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Energy Management Systems Definitions

NEMA

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION ■ 2101 L STREET, N.W., WASHINGTON, D.C. 20037

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Foreword

In the preparation of this standards publication input of users and other interested parties has been sought and evaluated. Inquiries, comments, and proposed or recommended revisions should be submitted to the concerned NEMA product subdivision by contacting the:

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Scope

This standard is in two sections: General Definitions and Electric Utility Definitions.

Section 1 provides definitions pertaining to electrical/electronic energy management systems for individual facility systems which benefit the user/occupant; multiple facility systems which benefit the user/occupant and electrical utility control of user loads to reduce generation requirements. Section 2 provides definitions of terms applicable to the electric utility energy management systems.

At present, only powerline carrier (PLC) communications are covered in this document in any detail. Other methods of communications such as VHF radio, UHF radio, commercial FM SCA, Commercial AM SCA, and telephone will be covered in future editions. Recommendations and proposals for definitions related to these other methods will be welcomed.

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ENERGY MANAGEMENT SYSTEMS DEFINITIONS

Section 1
GENERAL DEFINITIONS

1.1 ACCELERATED LIFE CYCLE

A period in which certain factors such as voltage, temperature, and so forth, to which a device is subjected, are increased or decreased beyond normal operating values to obtain observable deterioration in a reasonable period of time and thereby afford a means of predicting the probable device life under normal operating conditions or some measure of the durability of the equipment when exposed to the factors being aggravated.

1.2 ACCURACY

a. Conformity of a measured value to an accepted standard value.
b. A measure of the degree by which the actual output of a device approximates the output of an ideal device nominally performing the same function.

1.3 ACTIVE LOAD MANAGEMENT

See 2.54, LOAD MANAGEMENT, DIRECT.

1.4 ADAPTIVE CONTROL

A control method in which automatic means based upon the monitoring of independent variables are used to change the control parameters in a way intended to improve the performance of the control system.

1.5 ADAPTIVE DUTY CYCLING

A technique to automatically change the duty cycling program based on actual environmental conditions, usually temperature and humidity.

1.6 ALGORITHM

A prescribed set of well-defined rules or processes for the solution of a problem in a finite number of steps, for example, a full statement of an arithmetic procedure for evaluating sine x to a stated precision.

1.7 ANALOG

Pertaining to data in the form of continuously variable physical quantities.

1.8 ANALOG INPUT

An electrical input of variable value provided to the energy management system by a sensing device.

1.9 ANALOG POINT

A point that has a variable value, such as temperature.

1.10 ANALOG TO DIGITAL CONVERTER

A circuit or device whose input is information in analog form and whose output is the same information in digital form.

1.11 ANALOG TRANSMISSION

Transmission of a continuously variable signal as opposed to a discretely variable signal.

1.12 ANNUAL PEAK LOAD

See 1.64, DEMAND, ANNUAL MAXIMUM.

1.13 ANNUAL SYSTEM MAXIMUM DEMAND

See 1.64, DEMAND, ANNUAL SYSTEM MAXIMUM.

1.14 ASCII

American Standard Code for Information Interchange. An 8 bit coded character set to be used for the general interchange of data among information processing systems, communications systems, process control systems, and associated equipment.

1.15 ASYNCHRONOUS TRANSMISSION

Transmission in which each information character, or sometimes each word or small block, is individually synchronized, usually by the use of start and stop elements.

1.16 AUTOMATIC TEMPERATURE CONTROL (ATC)

A local loop network of pneumatic or electric/electronic devices which are interconnected to control temperature.

1.17 AVERAGE DEMAND

See 1.64, DEMAND, AVERAGE.

1.18 AVERAGE LOAD

See 1.64, DEMAND, AVERAGE.

1.19 BASE LOAD

See 2.52, LOAD, BASE.

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1.20 BAUD

A unit of signaling speed equal to the number of discrete conditions or signal events per second.

1.21 BATTERY BACKUP

Standby battery power to maintain memory and supply critical circuits if a power failure occurs.

1.22 BIT

An acronym for binary digit. The smallest unit of information which can be represented. A bit may be in one of two states, represented by the binary digits 0 and 1.

1.23 BLOCK INTERVAL DEMAND MEASUREMENT

A demand measurement where the length of time between successive demand readings is equal to the demand interval.

1.24 BUILDING MANAGEMENT SYSTEM

An energy management system usually with additional capabilities relating to the overall operation of the building in which it is installed, such as equipment monitoring, protection of equipment against power failure, building security, and so forth.

1.25 BUFFER

A storage device used to compensate for a difference in rate of flow of information or time of occurrence of events when transmitting information from one device to another.

1.26 BURDEN

The load usually expressed in volt-amperes at a specified power factor, placed on instrument transformer secondaries by the associated meter coils, leads, and other connected devices.

1.27 CALIBRATION

The making of adjustments necessary to bring operating characteristics into substantial agreement with standardized scales or marking.

1.28 CAPACITY FACTOR

The ratio of the average load on a machine or equipment for the period of time considered, to the capacity of the machine or equipment.

1.29 CARRIER-CURRENT COUPLING TRANSFORMER (BANK)

See 2.75, SIGNAL COUPLING TRANSFORMER (BANK).

1.30 "C-E-D" RATE FORM

See 2.63, RATE SCHEDULE, THREE PART DEMAND RATE.

1.31 CENTRAL CONTROL

A system whereby all data analysis and control actions are performed at a single point. See 1.82, DISTRIBUTED CONTROL SYSTEM, and 1.203, SUPERVISORY CONTROL.

1.32 CENTRAL PROCESSING UNIT (CPU)

The portion of the computer that performs the interpretation and execution of instructions. It does not include memory or input/output functions.

1.33 CHANNEL, VOICE GRADE

A communications channel suitable for transmission of speech, digital or analog data, or facsimile, generally with a frequency range from about 300 to 3000 cycles per second.

1.34 CLASS 2 CIRCUIT

Circuits providing energy limitation such that acceptable protection from electric shock is achieved (*National Electrical Code*, ANSI/NFPA 70-1984).

1.35 CLOCK HOUR

The 60-minute interval between any standard hour point on the clock and the following hour point, normally indicated by both hour points or by "Hour ended _____."

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1.36 CLOCK (TIME)

A device that measures time and controls other devices or equipment in accordance with present time(s) on a diurnal, weekly, and/or other basis.

1.37 COAX

Specially constructed single or multi-conductor cable which provides concentric shielding of conductors from electro-static fields.

1.38 COGENERATION

The intentional generation of electric power by a user that is electrically paralleled with electric supply from the serving utility at any voltage level. Resultant net flow of power between the utility system and the user may be in either direction. Likewise resultant reactive power flow may be either positive or negative.

1.39 COINCIDENT DEMAND

See 1.64, DEMAND, COINCIDENT.

1.40 COINCIDENT LOAD

See 2.52, LOAD, CONNECTED.

1.41 COMMUNICATIONS-BASED SYSTEM

An energy management system that can be remotely programmed or controlled from a distant point, or both, usually over ordinary telephone lines.

1.42 COMPUTER-BASED SYSTEM

An energy management system in which a computer is the central controlling device.

1.43 CONSERVATION

A reduction in energy usage.

1.44 CONSUMPTION

An amount of energy used. Electrical consumption is measured in kilowatt hours or kilovolt-ampere hours.

1.45 CONTINUOUS INTERVAL DEMAND MEASUREMENT

See 1.127, LAGGED INTERVAL DEMAND MEASUREMENT.

1.46 CONTROL ACTION

Any action which changes the rate of energy usage.

1.47 CONTROL CHANNEL

The channel that carries the signals directing the performance of the energy management system but does not carry the main power circuit.

1.48 CONTROL, CLOSED-LOOP

A system in which the value of some output quantity is controlled by feeding back the value of the controlled quantity, and using it to manipulate an input quantity so as to bring the value of the controlled quantity closer to a desired value.

1.49 CONTROL, OPEN-LOOP

A control system in which the system outputs are controlled by system inputs only, and no account is taken of actual system output.

1.50 CONTROL PERIOD

The time segment covering a control action.

1.51 CONTROL POINT ADJUSTMENT (CPA)

The procedure of changing the operating point of a controller. Normally adjusted from a remote location.

1.52 CONTROL POINTS INPUT

The number of devices that feed information into an energy management system.

1.53 CONTROL POINTS OUTPUT

The number of devices that an energy management system can control.

1.54 CONTROL STRATEGY

A procedure for controlling the operating point of a controller. Normally adjusted from a remote location.

1.55 CONTROL SYSTEM

A system in which deliberate guidance or manipulation is used to achieve a prescribed value of a variable.

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1.56 CONTROLLER

A device or group of devices that serves to govern in some predetermined manner, the electric power delivered to the apparatus to which it is connected. See 1.66, DEMAND CONTROLLER and 1.131, LOAD CONTROLLER.

1.57 COOL STORAGE

See 1.98, ENERGY STORAGE.

1.58 CONTROLLABLE LOADS

Loads whose energy usage can be regulated in response to energy management requirements.

1.59 COUPLING TRANSFORMER (BANK)

See 2.75, SIGNAL COUPLING TRANSFORMER (BANK).

1.60 CRT (CATHODE RAY TUBE)

An electron-beam tube in which the beam can be focused to a small cross section on a luminescent screen and varied in position and intensity to produce a visible pattern. See 1.228, VDT.

1.61 CROSS TALK

Undesired energy appearing in one signal path as a result of coupling from other signal paths.

1.62 DEAD BAND

The range through which the measured signal can vary without initiating a control action.

1.63 DEGREE-DAY

A unit measuring the extent to which the outdoor mean (average of maximum and minimum) daily dry-bulb temperature falls below (in the case of heating) or rises above (in the case of cooling) an assumed base. The base is normally taken as 65 °F for heating and for cooling unless otherwise designated. One degree-day is counted for each degree of deficiency below (for heating) or excess over (for cooling) the assumed base, for each calendar day on which such deficiency or excess occurs.

1.64 DEMAND

The rate at which electric energy is delivered to or by a system, part of a system, or a piece of equipment; expressed in kilowatts, kilovoltamperes, or other suitable unit at a given instant or averaged over any designated period of time.

- *ANNUAL MAXIMUM.* The greatest of all demands of the load under consideration which occurred during a prescribed demand interval in a calendar year.
- *ANNUAL SYSTEM MAXIMUM.* The greatest demand on an electric system during a prescribed demand interval in a calendar year.
- *AVERAGE.* The demand on an electric system or any of its parts over any interval of time, as determined by dividing the total number of kilowatthours by the number of units of time in the interval.
- *BILLING.* The demand upon which billing to a customer is based, as specified in a rate schedule or contract. It may be based on the contract year, a contract minimum, or a previous minimum and, therefore, does not necessarily coincide with the actual measured demand of the billing period.
- *COINCIDENT.* The sum of two or more demands which occur in the same demand interval.
- *INSTANTANEOUS PEAK.* The maximum demand at the instant of greatest load, usually determined from the readings of indicating or graphic meters.
- *INTEGRATED.* The demand usually determined by an integrating demand meter or by the integration of a load curve. It is the summation of the continuously varying instantaneous demands during a specified demand interval.
- *MAXIMUM.* The greatest of all demands of the load under consideration which has occurred during a specified period of time.
- *METER.* A device that indicates or records the demand or maximum demand.[1]
- *NONCOINCIDENT.* The sum of two or more individual demands which do not occur in the same demand interval. Meaningful only when considering demands within a limited period of time, such as day, week, month, or heating or cooling season, and usually for not more than one year.
- *PEAK.* The highest demand occurring during the billing period.

[1]Since demand involves both an electric factor and a time factor, mechanisms responsive to each of these factors are required as well as an indicating or recording mechanism. These mechanisms may be either separate from or structurally combined with one another. Demand meters may be classified as follows: Class 1, curve-drawing meters; Class 2, integrated demand meters; or Class 3, lagged-demand meter. (This footnote is classified as Authorized Engineering Information.)

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• *RATES.*

See 2.63, RATE SCHEDULE.

1.65 DEMAND CONSTANT

The value of the measured quantity for each received pulse, divided by the demand interval, expressed in kilowatts per pulse, kilovars per pulse, or other suitable units. See 1.184, PULSE CONSTANT.

1.66 DEMAND CONTROLLER

A device or system that monitors electric power demand and causes that demand to be controlled.

(See 1.71, DEMAND LIMIT; 1.107, FORECASTING OR PREDICTIVE DEMAND CONTROL; 1.116, IDEAL RATE; 1.118, INSTANTANEOUS DEMAND CONTROL; and 1.198, SLIDING INTERVAL DEMAND MEASUREMENT.)

1.67 DEMAND DIVERSITY

See 2.36, DIVERSITY.

1.68 DEMAND, END OF INTERVAL

The end of a fixed demand interval sometimes indicated by a utility meter pulse.

1.69 DEMAND FACTOR

The ratio of the maximum demand over a specified time period to the total connected load on any defined system.

1.70 DEMAND INTERVAL

The length of time upon which the demand measurement is based, typically 15, 30, or 60 minutes.

1.71 DEMAND LIMIT, DEMAND OBJECTIVE

A predetermined level of demand that is used as a set point in any energy management system to fix the maximum allowable demand.

1.72 DEMAND MANAGEMENT

That part of energy or load management treating instantaneous, or nearly instantaneous electric power utilization, usually measured in kilowatts.

1.73 DEMAND MEASUREMENT

See 1.106, FLOATING INTERVAL DEMAND MEASUREMENT; 1.190, ROLLING INTERVAL DEMAND MEASUREMENT; 1.198, SLIDING INTERVAL DEMAND MEASUREMENT.

1.74 DIAGNOSTIC PROGRAM

Software or firmware used to detect and isolate component malfunctions.

1.75 DIFFERENTIAL REGISTER METER

A watthour meter with two registers constructed so that it will record the total energy consumed on one register. The excess energy consumed is recorded on the second register when a predetermined demand level is exceeded.

1.76 DIGITAL INPUT

An electrical input of one or more bits provided to the energy management system.

1.77 DIGITAL POINT

A point that has an "either/or" value, such as on/off, which will be sensed to provide input to the energy management system. See 1.76, DIGITAL INPUT.

1.78 DIGITAL TO ANALOG (D/A) CONVERTER

A hardware device which converts a digital signal into a voltage or current proportional to the digital input.

1.79 DIRECT DIGITAL CONTROL

A mode of control wherein digital computer outputs are used to directly control a process, and monitored signals are converted to digital form for feedback to the computer.

1.80 DIRECT LOAD CONTROL

See 2.54, LOAD MANAGEMENT (DIRECT).

1.81 DISTRIBUTED PROCESSING SYSTEM

See 1.82, DISTRIBUTED CONTROL SYSTEMS.

1.82 DISTRIBUTED CONTROL SYSTEM

A network of independently functioning controllers under the jurisdiction of a central control element, and having the capability at each controller of data analysis and control action.

1.83 DUAL HEATING SYSTEM

A heating system utilizing two fuel or energy sources, such as gas, oil, coal, or electric power, either as alter-

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nate sources or with one as a booster to the other.

1.84 DUTY CYCLE

The percentage of time that a device on intermittent duty is energized during a specified period of time.

1.85 DUTY CYCLING

The process of turning off electrical equipment for predetermined periods of time during operating hours to reduce consumption and demand.

1.86 ECONOMIZER CONTROL

A form of control that opens or closes dampers in the HVAC system to use outside air for free cooling whenever the outside temperature is within a given range.

1.87 ELECTRIC SPACE HEATING

Space heating of a dwelling or business establishment or other structure using permanently installed electric heating as the principal source of space heating throughout the entire premises.

1.88 ENTHALPY CONTROL

The process of selecting either recirculated or outside air, depending on its heat content, to minimize mechanical heating or cooling requirements in a building.

1.89 EMC (ELECTROMAGNETIC COMPATIBILITY)

The capability of electronic equipments or systems to be operated in the intended operational electromagnetic environment at designed levels of efficiency. EMC is comprised of considerations of electromagnetic susceptibility and ambient EMI.

1.90 EMI (ELECTROMAGNETIC INTERFERENCE)

Impairment of a desired electromagnetic signal by an electromagnetic disturbance. RFI (Radio Frequence Interference) is a form of EMI.

1.91 ENCODER

A device that provides a means of converting a meter reading into a form suitable for communicating to a remote central location.

1.92 ENERGY OFF-PEAK

Energy supplied during periods of relatively low system demands as specified by the supplier.

1.93 ENERGY ON-PEAK

Energy supplied during periods of relatively high system demands as specified by the supplier.

1.94 ENERGY CHARGE

See 2.14, CHARGE, ENERGY CHARGE.

1.95 ENERGY CONSERVATION

The more effective use of energy resources. Energy conservation seeks to reduce energy invested per unit of product output, service performed, or benefit received through waste reduction. Energy conservation and energy use reduction are not synonymous.

1.96 ENERGY EFFICIENCY RATING

The calculated efficiency of a device in converting energy from one form to another.

1.97 ENERGY MANAGEMENT SYSTEM

A system, the expressed purpose of which is to control the consumption of, the demand for, or the supply of energy.

1.98 ENERGY STORAGE

Reversible processes of, or facilities for the stockpiling of energy in various forms for future use, including (but not limited to) one, or combinations of the following: chemical, mechanical, or hydraulic. See 1.57, COOL STORAGE, and 1.207, THERMAL STORAGE.

1.99 ERROR DETECTING/CORRECTING

The use of error-detecting codes so that a character or block detected as being in error automatically initiates a request for retransmission of the signal detected as being in error or reconstructs the original character or block from an error correction algorithm.

1.100 FACTOR

DEMAND—See 1.69, DEMAND FACTOR.
DIVERSITY—See 2.37, DIVERSITY FACTOR.
LOAD Z—See 2.52, LOAD FACTOR.

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UTILIZATION—See 1.223 UTILIZATION FACTOR.

1.101 FAILURE RATE (LAMBDA)

Expressed in % per 1000 operating hours.

1.102 FIRMWARE

Software that is resident in ROM (Read-Only-Memory) or PROM (Programmable ROM). See 1.199, SOFTWARE.

1.103 FEEDBACK

The returning of all, or a fraction of, the output to the input.

1.104 FIELD INTERFACE DEVICE (FID)

An intelligent hardware device (containing software or firmware) which implements the distributed processing aspects of operation with the central computer as well as maintaining effective control of field control loops in the absence of higher level influence.

1.105 FIXED INTERVAL DEMAND MEASUREMENT

See 1.23, BLOCK INTERVAL DEMAND MEASUREMENT.

1.106 FLOATING INTERVAL DEMAND MEASUREMENT

See 1.198, SLIDING INTERVAL DEMAND MEASUREMENT.

1.107 FORECASTING OR PREDICTIVE DEMAND CONTROL

A demand control algorithm where the demand is calculated for the demand interval based upon the history, incremental rate of usage, and the time remaining in the interval. The forecasting or predictive control technique requires kilowatthour pulses and demand interval signals. (See Figure 1-1.)

1.108 FSK (FREQUENCY SHIFT KEYING)

The form of frequency modulation in which the modulating wave shifts the output frequency between predetermined values, and the output wave has no phase discontinuity. *Note*: Commonly, the instantaneous frequency is shifted between two discrete values termed the mark and space frequencies.

1.109 FULL DUPLEX

A communications channel that can transmit data signals in two directions simultaneously.

1.110 HALF DUPLEX

A communications channel that transmits data signals in two directions, but not simultaneously.

1.111 HARDWARE

The mechanical, magnetic, electrical, and electronic devices of which a computer and its peripherals are built.

1.112 HARD-WIRED

A wiring system which is not multiplexed and in which conductor pairs for each signal are run between the control center and the signal source.

1.113 (DELETED)

1.114 HEAT PUMP

A year-round air-conditioning system employing refrigeration equipment in a manner which enables useable heat to be supplied to a space during the winter period and by reversing the operation cycle to abstract heat from the same space during the summer period. When operating as a heating system, heat is absorbed from an outside medium (either air, water, or the earth), and this heat together with the heat equivalent of the work of compression is supplied to the space to be heated. When operating on the cooling cycle, heat is absorbed from the space to be cooled and this heat together with the heat equivalent of the work of compression is rejected to the outside medium.

1.115 HVAC

Heating, Ventilating, and Air Conditioning.

1.116 IDEAL RATE, IDEAL CURVE DEMAND CONTROL

A demand control algorithm that uses both the kilowatt hour and demand interval signals as supplied by the utility metering equipment. Within the system an ideal energy usage pattern is stored as an initial offset and a pulse rate. The system operates by comparing the difference between the total kilowatthour pulses received from the utility

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and those generated by the system to a predetermined value. (See Figure 1-2.)

1.117 INDIRECT LOAD CONTROL

See 2.54, LOAD MANAGEMENT, INDIRECT.

1.118 INSTANTANEOUS DEMAND CONTROL

A demand control algorithm that uses a signal proportional to the instantaneous demand. This signal is compared to the demand limits. When the instantaneous demand exceeds the upper control limit or is less than the lower control limit, control action occurs. (See Figure 1-3.)

1.119 INTEGRATED DEMAND

See 1.64, DEMAND, INTEGRATED.

1.120 INTEGRATED PEAK

See 1.64, DEMAND, INTEGRATED.

1.121 INTERFACE

The interrelationship or means of communication between any two (or more) functions, modules, components, or communication devices.

1.122 INTERFERENCE

Any spurious energy or signal which tends to interfere with the reception of the desired signal or operation of electronic equipment. See 1.90, EMI.

1.123 INTERVAL, DEMAND

See 1.70, DEMAND INTERVAL.

1.124 INTRINSIC BARRIER

A component or circuit which limits the energy available in a hazardous location to a level that is incapable of igniting the hazardous atmosphere.

1.125 INVERTED RATE DESIGN

A rate design for a user class for which the unit charge for electricity increases as surge increases.

1.126 I/O

Input/Output.

1.127 LAGGED INTERVAL DEMAND MEASUREMENT

Continuous Interval Demand Measurement—A demand measurement where demand readings are taken continuously, as in thermally or mechanically lagged demand meters.

1.128 LIGHTING

Essential—Lighting which is necessary to the safe and productive use of the illuminated area. The presence of natural illumination may affect what is defined as essential.

Non-Essential—Lighting which would not impair the safety nor materially interfere with the occupancy of an area if it were turned off.

1.129 LINE CONDITIONING

Electrical modification of the characteristic response of a line to meet certain standards. The characteristics include frequency response, signal levels, noise suppression, impedance, and time delay.

1.130 LOAD CENTER

A point at which the load of a given area is assumed to be concentrated, for example, the breaker panel in a user's premise.

1.130A LOAD CONTROL RECEIVER

See 1.187, RECEIVER CONTROLLER.

1.131 LOAD CONTROLLER

A device or system that monitors user electric energy consumption and causes consumption or demand, or both, to be regulated.[2]

1.132 LOAD MANAGEMENT, AUTOMATIC (USER)

As a part of indirect load management, the automatic monitoring and control by a user of his loads to take advantage of electric rate economic incentives.[3]

1.133 LOAD SHAPE

See 2.52, LOAD CURVE.

1.134 (DELETED)

[2]The load controller may be user owned and operated and may or may not be connected or coordinated with load management communication facilities operated by the serving electric utility. The controller may include or may be coordinated with an associated demand controller or limiter. (This footnote is classified as Authorized Engineering Information.)

[3]Automation in the form of a load controller, or demand controller or limiter may be used. Signals direct from a utility may also be connected to such controllers to beneficially alter or moderate the control program. (This footnote is classified as Authorized Engineering Information.)

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1.135 LOAD SHEDDING (USER)

The process, implemented by load controllers or demand controllers, of user removal of preselected loads.

1.136 LOAD TRANSFER

The transferring of loads to an alternate source of power such as, but not limited to, emergency and stand-by systems. (See ICS 2-447.80 of NEMA Standards Publication ICS 2-1983, *Standards for Industrial Control Devices, Controllers, and Assemblies*.)

1.137 LOAD MANAGEMENT TERMINAL

That equipment, device, or system installed at a user location for the purpose of implementing load management or load shedding strategies.

1.138 LOCAL LOOP CONTROL

The controls for any system or subsystem which will continue to function when the central controller is non-operative.

1.139 LOSS (LOSSES)

The general term applied to energy (kilowatthour) and power (kilowatts) lost in the operation of an electric system. Losses occur principally as energy transforms from kilowatthours to waste heat in electric conductors and apparatus.

- *AVERAGE*—The total difference in energy input and output or power input and output (due to losses) averaged over a time interval and expressed either in physical quantities or as a percentage of total input.
- *ENERGY*—The kilowatthours lost in the operation of an electric system.
- *LINE*—Kilowatthours and kilowatts lost in transmission and distribution lines under specified conditions.
- *PEAK PERCENT*—The difference between the power input and output, as a result of losses due to the transfer of power between two or more points on a system at the time of maximum load, divided by the power input.
- *SYSTEM*—The difference between the system net energy (or power) input and output, resulting from energy (or power) lost and unaccounted for between the sources of supply and the metering points of delivery on a system.

1.140 MAGNETIC TAPE RECORDER

A magnetic recording device which utilizes one or more pulse initiators, attached to meters, to generate pulses at a rate proportional to the load, for storage on one or more data tracks of a magnetic tape. On a remaining tape track, a time pulse, generated every 15, 30, or 60 minutes by the recorder, is marked on the tape at appropriate intervals to properly space the pulse data.

1.141 MAGNETIC TAPE TRANSLATION SYSTEM

A system designed to read magnetic tape pulse information from magnetic tape meter tapes, and then arrange the data, generally on magnetic tape such as 9-track, for direct input to a main-frame computer for conversion to engineering units and for use in combination with output from similar magnetic tape meters.

1.142 MARGINAL COST PRICING

Pricing at the cost of producing the next unit of energy.

1.143 MAXIMUM DEMAND

See 1.64, DEMAND, MAXIMUM.

1.144 MAXIMUM LOAD

See 1.64, DEMAND, MAXIMUM.

1.145 METER REGISTER CONSTANT

The multiplier applied to the register reading to obtain kilowatthours.

1.146 METER READING SYSTEM (AUTOMATIC)

See 2.4, AUTOMATIC METER READING SYSTEM.

1.147 MICROCOMPUTER

A computer system based on a microprocessor and containing all the memory and interface hardware necessary to execute software.

1.148 MICROPROCESSOR

A central processing unit fabricated as one integrated circuit.

1.149 MID-PEAK

See 2.48, INTERMEDIATE PEAK DEMAND.

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1.150 MODEM

An acronym for Modulator/Demodulator. A hardware device used for changing digital information to and from an analog form to allow transmission over voice grade circuits.

1.151 MODULE

A sub-element of a control system, either hardware or software, performing a specific task.

1.152 MTBF

Mean Time Between Failure.

1.153 MULTIDROP

A form of party line communication system.

1.154 MULTIPLEX

To interleave or simultaneously transmit two or more messages on a single channel.

1.155 MULTIRATE WATTHOUR METER

A watthour meter having more than one set of energy recording registers, e.g., dual rate or differential register meter.

1.156 NEC

National Electrical Code, designated ANSI/NFPA-70.

1.157 NETWORK

An aggregation of interconnected conductors consisting of feeders, mains, and services.

1.158 NOISE

Random electrical signals, introduced by circuit components, natural disturbances, or other and unrelated circuits, which tend to degrade the performance of a control systems.

1.159 NONCOINCIDENT DEMAND

See 1.64, DEMAND, NONCOINCIDENT.

1.160 OFF-PEAK

Periods of relatively low system demands as specified by the supplier. See 1.92 and 1.93, ENERGY, OFF-PEAK/ON-PEAK.

1.161 ON-PEAK

Periods of relatively high system demands as specified by the supplier. See 1.92 and 1.93, ENERGY, OFF-PEAK/ON-PEAK.

1.162 ON-PEAK DEMAND REGISTER

A register that will record the maximum demand during on-peak periods.

1.163 OPTIMIZATION

The process of operating an environmental system at maximum efficiency, i.e., obtaining the desired environmental conditions at all times with the least consumption of energy.

1.164 OPTIMUM START/STOP

Control of equipment in such a manner that desired operating characteristics are reached at the desired time.

1.165 PARALLEL TRANSMISSION

The simultaneous transmission of bits over different lines.

1.166 PASSIVE LOAD MANAGEMENT

See 2.54, LOAD MANAGEMENT, INDIRECT.

1.167 PEAK

See 1.64, DEMAND, MAXIMUM.

1.168 PEAK DEMAND

See 1.64, DEMAND.

1.169 PEAK LOAD

See 1.64, DEMAND, MAXIMUM.

1.170 PEAK LOAD PRICING

A method whereby the price of energy during peak periods is based on the cost of producing energy during that period.

1.171 PEAK PERCENT LOSS

See 1.139, LOSS (LOSSES).

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1.172 PEAK SEASON PRICING

Pricing of electric service which reflects different costs for seasonal peak time periods.

1.173 PEAK SHAVING

Any action taken to reduce peak demand.

1.174 PEAK SPLITTING

The splitting of peak loads over two adjacent demand intervals.

1.175 PENALTY PRICING

Pricing of electric service in excess of the user cost to produce that electricity.

1.176 PID (PROPORTIONAL, INTEGRAL, DERIVATIVE)

Types of control theories.

1.177 POWER FACTOR

Ratio of real power to apparent power (watts/VA), usually expressed as a percentage (KW/KVA or KWH/KVAH).

1.178 POWER FACTOR CONTROLLER

A device or system used to control power factor generation by switching of capacitors.

1.179 POWER LINE CARRIER (PLC), BUILDING

A method of transmitting control signals using existing electrical wiring. Signals are introduced by superimposing on, or altering, existing waveforms. Signals are sensed by detecting these modifications of the waveforms with a remotely controlled receiver. A Building PLC uses relatively low communication energy of low radio frequency, generally between 100 and 500 kilohertz, to transmit and/or receive information exclusively over secondary distribution lines whose primary purpose is the distribution of electric power at a user facility. Also see 2.57, POWER LINE COMMUNICATIONS, UTILITY.

1.180 PROGRAMMABLE CONTROLLER

A digitally operating electronic apparatus which uses a programmable memory for the internal storage of instructions for implementing specific functions such as logic, sequencing, timing, counting, and arithmetic, to control, through digital or analog input/output modules, various types of machines or processes.

1.181 PROMOTIONAL RATE

A rate schedule with rates below the associated costs of providing services to the customer. A promotional rate establishes a pricing level which permits sales to be made which otherwise would not occur.

1.182 PROTOCOL

The method or code describing adherence to the order, preference, and procedure used in a control system. It describes the method structure used to communicate the elements of the control system.

1.183 PSK

Phase Shift Key. A method of encoding a message by changing the phase of the carrier signal.

1.184 PULSE CONSTANT

A value of kilowatthours per pulse determined by the metering equipment.

1.185 PULSE INITIATOR

Any device, mechanical or electrical, used with a meter to initiate pulses, the number of which are proportional to the quantity being measured.

1.186 PULSE PHASE COMMUNICATION

See 2.57, POWER LINE COMMUNICATIONS, UTILITY.

1.187 RECEIVER CONTROLLER

A device that accepts the signal from a transmitter and converts it for suitable operation of a controlled device.

1.188 REDUNDANCY

A method of duplicating a system function or component such that its failure will not prevent continued operation.

1.188A REMOTE TERMINAL UNIT (RTU)

See 1.104, FIELD INTERFACE DEVICE.

1.189 RIPPLE CONTROL

A low frequency (100-500 Hertz) communications system installed within an electric power network. See 2.57, POWER LINE COMMUNICATIONS, UTILITY.

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1.190 ROLLING INTERVAL DEMAND MEASUREMENT

See 1.198, SLIDING INTERVAL DEMAND MEASUREMENT.

1.191 SATURATION, APPLIANCE

See 2.3, APPLIANCE SATURATION.

1.192 SCADA

Supervisory Control and Data Acquisition.

1.193 SEASONAL DIFFERENTIALS

See 1.172, PEAK SEASON PRICING.

1.194 SECURITY CODE

A means of protection against unauthorized access to a system, for example, a password.

1.195 SERIAL TRANSMISSION

Transmission of bits in time intervals that follow each other without overlapping.

1.196 SETBACK

Reduction of heating or cooling during hours when a building is unoccupied.

1.197 SIMPLEX CIRCUIT

A communication channel capable of transmission of data signals in one direction only.

1.198 SLIDING INTERVAL (WINDOW) DEMAND MEASUREMENT

A demand measurement where the length of time between successive demand readings is less than the demand interval and where the demand interval is advanced incrementally in time such that the demand interval is the sum of the demand increments.

This term is also used to describe the demand control algorithm, which generally uses kilowatthour meter pulses to calculate the demand using the sliding window measurement technique. This information is then compared to a predetermined value and control action is initiated.

1.199 SOFTWARE

A term used to describe all computer programs whether in machine, assembly, or high-level language.

1.200 STAND-ALONE SYSTEM

An energy management system that performs all control functions without direction from any other unit.

1.201 SUBMETERING

Remetering of purchased energy by a customer for distribution to his tenants through privately-owned or rented meters.

1.202 SUMMER PEAK

The greatest load on an electric system during any prescribed demand interval in the summer, or cooling season.

1.203 SUPERVISORY CONTROL

Higher level manual or automatic intervention into a normally stand-alone control system(s), either central or distributed.

1.204 SYSTEM LOAD

See 1.64, DEMAND.

1.205 SYSTEM LOSS

See 1.139, LOSS (LOSSES).

1.206 TEMPERATURE CONTROL

A process or device that measures temperature and controls other devices or equipment in accordance with preset threshold(s).

1.207 THERMAL STORAGE

See 1.57, COOL STORAGE; 1.98, ENERGY STORAGE.

1.208 THREE-RATE WATTHOUR METER

See 1.155, MULTIRATE WATTHOUR METER.

1.209 MULTIPLE-RATE WATTHOUR METER

A watthour meter with multiple sets of registers constructed so that the off-peak energy will be recorded on one set of dials and the on-peak energy for different on-peak periods will be recorded on the other sets of dials.

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1.210 TIME-OF-DAY METERING

Metering by switching between registers of a multiple-rate watthour meter according to the historical level of demand seen by the utility.

1.211 TIME-OF-DAY PRICING

Pricing of service during periods of the day based on the historical pattern of demand during specific times of the day.

1.212 TIME-OF-USE METERING

See 1.210, TIME-OF-DAY METERING.

1.213 TIME-OF-USE PRICING

See 1.211, TIME-OF-DAY PRICING

1.214 TIME-OF-SEASON PRICING

Pricing of service during seasons of the year based on the cost of supplying the service during the various seasons of the year.

1.215 TRANSDUCER

(1) A device that when activated by signals from one or more systems or media can supply related signals to one or more other signals or media. (2) A device that converts energy from one form to another.

1.216 TRANSMISSION LINE

(1) A line used for electric power transmission. (2) The conductive connections between system elements which carry signal power.

1.217 TRANSPONDER

A receiver-transmitter or transceiver equipment, a capability of which is to transmit signals automatically when a proper interrogation is received.

1.218 TURN-KEY INSTALLATION

An installation of an energy management system in which one party assumes responsibility for all elements including design engineering, application engineering, provision of the energy management system and related equipment, general contracting, installation acceptance, training, documentation, and system maintenance.

1.219 TWO-RATE WATTHOUR METER

See 1.155, MULTIRATE WATTHOUR METER.

1.220 UL

Underwriters Laboratories, Inc.

1.221 UPS

Uninterruptable power supply.

1.222 USE MANAGEMENT

See 2.54, LOAD MANAGEMENT.

1.223 UTILIZATION FACTOR

The ratio of the maximum demand of a system or part of a system, to the rated capacity of the system or part of the system, under consideration.

1.224 UTILIZATION MANAGEMENT

See 2.54, LOAD MANAGEMENT.

1.225 VA

Volt-Amperes.

1.226 VAR

Volt-Amperes Reactive.

1.227 VAV

Variable Air Volume.

1.228 VDT

Video Display Terminal. See 1.60, CRT.

1.229 VOLUNTARY (LOAD) CONTROL

See 2.54, LOAD MANAGEMENT, INDIRECT.

1.230 WATTHOUR CONSTANT (K_h)

The registration, expressed in watthours, corresponding to one revolution of the rotor. When a meter is used with instrument transformers, the watthour constant is expressed in terms of primary watthours. For a secondary test of such a meter, the constant is the primary watthour

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constant divided by the product of the nominal ratios of transformation.

1.231 WINTER PEAK

The greatest load on an electric system during any prescribed demand interval in the winter, or heating, season.

1.232 WRIGHT DEMAND RATE

See 2.63, RATE SCHEDULE.

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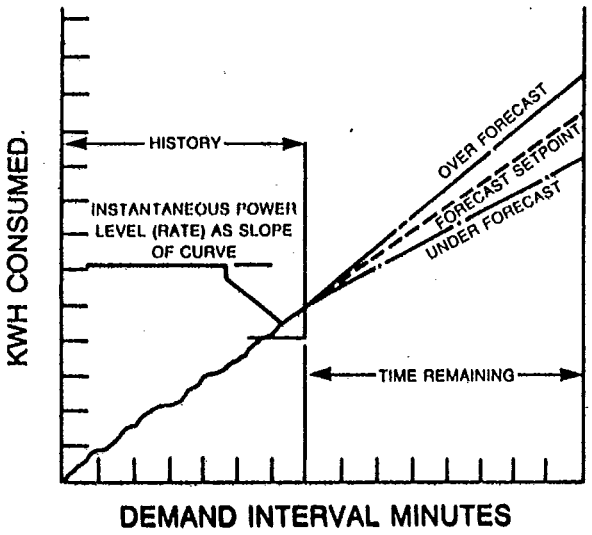

Figure 1-1
FORECASTING OR PREDICTIVE DEMAND CONTROL ALGORITHM

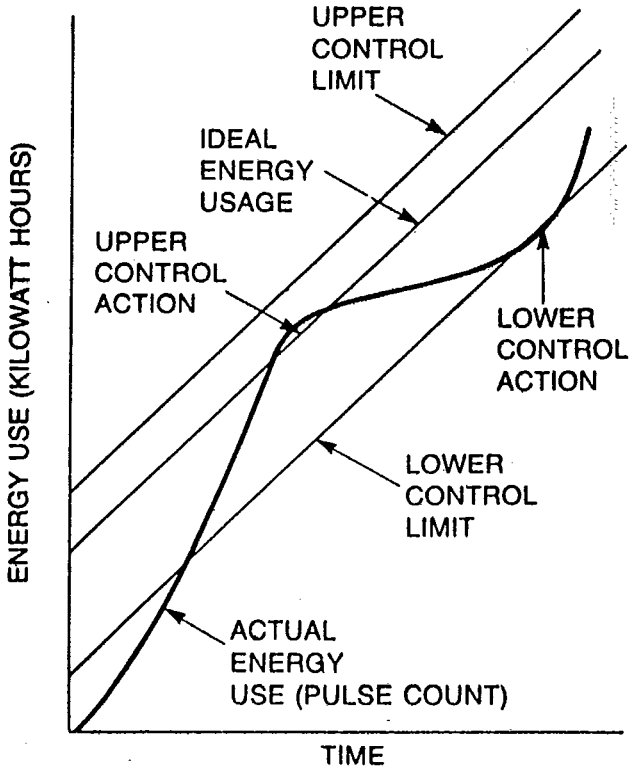

Figure 1-2
IDEAL RATE, IDEAL CURVE DEMAND CONTROL ALGORITHM

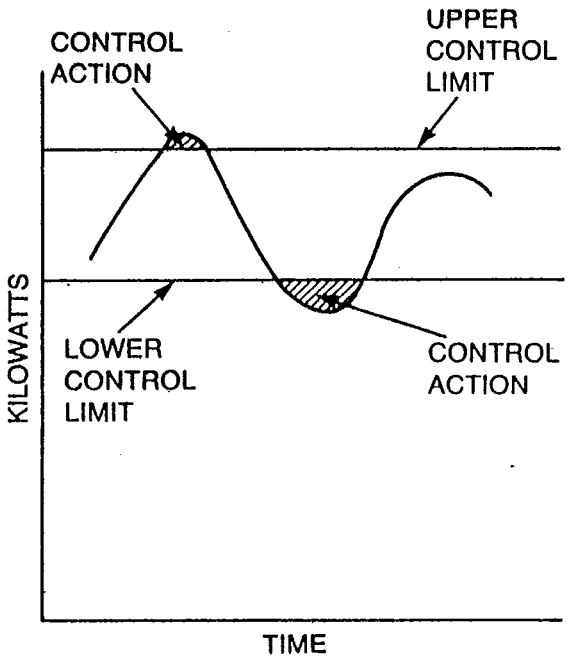

Figure 1-3
INSTANTANEOUS DEMAND CONTROL ALGORITHM

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Section 2

ELECTRIC UTILITY DEFINITIONS

2.1 AIR-CONDITIONING CONTROL (Electrical Power Utilization)

(a) Those control functions applied to air conditioning systems for the purpose of maintaining desired conditions of temperature and humidity.

(b) Those utility functions (in addition to general control functions) applied to electric air-conditioning compressors and condensor fans for the purposes of load management. In addition to load interruption and restoration, the functions of cold-load-start delay and anti-short-cycle are applied as required and coordinated with all other controls.

2.2 APPLIANCE

A utility term used to denote a device which converts electric energy into another useful form.

2.3 APPLIANCE SATURATION

The number of residences at which the specific types of household appliances served by a utility are installed, divided by the total number of residences.

2.4 AUTOMATIC METER READING SYSTEM

A utility term used to denote a system capable of reading a meter (watthour, demand, gas, water, or any other type of billing meter), preparing and conditioning the data and transmitting the accumulated information from the meter location to a central data accumulation device by a communications link (radio, telephone line, power line carrier, direct cable, or a combination thereof).

2.5 AVERAGE ANNUAL ELECTRICAL BILL (Per Customer)

A utility term used to denote annual revenue (exclusive of forfeited discounts and penalties) from a class of service (see Classes of Electric Service for list) divided by the average number of such users served for the 12-month period (usually refers to all residential users, including those with electric space heating).[4]

2.6 AVERAGE ANNUAL KILOWATTHOUR USE PER USER

Annual kilowatthour sales of a class of service (see Classes of Electric Service for list) divided by the average number of users for the same 12-month period (usually refers to all residential users, including those with electric space heating).

2.7 AVERAGE NUMBER OF USERS

The arithmetic average of users in the month in each of 12 consecutive months. For those billed other than every month, the number of such users is adjusted to a 12-month basis (e.g., for bimonthly billing the number of users billed, or counted, in each month is multiplied by two and the resultant averaged for the 12-month period).

2.8 BASE LOAD GENERATION

The largest, most efficient generating facilities within a utility system. These generators are operated to the greatest extent possible to maximize system mechanical and thermal efficiency and minimize system operating costs.

2.9 BILLING DEMAND

See 1.64, DEMAND, BILLING.

2.10 BLOCK HOPKINSON DEMAND RATE

See 2.63, RATE SCHEDULE.

2.11 BLOCK METER RATE

See 2.63, RATE SCHEDULE.

2.12 CAPABILITY (Generation)

The maximum load which a generating unit, generating station, or other electrical apparatus can carry under specified conditions for a given period of time, without exceeding approved limits of temperature and stress.

• *GROSS SYSTEM*—The net generating station capability of a system at a stated period of time (usually at the time of the system's maximum load), plus capability available at such time from other sources through firm power contracts.

• *MARGIN (MARGIN OF RESERVE)*—The difference between net system capability and system maximum load requirements (peak load). It is the margin of capability available to provide for scheduled maintenance, emergency outages, system operating requirements, and unforseen loads. On a regional or national basis, it is the difference

[4]A user with two or more meters at the same location because of special services, such as water heating, and so forth, is normally counted as one user, although some utilities count *each* meter as a separate user. (This footnote is classified as Authorized Engineering Information.)

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between aggregate net system capability of the various systems in the region or nation and the sum of system maximum (peak) loads without allowance for time diversity between the loads of the several systems. However, within a region, account is taken of diversity between peak loads of systems that are operated as a closely coordinated group. This number is expressed in one of two ways (a) excluding any consideration of load management systems capabilities or (b) including such capability.

- *NET SYSTEM*—The gross generating station capability of a system at a stated period of time (usually at the time of the system's maximum load), less the auxiliary or station power requirements, plus capability available at such time from other sources through firm power contracts less firm power obligations at such time to other companies or systems.
- *PEAKING*—Generating capability normally designed for use during the maximum load period of a designated time interval considering all forms of load management equipment operations.

2.13 CARRIER BYPASS

A path for carrier current of comparatively low impedance around some circuit element.

2.14 CHARGE

- *CONNECTION CHARGE*—An amount to be paid by a user in a lump sum, or in installments, for connecting the user's facilities to the supplier's facilities.
- *USER CHARGE*—An amount to be paid periodically by a user for electric service based upon costs incurred for metering, meter reading, billings, and so forth, exclusive of demand or energy consumption.
- *DEMAND CHARGE*—That portion of the charge for electric service based upon the electric capacity (kW or kVA) consumed and billed on the basis of billing demand under an applicable rate schedule.
- *ENERGY CHARGE*—That portion of the charge for electric service based upon the electric energy (kWh) consumed or billed.
- *FACILITIES CHARGE*—An amount to be paid by the customer as lump sum, or periodically as reimbursement for facilities furnished. The charge may include operation and maintenance as well as fixed costs.
- *FUEL ADJUSTMENT CHARGE*—An amount to be paid periodically by a user that is directly related to cost of fuel that the utility must pay during the period.
- *POWER FACTOR ADJUSTMENT CHARGE*—An amount to be paid periodically by the user that is related to the worst case power factor during a specified period.
- *RATCHET DEMAND CHARGE*—A monthly demand charge based on the current month's actual peak demand or based on the peak demand of a previous period.
- *TERMINATION CHARGE*—Any amount not resulting from a rate schedule application which is payable by a user when service is terminated at the user's request.
- *WHEELING CHARGE*—An amount to be paid for wheeling service.

2.15 CLASS OF SERVICE

A group of users with similar characteristics (i.e., residential, commercial, industrial, sales for resale, and so forth) which are identified for the purpose of setting a rate for electric service.

CLASSES OF ELECTRIC SERVICE:

Sales to Ultimate Customers[5]:
- Residential
- Commercial and Industrial:
  - Commercial
  - Industrial
    - or
  - Small Light and Power
  - Large Light and Power
- Public Street and Highway Lighting
- Other Public Authorities
- Railroads and Railways
- Interdepartmental

Sales for Resale (Other Electrical Utilities):
- Investor-Owned Electric Systems
- Cooperatively-Owned Electric Systems
- Municipally-Owned Electrical Systems
- Federal and State Electrical Agencies

2.16 (DELETED)

2.17 CUSTOMER LOAD MANAGEMENT, MANUAL

See 2.54, LOAD MANAGEMENT, INDIRECT.

2.18 CUSTOMER LOAD MANAGEMENT

See 2.54, LOAD MANAGEMENT, INDIRECT.

2.19 CUSTOMER LOAD CONTROLLER

See 1.131, LOAD CONTROLLER.

[5]Companies serving rural users under distinct rural rates classify such sales as "Rural." However, many companies serve customers in rural areas under standard Residential, Commercial, and Industrial rates and so classify such sales. Consequently, "Rural" is a rate classification rather than a user classification, and since it is frequently confused with "Farm Service" (a type of Residential or Commercial service, or both), the "Rural" classification has been generally discontinued as a customer classification. (This footnote is classified as Authorized Engineering Information.)

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2.20 CUSTOMER LOAD MANAGEMENT SYSTEM

A term used by a utility to designate a direct load management system. See 2.54, LOAD MANAGEMENT, DIRECT.

2.21 CUSTOMER LOAD MANAGEMENT TERMINAL

See 1.137, LOAD MANAGEMENT TERMINAL.

2.22 CUSTOMER SIDE DEMAND MANAGEMENT

Demand control programs implemented by the user as opposed to the supplier of energy.

2.23 CUSTOMER SIDE ENERGY MANAGEMENT

Energy management programs implemented by the user as opposed to the supplier of energy.

2.24 DECLINING BLOCK RATE

The pattern of unit charges within a user class that assesses a lower unit charge as usage increases.

2.25 DECLINING BLOCK STRUCTURE

See 2.63, RATE SCHEDULE.

2.26 DEMAND CHARGE

See 2.14, CHARGE, DEMAND CHARGE.

2.27 DEMAND LIMITER

An electrical/electronic, mechanical, or electromechanical device that monitors user electric power demand and causes that demand to be limited in a manner not to exceed a selected or programmed maximum value. Also see 1.66, DEMAND CONTROLLER.

2.28 DEMAND-LIMIT TRIPPING

As a part of direct load management, the process of, or equipment for, automatically opening a user service disconnect device or removing interruptible or deferrable load(s) at user utilization level when electric power or current flow to that user, or to a portion of his load, exceeds a specified level for more than a specified period of time, as determined by user agreement. The automatic function shall be enabled or disabled remotely by the serving utility via centralized communication means for coordination with other load management processes.[6] See also 2.49, INTERRUPTIBLE LOADS, 2.54, LOAD MANAGEMENT, and 2.72, SERVICE DISCONNECT.

2.29 DEMAND RATCHET

The demand that establishes the base for the Demand Ratchet Charge.

2.30 DEMAND RATES

See 2.64, RATES, DEMAND.

2.31 DEMAND READING

Highest or maximum demand for electricity that an individual user registers in a given interval. See 1.70, DEMAND INTERVAL.

2.32 DISTRIBUTION

The act or process of distributing electric energy from convenient points on the transmission or bulk power system to the consumers. Also, a functional classification relating to that portion of utility plant used for the purpose of delivering electric energy from convenient points on the transmission system to the consumers, or to expenses relating to the operation and maintenance of distribution plant.

2.33 DISTRIBUTION AUTOMATION

A means of performing various functions either on one or more distribution lines, within the confines of the secondary side of the distribution substation, or both via a communication link. The functions being activation or deactivation of devices, status monitoring or data gathering that would otherwise be performed manually. In the broadest sense, remote meter reading may be one of the data gathering functions.

2.34 DISTRIBUTION AUTOMATION (Power System Control)

The implementation by automatic means of the functions of monitoring and controlling elements of a distribution system for optimum efficiency and reliability of service and utilization. An appropriate degree of remote centralization by concentration of implementing communications usually facilitates coordination with higher system management levels such as transmission and generation.

[6] A local manual reset for the trip function may be provided for operation by the user upon reduction of causative load. (This footnote is classified as Authorized Engineering Information.)

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Feeder automation and load management are included with that portion of substation automation required to implement such functions as distribution feeder sectionalizing, fault detection, and metering. See also 2.33, DISTRIBUTION AUTOMATION.

2.35 DISTRIBUTION LINE (Electric Power Systems)

One or more circuits of a distribution system on a common line of poles or supporting structures, or in a common underground path, operating at primary or secondary voltages customary for distribution in the area.

2.36 DIVERSITY

That characteristic of variety of electric loads whereby individual maximum demands usually occur at different times. Diversity among users' loads results in diversity among the loads of distribution transfers, feeders, and substations, as well as between entire systems. See 2.52, LOAD, LOAD DIVERSITY.

2.37 DIVERSITY FACTOR

The ratio of the sum of the noncoincident maximum demands of two or more loads to their coincident maximum demand for the same period.

2.38 DOUBLE-RATE, DUAL-RATE, OR TWO-RATE WATTHOUR METER

A meter having two sets of register dials, with a changeover arrangement such that integration of the quantity will be registered on one set of dials during a specified time each day, and on the other set of dials for the remaining time.

2.39 ENERGY MANAGEMENT

As used by a utility, a term that denotes that part of electric power utility system operation that plans, coordinates, and controls power supply, transmission, distribution, and utilization. Coordination is maintained with management of a power grid of which the utility may be a member, and with reliability management within the utility system.

2.40 FEEDER (Electric Power Systems)

A main distribution line, usually three-phase, supplying electric energy within an electric service area or sub-area.

2.41 FEEDER AUTOMATION (Power System Control)

That part of distribution automation that provides monitor and control of electric utility and equipment and associated parameters distributed along primary distribution feeders. Functions may be:

(1) Locally controlled at particular equipment sites and remotely monitored by telemetering;
(2) Locally controlled with set points or thresholds remotely selected and remotely monitored;
(3) Remotely controlled and monitored; and/or
(4) A mixture of these levels of centralized remote automation may be utilized.

2.42 FIRM OBLIGATION

A commitment to supply electric energy or to make capacity available at any time specified during the period covered by the commitment.

2.43 FLAT DEMAND RATE

See 2.63, RATE SCHEDULE.

2.44 FLAT RATES

See 2.63, RATE SCHEDULE.

2.45 FLATTENED RATE DESIGN

The reduction or elimination of differential charges per unit of consumption based on quality of usage.

2.46 HOMEOSTATIC CONTROL (Power System Control)

See 2.54, LOAD MANAGEMENT, DIRECT and INDIRECT.

2.47 HOPKINSON DEMAND RATE

See 2.63, RATE SCHEDULE.

2.48 INTERMEDIATE PEAK DEMAND (Mid-Peak)

Shoulder load level defined for an electric power utility system, or part thereof, at a selected level, usually a lesser peak or plateau of the diurnal laod curve between

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off-peak or valley and on-peak. The third part of a three-part demand definition.

2.49 INTERRUPTIBLE LOADS (Electric Power Utilization)

(1) *(Commercial and Industrial)* Those loads that by contract can be interrupted in the event of a capacity deficiency in the supplying system. See also 2.55, LOAD SHEDDING.

(2) *(Load Management)* Those loads that by user agreement can be interrupted in the event of a capacity deficiency in the supplying, transmission, or distribution systems, or for load deferral to improve system load factor, to reduce peak demand, and/or otherwise to beneficially modify the shape of the load curve versus time and/or afford calculable equivalent spinning reserve. See also 2.54, LOAD MANAGEMENT; 2.55, LOAD SHEDDING.

2.50 INTERRUPTIBLE RATE

A rate normally covering reduced pricing for a supply of electricity that can be interrupted at the utility's option, either instantaneously as required or with advance notice.

2.51 K_h

See 1.230, WATTHOUR CONSTANT.

2.52 LOAD

The amount of electric power delivered or required at any specified point or points on a system. Load originates primarily at the power consuming equipment of the users.

- *BASE*—The normal minimum load of a system; the load which is carried 24 hours a day.
- *CONNECTED*—Connected load is the sum of the capacities or ratings of the electric power consuming apparatus connected to a supplying system, or any part of the system under consideration.
- *LOAD CURVE*—A curve on a chart showing power (kilowatts) supplied, plotted against time of occurrence, and illustrating the varying magnitude of the load during the period covered.
- *LOAD DIVERSITY*—The difference between the sum of the maxima of two or more individual loads and the coincident or combined maximum load, usually measured in kilowatts.
- *LOAD FACTOR*—The ratio of the average load in kilowatts supplied during a designated period to the peak or maximum load in kilowatts occurring in that period. Load factor, in percent, is also derived by multiplying the kilowatthours in the period by 100 and dividing by the product of the maximum demand in kilowatts and the number of hours in the period.
- *PEAK*—See 1.64, DEMAND, MAXIMUM and also 1.64, DEMAND, INSTANTANEOUS PEAK.

2.53 LOAD-FREQUENCY CONTROL

The regulation of the power output of electric generators within a prescribed area in response to changes in system frequency, tie-line loading, or the relation of these to each other, to maintain the scheduled system frequency and/or the established interchange with other areas within predetermined limits.

2.54 LOAD MANAGEMENT

The deliberate control or influencing of user loads in order to shift the time of use of electric power and energy.

- *DIRECT*—That subfunction of power system distribution automation that controls interruptible user loads or otherwise selected user appliances from one or more centralized, utility operated locations in chosen groups, load classes, and/or timed patterns. Characterized by remote control by the serving utility of user interruptible loads. Also called active load management.
- *INDIRECT*—That subfunction of power system distribution automation that implements economic incentives to induce user action, including automation provided by the user. Characterized by user local control of loads in response to economic incentives applied. Also called passive load management.
- *SYSTEM*—That sub-function of equipment (hardware) and programming (software) that implements direct and/or indirect load management, coordinated with other functions of energy management in an electric utility system.

2.55 LOAD SHEDDING

The process of deliberately removing preselected loads from a power system.

- *CAPABILITY*—The maximum load shedding ability expressed in KVA or KW that a load management system or systems can drop under specified conditions.
- *DISTRIBUTION, NON-ROUTINE*—The removal of user loads, interruptible or otherwise, on an all-call

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emergency basis for maintenance of system integrity, as upon loss of generation. See 2.71, SCRAM.

- *DISTRIBUTION, ROUTINE*—The routine process of interruption of interruptible or deferrable loads at the user utilization level to reduce peak demand, and restoration of such loads to increase valley demand for economic leveling of the load curve versus time.
- *TRANSMISSION*—The removal of preselected loads on substation bus or distribution feeder based upon detection of such parameters as system frequency sag below chosen threshold(s). As a nonroutine remedy, the interruption of preselected loads on a substation bus or distribution feeder based on a sequentially timed pattern for the purpose of matching demand to temporarily limited supply. Also see 2.70, ROTATING BLACKOUTS.

2.56 (DELETED)

2.56A METER RATES

See 2.65, RATES, METER.

2.57 POWER LINE COMMUNICATIONS, UTILITY

A method of transmitting control signals using existing electrical wiring. Signals are introduced by superimposing on or altering existing waveforms. Signals are sensed by detecting these modifications of the waveforms. Also see 1.179, POWER LINE CARRIER (PLC), BUILDING.

- *POWER LINE CARRIER (PLC)*—The use of relatively low communication energy of mid-audio to very low radio frequency, generally between 5 and 20 kilohertz, to transmit information and/or receive over the primary and secondary distribution lines of the distributing utility.
- *PULSE-PHASE*—The use of relatively high communication energy in the form of pulses, shaped or otherwise, that are synchronous with the fundamental power frequency to transmit information over transmission and primary and secondary lines whose primary purpose is the transmission and distribution of electric power. The information is contained in a relative shift in phase or timing of the electric power frequency voltage waveform as sensed at or near the zero-axis crossing thereof.
- *RIPPLE*—The use of relatively high communication energy of low audio frequency, generally between 100 and 400 Hertz, to transmit information downstream only over transmission and primary and secondary distribution lines whose primary purpose is the transmission and distribution of electric power.
- *TRANSMISSION COMMUNICATIONS*—The use of relatively low communication energy of low radio frequency, generally between 20 and 500 kilohertz, to transmit and/or receive information over the generating utility's transmission lines.

2.57A PLC CURRENT LEAD

A conductor or cable for interconnecting carrier-current coupling capacitor(s), transformer (bank), tuning unit(s), carrier-current transmitter, and/or carrier current receiver equipment.

2.57B PLC CURRENT LINE SHUNT

A network of inductance and/or capacitance connected across a power line, phase-to-phase, phase-to-neutral or phase-to-ground, that offers a high impedance to power-frequency current and a low impedance to one or more carrier-current frequencies.

2.57C PLC CURRENT LINE SHUNT, SINGLE-FREQUENCY

A carrier-current line shunt that offers low impedance to only one carrier-current frequency.

2.57D PLC CURRENT LINE SHUNT, TWO FREQUENCY

A carrier-current line shunt that offers low impedance to two separate carrier current frequencies.

2.58 POWER LINE COUPLING

- *PHASE-TO-GROUND*—A communication signal coupling circuit where the signal is connected to one phase conductor of a power line (or power lines), usually transmission, with the return path completed through ground or earth and/or associated shield wire, skywire, status wire, or overhead ground wire.
- *PHASE-TO-NEUTRAL*—A communication signal coupling circuit where the signal is connected to one or more phase conductors of a power line or bus, usually distribution, with the return path completed through an associated neutral conductor. It is a metallic circuit, i.e., one in which ground or earth forms no intentional part of the circuit.
- *PHASE-TO-PHASE*—A communication signal coupling circuit where the signal is connected to two or more phase conductors of a power line or bus. It is a metallic circuit, i.e., one in which ground or earth forms no intentional part of the circuit.

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2.58A PULSE-PHASE COMMUNICATIONS

See 2.57, POWER LINE COMMUNICATIONS.

2.59 PROTECTIVE RELAYING (Power System Control)

The process or implementing equipment, or both, for remote utilization of the control circuit of a detector of defective lines or apparatus or other condition of an abnormal or dangerous nature. A protective relay customarily initiates automatic application of a low frequency radio signal that is superimposed by various impedance coupling/decoupling means on the normal voltage of a power circuit between the points of detection, signal extension, if applicable, and resulting protective action. More than one protective relaying circuit may be multiplexed through appropriate terminal equipment on the same power circuit.

2.60 RADIO CONTROL

As used by a utility, control action effected by radio to carry out load switching functions.

2.61 RATE BASE

The value established by a regulatory authority, upon which a utility is permitted to earn a specified rate of return.[7]

2.62 RATE CLASS

A group of users identified as a class and subject to a rate different from the rates of other groups.

2.63 RATE SCHEDULE

The accepted forms of electric rates may be divided into two main classes, and each of these classes into several different types of rates, as follows:

Demand Rates	Meter Rates
Flat Demand	Block
Hopkinson Demand	Step
Three Part (C-E-D)	Straight-Line, or Flat kWh
Wright Demand	

2.64 RATES, DEMAND

Any method of charge for electric service which is based upon, or is a function of the rate of use, or size, of the user's installation or maximum demand (expressed in kilowatts, kilovoltamperes, or horsepower) during a given period of time.

- *FLAT*—A charge for electric service based upon the user's installation of energy-consuming devices.[8]
- *HOPKINSON*—The method of charge which consists of a demand charge based upon either estimated or measured demand or connected load; plus an energy charge based upon the quantity of energy used.[9]
- *THREE PART, OR THREE CHARGE*—A Hopkinson Demand Rate modified by the addition of a user charge. It consists of a charge per user or per meter plus demand and energy charges.
- *WRIGHT*—That method of charge which was the first to recognize load factor conditions by inclusion of demand costs in an initial high rate per kilowatthour, applicable to a certain number of hours use of a user's load, all excess kilowatthours being at a lower rate.

2.65 RATES, METER

Any method of charge for electric service based solely upon quantity, such as kilowatthours used.

- *BLOCK*—A certain specified price per unit is charged for all or any part of a block of such units, and reduced prices per unit are charged for all or any part of succeeding blocks of such units, each such reduced price per unit applying only to a particular block or portion thereof.
- *STEP*—A certain specified price per unit is charged for the entire consumption, the rate or price depending on the particular step within which the total consumption falls.
- *STRAIGHT-LINE*—The price charged per unit is constant, i.e., does not vary on account of an increase or decrease in the number of units.

2.66 RATE STRUCTURE

The design and organization of billing charges by user class to distribute the revenue requirement among users classes and rating periods.

2.67 RATES, LIFELINE

A low or reduced flat rate applicable to the first several hundred kilowatthours (kWh) consumed monthly by each residential customer or a special group of residential

[7]Generally, this represents the amount of property used and useful in public service and may be based on the following values or combinations thereof: fair value, prudent investment, reproduction cost, or original cost; and *may* provide for the inclusion of cash working capital, materials and supplies, and deductions for: Accumulated Provision for Depreciation, Contributions and Aid of Construction, Customer Advances for Construction, and Accumulated Deferred Income Taxes and Accumulated Deferred Investment Tax Credits. (This footnote is classified as Authorized Engineering Information.)

[8]Usually per watt, per kilowatt, or per horsepower, per month, or per year. Sometimes this type of rate is so much per user per year, or per month, for each of various classes of users, but estimated demand and quantity of energy likely to be used play an important part in the determination of the class. Such a rate as may be modified by the "block" method or the "step" method. (This footnote is classified as Authorized Engineering Information.)

[9]Either the demand charge or the energy charge, or both, may be of the block form. (This footnote is classified as Authorized Engineering Information.)

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customers. Revenue lost because of charging the low lifeline rates are recovered by raising rates for consumption by residential customers consuming beyond the lifeline level and/or by increasing rates for non-residential classes.

2.68 RATING PERIODS

The periods of time, corresponding to on-peak and off-peak periods, during which users pay peak and off-peak prices for electricity.

2.69 ROLLING BLACKOUTS

See 2.70, ROTATING BLACKOUTS.

2.70 ROTATING BLACKOUTS

The process of deliberately interrupting preselected loads from a power system, as a nonroutine remedy of energy management implemented through transmission supervision and substation automation, on a substation bus or distribution feeder basis in a sequentially timed pattern for the purpose of matching demand to temporarily limited supply.

2.71 SCRAM

A utility term used to denote emergency shedding of all controlled loads.

2.72 SERVICE DISCONNECT

(1) *(Manual)*—Means for interruption and restoration only by authorized personnel of the serving utility of the delivery of electric energy to the entire wiring system of individual premises served, usually with means for sealing the associated equipment and the selected condition against intrusion and unauthorized alteration.[10]

(2) *(Automatic)*—As a part of direct load management for the purposes of emergency load shedding, demand-limit tripping and/or remote implementation of user move requests, the process of, or equipment for remote and/or locally automated interruption and restoration of delivery of electric energy to the entire wiring system of individual premises served, often provided with conditional override means for operation by the user and usually provided with means for sealing the associated equipment against intrusion and unauthorized alteration.

2.73 SHOULDER LOAD PERIOD

That portion of time spanned by a diurnal load curve during which the intermediate peak demand definition is applicable. See also 2.48, INTERMEDIATE PEAK DEMAND.

2.74 SIGNAL COUPLING

The process of interconnecting communications devices in such a way that information can be transferred in either direction. The circuit element or elements through which two-way communications may be transferred. See also 1.59, COUPLING.

2.75 SIGNAL COUPLING TRANSFORMER (Bank)

An assembly of transformer units for coupling power line carrier receiving and transmitting equipment to a power line. See also 2.58, POWER LINE COUPLING.

2.76 SPINNING RESERVE

That reserve generating capacity connected to the utility bus and ready to take load.

2.77 STRAIGHT-LINE METER RATE

See 2.63, RATE SCHEDULE.

2.78 SUPPLY MANAGEMENT

That part of an energy management system that supervises and coordinates sources of power, including generation control, energy storage control, power exchange with another system, and/or wheeling of power between two other systems through a utility's own transmission facilities.[11]

2.79 TAIL BLOCK

The last or lowest priced block of energy in a declining block rate structure.

2.80 TELEPHONE CONTROL

The control of mechanisms or other apparatus via telephone channel(s) or connection(s).

[10]Depending upon the the configuration of serving primary and secondary distribution circuits to or among the particular premises, this function can be performed anywhere from primary feeder tap or lateral or distribution transformer cutout to the individual user service switch or fuse(s). For typical residential-type services, it is performed at the electric meter by removal from, or reorientation in the meter socket. Some meter sockets incorporate auxiliary devices for this purpose. (This footnote is classified as Authorized Engineering Information.)

[11]These activities are normally coordinated for maximum economic supply or generation and are usually performed under the higher level of management and control of the electric power grid of which the utility is a member. (This footnote classified as Authorized Engineering Information.)

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2.81 VOLTAGE REDUCTION

As a combined or coordinated function of substation and feeder automation, the process of, or equipment for temporary conservation of energy, implemented by reducing nominal electric distribution voltage by a selected percentage.

2.82 WHEELING SERVICE

The use of and access to the transmission facilities of one system to transmit power or energy of and for another non-contiguous system or user.

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NEMA STANDARDIZATION

The purpose of NEMA Standards, their classification and status are set forth in certain clauses of the NEMA Bylaws, which are quoted below:

Purpose of Standards

National Electrical Manufacturers Association Standards are adopted in the public interest and are designed to eliminate misunderstandings between the manufacturer and the purchaser and to assist the purchaser in selecting and obtaining the proper product for its particular need. Existence of a National Electrical Manufacturers Association Standard does not in any respect preclude any member or nonmember from manufacturing or selling products not conforming to the standard.

(Bylaw—Art. V, Sec. 1)

Definition of a Standard

A standard of the National Electrical Manufacturers Association defines a product, process or procedure with reference to one or more of the following: nomenclature, composition, construction, dimensions, tolerances, safety, operating characteristics, performance, rating, testing, and the service for which they are designed.

(Bylaw—Art. V, Sec. 2, Subsection A)

Dimensions

Where dimensions are given for interchangeability purposes, alternate dimensions satisfying the other provisions of the standards publication may be capable of otherwise equivalent performance.

(NEMA Policy Memorandum 84-2, dated June 7, 1984)

Classes of Standards

National Electrical Manufacturers Association Standards are of two classes:

1. NEMA Standard, which relates to a product commercially standardized and subject to repetitive manufacture, which standard has been approved by at least 90 percent of the members of the Subdivision eligible to vote thereon;
2. Suggested Standard for Future Design, which may not have been regularly applied to a commercial product, but which suggests a sound engineering approach to future development, which standard has been approved by at least two-thirds of the members of the Subdivision eligible to vote thereon.

(Bylaw—Art. V, Sec. 2, Subsection B)

Authorized Engineering Information

Authorized Engineering Information consists of explanatory data and other engineering information of an informative character not falling within the classification of NEMA Standard or Suggested Standard for Future Design.

(Bylaw—Art. V, Sec. 6, 1st Sentence)

Official Standards Proposal

An Official Standards Proposal is an official draft of a proposed standard which is formally recommended to an outside organization(s) for consideration, comment and/or approval.

(Bylaw—Art. V, Sec. 4, Subsection A)

Identification of Status

Standards in NEMA Standards Publications are identified in the foreword or following each standard as "NEMA Standard" or "Suggested Standard for Future Design." These indicate the status of the standard. These words are followed by a date which indicates when the standard was adopted in its present form by the Association.

The material identified as "Authorized Engineering Information" and "Official Standards Proposal" is designated similarly.

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