C to the

Reply Comments of AT&T Corp.). Today, AT&T has special access circuits to approximately 11,500 local serving offices ("LSOs"), with each LSO generally connected to two AT&T points-of-presence ("POPs"), resulting in approximately 21,000 unique LSO-POP combinations. *Id.* ¶ 5. Obtaining these facilities from non-incumbent suppliers (either through self-supply or from other competitive carriers) would be almost impossible, both because of the sheer number of the facilities required to connect these LSOs to the AT&T network and because many of these facilities are very low capacity circuits.

In particular, AT&T showed that it is economically infeasible for it to build facilities in the overwhelming majority of these locations. *Id.* Therefore, AT&T must generally rely on incumbent LECs to provide such access. Overall, for the "backbone" portion of AT&T's local network, AT&T almost *never* self-provides DS-1 transport and self-provides DS-3 transport only a small fraction of the time. *Id.* ¶ 6. AT&T also primarily depends upon incumbent LEC facilities for the "tail" portion of its network, *i.e.*, connections between customer premises and an LSO. *Id.* Further, AT&T uses non-incumbent facilities to access only a handful of the more than 3,000,000 commercial buildings in the country, and in the overwhelming majority of those cases, AT&T only has a "fiber to the floor" arrangement, which allows it to serve only a single customer in the building. *Id.* ¶ 30.

Nor are these numbers likely to change materially in the near future. AT&T provided sworn expert testimony demonstrating the many factors that impair its ability to deploy its own facilities, even to the minority of LSOs and buildings that might have

enough traffic to support the significant cost of deploying dedicated transport or loops, including:

(1) construction impediments (particularly those involving rights-of-way and building access issues);

(2) prior volume and/or term commitments that make it uneconomic to convert facilities because of termination liability penalties;

(3) exhaustion of collocation capacity; and

(4) long distances between the LSO and AT&T's POP or the LSO and a customer's building that make construction economically infeasible.

Id. ¶¶ 9-20. Further, in today's market, it is difficult even for AT&T to secure sufficient capital to fund construction of local networks at rates that conform to prudent business practices. *Id.* ¶¶ 22-23.

The other commenters provide similar marketplace evidence that confirms AT&T's experience. For example, Focal's reply comments (at 4-5) demonstrate that it "most often has no choice but to order the ILEC's high capacity loops and dedicated transport to serve its customers." ITC DeltaCom emphasizes it uses BellSouth special access services more than 95 percent of the time. ITC DeltaCom Reply at 4. Likewise, El Paso Networks states that its experience is that "interoffice transport capacity . . . is rarely available from sources other than the ILEC." El Paso Networks at 12. *See also* Sprint at 6 (Sprint "depend[s] on the ILECs for two-thirds of its special access and dedicated transport needs . . . in areas where its local networks are being deployed"). The competitive LECs' dependence upon the incumbents can also be seen from the fact that competitive LEC infrastructure investment pales in comparison to the incumbent LECs'

investment in constructing their ubiquitous networks. Sprint Reply at 5. Most broadly, WorldCom provides data showing that competitive LECs have only a 15 percent share for special access and private line services, have penetrated only a small fraction of commercial office buildings, and have deployed only modest amounts of local fiber. WorldCom Reply at 7 & Attachment at 1-7. All of this hard factual evidence from the marketplace clearly validates the Commission's decision not to rely on models in making decisions under the impairment standard of section 251(d)(2).

B. Dr. Crandall's Models Fail To Consider Fully Many Factors That Competitive LECs Must Take Into Account When Considering Whether To Spend Their Investors' Money To Deploy Facilities.

As discussed above, USTA only recently placed into the public record a fraction of the documentation that purports to provide the detailed backup for one of Dr. Crandall's models. USTA did not provide any information supporting the other two Crandall models, and the information provided for the third can only be characterized as superficial. *See infra* Part IV.

Nonetheless, it is clear from even the Crandall declaration's summary description that conclusions based on the output of these models are not entitled to any weight. It is elementary that models that do not correctly reflect all of the relevant considerations in a competitive LEC's decision to build alternative facilities cannot provide a rational basis for a finding that such carriers are able to self-supply facilities with the same quality, cost, timeliness, scope of coverage and other operational factors as the incumbent LEC. On its face, however, Dr. Crandall's analysis fails completely to take into account the numerous practical difficulties competitive LECs face in their attempts to deploy

facilities, even to those customers whose demand for services might make the construction of alternative facilities theoretically feasible. Indeed, Dr. Crandall is able to reach conclusions that support his clients' position only by systematically understating the costs of deploying fiber and overstating the revenues earned by competitive providers.

In particular, Dr. Crandall understates costs by improperly assuming:

- an "incremental" methodology that ignores huge categories of costs that competitive LECs must incur to provide high-capacity services;
- a simplistic network architecture that ignores basic engineering principles; and
- patently unrealistic values for key cost inputs.

Moreover, Dr. Crandall overstates revenues available to competitive LECs by improperly assuming that:

- competitive LECs can build facilities instantaneously, which ignores, among other things, the significant delays typically incurred in obtaining rights-of-way;
- competitive carriers incur no costs prior to generating revenues;
- competitive carriers routinely penetrate entire buildings and provide all telecommunications services for all customers in such buildings;
- competitive carriers provide no services to any customers in buildings that they potentially may serve; and
- a customer won by a competitive LEC is retained in perpetuity, with no ongoing marketing costs.

As explained below, each of these simplifying assumptions wishes away real world considerations critical to the Commission's impairment analysis.

The "incremental" assumption. By his own admission, Dr. Crandall does not even attempt to capture all the costs of providing high-capacity service. Instead, he uses an "incremental" approach that assumes competitive carriers already have in place an existing fiber network and the associated electronics and that such facilities have sufficient capacity to handle all traffic generated by extending the network to individual buildings. *See* Crandall Dec. at 29-30, 43-44; CSMG Report at 5-8. However, as described below in detail, Dr. Crandall also assumes that existing fiber facilities are not being used as part of a backbone network providing services to any existing customer. Dr. Crandall therefore assumes that competitive LECs need only recover the costs of incrementally expanding their *existing* network to additional buildings and do not need to recover from any customer any of the significant costs of the fiber backbone and associated electronics. In reality, of course, competitive LECs would not deploy fiber backbone facilities without the prospects of recovering the significant costs of those facilities.

Further, Dr. Crandall assumes that the competitive LEC has in place all the necessary back office systems and unused network capacity to handle all the incremental local and special access traffic generated by extending the network. Thus, the CSMG model assumes that only minimal costs are incurred to provide these incremental services and that the additional local and special access revenues garnered at the newly-connected buildings have nearly a 100 percent profit margin. *See* CSMG Study at 32. If this were true, then there is little doubt that extensive builds would occur. But it is not true. Clearly, these local and special access services have associated incremental costs and, by

omitting them, the breakeven revenue levels that competitors need to achieve to deploy economically fiber are artificially reduced

Network architecture assumptions. Dr. Crandall pushes this incremental approach even further, assuming that a competitive LEC can reach the target building in the shortest distance possible. Crandall Dec. at 25. This assumption fails to recognize the realities of deploying diverse fiber, making a quantum leap past the real world and even beyond the USTA-described "tiny robots" that lay fiber through sewers, USTA Report at 13, to a methodology that tunnels through all obstacles in a straight line from the customer's building to the competitive LEC fiber. In reality, public rights-of-way run parallel to streets and rarely run in a straight line from a particular building to a competitive LEC's backbone fiber. In fact, the shortest distance between deployed fiber and a building may be under a river or across private property or through restricted areas such as military installations. Or, it may run over other terrain where rights-of-ways are not available or where construction would be prohibitively expensive.[3] It is precisely for these reasons that the Commission uses "rectilinear routing" rather than "airline

[3] With respect to Table 6, Dr. Crandall alleges that the distribution of actual fiber extensions made in Cleveland is evidence that such extensions are possible. *See* Crandall Dec. at 27. However, he does not provide the quantity of extensions (*i.e.*, he provides only a percentage distribution) and, more importantly, he does not address the cost or profitability of these extensions, the type of extension (wired or wireless) or even whether the competitive LECs that constructed the extensions are still in business. Nor does he explain whether he eliminated the extension of long haul fiber from the data set to ensure that he was only analyzing extensions of *local* fiber.

distances" in calculating distribution and feeder cable costs for its universal service cost model.[4]

Two additional overly-simplistic network architecture assumptions in the models not only substantially understate competitive LEC costs but, if these assumptions were implemented in practice, they would potentially jeopardize the quality of service that a carrier could offer. First, Dr. Crandall apparently connects building laterals without regard to the nature of the fiber to which the lateral is connected. This simplification trivializes the way in which fiber facilities are deployed and would prevent the efficient utilization of transport capacity. Second, he apparently ignores the routine practice of providing *dual* and *diverse* feeds to and from building common space and LSOs.[5] This is particularly significant given the study's unrealistic assumption (discussed below) that the competitive LEC serves all telecommunications needs of all the tenants in the building. The failure to provide for lateral diversity could easily result in the modeled costs being only *half* of what would actually be incurred.

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[4] Tenth Report and Order, *Federal-State Joint Board on Universal Service*, 14 FCC Rcd. 20156, ¶ 82 (1999) ("*Inputs Order*"). "A rectilinear measurement computes the distance between two points by constructing a rectangle with the two points as opposite vertices and measuring the distance of two adjacent sides of the rectangle. The airline distance is the length of the diagonal line that directly connects the two points." *Id.* ¶ 80 n. 196.

[5] The section of the CSMG electronic spreadsheet dealing with this point appears to be the "Lateral Variables" section of the "Engine" tab. The three variables are identified: "Distance of lateral (ft.)," "%age Underground," and "Strands per lateral." If the CSMG study were to account for diverse dual feeds, the spreadsheet should contain a variable value field allowing the specification of the number of laterals per customer location.

In the real world, a competitive LEC cannot simply tap into the nearest fiber that is in the vicinity of a potential special access customer unless that fiber was deployed as a customer ring or sub-ring. Typically, a fiber lateral is used to connect a building to a customer ring that is separate from, but connects to, the backbone ring. Customer rings generally do not incorporate add-drop multiplexing functionality. As a result, individual fiber strands on the ring must be dedicated to individual locations. This, in turn, means that the customer ring generally lacks the grooming functionality that permits the most efficient facility optimization and cost minimization, which is essential for backbone facilities. Therefore, customer rings are deployed with an eye towards serving multiple locations in a specific but limited locality, because of the higher costs associated with devoting the entire capacity of a fiber strand to a single customer or building.

In contrast, a backbone facility is designed to maximize utilization of a node-to-node facility. This is accomplished by routing the backbone fiber through strategically placed add/drop multiplexers, digital cross-connect systems and passive cross-connection devices that permit modification of communications paths and reorganization of the customer services that are assigned to individual time slots within a communications path.[6] Furthermore, the existence of spare strands within a fiber cable does not guarantee that a customer ring could be deployed, because some or all of the available capacity may be reserved for growth of the backbone facility itself. And even if one or more strands on

[6] The same fiber optic cable may contain strands that are employed for either backbone or customer rings; however, the individual strands cannot be used interchangeably. In fact, backbone fibers are often contained in separate buffer tube(s) from other fibers on a route in order to minimize splicing activities around backbone fibers.

a cable were available, it would be highly inefficient to dedicate the strand to a single building or customer unless the spare strand (i) was part of a preexisting customer ring, (ii) could be configured into a customer ring, or (iii) was used for a customer location with exceptionally high demand – certainly much greater demand than the single DS1 capacity threshold set by Dr. Crandall. The sparse documentation provided to date for Dr. Crandall's analysis does not indicate whether the type of fiber facilities (backbone, customer ring or sub-ring) was a consideration in the calculations regarding the distance necessary to connect a building to existing fiber.[7] Given the general lack of technical sophistication of the study, however, it is reasonable to expect that this critical and practical consideration was not considered at all.

Even assuming, as Dr. Crandall implicitly does, that the fiber ring accessed might be a customer ring deployed by the carrier, the analysis is still deficient. First, based on the little information that AT&T has received thus far, the analysis does not appear to take into consideration the added time and costs associated with implementing a dual-feed diverse architecture for buildings that a competitive LEC would bring on-net. The field survey and engineering time to achieve the requisite path diversity alone can be significant. Additionally, it is AT&T's standard practice for common space on-net buildings to use two identical feeds that not only use separate entrances to the building but also to use separate paths back to the fiber customer ring. Such redundancy is

[7] As explained in Part III *infra*, it actually appears that the study in certain instances used long-haul rather than local fiber (*e.g.*, Level 3 fiber in Cleveland, OH and Seattle, WA).

necessary to assure that the building will not lose service if one of the feeds is cut or damaged.

Second, it is not apparent that Dr. Crandall takes into consideration the fact that the competitive LEC's fiber configuration would generally employ unidirectional transmission paths. In such cases, four fibers are deployed, with two fibers in each of the diverse building feeds.[8] The "active" path uses one fiber strand for receiving communications and another fiber strand for sending communications, and the back-up path has a similar configuration. As a result, the costs set forth are likely to be significantly understated even in those few instances where the building could be connected to a pre-established customer ring.[9]

In addition, the model's "straight-line" approach and assumption that the competitive LEC's fiber backbone can always be severed and re-spliced at the straight-

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[8] Page 25 of the CSMG Report shows the illustrative "fiber and conduit cost" at 500 feet for Cleveland to be $16,735. This result is reproduced by multiplying the unit costs show on page 31 for the fiber lateral deployment in Cleveland (albeit a length of between 497-498 feet rather than 500 feet would be required to reproduce the numbers precisely). This clearly shows that only a *single* cable is assumed to the building being served.

[9] An additional implication of the failure to employ this architecture in the models is that the number of buildings that Crandall asserts could be served by existing fiber could not be accommodated. For example, an extremely large fiber optic cable contains 288 strands. *See Inputs Order*, App. A. Setting aside 48 strands for backbone purposes – which is not an unreasonable reservation – only 240 strands would be available for building laterals. Given that a minimum of 4 strands per location would be needed, a maximum of 120 buildings could be added to the entire cable before the cable's entire capacity is exhausted. (This assumes a ring architecture in which, if a lateral strand were severed, one transmission strand could route "clockwise" while the back-up transmission strand could route "counterclockwise." Of course, no diversity would exist at the splice point. In all events, four lateral strands from the building would consume two transmission strands on the ring).

line intersection point also requires that the competitive LEC either fortuitously has multiplexing functionality at the precise point where the fiber lateral intersects the backhaul fiber or is willing to dedicate the entire capacity of the fiber strand (from the point of intersection to the site where the multiplexing function is present) to a single building. These conditions are not likely to be met in a large proportion of cases. The only alternative is for the competitive LEC to install multiplexing functionality at the point of intersection or to deploy a customer ring – but these significant costs are simply ignored in Dr. Crandall's study.

Biased input assumptions. Finally, Dr. Crandall uses inputs in his models that do not remotely reflect real-world costs and thus significantly understate the gross revenues a competitor would need to support the economic deployment of fiber to individual buildings. For example, a major driver of the cost of fiber deployment is the cost of trenching. Trenching costs are assumed in the $17 - $30 range, *see* CSMG Study at 31, but that is far below the costs that competitive LECs would likely incur. After assessing the evidence on this very issue in the universal service cost model proceeding, the Commission itself determined that, for normal terrain, efficient trenching costs are between $27.79 and $42.59 per foot for dense urban areas. *Inputs Order*, App. A. For cities located on more difficult terrain, trenching costs for dense urban areas range from $38.86 to $92.02 per foot. *Id.* And these values do not include necessary manhole costs, which can raise the per-foot costs considerably. *Id.* (showing manhole costs ranging from $1,436.50 to $3,230.00).

Dr. Crandall also underestimates the costs of underground fiber cable by over 40 percent. He assumes the cost of an underground 144-strand fiber cable is $4.32 per foot. CSMG Study at 31. The Commission, however, found for purposes of calculating universal service funding that the same cable costs $6.14 per foot, *Inputs Order*, App. A.[10]

The "instantaneous build" assumption. Dr. Crandall's theoretical construct assumes that competitive LECs have the ability to serve any customer for whom the potential revenues exceed the costs of extending existing fiber to the customer. Crandall Dec. at 28-31. These assumptions completely ignore the numerous real-world obstacles AT&T and other competitive LECs have documented that they face in winning and serving customers. Both municipalities and landlords often demand exorbitant fees and other onerous conditions before a new entrant can even reach a contract to build new facilities, much less begin (or complete) construction. Fea-Taggart Dec. ¶¶ 10, 11.

For example, AT&T showed that the negotiations with municipalities and landlords necessary to secure the rights-of-way from AT&T's fiber ring to individual buildings almost always take at least four to six months to complete, and some negotiations (and resulting litigation) have lasted for years. *Id.* ¶ 10. This is particularly true in those instances where negotiations require participation from the incumbent LEC

[10] Further, the model assumes only minimal costs for building access (around $4,000 per building, growing 4 percent per year) and virtually no obstacles resulting from municipal franchise/right-of-way negotiations (*e.g.*, that there will be no demands from landlords for on-going revenue sharing, and modest franchise fees – none exceeding 5.5 percent of revenue – in only three of the six cities he studied). *See* CSMG Study at 32-33.

or other third parties. *Id.* ¶ 12. Moreover, there is no guarantee that such negotiations will be successful. In some of these instances, negotiations have broken down and AT&T has been forced to abandon its construction plans altogether. *Id.* ¶ 18.[11]

As a result of these and other practical hurdles competitive LECs must overcome, *see* Fea-Taggart Dec. ¶¶ 3-31, the process of deploying loop facilities typically takes at least a year and sometimes much longer. This delay – which is not reflected at all in Dr. Crandall's studies – makes it extremely difficult for AT&T and other competitive LECs to gain customers. A competitive LEC cannot simply spend tens or hundreds of thousands of dollars to extend its network on the hope that it will eventually win customers away from the incumbent LEC. Instead, it must first obtain an agreement with a customer to provide services. Customers, however, do not usually approach competitive LECs until they have a short-term need for additional capacity. As a result, they are generally unwilling to wait for a competitive LEC to complete the arduous process of building facilities, especially when the incumbent is usually available to meet their needs immediately with its existing, ubiquitous network. *Id.* ¶¶ 16, 20. Thus, the need for immediate service often trumps the customer's desire to use an alternative provider, and in those situations the competitive carrier does not even get the opportunity to construct its own facilities to serve the customer. *Id.* ¶ 20. The only way to prevent this from happening is for the competitive LEC to resell incumbent LEC special access

[11] ALTS has extensively detailed the difficulties in obtaining rights-of-way from municipalities and landlords. *See generally* D. Walcott, *Local Competition Policy & The New Economy* at 9 (Feb. 2, 2001).

services, but even if this were profitable notwithstanding the monopoly rents embedded in existing incumbent LEC dedicated access rates, the competitive LEC still faces another practical roadblock – customers, fearing service disruption, often resist subsequent rearrangement of their services to connect them with the competitive LEC's facilities. *Id.* ¶ 28.

Revenue timing assumptions. The models not only assume that competitive facilities are instantaneously deployed, but they also assume the competitive LEC does not have to expend capital before it is able to generate revenues from its new facilities. This is obviously nonsense. Moreover, the time when competitive LECs begin to earn revenues in relation to the timing of their various capital, pre-operating, and operating expenditures obviously has a dramatic effect on the CSMG model's net present value ("NPV") calculations. Because of the time value of money, revenues earned in the future are less valuable in real terms than revenues earned today. Thus, greater revenues are required to cover current costs if the revenues are generated after the initial capital, pre-operating, and operating expenditures are incurred.

Dr. Crandall's models grossly overstate the NPV of the revenues competitive LECs earn by failing to account for the way those carriers must time their expenditures. All of the significant capital costs listed on page 27 of the CSMG Report would be incurred before the competitive carrier can generate *any* revenues associated with those costs. In addition, expenses such as the permit, franchise, and sales costs listed on pages 21 and 22 of the CSMG Report also occur before any revenue can be generated. Moreover, the lag between the time when a competitive LEC begins spending money to

win and serve a customer and the time it begins to collect revenues is considerable – typically at least a year. In sharp contrast, the models wish away this period and assume that a competitive LEC will be earning earn maximum revenues as soon as it incurs any expenditures.[12]

The "100 percent success rate" assumption. And the unreality of the Crandall models does not stop there. Not only do they assume instantaneous construction and revenue generation, they also assume that the competitive LEC *immediately* wins *all* services for *all* customers in the building (both high-capacity and low-capacity customers). Crandall Dec. at 29-30, 39. This rises to the level of the absurd. AT&T's reply comments provided substantial evidence showing that in many cases it is *impossible* to serve all customers in a building due to impediments created by landlords. *See* Fea-Taggart Dec. ¶¶ 16-20, 30-31. Further, even where AT&T can gain access to an entire building, many customers have refused to permit AT&T to "roll" their existing service to AT&T facilities, even when AT&T offered them financial incentive to do so, because they did not want to risk the possibility of any service disruptions. *Id.* ¶ 28. Competitive LECs face the reality that no one has ever been fired for buying access from the incumbent LEC, and many customers are unwilling to take the (perceived) risk of using competitive LEC facilities, even if they offer generally superior performance and lower price. *Id.* This customer perception has been exacerbated by the recent spate of public announcements of competitive LEC bankruptcies, creating the impression that

[12] *See* CSMG Cost Model CD, Worksheet "Financial," "Total Revenue" and "Operating Expenses" lines on the Income Statement, "Fiber Capex" lines on the Balance Sheet.

new entrants may not be reliable suppliers. *Id.* ¶ 37. This perception is yet another major factor that dissuades individual customers – much less all of the customers in a multi-tenant building – from giving all of their business to a new supplier. *Id.*; Declaration of Alice Carroll and Cynthia Rhodes ¶ 15 (attached as Exhibit A to the Comments of AT&T Corp.).

And in all events, even if it were correct to assume away the significant barriers competitive LECs face in penetrating buildings (and it clearly is not), the assumption that a single competitive LEC could win all of the customers in a building is flatly inconsistent with that assumption. If one could ignore all the significant barriers to providing local telecommunications services, then one could not reasonably expect, as the models explicitly do, that a single competitive carrier would win all the customers in a building. Rather, in such an intensely competitive environment, there would be multiple competitive LECs serving the same building.

The "no prior service" assumption. At the same time Dr. Crandall assumes that competitive carriers will win all the customers in a building prior to extending fiber to the building, he assumes for modeling purposes that the competitive LEC provides *no* services, either local or long distance, to any customer located in a building with a high-capacity customer. *See* Crandall Dec. at 30. In this way, Dr. Crandall claims all of the customers' revenues as "incremental" revenues that are obtained for the "incremental" cost of adding a fiber extension to the building.

This assumption is obviously not true, particularly for carriers such as AT&T, WorldCom and Sprint, which are also the largest interexchange carriers.[13] Further, in the few instances where landlords permit competitive LECs to gain access to an entire building on the same terms as incumbents, there are often multiple competitive LECs providing service. Declaration of C. Michael Pfau ("Pfau Dec.") ¶ 44 (attached as Exhibit B to the Reply Comments of AT&T Corp.). The result of this assumption is to overstate the amount of revenues potentially available to a competitive LEC for its "incremental" build, again overstating the number of "addressable" buildings.

The "perpetual service" assumption. Finally, the models not only assume that a competitive LEC wins all the customers in a building, they also make the fantastic assumption that it keeps the customers it wins in perpetuity,[14] without any need to invest in additional marketing expenses,[15] and that the competitive LECs incur no incremental, on-going costs to serve the customers they have already won, except for some billing costs, long distance costs, minor Sales, General & Administrative costs, and costs for

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[13] This is so because the largest long distance carriers would often already be serving customers in the largest buildings and because the customers most likely to be heavy users of high-capacity facilities would be most likely to use multiple carriers to better assure continued communications capability should one carrier experience a network failure.

[14] Dr. Crandall's assumption that a customer remains with a competitive LEC forever is apparent from the fact that Dr. Crandall multiplies the year 10 EBITDA (earnings before income taxes, depreciation and amortization) by 10 to determine the net present value of revenues that a competitive LEC will earn by serving a building. *See* Crandall Dec. at 44.

[15] The documentation provided on the CSMG study makes no mention of any marketing expenditures by a competitive LEC after it wins the initial contract.

premise equipment and maintenance of the fiber extension. These assumptions are not only unrealistic, but the only way they could even possibly occur is if the competitive LECs establish long-term exclusionary contracts – a practice that is expressly prohibited by the Commission's *Building Access Order*, except in very limited circumstances.[16] In fact, competitive LECs are typically able to sign customers to contracts lasting only a few years. Thus, they cannot expect to avoid ongoing sales and marketing costs, and quite possibly declining unit revenues over time, in order to keep the business.

* * *

In sum, the Crandall models and the conclusions they generate are remarkable chiefly for how unambitious they really are. The models merely identify situations where, in a world without practical operational procedures and problems, it would be theoretically economic for a competitive LEC that already has fiber transport facilities in place to extend those facilities to buildings where special access customers are located. Although such simplified models may be reasonable for instructional purposes, they have no application to the serious decisions that businesses must make about how to spend their investors' funds. In those real-world situations, they cannot ignore competitive carriers' critical marketplace imperative – the need to derive a reasonable return on their investment. That means taking reasonable account of all the "friction" that exists in the

[16] *See generally* First Report and Order and Further Notice of Proposed Rulemaking, *Promotion of Competitive Networks in Local Telecommunications Market, Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, Review of Sections 68.104, and 68.213 of the Commission's Rules Concerning Connection of Simple Inside Wiring to the Telephone Network*, 15 FCC Rcd 22983 (2000).

real world – *i.e.*, the significant transaction costs and impediments described above and in the comments that demonstrate the *real* problems competitive LECs face in deploying local fiber in order to compete with incumbent LECs.

Given the unrealities of the models, it is not surprising that there is an extraordinary disconnect between Dr. Crandall's conclusions and recent market developments. If he were correct and there were literally hundreds of thousands of buildings that could profitably be served by competitive LECs, then the capital markets should be pouring in billions of dollars to fund construction of competitive networks, and the prices of special access services would be plummeting. But exactly the opposite is occurring. As AT&T explained – and as an even more recent spate of news stories attests[17] – the capital markets are effectively closed to competitive LECs. Indeed "[t]he reality is that almost no CLECs are profitable and most are saddled with massive debt."[18] In short, the Baby Bells, "with their seemingly impenetrable local-service fortresses, are emerging as the hands down winners."[19] If this is true – and the above news reports

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[17] *See, e.g.*, Y. Noguchi, *Teligent to Cut 900 Jobs*, The Washington Post (May 11, 2001); G. Zuckerman, *Wrong Numbers: Telecom Debt Debacle Could Lead to Losses Of Historic Proportions*, Wall St. J., at A1 (May 11, 2001); D. Solomon, *Everyone's Got A Solution For Industry's Woes*, Wall St. J., at B1 (May 3, 2001); L. Lazaroff, *Jonas Launches CLEC Rollup*, The Daily Deal (May 3, 2001); J. Boyd, *Service Discontinued - As Carriers Go Bust, Customers Need Recovery Options*, InternetWeek, at 104 (Apr. 30, 2001).

[18] M. Martin, *Besieged CLECs Continue to Flounder*, Network World, at 22 (May 7, 2001) (2001 WL 10797656) (quoting Jeff Moore, an analyst with research firm Current Analysis).

[19] R. Farzad, *Has the Telecom War Been Won?* Dow Jones News Service (May 15, 2001).

speak for themselves – this is hardly the time for the Commission to put competitors at an even greater competitive disadvantage by denying them access to high-capacity facilities in general and to high-capacity loop-transport combinations in particular.

Moreover, if Dr. Crandall was correct about how easy it is to win large business customers, there would be every reason to expect significant incumbent-against-incumbent competition for high-capacity services. After all, the incumbents not only have in place all the back office systems necessary to provide local services, particularly high-capacity services, in neighboring territories, but also the funds and the expertise to provide such services. That is why the Commission has repeatedly found that incumbent LECs are among the most likely and significant potential entrants into an adjacent incumbent LEC's territory.[20] But rather than enter neighboring territories and win customers with the ease suggested by these theoretical models, the incumbents have shown virtually no interest in competing outside their territories – even SBC, which is under an affirmative obligation to enter out-of-region territories.[21] The incumbents' own actions speak much louder about the real world than any models.

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[20] Memorandum Op. and Order, *Application of GTE Corporation and Bell Atlantic Corporation For Consent to Transfer Control of Domestic and International Sections 214 and 310 Authorizations and Application to Transfer Control of a Submarine Cable Landing License*, 15 FCC Rcd 14,032, ¶¶ 100, 107-08 (2000); Memorandum Op. and Order, *Applications of Ameritech Corp. and SBC Communications, Inc. For Consent to Transfer Control of Corporations Holding Commission Licenses and Lines Pursuant to Sections 214 and 31(d) of the Communications Act and Parts 5, 22, 24, 25, 63, 90, 95, and 101 of the Commission's Rules*, 14 FCC Rcd 14,712, ¶¶ 66, 77-91 (1999).

[21] *See* P. Davidson, *SBC Scales Back Plans For Local Telephone Service*, USA Today, at 1B (March 19, 2001) ("SBC Communications is sharply scaling back its much-ballyhooed plan to offer local phone service outside its 13-state region," which "deals another blow to the prospect of new choices for consumers"); M. Wigfield, *SBC Curtails*

(continued . . .)

III. THE MODELS DO NOT EVEN PROPERLY REFLECT THE IDEALIZED WORLD THEY ASSUME.

Even assuming *arguendo* that these theoretical constructs are relevant to this proceeding, the limited information available from the Crandall declaration shows that the modeling techniques used are faulty and that the models fail to calculate even the incremental costs of expanding existing competitive LEC networks in a frictionless world. Buried in the Crandall declaration is evidence regarding overall error rates in the Probit model, which is used to identify potential high-capacity customers. As described above, the Probit model based the identification of potential high-capacity customers on the number of on-site employees and the industry (*i.e.*, the standard industrial code ("SIC"))[22] of the customer. Crandall Dec. at 19. Dr. Crandall himself admits, however, that the Probit model, which provides the first and most fundamental input (*i.e.*, buildings that might have sufficient revenues to justify a build) is wrong one out of five times. *Id.* Moreover, as also discussed above, Dr. Crandall's approach applies three models in sequence – the Probit Model, the OLS Model and the CSMG study. If each model were likewise 80 percent accurate (and there is no evidence that they are even this reliable), the

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(. . . continued)
Effort To Launch Local Service in New Mkts, Dow Jones News Service (March 6, 2001) ("SBC Communications Inc. is curtailing its push into 30 new markets, a push which was a condition of SBC's merger with Ameritech Corp. in 1999"); M. Wigfield, *FCC Criticizes SBC's Work on Merger Conditions*, Wall St. J., at A4 (Oct. 9, 2000) (2000 WL-WSJ 26612388) (reporting on letter from FCC and industry opinions that SBC is violating merger conditions by allowing service levels to decline, and by refusing to open its own markets while simultaneously declining to offer out of region services to the extent it should).

[22] The SIC identifies an industry group such as Agricultural and Government. Dr. Crandall stratifies buildings by SIC to perform his Probit and OLS regressions.

overall conclusion would not be any more than about 50 percent accurate (0.8 x 0.8 x 0.8 = 0.512).[23]

The limited documentation provided for review in connection with these comments also indicates that Dr. Crandall ignored rigorous analytical methods in order to achieve a pre-designed outcome. In particular, even though the inputs used in running the models are highly variable in nature, the key results are presented as point estimates, rather than a range of probabilistic outcomes. Given that the estimates themselves contain significant error, there is no reason to expect that these point estimates accurately reflect the true values of the variables that are modeled.

For example, the principal result discussed in the text of the Crandall declaration is that 90.4 percent of Cleveland buildings with a high-capacity "anchor tenant" could be profitably served by a competitive LEC. Crandall Dec. at 31. In reporting this point estimate, however, Dr. Crandall ignores random variation around the predicted values of "Distribution of Expected Revenues From Buildings" shown in Figure 3. Critically, a large number of revenue points lie just above the predicted "breakeven" frontier line. *Id.* at 30. Nevertheless, the OLS regression model has low values for the "t statistics" associated with the industry groups that are drawn into the revenue estimates by the Probit model. *Id.* at 38-41. The low values of the t statistics imply that the true revenue,

[23] Neither Dr. Crandall nor USTA has provided information regarding the variability of the OLS model used to estimate building revenues or information relating to the extent of variation in cost inputs derived by CSMG through informal and limited interviews. Without full disclosure of the model details, the variability of the inputs to the models, the variance of model predictions and a full understanding of the interplay of the models the reliability of the modeling process cannot be independently established.

could it actually be determined, would have equal probability of having any value in the range defined by the point value estimated by Dr. Crandall plus and minus a large "confidence interval." Therefore, many of the points that are shown as lying just above the "breakeven" line (and thus profitable for a competitor) may actually fall *below* the line and thus not be addressable by competitive LECs, even in the wildly hypothetical world that the models assume.[24] The same is also true for the graphs reporting results for the other five cities discussed in the declaration. *See* Crandall Dec. at 46-50.

Most critically, Dr. Crandall's reported results are at war with the CSMG Report submitted by USTA, in which the developers of the CSMG model Dr. Crandall used discuss the methodology they used in their model. In his declaration, Dr. Crandall asserts that 90.4 percent of high-capacity buildings in Cleveland, Ohio are "addressable" by existing competitive LEC networks; 92 percent for Seattle, Washington; 82.1 percent for Tucson, Arizona; 88.6 percent for St. Paul, Minnesota; 91.6 percent for Dayton, Ohio; and 90.9 percent for Greenville, North Carolina. Crandall Dec. at 30, 46-50. The CSMG Report contains a similar analysis for these same cities. The results provided by CSMG, however, are *radically different* from those Crandall generated. *See* CSMG Report at 11. According to CSMG, only a small fraction of "off net" buildings in the six markets Dr. Crandall reviewed are addressable by existing competitive LEC fiber. *Id.*[25] In addition,

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[24] Tellingly, Dr. Crandall has not quantified the impact on his results of this effect or provided the data necessary to allow someone else to perform that analysis.

[25] Only the 0 percent and 100 percent points on the graph on Chart 11 of the CSMG Report are shown. The precise percentages associated with the bar that represents each city on the graph are not shown. Nonetheless, the bars are drawn such that it is clear that significantly less than 50 percent of the buildings in each city are reported as addressable.