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Pam Bonrud
Executive Secretary
Public Utilities Commission
500 East Capitol Avenue
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RE: Written Comments on Proposed Amendments to ARSD 20:10:33:19
Our file: 0053

Dear Pam:

Please accept this letter on behalf of Midcontinent Communications as written comments offered in further support of amendments to the power supply backup rule (ARSD 20:10:33:19). Midcontinent will state for the record once again that the revisions to the Midcontinent Rule made by the LRC upon review of the draft are acceptable. Midcontinent would also request an opportunity to address the Commission regarding a final proposal on the rules.

Attached hereto are copies of the Rule's counterparts in states surrounding South Dakota. As one can see the majority view point is that telephone service providers are allowed (in Minnesota, Iowa, Nebraska, and North Dakota) to determine for themselves what system of power backup redundancy is appropriate, given the customer demographics, age and type of physical plant, electrical service provider, or any other of a myriad of considerations. Midcontinent urges that the Commission set a rule which provides that remote terminating or "customer end" electronics be backed up with a power source determined by the telephone provider.

If the Commission determines that it is important to provide a structure which sets forth a particular style of providing backup electrical power, then it seems to clear to Midcontinent that the Commission will have adopted a rule which requires revision on a revolving basis. The varied manners in which services are delivered will dictate that such a rule be revised in the future.

However, should the Commission decide to develop a rule which allows a telephone service provider to select, then the Commission will have developed a rule which meets the customer's requirements, gives the Commission authority to investigate failures, if any, to meet the customer's requirements and allows telephone service providers to use their ingenuity to find the most economical way to meet all those interests.

We have appended two bulletins from the USDA's RUS Telecom web site which appear to address the subject area. It appears that the RUS rules contemplate eight hours of backup power which period can be shortened to three hours where generators are used.

It is important to underscore the Midcontinent experience. I have attached to this letter as Exhibit C a copy of the Midcontinent Operating System Guidelines which provide the road map for Midcontinent's use of generators to assure that Midcontinent's system is "always on." As you can see it is a detailed system which provides that generators be dispatched and serviced on a timely basis. As noted at the hearing, Midcontinent has been using such a system for some period of time with no problems of note.

Regarding the SDTA sponsored rule draft, Midcontinent would reiterate three points. 1) Its opposition to rule making based on financing rules in place set by a Federal agency; 2) Its use of eight hours of backup time; and 3) Its references to "permanent."

Rural telcos enjoy an ability to borrow money at what is believed to be preferential rates from the Rural Development Authority, a division of the United Stated Department of Agriculture. The rules associated with borrowing that money are also applicable to rural telco systems based on their access to those funds.

Midcontinent is unable to access those funds for a variety of reasons. Nor are several other South Dakota telcos. For a variety of reasons Midcontinent would caution against using RUS rules as the basis for statewide rules upon the same subject.

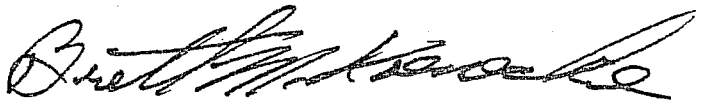
Midcontinent also argues against adoption of an eight hour standard for response to loss of commercial power. Midcontinent believes, as shown by the system it has put in place that the customer is and should be able to expect that his phone will remain on duty during instances of localized power interruption. That expectation should be realized for those localized power interruptions whether they are one minute, one hour, or one day.

Finally, the draft advanced by SDTA makes reference to "permanent" in several instances. Midcontinent reflects upon the matter and thinks that "permanent" is not the best modifier to define the various installations and applications of capital, manpower, and institutional vigor which might be required by such a rule.

Midcontinent appreciates the Commission and Staff interest in this matter. We would be happy to answer any questions arising from these comments.

Very truly yours.

MAY, ADAM, GERDES & THOMPSON LLP



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Enclosures

cc: Rich Coit
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UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Electrification Administration

BULLETIN 1751E-302

SUBJECT: Power Requirements for Digital Central Office Equipment

To: All Telephone Borrowers
REA Telephone Staff

EFFECTIVE DATE: Date of Approval

EXPIRATION DATE: Three years from effective date

OFFICE OF PRIMARY INTEREST: Central Office Equipment Branch, Telecommunications Standards Division

PREVIOUS INSTRUCTIONS: This bulletin replaces REA Telecommunications Engineering & Construction Manual (TE&CM) Section 302, Power Requirements for Community Central Office Equipment, Issue No. 6, dated April 1989.

FILING INSTRUCTIONS: Discard REA Telecommunications Engineering & Constructions Manual (TE&CM) 302, Power Requirements for Digital Central Office Equipment, Issue 6, dated April 1989, and replace it with this bulletin. File with 7 CFR 1751 and on REANET.

PURPOSE: This bulletin provides REA borrowers, and other interested parties with information concerning power requirements for digital central office equipment.

James B. Huff Sr. — Administrator

10/15/93 — Date

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Power Requirements For Digital Central Office Equipment

ABBREVIATIONS

AC	Alternating Current
AH	Ampere Hour
AM	Administrative Module
AMAF	Automated Message Accounting Frame
BHA	Busy Hour Attempts
BMC	Billing Media Converter
BTU	British Thermal Unit
CC	Common Control
CCS	Hundred Call Seconds
CM	Communication Module
CMF	Control and Maintenance Frame
COE	Central Office Equipment
CPU	Central Processing Unit
CUA	Circuit Unit Assembly
DAT	Digital Analog Trunk
DC	Direct Current
dc-ac	direct current - alternating current
dc-dc	direct current - direct current
DCI	Digital Carrier Interface
DCM	Digital Carrier Module
DCO-E	Digital Central Office Exchange
DCS-SE	Digital Central Office Small Exchange
DCTU	Digital Carrier Trunk Unit
DLTU	Digital Line & Trunk Unit
DTC	Digital Trunk Controller
DTMF	Dual - Tone Mutlifunction
GDSU	Global Digital Service Unit
GPIO	General Purpose Input Output
LCE	Line Concentrating Equipment
LCE	Line Concentrator Equipment
LGC	Line Group Controller
LLS	Local Line Switch
LTF	Line Trunk Frame
LU	Line Unit
MDX	Modular Digital Exchange
MMSU	Modular Metallic Service Unit
MSU	Modular Shelf Unit
MTM	Maintenance Trunk Module
OPM	Outside Plant Module
OPSM	Outside Plant Subscriber Module
P.E.	Peripheral Equipment
PCCM	Power Cooling Control Module
PDC	Power Distribution Center
PWBA	Printed Wire Board Assembly
RLCM	Remote Line Concentrator Module
RLG	Remote Line Group
RSLE	Remote Line Subscriber Equipment
RSLM	Remote Subscriber Line Module
SCM	Subscriber Carrier Module
SLC	Subscriber Loop Carrier
T&M	Trunk and Maintenance
TM	Trunk Module
TMF	Toll Multifunction
TU	Trunk Unit
V	volts

1. GENERAL

1.1 This bulletin is intended to provide REA borrowers, consulting engineers, contractors and other interested parties with technical information for use in the design and construction of REA borrowers' telephone systems. It discusses, in particular, the methods used in calculating the power requirements for central offices. It provides means to calculate the required capacities of the storage batteries and charging equipment for particular applications.

1.2 This bulletin replaces REA TE&CM 302, Power Requirements for Digital Central Office Equipment, Issue No. 6, dated April 1989. This bulletin provides power calculation methods for various digital, stored program controlled central office equipment.

1.3 General specifications governing storage battery and charging equipment for proposed Central Office Equipment (COE) are covered in Items 12.1 and 12.2, Part III, of Bulletin 1753E-001 (Form 522), "REA General Specification for Digital, Stored Program Controlled Central Office Equipment." Based on these general specifications, determination of the required capacities of battery and charger is made by the manufacturer.

2. BASIS FOR CALCULATIONS

2.1 Charging equipment furnished with a central office should have sufficient capacity to supply the dc power necessary for the satisfactory operation of the office during the busy hour. This includes the dc requirements for carrier, loop extenders, voice frequency repeaters, and dc-dc converters or dc-ac inverters to operate input/output devices.

2.1.1 Determination of the requirements for emergency generating and charging equipment is covered in Bulletin 1751E-320, "Emergency Generating and Charging Equipment." A suggested method of charger size computation is provided in Figure 8.

2.2 Charging equipment for digital central offices should be provided on one of the following bases:

(a) Two chargers either of which is capable of carrying the full office load; or

(b) Three chargers each of which is capable of carrying half the office load.

Arrangement (a) may be used in any central office power system. Arrangement (b) may offer potential cost savings when applied to power requirements in relatively large digital, stored program controlled offices.

2.3 Storage Battery

2.3.1 The storage battery furnished with a central office should have sufficient capacity to supply the dc power necessary to sustain satisfactory operation of the exchange for the period specified.

Specific REA minimum requirements are in 7 CFR 1755.522, which is also contained in Part III of REA Bulletin 1753E-001 (Form 522). Appropriate allowances should be included for any equipment which is normally ac operated but arranged for dc operation in case of an ac failure. See paragraph 1.3 of this bulletin for location of specific requirements in central office equipment specifications.

2.3.2 The minimum usable voltage to be delivered to the central office equipment during battery discharge should be determined using COE manufacturer's design criteria. When power flows from the battery through the power board to the equipment, a voltage drop (IR loss) is experienced as a result of the resistance of the current carrying conductors. In many cases equipment design is based on 44 volts being available at the power entry to the bay. Performance of the digital COE at voltages less than 44 volts becomes unpredictable. For effective design, voltage drop from the source to the equipment bay is considered by allocation as follows:

Battery to Power Board	0.5
Power Board to Equipment Bay	0.5
Minimum Equipment Voltage	44.0
Total	45V dc - 45.0 Vdc

In the case of a 24-cell battery (45/24) = 1.88 volts per cell becomes the minimum operating voltage.

2.3.3 The computation of battery size to meet the site power requirement is described in Figure 7 - Estimating Telephone Battery Sizes. This method permits computation with differing numbers of hours of reserve and numbers of cells in the battery string. The computation is applicable to lead-acid batteries, lead antimony, or lead-calcium batteries (see manufacturer's data for capacity, dimensions, etc.).

2.3.4 REA recommends that the battery provided should have the capacity to maintain the central office load for a period of 8 hours. Systems that are equipped with emergency generators are allowed to reduce the 8 hours to a 3-hour reserve time.

2.3.5 Determination of battery capacity to be supplied should be based on power outages experienced at the site and on the evaluation of the future performance of the ac power system. Another consideration is the size of the dc load to be supplied. Small electromechanical switching systems have a limited amount of fixed power consuming devices, while a large part of system devices only require power when in use. As a result battery capacity determinations were made assuming busy hour switching activity. The telecommunications industry considers 8 busy hour battery capacity appropriate for most small installations. The expectation of 8 consecutive busy hours of usage following a power interruption was negligible, resulting in battery power being usable for longer than the 8-hour period. Power consumption in digital switching equipment is almost constant, whether or not calls are being processed. In addition, the total power consumed by digital switches is greater than the electromechanical systems. The concept of "busy hour drain" has lost its impact in digital offices where the operating drain represents the constant load. The solution most often used is to provide an emergency generator to supply power on a long-term basis and to install a battery with 3 hours capacity.

3. CALCULATIONS

3.1 The following sample calculations describe the suggested procedure to determine the power requirements for digital, stored program controlled central office equipment. Sample calculations are included for the following switching equipment types:

Manufacturer	System Designation
Figure 1 - Northern Telecom	DMS-100, DMS-10
Figure 2 - Siemens Stromberg-Carlson	DCO
Figure 3 - Redcom	MDX
Figure 4 - AT&T	5 ESS
Figure 5 - Mitel	GX5000

3.2 Figure 6 lists various power requirements for loop extenders, voice frequency repeaters, carrier equipment and other equipment.

3.3 Figure 7 illustrates the method used in determining the capacity of a storage battery required for a particular application. This figure also illustrates, in Example 2, a method for calculating the ampere-hour reserve of existing batteries when the current requirement of the central office equipment is changed as a result of equipment additions or higher than anticipated calling rates, etc.

3.4 Figure 8 illustrates the suggested method used in determining charger capacity required for a particular application. If 110 percent of the rated output of the charger is equal to or greater than the calculated charger dc current requirement, the charger is considered as satisfactorily meeting the specification requirements. Three suggested solutions in terms of the number of chargers and their capacity are included.

3.5 In some cases specialized equipment requires power at a voltage different from the -48V dc central office battery. Dc-dc converters can be supplied at ±24V dc, ±48V dc, ±130V dc and other values. These other voltages are used to supply radio and carrier equipment operated at -24 volts, coin collect circuits at ±130 volts and other equipment. The power required by the dc-dc converters has to be included in the total load to be carried by the central office dc power system.

3.6 It should be kept in mind that the calculation methods shown in this section are to provide estimates only. Engineering judgment has to be used for each individual application. It is, therefore, recommended that the manufacturer of the system be consulted for specific applications.

UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Electrification Administration

BULLETIN 1751E-320

SUBJECT: **Emergency Generating and Charging Equipment**

TO: All Telephone Borrowers
REA Telephone Staff

EFFECTIVE DATE: Date of Approval

EXPIRATION DATE: Three years from effective date.

OFFICE OF PRIMARY INTREST: Central Office Equipment Branch, Telecommunications Standards Division

PREVIOUS INSTRUCTIONS: This bulletin replaces REA Telecommunications Engineering & Construction Manual (TE&CM) Section 320, Emergency Generating And Charging Equipment, Issue 5, dated June 1990.

FILING INSTRUCTIONS: Discard REA Telecommunications Engineering & Constructions Manual (TE&CM) Section 320, Emergency Generating and Charging Equipment, Issue 5, dated June 1990, and replace it with this bulletin.

PURPOSE: This bulletin provides REA borrowers and other interested parties with information concerning emergency generator and charger equipment.

James B. Huff, Sr. — Administrator

07/14/93 — Date

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Emergency Generator And Charging Equipment

ABBREVIATIONS

BTU	British Thermal Unit
COE	Central Office Equipment
LP	Liquified Petroleum

1. GENERAL

1.1 This bulletin provides REA borrowers and other interested parties with a guide in selecting suitable emergency generating and charging equipment. Also included is a discussion on the economic benefits obtained through longer subscriber loops by stabilizing the central office voltage.

1.2 Storage batteries have customarily been used as a source of reserve power to maintain uninterrupted operation of central office facilities in case of failure of the commercial source of power. The capacities of such batteries are normally chosen so that they will sustain operation of the central office under busy hour conditions for a period of 8 hours as specified in the Central Office Equipment (COE) contract to a minimum voltage as specified by the central office equipment supplier, and in Bulletin 1751E-302, Power Requirements for Community Central Office Equipment, section 2.3.2.

1.3 With present-day central office equipment and power loading, storage batteries often prove inadequate to hold the voltage at the level required to ensure uninterrupted operation of central office equipment. Provision of emergency generating and charging equipment is warranted in such instances.

1.4 There are alternative means of maintaining the office voltage for an extended interval of time such as the installation of an End Cell unit. However, a discussion of these other means is beyond the scope of this document.

2. GENERAL GENERATING EQUIPMENT NEED

2.1 The possibility of prolonged power failures is always present. Careful consideration of standby equipment with automatic transfer is essential to ensure dependable telephone service.

2.2 Where commercial ac power supply is not extremely reliable, some method of stabilizing the office voltage shall become a necessity. The use of emergency generating equipment with automatic transfer is one method of maintaining a fixed office voltage.

2.3 As an added assurance of service continuity, a minimum of two (2) chargers are required in Item 19.3, Part I, of REA Bulletin 1753E-001 (Form 522), "REA General Specification for Digital, Stored Program Controlled Central Office Equipment," in one of the two following configurations:

a) Two chargers either capable of carrying the full office load; or

b) Three chargers each capable of carrying one-half of the office load.

The chargers should be connected on a load-sharing basis so that should one fail, the other charger(s) will carry the office load. The remaining charger should be capable of recharging the batteries during periods of light loads.

2.4 A standby ac generator may also be provided to stabilize the voltage level to permit extended loop limits. Most digital, stored program controlled systems will not provide 1900 ohm operation except under float voltage conditions (51 to 52 volts).

3. ADVANTAGES

3.1 An extension of subscriber loop limits is possible with most types of central office equipment accepted by REA by maintaining the office voltage at 51 to 52 volts. With a constant office voltage of 51 to 52 volts, the maximum subscriber loop, in most cases, is 1900 ohms including the telephone set.

3.2 In some circumstances there may be an economic advantage with stabilized voltage, where longer subscriber loops are involved, in permitting more extensive use of finer gauge cables and eliminating the need of range extension devices. Discussion of loop limitations is referenced in REA Bulletin 1753E-001,(Form 522), Part I, Paragraph 6.6 Loop Extension.

3.3 An added economy that can be realized with a standby power generator is a reduction in the busy hour battery reserve. Where an 8-hour reserve would normally be specified without a standby generator, a 3-hour reserve is adequate when a fixed standby power plant is provided. As an example, where the busy hour current drain is calculated at 100 amperes and an 8-hour battery reserve is required without a standby power plant, the 8-hour battery reserve must be 960 ampere-hours for a final voltage of 1.88 volts per cell. With a standby power plant and a 3-hour reserve, a 520 ampere-hour battery would be adequate. In both cases, the next larger standard size should be selected, but the savings in the battery cost could substantially aid in the purchase of an engine generator or an extra charger.

3.4 During any type of emergency, including those which fall under civil defense, it is essential to maintain telephone service over as wide an area as possible. An auxiliary power plant would add assurance that telephone service would not be entirely disrupted.

4. TYPES OF ENGINE GENERATOR EQUIPMENT

4.1 Engine generators are manufactured in both ac and dc models. The recommended models are the ac type with 120/240 volt, 60 hertz, single or three phase output.

4.2 Gasoline, Liquified Petroleum (LP) gas, natural gas, or diesel engine-driven alternating current generators are available and may be of the air-cooled or water-cooled variety. A detailed description of these various types is given in section 5.

4.3 The machine selected for a particular application should have electrical output characteristics the same as those of the primary source of power. Machines with outputs from 500 to 3,500 watts are normally designed for 120 volt, 60 hertz, single-phase operation. Generators with outputs of 3,500 watts or more are designed for 120/240 volt, 60 hertz, single-phase or three-phase operation.

5. FUEL CONSIDERATIONS

5.1 Since the type of fuel used for emergency engine-driven generating plants is an extremely important consideration, it should be realized that each type has characteristics advantageous to one application, but disadvantageous to another. The major influencing factors for fuel selection are: (a) availability; (b) initial cost; (c) maintenance costs; (d) local fuel storage regulations; and (e) performance requirements.

5.2 Gasoline plants have a lower initial cost than diesel types. Gasoline plants start quickly and dependably over a wide range of temperatures and deliver full rated power. The major disadvantage of gasoline plants is the difficulty in storing the fuel over extended periods of time. This being the case, special precautions have to be taken and minimal quantities kept on hand.

5.2.1 Where recommended by the manufacturer of the engine-generator, unleaded gasoline should be used. For generator sets which operate at constant speeds, lead deposits in the combustion chamber are difficult to "blow out" through the exhaust ports unlike engines operating at variable speeds. Using unleaded gasoline helps reduce problems such as: cylinder head deposits, sticking or burned valves, spark plug fouling, piston wear, ring wear and sticking, cylinder wall wear, and poor oil control after ring fouling.

5.2.2 If it is desired to change from leaded to unleaded gasoline in an existing engine, it is necessary to remove all lead deposits from the engine to prevent preignition from causing severe damage to the engine.

5.3 Gaseous fuels come in two major types: piped-in and LP gas. The former may be natural or manufactured, and the latter a mixture of propane and butane which is supplied under pressure in tanks. No storage problems are encountered with piped-in gas and it is, therefore, quite simple to use. Because LP gases are heavier than air and highly combustible, their storage comes under strict insurance underwriters' regulations. In areas where low temperatures may be encountered, a larger mix of propane should be used. This is the case because butane has a boiling point of about -10°C, whereas propane's boiling point is about -44°C.

5.4 Gaseous fuel contributes to longer engine life and reduced maintenance due to more complete, efficient combustion. Since this fuel contains no lead, there are minimum carbon deposits, less sludge formation, longer valve life and no combustion chamber deposits. In that gaseous fuels remain fresh in storage, starting is quicker after long shutdowns.

5.5 For optimum engine performance of the British Thermual Unit (BTU) gaseous fuel content should be at least 1100 BTU's per cubic foot. Natural and bottled gases meet this requirement, but some manufactured gases may run as low as 450 BTU's. When a lower-rated fuel is used, the manufacturer should be contacted regarding the necessary derating of the plant's capacity.

5.6 Diesel engines are constructed considerably heavier and sturdier than gasoline models which results in higher initial costs. However, the longer life and lower maintenance may justify these high costs. Generally only diesel engines are available in the larger sizes. Diesel fuels are safe and relatively easy to store in sufficient quantities.

5.7 Diesel fuel has a higher BTU content than gasoline. Fuel consumption is considerably less and the efficiency and fuel savings increase with the size of the unit.

5.8 The heavier weight construction of diesel engines plus the absence of plugs, points, and condensers reduces maintenance costs over those of gasoline engines. Diesel engines offer prompt starting, operating speeds are reached quickly, and heavy loads are handled easily.

6. CAPACITIES

6.1 The output capacities of the air-cooled gasoline or LP gas powered units range from about 1000 watts to 15,000 watts, and those of water-cooled units are from 5000 watts upwards.

6.2 Air-cooled diesel powered models range in output capacity from about 3000 watts to 15,000 watts; water-cooled units from 5000 watts upwards.

6.3 Generator ratings listed by the manufacturers should be considered carefully. Rating methods have not been standardized; therefore, a generator rated at 15 kw, for instance, may be unable to supply this load except for a short time. Comparison of the engine horsepower rating and the generator wattage rating should show a ratio of approximately 2 to 1, i.e., 2 horsepower to every kilowatt. It is also important to remember that even though a 15 kw unit rated at less than 30 horsepower may develop the full 15 kw output when new, as the unit ages and wears the output level will drop.

6.4 If the altitude of the installation is greater than the altitude of the manufacturing site, the unit should be derated about 4 percent per 350 meters above sea level.

7. APPLICATION

7.1 When calculating the generator size required, at least part of the central office lighting load should be included so that it is possible to operate some lights and soldering equipment as well as provide the power requirements for the charger. Frequently, a generator one size larger than required for the projected equipment drain is sufficient and can be obtained for small added cost. Providing power for air conditioning, heating and full lighting will increase the cost of a generator substantially but may be desirable in some cases. Air conditioning and/or heating may be mandatory in certain areas for certain equipment, especially for digital, stored program controlled offices. If the central office equipment is located in the headquarters building, it may also be desirable to have sufficient generator capacity to operate office machines and computer equipment although inverters are normally provided for this purpose.

7.1.1 Where long-range growth and power requirements are uncertain, it is advisable to provide standby generator capacity for a shorter time period. When the load reaches this smaller unit's capacity, it could be transferred elsewhere, sold or traded in.

7.2 If the plant is to be mounted inside the central office building, suitable provision have to be made for the entrance of cooling air and for the discharge of exhaust gases into the outside air. Openings for ventilation should be placed to allow the cool air to enter, be forced through the engine cooling system and exit without circulating around the room.

7.3 Some means, such as described in paragraph 9.1.5, have to be provided to prevent voltage from being fed back onto the commercial power facilities to prevent accidental contact with a live line presumed to be unenergized.

7.4 Portable units are not recommended in areas where the year-round weather conditions will not permit transporting the unit between offices. When emergency power is required, it may be needed in more than one office at the same time. Under such circumstances transportable units are impractical.

8. INSTALLATION

8.1 If the Central Office (CO) building is to be new construction, or an addition to an existing building is proposed, it may be advantageous to install the auxiliary power plant as a part of the building contract if the plant is to be permanently mounted in a separate room of the central office building. If a separate room of the CO building is used, it should be enclosed by firewalls and entrance should be from the outside of the building only.

8.2 A clean, dry, well-ventilated location has to be chosen for placement of the auxiliary power plant. The location chosen should preferably have minimum temperature variations. Locations where temperatures are unusually high should be avoided because inefficient cooling will result. Where temperatures fall below 10°C, special accessories such as electric water jacket or manifold heaters will be needed to ensure dependable automatic starts. Since moisture reduces plant efficiency, the power plant has to be located where rain and moisture cannot get to it. For outside installation a weatherproof housing should be specified.

8.2.1 In areas where flooding is prevalent, basement locations have to be avoided. Rooftop installation has advantages such as less noise, rapid dispersion of exhaust fumes, less likelihood of vandalism, and less snow bank problems as well as no flooding. Of course, when a rooftop installation is considered, the structure must be able to support the generator weight and vibration.

8.3 Enough space should be allowed around all sides of the plant for cleaning, ventilation and servicing. The position should be chosen so that ducting to the inlet and outlet openings can be conveniently arranged. Careful consideration has to be given to fuel, exhaust and electrical line routing when choosing a location. Building codes have to also be considered.

8.4 Two louvers with automatic shutters are often necessary in the space provided for the auxiliary power plant; one for air intake and the other to permit escape of the warm air created by the power plant. These openings are in addition to those required for discharge of exhaust gases.

8.5 Mufflers are necessary in most cases to minimize exhaust noise. They are especially important when the central office is located in a residential area. Since a cool muffler creates undesirable carbon deposits, the muffler must be installed as close as practical to the engine.

8.6 When the installation of the ac plant is made a part of the building contract, the plans should include provisions for a fuel line and for a control box to permit transfer features. Mounting needs, including facilities for bolting the unit to the floor or pier, also have to be considered by the architect or engineer. Vibration damping should also be provided.

8.7 Smaller units, 10 kw or less, should be installed on a concrete foundation equipped with anchor bolts. In some cases, steel beam sections will make a satisfactory base. For large plants, which are equipped with steel skids, a separate foundation may not be necessary although it is recommended. In any case, make certain that the floor will support the weight of the plant.

8.8 Regardless of the type of unit considered, the suppliers of auxiliary power plants should be contacted and their help solicited in determining installation requirements. Most suppliers provide sample specifications for each size plant and each provide forms that, when completed, list all information required for the purchase of an adequate standby plant. The local representatives of the suppliers can lend assistance in determining plant requirements.

8.9 When not made part of a building contract, standby power plants should be purchased under a separate contract, REA Form 773 Miscellaneous Construction Work and Maintenance Service. In cases where the supplier of the power plant has an installation force, it may be more convenient and possibly more economical to purchase the unit installed. The supplier assumes full responsibility of all phases of the work including delivery, installation and testing of the plant.

9. GENERAL SPECIFICATIONS

9.1 Regardless of the size of the plant or the type of fuel used to power the plant, the following general specifications should apply as a minimum:

9.1.1 The prime mover should deliver at least 2 horsepower at the rated governed revolutions per minute (RPM) for each kilowatt of the generator's full output rating.

9.1.2 The prime mover's ignition system and associated electrical equipment should be equipped with adequate shielding against radio frequency interference.

9.1.3 Adequate speed regulation should be provided to maintain output voltage under full load to within 10 percent of the output voltage under no load. The frequency under full rated load should be kept within 3 Hz of the no load frequency.

9.1.4 It should be possible to vary the output voltage 5 percent from the rated voltage under full load, regardless of generator speed.

9.1.5 An automatic switchover panel should be provided for an automatic transfer switch with a fail safe feature to prevent voltage from being fed back onto the line. This transfer switch has to be listed by Underwriter's Laboratories or some other organization that meets the definition of "Listed" found in Article 100 of the National Electrical Code, ANSI/NFPA 70.

9.1.6 Cold start generators should be under the protection of a timer to prevent starting of the prime mover for at least 5 seconds after failure of commercial power. This delay should be adjusted to suit the commercial power characteristics. In offices where volatile memories are used, special uninterruptible inverters may be needed to apply continuous power to these items.

9.1.7 Batteries for starting the prime mover of cold start generators should be the "dry charged" type placed under trickle charge after installation. The trickle charger should be regulated to vary the charging current over the required range to provide a full charge without overcharging.

10. RECOMMENDED FEATURES

10.1 All of the engine-driven generators presently available have various features which may or may not be included in the base price of the generator. These features vary with different manufacturers and with models as well as capacity and the type of fuel required. Which options to include will be determined by each specific application, but in most cases the plants should be equipped with the following features:

10.1.1 Load Transfer - Since the power plant is used for emergency power, this control is needed to automatically start the plant when the commercial power fails. Load transfer controls can also be used to ensure that the plant runs for at least 15 to 30 minutes once started. This assures that it reaches operating temperature, evaporates moisture from the oil, etc. The cost of this control is largely dependent upon the size of the plant and added optional equipment desired, such as a time exerciser and/or time delay relays, etc. These load transfer switches should have the safest arrangement of controls possible and all live contacts should be out of reach of unauthorized telephone company personnel. In any case, they have to be listed by Underwriter's Laboratories or some other organization that meets the definition of "Listed" found in Article 100 of the National Electrical Code, ANSI/NFPA 70, and kept locked and access given to authorized personnel only.

10.1.2 Time Exercisers - This option is part of the load transfer equipment and causes the unit to start automatically at timed intervals, run for a short time and then shut off. It is necessary in unattended exchanges to ensure that the emergency plant will start. This equipment should be set to operate at least once a week for at least 30 minutes running time.

Exercising should be done under full load to lubricate internal parts, remove moisture, assure proper starting, keep fresh fuel in the carburetor, bring the engine to operating temperature and recharge the battery. Long periods of no load operation can cause cylinder wall glazing and poor ring seating and attendant high oil consumption. However, the generator should not take over the load until it has reached running speed.

10.1.3 Time Delay Relay - This relay prevents the plant from transferring to the load for outages lasting only a moment or two. (See paragraph 9.1.6). Conversely, it also prevents the unit from retransferring immediately when the commercial power is restored in case the restoration should be momentary. Returning power often fluctuates for several minutes before returning to its nominal value. The central office should not be returned to commercial power until these fluctuations have ceased. It is recommended that a 15-minute delay be used. If the time it takes for these fluctuations to steady is known, a shorter delay may be used.

10.1.4 Frequency Meter - This meter is used to monitor the output of the plant to determine that the 60 Hz output does not vary more than plus or minus 1.5 Hz.

10.1.5 Alarms - In the event that the plant fails to start, either during the period selected by the exerciser or as a result of a commercial failure, a means of transmitting an alarm to an attended office should or needs to be a part of the system. This can be accomplished by an applique circuit that connects to the existing central office alarm circuitry. Alarms can also be used to indicate low oil pressure, high temperature, low fuel level, etc.

10.1.6 Test Switch - A test switch to simulate a commercial power failure is required so that the plant can be manually turned on and off for maintenance checks. There should be an on-off switch on the generator set to permit testing the engine without interrupting normal ac functions.

10.1.7 Underground Fuel Tank - A buried fuel tank may be desirable for a permanently fixed large size water-cooled plant or a medium range LP gas-fueled plant. For the smaller units, 4 kw or less, an above-ground tank with a capacity of 10 to 55 gallons should be adequate. Where longer outages can be reasonably expected, a tank with a capacity for 120 hours full load operation should be provided.

10.1.8 Battery and Trickle Charger - The battery required may be either a single 12-volt battery with a 55-ampere hour capacity needed with the smaller engine generators or as many as four 6-volt batteries for larger diesel or gasoline units. A battery and a means of keeping it charged is a necessary part of the equipment. Provision for mounting space for both the battery and charger should be given consideration, either as a part of the

transfer panel or wall mounting space inside the building if the plant is mounted externally.

The batteries should be mounted on a wood or metal platform as near as possible to the generator, but not beneath it. Battery cables should be the proper size and kept as short as practical.

10.1.9 Crankcase or Water Jacket Heater - Where cold weather occurs, a water jacket or crankcase heater should be ordered with the engine-generator if the plant is to be mounted outside of the building or inside in an unheated room of the central office building.

10.1.10 Running Time Meter - This instrument indicates the accumulative operating time of the engine-generator. This is important in performing periodic maintenance.

10.1.11 Day Tank - A gravity fed priming tank should be installed to assure quick starting of gasoline engines and certain diesel models. While the plant is not being operated, evaporation of gasoline may occur in the carburetor or fuel in the supply line may drain back into the main tank causing a delay in starting, since the fuel has to again be pumped from the tank to the carburetor. The day tank will replace this fuel by means of gravity flow.

Minnesota Rules, Table of Chapters

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7810.3900 EMERGENCY OPERATIONS.

Each telephone utility shall make reasonable provisions to meet emergencies resulting from failures of lighting or power service, sudden and prolonged increases in traffic, illness of operators, or from fire, storm, or acts of God, and each telephone utility shall inform employees as to procedures to be followed in the event of emergency in order to prevent or mitigate interruption or impairment of telecommunications service. It is essential that all companies shall make reasonable provisions for emergency power. In offices without installed emergency power facilities, there shall be a mobile power unit available which can be delivered on short notice, and which can be readily connected. Each central office shall contain as a minimum four hours of battery reserve. In exchanges exceeding 5,000 lines, a permanent auxiliary power unit shall be installed.

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affected, the time, date and nature of the report, the action taken, the date and time of trouble clearance or other disposition and the identification of the person making final disposition. The carrier shall furnish reports to the Commission upon request.

002.04C It shall be the objective to so maintain access line service that the average rate of all access line trouble reports in an exchange is no greater than six (6) per one hundred (100) access lines per month, based on a six (6) month period. In the event this average trouble rate reaches eight (8) per month, in a particular exchange, it shall be the responsibility of the exchange carrier serving that exchange to develop a plan to improve service in the exchange with the objective being to reduce trouble reports to acceptable levels.

002.04D In the case of access line service interruptions, each exchange carrier shall provide repair service daily consistent with the bona fide needs of the customer and the personal safety of exchange carrier personnel.

002.05 Emergency Operations and Power:

002.05A Each exchange carrier shall make reasonable provisions to meet emergencies resulting from failures of lighting or power service, sudden and prolonged increases in local calls or similar emergencies and each exchange carrier shall inform its employees as to procedures to be followed in the event of emergency in order to prevent or mitigate interruption or impairment of access line service.

002.05B It is essential that all central offices have reasonably adequate provisions for emergency power. For offices without permanently installed emergency power facilities, there shall be a mobile power unit available which can be delivered on reasonably short notice and which can be readily connected.

002.05C Each central office shall contain, as a minimum, three (3) hours of battery reserve.

(1) A negligent or willful act on the part of the subscriber;
(2) A malfunction of subscriber-owned telephone equipment;
(3) Disasters or acts of God; or
(4) The inability of the company to gain access to the subscriber's premises.

The adjustment, either a direct payment or a bill credit, shall be the proportionate part of the monthly charges for all services and facilities rendered inoperative during the interruption. The adjustment shall begin with the hour of the report or discovery of the interruption. Adjustments not in dispute shall be rendered within two billing periods after the billing period in which the interruption occurred.

Repair—missed appointments. When a utility makes an appointment for installation or repair within a given range of time, and misses that appointment by over an hour, the customer will receive one month's primary local service free of charge. This is applicable to each missed appointment. The expense incurred as a result of a missed appointment in providing free primary local service shall not be included in rates.

Emergency operation.

a. Each telephone utility shall make reasonable provisions to meet emergencies resulting from failures of power service, climate control, sudden and prolonged increases in traffic, illness of operators, or from fire, explosion, water, storm, or acts of God, and each telephone utility shall inform affected employees, at regular intervals not to exceed one year, of procedures to be followed in the event of emergency in order to prevent or mitigate interruption or impairment of telephone service.

b. All central offices shall have adequate provision for emergency power. Each central office shall contain a minimum of two hours of battery reserve. For offices without permanently installed emergency power facilities, there shall be access to a mobile power unit with enough capacity to carry the load which can be delivered on reasonably short notice and which can be readily connected.

c. An auxiliary power unit shall be permanently installed in all toll centers and at all exchanges exceeding 4,000 access lines.

d. Each local exchange utility shall maintain and make available for board inspection, its current plans for emergency operations, including the names and telephone numbers of the local exchange utility's disaster services coordinator and alternates.

Business offices.

a. Each local exchange utility shall have one or more business offices or customer service centers staffed to provide customer access in person or by telephone to qualified personnel, including supervisory personnel where warranted, to provide information relating to services and rates, accept and process applications for service, explain charges on customers' bills, adjust charges made in error, and, generally, to act as representatives of the local exchange utility. If one business office serves several exchanges, toll-free calling from those exchanges to that office shall be provided.

b. Upon the closing of any local exchange utility's public business office, the company must provide to the board, in writing, at least 30 days prior to the closing of the office the following information:

(1) The exchange(s) and communities affected by the closing;
(2) The date of the closing;
(3) A listing of other methods and facility locations available for payment of subscribers' bills in the affected exchanges; and
(4) A listing of other methods and locations available for obtaining public business office services.

National Standards Institute, the National Electrical Code, the National Electrical Safety Code, the exchange carriers standards association, the rural electrification administration, and such other codes and standards as are generally accepted by the industry, except as modified by this commission or by municipal regulations within their jurisdiction. The telecommunications plant shall be designed, constructed, maintained and operated in accordance with these standards, and in such manner to best accommodate the public, and to prevent interference with and from service furnished by other public utilities insofar as practical. The carrier shall design and construct the telecommunications facilities to reduce or prevent electromagnetic interference from AC power systems. The carrier shall engage in prior coordination with power utilities in the area before placing new plant or making major changes in existing plant likely to be impacted by the power utility's facilities. Such coordination shall be governed by the latest issue of ANSI/IEEE 776 Guide for Inductive Coordination of Electric Supply and Communications Lines.

(2) Automatic number identification. Exchange carriers shall have as an objective the provision of automatic number identification in all exchanges. All exchange carriers shall file a report with the commission within six months following adoption of this rule, and every six months thereafter, including the status of current exchanges and plans to comply with this provision.

(3) Party line service. Where party line service is provided, no more than four customers shall be connected to any one channel, unless such action is approved by the commission. The exchange carrier may regroup customers in such a way as may be necessary to carry out the provisions of this rule. Upon completion or delay in the meeting of this requirement a report to that effect shall be filed with the commission.

(4) Selective carrier denial. Exchange carriers shall have as an objective the provision of selective carrier denial in all exchanges. All exchange carriers shall file a report with the commission within 18 months following adoption of this rule, and every 6 months thereafter, including progress towards compliance and timetable for completion of implementation. (History: Sec. 69-3-103, MCA; IMP, Secs. 69-3-102 and 69-3-201, MCA; NEW, 1989 MAR p. 1515; Eff. 9/29/89.)

38.5.3351 EMERGENCY OPERATION (1) Carriers shall make reasonable provisions to meet emergencies resulting from failures of lighting or power service, unusual and prolonged increases in traffic, illness of personnel, or from fire, storm, or other acts of God and inform its employees as to procedures to be followed in the event of emergency in order to prevent or minimize interruption or impairment of telecommunications service.

(2) Each central office and interexchange toll switching office or access tandem shall contain as a minimum four hours of battery reserve.

(3) In central offices exceeding 5,000 lines and in all interexchange toll switching offices or access tandems, a permanent auxiliary power unit shall be installed. In central offices without permanently installed emergency power facilities, there shall be a mobile power unit available which can be delivered and connected on short notice. (History: Sec. 69-3-103, MCA; IMP, Secs. 69-3-102 and 69-3-201, MCA; NEW, 1989 MAR p. 1515; Eff. 9/29/89.)

38.5.3352 CONSTRUCTION WORK NEAR EXCHANGE CARRIER FACILITIES (1) Upon receipt of written or verbal notification from the property owner, or from a contractor, of work which may affect its facilities used for serving the public the carrier shall investigate and decide what action if any, must reasonably be taken to protect or alter telephone facilities in order to protect service to the public and to avoid unnecessary damage, such as identifying in a suitable manner the location of any underground

(vi) The provider shall maintain its system in a manner to meet service adequacy standards defined in rules 508 through 511 herein, and in accordance with the general practices and standards of the telecommunications industry. Programs of testing, inspections and preventive maintenance aimed at achieving efficient operation of its system to permit, at all times, the rendering of safe, adequate and continuous service shall be adopted. The existence of inductive interference, cutoffs, crosstalk and excessive noise is evidence of the necessity of a maintenance program.

Section 506. Provision of Service During Maintenance or Emergencies.

(a) The provider should make reasonable provisions to meet catastrophic emergencies.

(b) For any local central office, toll switching facility, tandem switching facility or any facility critical to network integrity, permanent auxiliary power generation capable of sustaining functionality for a minimum of eight (8) hours shall be installed and operable. Quarterly functional tests shall be conducted to assure auxiliary power sources correctly activate and continue uninterrupted facility operation. The test results shall be filed with the Commission.

(c) Service interruptions for an extended time due to maintenance requirements shall be done at a time which causes minimal inconvenience to customers. Customers shall be notified in writing, in advance by the provider of extended maintenance requirements with appropriate and reasonable consideration of customer security requirements considered.

(d) The provider shall maintain a disaster recovery plan to comply with the requirements of FEMA and/or WEMA.

Section 507. Availability of Service - Adequacy of Facilities. The provider shall employ prudent management and engineering planning and design practices to assure that adequate equipment is in place to meet requests for service to prospective customers in its service territory within a reasonable time as set forth in this section. The time frames specified in this section and the associated remedies for failure to meet these time frames apply to requests for local exchange service. To facilitate this section, all telecommunications providers shall file terms of service, tariffs or other documents which set forth the conditions and costs under which service extensions will be made available.

(a) Construction Charge Estimate. Where construction charges apply, the provider shall provide to the customer a good faith written cost estimate of the amount of

Power Supply Response Team

Objective

The Objective of the Power Supply Response Team (PSRT) is to provide uninterrupted service to telephone subscribers during periods of commercial power interruption. Midcontinent Communications utilizes power supplies within its network which convert commercial power to 87.5-volts AC and provide the power to the network nodes, amplifiers and customer premise equipment. Each power supply unit shall have battery backup in order to continue to provide network power in the event of a commercial power failure. Portable generators shall be deployed by the PSRT to provide continuous uninterrupted power augmenting the battery power life cycle.

Power Supply Response Team Members

The PSRT shall consist of the Network Operations Center (NOC) staff, outside plant and on-call technicians (OSPT), outside plant supervisors (OSPS) and company management.

Manpower Plan

Normal Business Hour Plan- All regularly scheduled technicians, supervisors and NOC staff are available for participation as PSRT members.

Off-Hour Plan- On-call technicians, secondary on-call technicians, NOC staff are available 24 hours, 7 days every week as PSRT members.

Communication tools- Communication tools include the NOC Network Management System (NMS), cellular telephones, wire-line telephones, pagers and Internet email.

Vehicles- Vehicles are provided for all OSPT and OSPS.

Network Operations Center Monitoring

The Network Operations Center (NOC) shall monitor all power supply units (PSU) on a 24 hour 7 day per week basis. When status monitoring detects an interruption of commercial power to a PSU and battery operation is engaged (power event), a ticket is created and an NMS Alert is communicated to the PSRT.

Power Event Status Definitions:

Gray power event- one-three PSU on power event ticket.
Brown power event- at least four but less than 11% of total PSU on power event ticket.
Black power event- 11% or more of total PSU on power event ticket.

The following documentation has been provided to the NOC staff to ensure quality performance:

a) Commercial Power Utility Company list of telephone numbers and personnel contacts.
b) Midcontinent Supervisor and on-call technician telephone numbers and schedule.
c) Information necessary to calculate the anticipated run times of PSU(s) on battery operation.
d) PSU documentation including but not limited to location of units, number of batteries installed, load and network equipment operating on battery power.

Power Event:

1) The NOC staff creates a ticket (NMS Alert) when a power event occurs.
2) The NOC staff logs the event by PSU name(s), location(s), address(s), time and date on a single ticket power event.
3) The NOC staff calculates the anticipated battery run time of the PSU(s) involved in the power event and logs the anticipated loss of network power time of day (LNPT).
4) The NOC staff contacts the commercial power utility company within 20-25 minutes of the power event, inquires into the circumstance.

Power Event + 30 minutes:

5) The NOC staff, when commercial power has not been restored within 30 minutes of the ticket event contacts the appropriate OSPT/OSPS.
6) The NOC staff communicates to the OSPT/OSPS the PSU(s) involved in the power event, location(s), address(s), the LNPT, the power event status (gray/brown/black) and the power company inquiry response.
7) The NOC staff updates the ticket (NMS Alert), and logs all pertinent information from prior activities.

Continuous Updates:

8) The NOC staff shall continue to monitor the status of the PSU(s) and report to the OSPT/OSPS any and all changes including but not limited to; return to normal operation (commercial power), expansion or contraction of the number of PSU(s) affected and log appropriately.

LNPT -90 minutes:

9) The NOC staff, when commercial power has not been restored within 90 minutes of the pending LNPT, shall communicate to the OSPT/OSPS that action is required.
10) The NOC staff updates the ticket (NMS Alert), with the name of the OSPT/OSPS contact personnel and designates that action is required.

Continuous Updates:

11) The NOC staff shall continue to monitor the status of the PSU(s) and log including but not limited to the generator installation, time and OSPT reporting.

Power Event Conclusion:

11) The NOC staff shall continue to monitor the status of the PSU(s) and once commercial power has been restored log appropriately.
12) The NOC staff, after commercial power has been restored for 30 minutes, verifies status with the commercial power company.
13) When the commercial power company verifies power is restored and stabilized, the ticket (NMS Alert) shall be closed and the OSPT informed.

Outside Plant Technician (OSPT) or Supervisor (OSPS) Responsibilities

Power Event:

1) No action is required by the OSPT/OSPS.

Power Event + 30 minutes:

2) OSPT/OSPS receives communication from the NOC of the Power Event.
3) OSPT/OSPS accepts the responsibility and decision making process to deploy the manpower and resources necessary to provide continuous power to the network.
4) OSPT/OSPS makes decisions on response(s) required based upon the escalation policy.
5) OSPT/OSPS communicates all progress on all tickets to additional OSPT(s) during shift change notifications.

Continuous Updates:

6) OSPT/OSPS to be available for updates from the NOC staff.

LNPT -90 minutes:

7) OSPT receives communication from NOC to deploy generator(s).
8) OSPT without delay to picks up the generator(s) at the storage location.
9) OSPT without delay to installs the generator(s) at the PSU location(s).
10) OSPT notifies the NOC of the PSU generator(s) installation.

Power Event Conclusion:

11) OSPT notifies the NOC when the generator is removed.
12) OSPT returns the generator(s) to the storage location.
13) OSPT follows the maintenance and refueling plan.
14) OSPT updates the generator(s) usage log.

Escalation Policy

- If the power event status is gray, OSPT is not required to escalate.
- If the power event status is brown, the OSPT shall contact the secondary on-call technician and his supervisor. The supervisor at his/her discretion may contact the General Manager.
- If the power event status is black, the supervisor shall contact the General Manager. The General Manager shall contact company management for assistance from other Midcontinent systems as necessary.

Equipment Plan (Generators)

Each system shall have ready for service at an accessible posted location, fueled generators equal to ten percent (10%) plus one of the installed base of PSU(s). If needed, a trailer shall be available on site for transport of the required units.

Each accessible location shall have a maintenance and refueling plan on site for use and included in the company's preventative maintenance program.

Each accessible location shall have a generator usage log posted for documentation.

PSU Documentation

- All PSU changes requiring Network Change Notices shall be documented in AutoCAD and communicated by the AutoCAD Database Coordinator to the NOC.
- The AutoCAD Database Coordinator shall verify the accuracy of and reconcile NOC and AutoCAD PSU information every six months.
- Database information shall include the type, location, street address, power utility provider and number of batteries installed.

Post Mortem Meetings

A meeting shall automatically be called to review any circumstance where a subscriber is out of service because of PSRT procedure failure. A report of conclusions and recommendations for corrective action shall be available at the system office.

Training

OSPT and OSPS shall be trained in the operation of the PSU, generator installation and PSRT procedures.

Periodic outage simulations shall be conducted without prior notice to the PSRT members by management to evaluate the continued effectiveness of the plan and readiness of the system tested.