A - B

Aerial cable: cable which is installed on poles.

Algorithm: a set of mathematically based step-by-step procedures or logic that solves a specific problem, or a specific portion of a problem.

Annual cost: the *total cost*, including operating expenses, depreciation, return on investment and income taxes, which are associated with a particular item over the course of a year.

ARMIS: Automated Reporting Management Information System--a standardized set of data which major *local exchange carriers* are required to report to the Federal Communications Commission.

Available pairs: the number of pairs of copper or fiber present within a particular *sheath* of cable. Used as the denominator in calculating *effective fill*.

Average cost: the *total cost* of producing a given quantity of output, divided by the total quantity of output (number of units produced).

Baseline data: a set of data containing the estimated overall market demand for telecom services (e.g. number of lines, volume of usage) and other characteristics of one or more *wire center serving areas*. This data is generally specified for each of the *distribution areas* served by each of the *wire centers*.

Buried cable: cable which is installed directly in the ground, by placing into a trench or through plowing.

C

Cable segment: a section of copper or fiber cable, composed of one or more cable *sheaths*, running between two *nodes*.

Cell: the basic building block, and smallest unit, of a *spreadsheet*. It can contain a number or an *algorithm*. Each cell can be referenced or located by the *column* and *row* in which it appears.

Central office: a geographic location (typically a building) containing a telecommunications switch; the same location is sometimes described as a *wire center*.

CLLI: common language location identifier--an industry standard method, or code, used to identify individual central offices.

CO: *central office*.

Column: in the context of a *spreadsheet*, a set of *cells* that are arranged vertically on the screen.

Common costs: costs which are incurred when a production process yields two or more outputs (also known as *shared costs*). Depending upon the context, the term "common costs" is often used to refer specifically to administrative and general costs which are associated with broadly defined groups of outputs, or the entire output of the firm (e.g. the salaries of the firm's top executives).

Configuration: a specific set of *drop wire*, *distribution cable*, *feeder cable*, and other facilities arranged into a network which is designed to serves a specified set of customers with a specified set of services.

Configuration one: in the context of a *LRSAC*, *LRMCS*, *LRTC*, *TELRIC* or *LRMCE* study, the network *configuration* which serves all of the customers and services which the user specifies will be included within the study. In the context of a *TSLRIC* study, the network configuration which serves all of the customers and services which the user specifies will be present on the network regardless of whether or not the incremental customers/services are provided.

Configuration two: in the context of a *TSLRIC* study, the network *configuration* which serves all of the customers and services which the user specifies will be present on the network, including the incremental customers/services.

Cross-connect: a location or facility where individual pieces of cable, or *cable segments* are connected together. Typically used to describe the splicing devices and other miscellaneous investment associated with the tapering and branching of distribution cable.

Customer termination: the group of network facilities located at or adjacent to the customer's premises which collectively constitute an end point for the carrier's network facilities, including the *NID*, *drop wire*, and associated *terminal*.

D

Default values: a set of labels and/or numbers which can be used by the Telecom Model if the user does not select or create an alternative set of labels and/or numbers associated with a specific cost study.

Direct costs: those costs which can be specifically attributed to the production of a specific item, without requiring the use of allocations to separate these costs from costs incurred in the production of other items.

DA: *Distribution area*.

DA node: the location where *distribution cable* within a DA connects to the feeder cable that serves that DA.

Digital line carrier: a system which electronically conveys information over copper or fiber cable in a binary (digital) format. Also known as a *pair gain system*.

Distribution area: a relatively small geographic area used in designing a local network. All of the customers within this area are typically served by one or more *distribution cables* which are connected to one or more other cables (see *feeder cable*) at a central location, or *node*. Distribution areas (DA's) can vary widely with regard to the geographic area and number of customer lines contained within them. An urban DA can be as small as a city block and contain many hundreds of customer lines, while a rural DA can be as large as several square miles and contain as few as a dozen customer lines. In running the Telecom Model, the characteristics of each DA are specified as part of the GIS data which is used as an input to the *GIS to baseline process*.

Distribution cable: the cable which connects customers to the feeder network. It typically runs from the remote *terminal* to the *DA node*.

Drop wire: the cable which connects the customer's inside wiring to the network. It typically runs from the *NID* to the remote *terminal*.

E - F

Economies of density: reductions in *average cost* which arise when a large volume of traffic (or large number of customers) is handled by a single facility, relative to the average cost which would be incurred if a smaller volume of traffic (or number of customers) were handled by the facility in question.

Economies of scale: reductions in *average cost* which arise when a large volume of output is through a single production process, relative to the average cost which would be incurred if a smaller volume were produced.

Economies of scope: reductions in *total cost* and *average cost* which arise when multiple items are produced through a single production process, relative to the cost which would be incurred if each of these items were produced separately (on a *stand alone* basis).

Effective fill: a measurement of the extent to which a particular network component or device is fully occupied or used, taking into account the *lumpiness* of the item in question.

Excel: a Microsoft software product which can be used to create *spreadsheets* with up to 256 columns and 16,000 rows, for a total of up to 4 million cells, within each worksheet. A single spreadsheet file can contain numerous worksheets. The Telecom Model's *algorithms* are contained within Excel *spreadsheet* files, as indicated by the file extension .xls.

Feeder cable: cable which connects one or more *DA nodes* to a wire center.

Feeder segment: a section of feeder cable running between two *nodes*.

Fill: a measurement of the extent to which an item is occupied or used.

Fixed cost: an item of cost that does not vary within a specified context. For example, the minimum cost of installing a particular type of facility, regardless of size, can be considered a fixed cost; this cost cannot be reduced, but it can be avoided entirely by not installing the facility in question.

G - K

Geographic Information System: a computerized data handling and processing system which is capable of storing and using data describing places on the Earth's surface. It enables the user to analyze the spatial relationships between different data sets using location (e.g., latitude and longitude) as the common attribute.

GIS: *Geographic Information System*.

L

LEC: local exchange carrier.

Line: a communications path between a customer location and a wire center.

Local exchange carrier: a firm operating a telecommunications network within one or more *wire center serving areas*

Local exchange service: a switched communications service which allows customers to communicate with other customers within a specified local calling area, generally consisting of one or more *wire center serving areas*.

Long run: a planning horizon where all costs are potentially variable, including the scale and type of plant used by the firm. This is the approach used in the Telecom Model.

Loop: in an analog context, a pair of copper wires connecting the *NID* at the customer's premise to the *main distribution frame* at the wire center. In a digital context, a single 64 kilobit per second (voice equivalent) communications path from the NID to the *main distribution frame* at the wire center.

LRSAC: long-run *stand-alone cost*.

LRMCS: long-run *marginal cost of a service*.

LRMCE: long-run *marginal cost of an element*-- the change in total cost associated with a minimal incremental change in the output of that element, over the long run.

LRTC: long-run *total cost*.

Lumpiness: what characterizes a component or facility that cannot readily be divided into small parts, or scaled to provide an exact fit with the actual requirements of the network.

M

Main distribution frame: the facility used to efficiently connect feeder cables to other facilities located at the same *wire center*, including the *switch* as well as *trunks* and other *feeder cables*.

Marginal cost: the rate of change in *total cost* resulting from a minimal change in the quantity produced.

Marginal cost of an element: the rate of change in total cost resulting from a minimal change in the output of the specified service.

Marginal cost of a service: the rate of change in *total cost* resulting from a minimal change in the quantity of the specified network element.

Minutes of use: in the context of *switching*, the measured amount of time associated with calls. Unless otherwise specified, this is generally the conversation time, beginning when the called party answers the phone and ending when both parties hang up.

MOU: *minutes of use*.

Model: a numerical representation of an actual or hypothetical real world situation.

N - R

NID: network interface device--the splicing block, junction box or other device used to connect the customer's inside wire with the carrier's facilities (typically the *drop wire* or *intrabuilding cable*).

Node: a point of connection or branching in the network. Within a network of *central offices*, each *wire center* is a node. Within a single *wire center serving area*, each point where a segment of *feeder cable* branches or connects to another feeder cable is a node. Each serving area interface where feeder cable connects to *distribution cable*, is a node.

Pair gain ratio: the relationship between the number of voice equivalent communication channels which are electronically derived on a *digital line carrier* system and the actual number of copper pairs used; the number of copper loops is generally less than the number of derived channels.

Pair gain system: a system used to electronically derive a large number of voice equivalent communication channels from a smaller number of copper pairs.

PBX trunk: a line which is connected to a customer's PBX system; generally carries heavier traffic volumes than other types of lines.

Remote electronics: the portion of a *digital line carrier* system which is located away from the *wire center*.

Riser cable: a specific type of *intrabuilding cable*, which is installed vertically through a multi-story building, in order to connect a carrier's *distribution cable* to customers located on upper floors of the building.

Row: in the context of a *spreadsheet*, a set of *cells* that are arranged horizontally on the screen.

S

Setup costs: *switching* costs associated with establishing a call

Shared costs: costs which are incurred when a production process yields two or more outputs (also known as *common costs*). Depending upon the context, the term "shared costs" is often used to refer to common costs which are associated with a narrowly defined function, or a small groups of outputs, rather than the entire output of the firm. For example, the cost of the wire center building may be described as a shared cost of serving both business and residence customers within that *wire center serving area*. Similarly, the building may be described as a shared cost of several network elements, including the *loop* and *switching*.

Sheath: the flexible insulating material that cable manufacturers use to enclose multiple strands of fiber or copper into a single unit for convenience of shipping and installation.

Special access: a service which does not utilize *switching*, but instead provides a dedicated communications path from the customer's location to another location, routed through a *wire center*.

Spreadsheet: a set of *algorithms* and data stored within *cells* which are arranged into *columns* and *rows*.

Stand alone cost: the *total cost* to provide a particular item (e.g. service) in a separate production process, without the benefit of economies of scope. A stand alone cost study is limited to a specified group of services, customers, or geographic area; the network is designed to serve this group on an isolated basis, so that none of the facilities are shared with services, customers or areas that fall outside the scope of the study.

Structures: in the context of *distribution cable* and *feeder cable*, the facilities and costs associated with holding the cable in place, including poles, conduit, trenching and plowing.

Subscriber loop: in an analog context, a pair of copper wires connecting the *NID* at the customer's premise to the *main distribution frame* at the wire center. In a digital context, a single 64 kilobit per second (voice equivalent) communications path from the NID to the main distribution frame at the *wire center*.

Switch: a facility which can connect a variety of different lines and/or *trunks*.

Switching: the function of connecting different lines and/or *trunks*.

Switched service: the generic term used to describe telecommunications services which utilize switching.

T - U

Tandem switch: a *switch* which is used to connect *trunks* from two or more other switches. It is sometimes less costly to route calls from one switch to another via a third switch (functioning as a tandem), because this reduces the total number of trunks required to handle the total volume of traffic, and/or because it eliminates the need to provide direct trunks for all of the potential combinations of switches.

TELRIC: total element long-run incremental cost--a term coined by the Federal Communications Commission to describe a specific approach to costing, which includes the *incremental cost* resulting from adding or subtracting a specific network element in a long run planning horizon, plus an allocated portion of any *shared costs* incurred in producing that element and others.

Terminal: a device attached to a cable for convenience in making connections. Typically used to describe the connection point between *drop wire* or *intrabuilding cable* and the nearest *distribution cable*.

Total cost: the aggregate amount of all costs incurred in producing a specified volume of output. When used in the context of a *LRTC* study, it refers to the sum of all the *direct*, *joint* and *shared costs* required to produce all of the specified services to all of the customers included within the study in question.

Trunk: a communications path between two *wire centers*.

TSLRIC: total service long run incremental cost--the firm's total cost of producing all of its services assuming the service (or group of services) in question is offered, minus the firm's total cost of producing all of its services excluding the service (or group of services) in question.

Underground cable: cable which is installed below grade within a system of pipes or ducts.

Utilization factor: a numerical percentage factor used in network design to ensure that sufficient capacity is provided to account for maintenance requirements, and to provide adequate operational flexibility.

V - Z

Variable cost: a cost which changes as the scale of a facility, or the volume of output, changes.

Wire center: a geographic location where access lines and/or *trunks* terminate; the same location is sometimes described as a *Central Office*, if some of the lines are switched at that location.

Wire center serving area: the entire geographic area served by a specified *wire center*; this overall area can generally be disaggregated into multiple *distribution areas*.

Working pairs: the number of pairs of copper or fiber within a particular *sheath* of cable which are actually being used to provide service. Used as the numerator in calculating *effective fill*.

.xls: the file extension used to identify *Excel* files.

Zone: A portion of a *wire center serving area* containing one or more *distribution areas* which are grouped together for analytical purposes (typically on the basis of common characteristics). Zone 1 typically includes the distribution areas with the highest density and/or in the immediate vicinity of the *wire center* or *central office*; zone 2 typically contains the remaining distribution areas.

Because the Telecom Model uses a geographic information system (GIS) approach, the cost results can be aggregated and aligned to match virtually any geographic area which is larger than a distribution area. For instance, cost results can be summarized in accordance with political boundaries (e.g., counties), census boundaries (e.g. census block groups), or post office boundaries (e.g., zip code areas).

Furthermore, the Telecom Model takes advantage of a wide variety of different geographic data, in order to more accurately estimate costs. For instance, data can be obtained concerning soil conditions, including the presence or absence of bedrock or a high underground water table, which indicate where it will be unusually difficult to install cable. These data are used in the Telecom Model to more accurately estimate the costs of installing facilities in a particular area.

The Telecom Model allows as much refinement of the GIS data as needed for a particular project. For

example, instead of using an entirely computer generated network routing, the network design can potentially be improved by using a less computerized, more labor-intensive approach. Given enough time and effort, an outside plant engineer can develop the most cost-effective, or appropriate feeder network. This process can be greatly aided by starting with an automated approach, analyzing the results, then making further refinements. Similarly, the Telecom Model is not limited to a purely forward looking or "blank slate" approach. The model can be used with GIS data for the actual locations of the DA nodes in the incumbent carrier's network; the actual routing of the feeder segments connecting these nodes to the wire center, or virtually any combination of actual and forward looking data.

carriers engage in "cream skimming" or otherwise experience different market shares in different portions of the same wire center serving area. Second, the standard reports provide separate summary information for the two zones, allowing the user to easily observe cost patterns which are associated with distinct zones, but are otherwise common across multiple geographic areas. For instance, costs can be analyzed for all of the zone 1 portions of a group of wire centers separately from the zone 2 portions of those wire centers.

The user has virtually complete control over the zone designations used in the Telecom Model. Zones can be designated on the basis of geographic characteristics (e.g. distance from the wire center) or on the basis of cost characteristics. For example, the user can review the results of an initial cost study based upon a uniform geographic designation, then refine the zone designation for purposes of a subsequent study, in order to more precisely classify the distribution areas into two zones with relatively homogeneous cost

characteristics. In this manner, the user can ensure that the zone one only includes relatively low cost, high density distribution areas, while the zone two only includes relatively high cost, low density areas.

Total service long run incremental cost (TSLRIC) is equal to the firm's total cost of producing all of its services assuming the service (or group of services) in question is offered, minus the firm's total cost of producing all of its services excluding the service (or group of services) in question. TSLRIC has also been defined as the change in total cost resulting from adding the entire amount of a service to the company's total output, with the output of all other services remaining constant. In effect, TSLRIC measures the difference between producing a service and not producing it.

TSLRIC can be useful in public policy and pricing decisions. For example, TSLRIC estimates can indicate the presence or absence of subsidies for a service in the aggregate. Similarly, incremental costs can be useful in developing or examining regulatory or pricing policies applicable to a particular service or group of customers. For instance, the Telecom Model can compute the additional cost incurred when a network is expanded to serve a specified block of customers

Marginal Cost

Marginal cost is the rate of change in total cost resulting from changes in output. In mathematical terms, marginal cost is the first derivative of the total cost function with respect to output, assuming the cost function is continuous and smooth. In practical applications, the cost function is not necessarily smooth or continuous. Because telecom cost are inherently lumpy and non-linear, the slope of the total cost curve can vary widely depending upon the specific portion being considered. The Telecom Model estimates marginal cost within approximately plus or minus 10% of the volume of output. This focuses the marginal cost estimate within the most immediately relevant range of output, without allowing the marginal cost estimates to become too volatile.

distance service, and interstate long-distance service. Since the installation of an additional loop facility increases the capacity available for placing and receiving all three types of calls, the telephone company cannot increase the capacity for local calls without concurrently increasing the capacity for toll calls.

Similarly, the cost of a telephone pole does not vary much, regardless of the size or type of cable which it carries. If a pole is used to provide subscriber loops to two different groups of customers (e.g. those in zone 1 and those in zone 2), the pole is a joint cost of serving both groups of customers.

Economic theory demonstrates that there is no inherently correct method of allocating joint costs among the various joint products. In competitive markets, purchasers of each of the joint products will bear some share of the joint costs, in relative proportions that are determined by the relative strength of demand in the various markets. Thus, assuming competitive markets, purchasers of

interpreting the cost estimates produced by the Telecom Model.