UNITED STATES

DEPARTMENT OF AGRICULTURE

RURAL UTILITIES

SERVICE

SUMMARY OF

ITEMS OF ENGINEERING INTEREST

AUGUST 2000

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ABBREVIATIONS

ACSR	Aluminum Conductor Steel Reinforced
ARS	Agriculture Research Service
ANSI	American National Standards Institute
APS	Arizona Public Service Company
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
BGEPA	Bald and Golden Eagle Protection Act
BIL	Basic Impulse Insulation Level
CFR	Code of Federal Regulations
CNN	Cable News Network
CWP	Construction Work Plan
DCS	Data Collection System
DG	Distributed Generation
DOE	Department of Energy
ER	Environmental Report
ESA	Endangered Species Act
ESD	Electric Staff Division
FERC	Federal Energy Regulatory Commission
G&T	Generation and Transmission
HSS	High Strength Steel
ICBO	International Conference of Building Officials
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IWO	Inventory of Work Orders
kip	1000 Pounds
kV	Kilovolt
M&E	Mechanical and Electrical
MBTA	Migratory Bird Treaty Act
MLEA	Moon Lake Electrical Association
MOU	Memorandum of Understanding
NAPM-REU	National Association of Purchasing Management-Rural Electric Utilities
NEHRP	National Earthquake Hazard Reduction Program
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NRECA	National Rural Electric Cooperative Association
OLF	Overload Factor
OHGW	Overhead Groundwire
PG&E	Pacific Gas and Electric
PSN	Photovoltaic Services Network
PV	Photovoltaic
RBS	Rated Breaking Strength
REA	Rural Electrification Administration
RTB	Rural Telephone Bank
RUS	Rural Utilities Service
RUS List of Materials	RUS Informational Publication 202-1, “List of Materials Acceptable for Use on Systems of RUS Electrification Borrowers”
T&D	Transmission & Distribution
UBC	Uniform Building Code
USDA	U. S. Department of Agriculture
USDI	U. S. Department of the Interior
USFWS	U. S. Fish and Wildlife Service
USGS	U. S. Geological Survey
Western	Western Area Power Administration

ENGINEERING and OPERATIONS

Revisiting Stray Voltage

In February and March 2000, the U. S. Department of Agriculture (USDA) received several letters and telephone calls from a number of dairy farmers in Wisconsin and Minnesota. The farmers advised that their dairy herds are experiencing distress that is affecting the health of cows and their milk production. These farmers attribute the problem to stray voltage that they believe is originating from the power lines serving their farms. The farmers indicated there is an alarming loss of communications and trust between the farmers, the electric utilities that serve their farms, and others in the state and local governments.

These complaints brought to mind RUS past history with stray voltage concerns. In a September 24, 1981, letter to all electric borrowers, the Rural Electrification Administration (REA) advised of a large increase in complaints related to stray voltage on farms. This REA letter briefly discussed some of the causes and remedies of stray voltage, and recommended that REA borrowers share the information with the farmers that they serve. A follow-up letter of April 27, 1983, to all electric borrowers contained additional reference sources for information on the subject and included some suggested information on stray voltage which could be provided in "bill stuffers" to customers. At that time, borrowers and farmers were working together to identify and alleviate stray voltage problems at farms.

In December of 1991, the Department of Agriculture's Agriculture Research Service (ARS) published a most complete 140 page reference and source of help on the subject of stray voltage at farms…Agriculture Handbook 696, "Effects of Electrical Voltage/Current on Farm Animals." The Department published this handbook because of concerns about the way stray voltage research results were being misinterpreted and misconstrued, and because of the general lack of understanding of the causes and effects of stray voltage on farms. This handbook has been used widely and is generally considered to be a prime reference on the subject.

Subject matter includes such information as:

1. The history of stray voltage/current on farms,
2. The physical and electrical sources of this phenomena,
3. The physiological and behavior bases for losses in production,
4. Method for identifying and detecting problems
5. Methods for mitigating stray voltage/current problems, and
6. Areas where further research may be required.

The primary emphasis was on cattle and dairy farms, but the theories and procedures discussed were relevant for all types of livestock and the associated housing facilities. Recommendations

were made to address action levels and mitigation techniques. The fundamental conclusion of this handbook was that stray voltages/currents could be reduced to acceptable levels.

The handbook can be purchased from the National Technical Information Service, Technology Administration, U. S. Department of Commerce, Springfield, VA 22161, phone (703) 605-6000. Please advise that you wish to purchase **NTIS Order No. PB92-172873.**

The recent year 2000 problems described by dairy farmers appear to be multifaceted and involve:

1. Misunderstanding or lack of knowledge about electrical properties and phenomenon,
2. Misunderstanding or lack of knowledge about animal health, physiology and behavior, and,
3. Poor or lack of communications between all parties involved.

In an effort to help resolve these problems, the Electric Staff Division (ESD) is currently soliciting involvement and assistance from other USDA agencies. One agency, the Agriculture Research Service, has experts in animal husbandry and behavior and knowledge of the reaction of animals to electrical voltages and currents. Another agency, Cooperative State Research, Education and Extension Service and its various Extension Service offices throughout the U. S., could provide help by visiting farmers and farmer organizations to educate farmers about the cause and cures of stray voltage problems. This education effort could help alleviate the misunderstandings and lack of knowledge about stray voltage and open the pathway to better communications with all involved parties.

If you would like more information or have any questions, please call John Pavek, Chief, Distribution Branch, at (202) 720-5082.

New Trend in Distribution Generation for the 21st Century

Perhaps you have read articles, seen reports, or may have attended power generation seminars on the new technology called “Fuel Cells” that promises to revolutionize the power distribution industry as we know it.

In the not too distant future, some rural electric customers will have the opportunity to supply a portion of their own power needs using on-site generators. These highly efficient and reliable fuel cells will be available in five to ten years with a reasonable per kilowatt installation cost.

This new technology promises almost flawless reliability and emission-free (the only by products are water, carbon dioxide, and heat...and the heat can be used for hot water or home heating as well). Fuel cells behave like batteries, but unlike batteries, they are endlessly charged. The fuel cells use fuel from a natural gas line or a propane cylinder; the fuel is cleaned, then converted into a hydrogen-rich product, gas, which is then fed to the fuel cell module. In the module, the supplied hydrogen and oxygen from the air are electrochemically combined to produce DC

electric power. The DC power is fed to a power converter, where it is converted to AC power, which is then available to meet the business or residential power requirements.

A growing number of electric customers nationwide believe that fuel cells are a model energy source for the 21st century. This customer belief should make rural electric distribution managers more aware and cause them to get involved in this new trend. The U. S. Department of Energy has also been involved, and has invested in this area and recently announced that the first 100 kW fuel cells experiment has completed a record of 8700 hours of generation supplying 110 kW of electricity to a local power grid. Additional tests and applications for the units up to 250 kW are underway. Tri-County EMC of Reynolds, Georgia, for example, is planning to market home generation system to its customers by the year 2001.

The potential value of fuel cell technology is already recognized, and in the very near future, the cost of fuel cells should be comparable with other types of power production. The expected retail price per unit is about $8500 and should drop by half within a few years. The estimated unit cost will run between 12 and 16 cents per kilowatt-hour for average household usage. In addition to the positive benefits surrounding fuel cells, customers are expected to be willing to pay the initial installation cost for the benefit of having their own independent generator.

If you would like more information or have any questions, please call Ted V. Pejman, Electrical Engineer, Transmission Branch, at (202) 720-0999.

DOE and Rural Electricity Providers: A Lesson in Economic Benefits

A particularly grizzly winter on the Rocky Mountain Plains provided the impetus for a successful partnership between the U.S. Department of Energy's Sandia National Laboratories and several rural electric cooperatives – a partnership that demonstrated that rural electric utilities will be the first domestic electric utilities to have an economically viable use for photovoltaics.

During the winter of 1988, K. C. Electric Association, Hugo, Colorado, lost more than 600 utility poles to ice and snow. The buildup on lines snapped poles like toothpicks – at a cost of about $10,000 for each mile of line that K. C. Electric had to rebuild.

K. C. Electric, like many rural electric cooperatives, is responsible for operating and maintaining a distribution system serving many remote ranching and farming loads. Many of the downed lines served only a small load – often just one livestock water pump. To be sure, one small pump is a critical load when cattle need water. K. C. Electric owns miles and miles of distribution lines across the eastern Colorado plains. And they are not unique. Rural coop-owned loads are often characterized by their relatively small power requirements, remote locations, and high cost of service.

Enter DOE's National Photovoltaics Program (via Sandia). Could a photovoltaic (PV) array power a water pump in isolated instances such as those served by K. C. Electric? Matching a proven technology to this specific application was the key. A partnership that included not only

Sandia, but also the Western Area Power Administration and the Electric Power Research Institute, focused on examining and assessing the relative economic benefits of PV power versus conventional power for small water pumping systems.

As part of the cooperative cost-shared agreement, which included the NEOS Corporation, a contract was let for $10,000 to purchase a water pumping system as a demonstration project at one of K. C. Electric's remote customer sites. The installation would give the rural utility a chance to see the technology at work and assess the costs - and cost savings - while familiarizing its personnel and customers with PV power. And DOE's National PV Program would benefit too. Quoting from a letter that Sandia engineer, John Stevens, who led DOE's role in the project, wrote to K. C. Electric:

> "…the U.S. DOE National Photovoltaic Program would gain substantially…from an electric utility documenting their costs, both installation and maintenance, of photovoltaic systems installed to meet customer loads."

In short, the DOE Program wanted the coops to look very closely at the cost of PV versus the cost of line extensions.

The project successfully demonstrated PV for rural co-ops and provided some excellent preliminary information. A direct outgrowth of this was a survey by NEOS of some 25 electric cooperatives in Colorado, Nebraska, and Wyoming to determine the potential market for this PV application. It wasn't long before more than 6,800 remote water pumping installations for cattle grazing were identified, all of which were possible candidates for being powered by PV. Taken together, they represented nearly 3.5 megawatts of electric service capacity for utilities, or over $20 million in equipment sales for PV suppliers. Yet another spin-off activity was NEOS' work with five host utilities in Wyoming to install and monitor water pumping systems across their service territory. Again, the project would serve the dual purpose of demonstrating performance and reliability of the pumping application and familiarizing rural utilities with PV power.

DOE's participation in these efforts took the form of numerous technical consultations by Sandia engineers, and assistance with a document called *PV Products List*, through Photovoltaic Services Network (PSN), a non-profit organization formed by a coalition of some of these same rural electric services providers. *PV Products List* provided a single point of contact – PSN – for purchasing appropriately sized PV systems. The *PV Products List* still stands as a valuable service where a future investment makes sense. It is one of the most tangible ways that the rural electric cooperatives could be helped in their day-to-day activities in purchasing, installing, and maintaining remote PV water pumping systems.

During this period of time – the late Eighties – the use of PV power by electric utilities was being talked about everywhere. One particular concept, developed by Pacific Gas and Electric (PG&E), for introducing PV into the utility industry, suggested that PV cost-effectiveness for particular utility niches would be the driving force behind its introduction. The concept clearly suggested how PV-powered application might diffuse into the utility market. Specifically, utility involvement with PV likely would begin with installations that allowed the utility to postpone expensive construction projects by supplying increasing load demand with PV.

The program contracted with four electric utilities to study the economic benefit of PV systems for support of distribution feeders. This study was performed because of the PG&E Kerman Feeder study. The Kerman study produced the rather startling result that a PV system, when installed at a carefully selected location, could have benefits that would allow an installed cost of as high as $6.50 per watt. This was in contrast to the prevalent theory that PV must be installed for $2.00 per watt to be competitive in the utility environment.

DOE's effort intended to investigate the range and reality of the PG&E values for other utilities. The results of the four contracts clearly indicated that the greatest benefit comes when PV can be installed at a location where it offsets load growth that is forcing the utility to spend money on capital-equipment upgrades, such as increasing line or substation capacity. In addition, the greatest benefit is realized when the load that is growing is relatively small, and the cost of the upgrade is relatively large. This situation is most often seen in the service area of rural co-ops, where the co-op typically has long lines serving small loads. In fact, the best result of the four utility studies was a situation with a co-op that had a 36-mile long 25 kV line serving a small town. Load growth in that town was forcing the utility to consider upgrading the line to 69 kV. The study showed that installation of a 50kW PV system would allow postponing the line upgrade for 5 years. The economic benefit to the utility of postponing the line upgrade would allow the expenditure of $10.50 per watt to build a 50 kW PV system.

An important factor in the high benefit value for this co-op was that the specific problem on this line was voltage support, rather than capacity support. Thus, a relatively small amount of local generation could cure a problem that otherwise would require line reconstruction.

This set of studies illustrated the important lesson that long, lightly loaded lines that are approaching a need for upgrading are the places where PV can first see economic break-even conditions. Since the nation's rural co-ops' very nature means they are rife with long, lightly loaded lines, then the rural co-ops are the utilities that are in a position to first take advantage of the modular, distributed, low maintenance aspects of grid-support PV systems.

Photovoltaic Systems for Utility Companies (published in 1990 with DOE PV Program funding) encouraged electric cooperatives and utilities to consider PV for their remote customer loads. The installation by K. C. Electric was cited as a demonstration of what could be done in lieu of rebuilding downed lines.

The PG&E concept did not offer (nor was it intended to offer) suggested methods for initiating this utility market penetration within any particular market niche. But by then, several utilities in the western United States had begun testing PV service programs. To transfer information from those utilities to others that might be interested, DOE collaboratively focused on: (1) identifying utilities that then offered PV as a service option for isolated utility loads, such as livestock water pumping; (2) gathering information on program implementation procedures and constraints; (3) assessing utility and customer attitudes toward PV-powered systems; (4) documenting the cost, performance, and reliability of any PV-powered systems installed by these utilities; and (5) compiling all "lessons learned" into a document describing PV as a utility service option for

livestock water pumping. *Photovoltaic Power as a Utility Service: Guidelines for Livestock Water Pumping* (published in 1993 at Sandia) was the result.

Presentations on this successful model were given at the 1992 Rural Electric Power Conference, at SOLTECH's 1990 meeting, and in 1993 at the IEEE Summer PES meeting. As a result of the successful partnership, two electric utility cooperatives in the western United States soon offered PV-powered electric service options for remote water pumping applications to their rural customers. Others would follow.

The DOE/rural co-op project was important because livestock water pumping occurs frequently in the western and mid-western U.S. and the cost of serving this load using traditional utility methods can be excessive. The lessons learned from utility PV-powered water pumping services are applicable to other off-grid PV service applications as well.

The bottom line experience of this early DOE partnership with rural electric service providers is the same as the bottom line for all utilities: Long lines with small loads represent extraordinary cost savings to rural electric cooperatives. They are, in fact, where PV *first* makes sense for utilities.

If you would like further information or have any questions, please call Jim Rannels, Director, Office of Solar Energy Technologies of DOE at (202) 586-1720, E-mail JAMES.RANNELS@hq.doe.gov, or Georg Shultz, Chief, Energy Forecasting Branch, at (202) 720-1920.

Distributed Generation Standards

Distributed Generation (DG) is defined as any generating resource other than central station generation placed close to the load being served, usually meaning customer site. DG may be connected to the supply side or demand side of the meter. DG technologies may range from gas turbines of 50 megawatts or more, to 25 kW micro-turbines, to photovoltaic systems of less than 1 kW. Other technologies such as wind turbines, internal combustion engines, small hydros, flywheels, fuel cells, and batteries also exist among these size ranges.

DG technologies can provide energy, ancillary services, reliability and power quality to electric service providers, irrigation districts, municipal utility districts and end users. According to National Rural Electric Cooperative Association (NRECA) surveys, DG is taking hold in many parts of the country. For example, these surveys reported that "there are more than 125 MW of local generation sets at cooperative consumer sites in Florida. Ten of 31 G&Ts reported that either they or some of their customers are using local equipment for distributed generation applications..."

Even modest adoption of DG technologies could have a significant impact on cooperatives. Therefore there is a clear need for good useful standards for interconnecting DG units with

electric distribution systems. There are already some interconnection standards recently issued and some under development.

The completed standards include:

Institute of Electrical and Electronics Engineers (IEEE) Standard 929-2000, entitled "Recommended Practice for Utility Interface of Photovoltaic (PV) Systems." This document provides a straightforward, understandable interconnection standard for PV systems and utilities. This standard is expected to influence other interconnection standards for distributed generation as well.

The California Public Utilities Commission has published a comprehensive document describing the minimum operating, metering, and interconnection requirements for any generating source or sources paralleled with any electric utility system within the State of California. This document is entitled, "RULE 21 - NONUTILITY-OWNED PARALLEL GENERATION".

Rule 21 can be downloaded from the following Internet address:

http://www.pge.com/customer_services/business/tariffs/#ER

(under Electric Rules Click on item No. 21 Nonutility-Owned Parallel Generation)

IEEE Standard under development:

IEEE SCC21 P1547 Working Group is currently working to produce a standard document for interconnection of all types of distributed generation resources with electric power systems by the end of this year. A published standard is planned in 2002. The draft entitled "IEEE P1547 Standard Draft 04 - Distributed Resources Interconnected with Electric Power Systems." The draft is available for viewing at:

http://technet.nreca.org/distribgen.html

To help IEEE produce a consensus document for the interconnection of all types of distributed generation with investor owned urban and rural utility grids, it is essential for cooperative engineers to work in unison and to agree on practical, meaningful provisions. Therefore input from rural electric cooperatives is deemed essential to avoid development of overly complex standards and to focus on meaningful grid interconnection standards especially pertinent to rural areas. Rural Utilities Service (RUS) *highly* recommends that RUS borrowers get involved in the development of this standard.

We encourage rural electric cooperative engineers and managers to review the referenced standards and use them as tools to become familiar with the issues involved. Knowledge from these readings should then be used to evaluate and provide comments to IEEE SCC21 P1547 Working Group. Provide comments to IEEE through Dr. Paul Dolloff, technology consultant at East Kentucky Power Cooperative to influence this rapidly evolving IEEE standard. Dr. Dolloff is the NRECA Transmission and Distribution Engineering Committee representative on the IEEE

SCC21 P1547 standards working group. He may be reached by phone at 606-744-4812 and by e-mail at *pauld@ekpc.com*.

If you would like more information or have any questions, please call Mike Eskandary, Electrical Engineer, Transmission Branch, at (202) 720-9098.

Safety Signs

We have previously discussed and would like to reiterate the ANSI standards for environmental and facility safety signs. These standards are intended to promote uniform national practice, and include considerable changes from some past safety sign practices. As a result of these new safety sign standards and other needed changes, RUS has revised Bulletin 1728F-806, Specifications & Drawings for Underground Electric Distribution. We deleted the formerly used standards for safety signs and now refer to the following ANSI standards:

ANSI Z535.1 Safety Color Code

ANSI Z535.2 Environmental and Facility Safety Signs

ANSI Z535.3 Criteria for Safety Symbols

ANSI Z535.4 Product Safety Signs and Labels

ANSI Z535.5 Accident Prevention Tags (for Temporary Hazards)

These consensus generated and coordinated standards are intended to apply to every permanent or temporary safety sign or tag used on a utility system. These standards prescribe details for colors, shapes, and panel layout for the three panel types: (1) the signal word panel, (2) the message panel, and (3) the pictorial panel. For dead-front pad-mounted equipment, we recommend that the “Warning” sign be placed on the exterior and the “Danger” sign be placed inside the enclosure.

In the past, most borrowers have used the “Danger” sign for substation fences with no additional safety signs inside the substations. We recommend that the “Warning” signs be placed on the surrounding fence and “Danger” signs be installed inside the substations on structures that support live parts. State regulatory agencies or insurance companies may also have recommendations on this topic that should be considered.

If you would like more information or have any questions, please call Trung Hiu, Electrical Engineer, Distribution Branch, at (202) 720-1877.

New Guidelines for RUS Approval to Use Steel Distribution Poles

In January, 2000, RUS again updated its guidelines of things that borrowers should consider when requesting RUS approval to use steel distribution poles. These new guidelines, now identified as "Version 5," are included below. These new guidelines provide borrowers much more information regarding the proper use and selection of steel distribution poles and associated pole-top assemblies. The new guidelines also provide more information on who and how to contact certain individuals at RUS to answer specific questions regarding steel poles. Now, RUS asks that a borrower address (in writing) only the nine issues listed on the last page of the guidelines (as applicable) when submitting a request to RUS.

RUS Guidelines and Approval for the Use of Steel Distribution Poles
Version 5

The Rural Utilities Service (RUS) will consider a borrower's written request to use steel distribution poles for site specific projects on a case-by-case trial basis to gain experience. Before granting approval, RUS needs sufficient information to assure that the application of steel poles will result in safe and reliable construction and meet RUS requirements.

Borrowers requesting RUS approval to use steel distribution poles are asked to read the following guidelines and design information and to furnish RUS with the information requested in Part II.

Part I: RUS Guidelines and Design Information for Using Steel Distribution Poles

A: MATERIALS

Except for various miscellaneous material items, RUS regulations require that borrowers use materials that RUS has fully, conditionally or technically accepted. A compilation of fully and conditionally accepted materials may be found in Informational Publication 202-1, "List of Materials Acceptable for Use on Systems of RUS Electrification Borrowers" (List of Materials). This List of Materials can be accessed through the internet at:

http://www.usda.gov/rus/electric/listof.htm

For information on technically accepted items and other questions regarding materials, please contact:

Mr. Harvey Bowles, Chair
Technical Standards Committee "A" (Electric)
Rural Utilities Service, Stop 1569
1400 Independence Avenue SW
Washington DC 20250-1569

Phone: (202) 720-0980
Fax: (202) 720-7491
Email: hbowles@rus.usda.gov

Borrowers requesting RUS approval of materials not presently accepted, for use with steel poles or any other application, are asked to provide: a description of the material, catalog sheets, test results, and the name and address of the manufacturer. Such requests should be sent to the appropriate regional Engineering Branch Chief. (See Section G)

B: LIGHTNING IMPULSE WITHSTAND STRENGTH and SURGE PROTECTION

A lightning impulse withstand strength, often called Basic Impulse Insulation Level or BIL, of less than 300 kV on distribution pole top assemblies will usually facilitate flashovers of lightning strikes to or near distribution lines. A recloser operation, which will cause lights to flicker, is usually required to clear the resulting arc. RUS advocates that the withstand strength (dry flashover, phase-to-phase and phase-to-ground) be no less than 300 kV to minimize recloser operations and thus improve the quality of service. This level is especially important on deadends where voltage doubling can occur.

A withstand strength of 300 kV (dry flashover) can be achieved on steel poles by using many of the standard RUS pole-top assemblies and installing a fiberglass-reinforced plastic pole-top pin (item "b (2)" in the List of Materials) on the phase conductor attached to the very top of the pole.

A 300 kV lightning impulse withstand strength (dry flashover) can be attained on a steel pole deadend structure by installing a 24 inch (minimum length) insulated extension link (item "eu" in the List of Materials) between the primary deadend suspension insulators and the steel pole.

Borrowers do not need additional RUS approval to use the above two material items or the resulting modified standard pole top assemblies.

The designated maximum transverse load on fiberglass-reinforced plastic pole-top pins is 500 pounds. The maximum line angles for this loading limitation can be found in Table I of RUS Bulletin 1728F-803, "Specifications and Drawings for 24.9/14.4 kV Line Construction."

RUS recommends the installation of surge arresters at 800 foot to 1,200 foot intervals and at deadends on all distribution lines which are exposed to frequent lightning strikes. This recommendation is especially applicable to distribution lines built with steel poles because of

their generally lower lightning impulse withstand strengths. An adequate number of installed surge arresters minimizes the number of lightning flashovers and the resulting momentary outages and damaged insulators.

C. GROUNDS, GROUNDING

The National Electrical Safety Code (NESC) requires that all non current-carrying metallic members on a line support structure be effectively grounded. Thus, each steel pole needs to be effectively bonded to all primary and secondary neutrals, down guys, messengers, and all other metallic attachments to the pole. Other NESC grounding requirements may also apply.

A steel pole may be used as a grounding conductor if the pole meets the sufficient conductivity and low impedance requirements of the NESC.

Since a directly embedded steel pole is not recognized in the NESC as a grounding electrode, separate driven ground rods or grounding electrodes need to be used for all equipment, surge arresters and other required system grounds. The use of stainless steel or galvanized steel ground rods and non-copper ground wires in the soil near steel pole distribution lines will help to mitigate the corrosive effects of dissimilar metals buried in close proximity.

D: COSTS AND ECONOMIC STUDIES

RUS does not require borrowers to provide any economic studies or cost comparisons to justify the use of steel distribution poles in lieu of wood poles. However, borrowers are encouraged to compare the initial and long-term estimated installed cost of equivalent distribution structures or lines constructed with steel poles versus wood poles. Borrowers may, at their discretion, furnish the results of their cost estimates to RUS.

Questions or comments regarding Sections B through D above are welcomed by and should be sent to:

John Pavek, Chief
Distribution Branch
Electric Staff Division
Rural Utilities Service, Stop 1569
1400 Independence Avenue SW
Washington DC 20250-1569

Phone: (202) 720-5082
Fax: (202) 720-7491
Email: jpavek@rus.usda.gov

E: RAPTOR PROTECTION USING STEEL POLES

RUS advocates that distribution lines be designed and constructed in a way that will minimize the electrocution of raptors and other animals. Distribution construction with steel poles need

extraordinary consideration because of the short distances between the bare energized phase conductors and the grounded steel pole.

On single-phase lines, the installation of 24 inch long fiberglass-reinforced plastic pole-top pins ("item b (2)" in the List of Materials) will minimize the electrocution of small raptors. On three-phase lines, some raptor protection can be achieved in an economical manner by installing fiberglass-reinforced pole-top pins and perch guards on the crossarms as shown on assembly VP3.3G in Bulletin 1728F-803.

Good raptor protection can be achieved on both single-phase and three-phase structures by:

- Installing 24 inch long fiberglass-reinforced plastic pole-top pins;
- Using non-metallic crossarms and covering the pole, from the neutral up to and including the top of the pole, with an insulating coating that has a dielectric strength of at least 15,000 volts; and,
- Using 36 inch (minimum length) fiberglass-reinforced plastic guy strain insulators (item "w") and extension links (item "eu") for all connections to the pole above the neutral position. (See Bulletin 1728F-803, assemblies VA5.4 and E5.1G)

Any questions or comments regarding raptor protection can be directed to:

Dennis Rankin
Rural Utilities Service, Stop 1571
1400 Independence Avenue SW
Washington DC 20250-1571

Phone: (202) 720-1953
Fax: (202) 720-1820
Email: drankin@rus.usda.gov

F: SELECTION OF STEEL DISTRIBUTION POLES

Generally, a wood pole cannot be replaced with a steel distribution pole of the same class because of NESC strength requirements. After the selection of the NESC grade of construction, certain "design load" calculations are required to determine the minimum class of a steel distribution pole that can be used in lieu of a wood pole for standard RUS pole-top assemblies. The calculations involve the overload factors and strength factors, for both wood and steel poles, as found in Tables 253-1 and 261-1A of the 1997 edition of the NESC. (Note that some of these values will probably be changed in the next edition of the NESC.) RUS has performed the calculations for steel pole "design loads" for various poles and the results are shown in the tables below.

Required Steel Pole Design Loads

(Columns 1 and 2 from American National Standards Institute (ANSI) 0.51)
(Design loads 2 feet from top of pole)

TABLE 1 - NESC GRADE C STRUCTURES (RUS Tangent and Small Angle Assemblies) (Not at a Crossing) (For New and Replaced Grade C Structures)		
ANSI 0.51 Wood Pole Class	**Wood Pole Design Load (lbs.)**	**Steel Pole Design Load (lbs.)**
H1	5400	5800
1	4500	4800
2	3700	4000
3	3000	3200
4	2400	2600
5	1900	2000
6	1500	1600
7	1200	1300

TABLE 2 - NESC GRADE B STRUCTURES (RUS Deadend and Large Angle Assemblies) (Not at a Crossing) (For New and Replaced Grade B Structures)		
ANSI 0.51 Wood Pole Class	**Wood Pole Design Load (lbs.)**	**Steel Pole Design Load (lbs.)**
H1	5400	3500
1	4500	2900
2	3700	2400
3	3000	2000
4	2400	1600
5	1900	1200

TABLE 3 - NESC GRADE B STRUCTURES (RUS Deadend and Large Angle Assemblies) (Not at a Crossing) (For Existing Grade C Wood Structures to be Replaced with Grade B Steel Structures)		
ANSI 0.51 Wood Pole Class	**Wood Pole Design Load (lbs.)**	**Steel Pole Design Load (lbs.)**
H1	5400	6600
1	4500	5500
2	3700	4500
3	3000	3600
4	2400	2900
5	1900	2300

RUS regulations require a minimum of NESC Grade C construction in the design and construction of distribution lines and structures. NESC Section 24, Grades of Construction, and RUS may require higher grades of construction for certain structures, locations, and conditions.

For example, deadend structures and line angle structures where the transverse loads are more than 500 pounds per conductor involve additional calculations (such as loading trees) to determine the required minimum steel pole strength and pole class. Thus, ***RUS advocates*** that these types of structures (and steel pole selection) be designed (1) under the direction of a registered professional engineer, and (2) meet NESC Grade B strength requirements.

The design of unguyed angle and dead-end steel pole structures should consider pole deflection and greater embedment depths. Extreme ice conditions and appropriate high winds should be considered in the design loads.

Questions or comments regarding proper selection and installation of steel poles should be sent to:

Robert Lash, Chief, Transmission Branch
Rural Utilities Service, Stop 1569
1400 Independence Avenue SW
Washington DC 20250-1569

Phone: (202) 720-0486
Fax: (202) 720-7491
Email: blash@rus.usda.gov

OR

Donald Heald, Engineer
Rural Utilities Service, Stop 1569
1400 Independence Avenue SW
Washington DC 20250-1569

Phone: (202) 720-9102
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G: REQUEST FOR RUS APPROVAL TO USE STEEL DISTRIBUTION POLES

Borrowers requesting RUS approval to use steel distribution poles should send their written request and supporting information to the appropriate regional Engineering Branch Chief at the address given below.

Charles M. Philpott
Chief, Engineering Branch
Northern Regional Division
Rural Utilities Service, Stop 1566
1400 Independence Avenue SW
Washington DC 20250-1566

Phone: (202) 720-1432
Fax: (202) 720-1411
Email: cphilpot@rus.usda.gov

OR

Louis Riggs
Chief, Engineering Branch
Southern Regional Division
Rural Utilities Service, Stop 1567
1400 Independence Avenue SW
Washington DC 20250-1567

Phone: (202) 720-0848
Fax: (202) 720-0097
Email: lriggs@rdmail.rural.usda.gov

Part II: Information Needed by RUS for Case-by-Case Approval of Steel Distribution Poles

Before granting approval, RUS needs all of the information requested below to determine if the steel pole application will result in safe and reliable construction and meets all of RUS' requirements.

1. Indicate the maximum number of steel poles to be used.

2. Indicate the name of the steel pole manufacturer.

3. Define the project or location(s) where the steel poles will be installed.

4. In addition to "experimental purposes to obtain experience," furnish sound reason(s) for using steel poles.

5. Indicate that only RUS accepted materials are to be used. *Otherwise, see Section A of steel pole guidelines regarding the need to request material approval.*

6. Indicate that only RUS standard construction is to be used. *Otherwise, please furnish sufficient dimensioned drawings and other technical information for RUS' evaluation of the design. See Sections A and B of steel pole guidelines.*

7. *(If, and only if, the design has less than a 300 kV withstand strength [see guidelines, Section B], then briefly describe assemblies and materials to be used and anticipated impact [if any] on system power quality and reliability and materials.)*

8. Describe raptor protection measures, if any, that are to be incorporated into the design. *Note that RUS recommends that raptor protection be considered in distribution line designs. Lines using steel poles may require additional consideration. See guidelines, Section D.*

9. Indicate that the determination of the class of the steel poles for each application is based on the proper engineering calculations performed by a competent person. *(See guidelines, Section F.)*

If you have any questions or need additional information regarding RUS approval or the use of steel distribution poles, please feel free to contact any of the persons identified in the above guidelines.

Update of Bulletin 50-3 (D-804) – 12.47/7.2 kV Construction Standards

Presently RUS is updating Bulletin 50-3, "Specifications and Drawings for 12.47/7.2 kV Line Construction." This bulletin was last updated in 1983. A first draft of the bulletin with proposed changes has been completed and is being circulated within RUS for comments.

RUS is proposing some major changes in the update of this bulletin. All of the construction assembly numbers will be changed to conform to RUS' updated standard format numbering scheme as explained in Bulletin 1728F-800, "Assembly Unit Numbers and Standard Format". This is the same standard numbering format used in Bulletin 1728F-803, "Specifications and Drawings for 24.9/14.4 kV Line Construction" which was published in the *Federal Register* in December, 1998. RUS realizes that it will take time for borrowers to become familiar with the new numbers and also that most borrowers will need to make changes in their computer software. Thus, RUS will allow adequate time between the date that the future new 12.47/7.2 kV construction standards is published and the date it will be made effective. Also to help borrowers, the new standards book will contain an appendix which shows the conversion of the old assembly numbers to new ones when applicable.

Just like new Bulletin 1728F-803, the new 12.47/7.2 kV construction standards book will be divided into 19 sections wherein each section pertains to a different type of assembly unit. Nearly all of "M" (miscellaneous) assemblies will either be eliminated or renumbered for ease in locating in the book. The future new bulletin will also contain "design parameters" on most drawings and tables showing the maximum line angle allowed on pole-top assemblies. Also, just as in Bulletin 1728F-803, stirrups will be allowed for certain construction conditions, a 3 inch square, curved washer will be required for all primary and neutral deadends, and a 2 ¼ inch washer will be required under the shoulder of all 7.2 kV crossarm pins. The last two items are needed to provide greater strength for assemblies and allow greater line angles, respectively.

Please note that the above changes in the new 12.47/7.2 kV construction standards book are proposed changes and will not be required or finalized until the new book is published as a proposed rule, all comments are addressed by RUS and then published as a final rule. Your questions, comments and suggested are welcomed by RUS.

If you would like more information or have any questions, please call Jim Bohlk, Electrical Engineer, Distribution Branch, at (202) 720-1967.

Bulletin 1728F-803, Specifications and Drawings for 24.9/14.4 kV - Corrections

In December, 1998, RUS published Bulletin 1728F-803, "Specifications and Drawings for 24.9/14.4 kV Line Construction." We have identified the following errors since the first printing of this bulletin. Please make the following changes in all of your copies of Bulletin 1728F-803.

> TABLE VII, Maximum Line Angles on Spool Insulator Assemblies, at the beginning of Section "N", has the wrong value (*1,500 lbs./conductor*) entered for the designated maximum transverse load for ANSI Class 53-4 spool insulators. The correct value is 2,250 lbs./conductor, which is fifty percent of the mechanical and electrical (M&E) strength for this class of insulator. Thus, all of the line angles are incorrect; they are smaller than they need to be. The attached table (Exhibit 1) has the correct designated maximum transverse load value entered and the subsequent, calculated line angles (which

are greater) and are now correct. Please make copies of the attached table and replace TABLE VII in each copy of Bulletin 1728F-803.

The drawings of Assembly "VD1.81L" should show the outside clamp type crossarm pins (item "f") 8 inches from the end of the arm and on Assembly "VD1.83L" the clamp type crossarm pins should be arranged the same as shown on the "VD2.91L" assembly drawing.

On Assembly "VA5.21,VA5.31" the neutral tying guide should be "L2-2G" and not "LG.2G."

Change the quantity (QTY) of material items on the following assemblies:

Assembly	Item	Description	Change From	Change to
VC2.51	"a"	Insulators, white	1	2
VB3.1	"d"	3" square, curved, washer	2	3
	"o"	Bolts, eye	2	3
	"ek"	Locknuts	2	3
VB6.21	"d"	3" square, curved, washer		add 2
	"d"	2 ¼" square washer	12	10
VC4.2L	"o"	Bolts, eye	12	8
	"ek"	Locknuts	12	8
VC5.21, 31	"d"	3" square, curved, washer		add 1
	"d"	2 ¼" square washer	11	10
VC6.21, 31	"d"	3" square, curved, washer		add 2
	"d"	2 ¼" square washer	12	10
E1.1, E1.01	"d"	3" square, curved, washer		add 1
	"d"	2 ¼" square washer	1	0

If you would like more information or have any questions, please call Jim Bohlk, Electrical Engineer, Distribution Branch, at (202) 720-1967.

MATERIAL and PROCUREMENT

RUS Acceptance of Fiberglass Crossarms

RUS is now including fiberglass crossarms in RUS Informational Publication (IP) 202-1, "List of Materials Acceptable for Use on Systems of RUS Electrification Borrowers." RUS has developed a requirements sheet for the acceptance of fiberglass crossarms and has invited a number of manufacturers to submit applications for acceptance.

Fiberglass arms have to comply with the following requirements to be considered for acceptance by RUS for inclusion in the RUS List of Materials:

- Meet the same load capacity as the standard wood crossarms (unbraced);
- Meet the same cross section as the wood crossarm;
- Meet the same environmental requirements as the wood crossarms.
- Meet the same accelerated weathering requirements as wood crossarms.

If you would like more information, have any questions, or wish to obtain a copy of our "Items Required in an Application for RUS Acceptance of Fiberglass Crossarms" sheet, please contact H. R. Lash, Chief, Transmission Branch, at (202) 720-0486 or Norris Nicholson, Electrical Engineer, Transmission Branch, at (202) 720-1924.

RUS Bulletin 1724E-216, Guide Specification for Standard Class Spun Prestressed Concrete Poles.

RUS has published Bulletin 1724E-216, "Guide Specification for Standard Class Spun Prestressed Concrete Poles," dated July 6, 2000. This guide specification provides a basis for procuring direct embedded standard class spun prestressed concrete poles. If poles are competitively bid, use of this specification will help to eliminate ambiguities which might arise in the evaluation process.

This purchase specification covers the technical aspects of design, materials, manufacturing, inspection, testing, and delivery of direct embedded standard class spun prestressed concrete poles. It is recommended that this specification (1724E-216) be limited to poles that are not guyed, not subjected to unbalanced lateral loads, or do not have deflection limitations or other special limitations. For concrete pole applications that are subject to these considerations, it is recommended that the owner use RUS Bulletin 1724E-206, "Guide Specification for Spun, Prestressed Concrete Pole and Concrete Pole Structures."

Standard Class Pole

In some cases, utilities prefer to specify that certain spun concrete poles be designed according to a standardized loading criterion, much like the standard classifications for wood poles.

Bulletin 1724E-216 was developed to establish a standard classification system and to assist the owner in procuring a standard class concrete pole which is properly designed for the intended loading criteria. Since it has become a widespread practice in the industry to design and manufacture poles which are based on the wood pole classification system of the American National Standards Institute (ANSI 05.1), the concrete pole classifications developed in this specification generally follow the wood pole classification system. However, to avoid confusion with the wood pole classifications, the concrete pole classifications have a unique naming system. The standard classes of concrete poles are found in Table 1, which follows.

TABLE 1

Strength Requirements

Standard Class Designations For Spun Concrete Poles	Minimum Ultimate Moment Capacity At Five Feet From Pole Tip (Ft.-Kip)	Tip Load (Lbs.)
C-12.0	96	12,000
C-11.0	88	11,000
C-10.0	80	10,000
C-09.0	72	9,000
C-08.0	64	8,000
C-07.1	57	7,125
C-06.2	50	6,250
C-05.4	44	5,450
C-04.7	38	4,700
C-04.0	32	4,000
C-03.4	27	3,375
C-02.8	23	2,825
C-02.3	19	2,325
C-01.9	15	1,875

In some cases, the owner may design a transmission line based on wood pole classifications as described in ANSI 05.1 and then wish to order concrete poles which meet the wood pole equivalent loadings. Because of the differences in overload factors applied to wood poles in comparison to concrete poles, the owner needs to be sure that the overload factors are properly accounted for in the design of the concrete poles.

“Wood pole equivalent” is a term that may be defined in a number of ways. For purposes of this commentary, the term “wood pole equivalent” is defined as a standard class prestressed concrete

pole which is equated by required ultimate loading to an ANSI 05.1 standard class wood pole. The equation is made by a ratio of the overload factors (OLF) applicable for each pole type and loading criteria.

TABLE A-1

WOOD POLE EQUIVALENCY

BASED ON 2.5:4 RATIO

(0.625 Equivalency Factor)
(1997 NESC Grade B District Wind Loading)
(Equivalencies based on approximate groundline strength)

Design Wood Pole Class Based on 4.0 OLF		**Select** Concrete Pole Class Based on 2.5 OLF
H6		C-07.1
H5		C-06.2
H4		C-05.4
H3		C-04.7
H2		C-04.0
H1		C-03.4
1		C-02.8
2		C-02.3
3		C-01.9

TABLE A-2

WOOD POLE EQUIVALENCY

BASED ON 1.1:1.5 RATIO

(0.733 Equivalency Factor)
(1997 NESC Grade B Extreme Wind Loading)
(Equivalencies based on approximate groundline strength)

Design Wood Pole Class Based on 1.5 OLF		**Select** Concrete Pole Class Based on 1.1 OLF
H6		C-09.0
H5		C-08.0
H4		C-07.1
H3		C-05.4
H2		C-04.7
H1		C-04.0
1		C-03.4
2		C-02.8
3		C-02.3

TABLE A-3

WOOD POLE EQUIVALENCY

BASED ON 1:1 RATIO

(1.0 Equivalency Factor)
(Ultimate-to-Ultimate Comparison)
(Equivalencies based on approximate groundline strength)

Design Wood Pole Class		**Select** Concrete Pole Class
H6	⇒	C-12.0
H5		C-10.0
H4		C-09.0
H3		C-08.0
H2		C-07.1
H1		C-05.4
1		C-04.7
2		C-04.0
3		C-03.4

The design and purchase of concrete poles as an equivalent to wood poles can be vague even with clear instructions. As such, the owner should be sure that the equivalency is properly determined. Once the equivalency is determined, the owner should specify the standard class concrete pole based on the classifications detailed below. In doing this, the manufacturer will not be involved in the equivalency process and the ambiguity should be eliminated.

Conclusions concerning wood pole equivalencies – The designer may avoid the confusing concept of wood pole equivalency by using the procedure below to select the standard class pole from the table below:

- Calculate the induced design moment to which the pole will be subjected using expected applied loads with overload factors.

- Determine the equivalent tip load for this moment.

- Select the pole from Table 1 of the Specification. (Remember: In utilizing standard class spun concrete poles, a complete structural analysis is still required for all structures. All appropriate loading criteria are considered in the analysis. Once the required concrete pole strength is determined, a standard class spun concrete pole that meets the actual loading conditions can be selected).

Examples as to how to determine which standard class spun concrete pole to use are summarized below. These examples also appear in the Bulletin.

Example 1: For the TUC-1 pole structure and loading conditions

General information:

Line voltage:	138 kV
Structure type:	TUC-1 Concrete Pole Structures

Geometry of the structure and location of loads:

	Distance from Pole Top, Ft.
OHGW	0.25
Conductor 1	7.50
Conductor 2	17.50
Conductor 3	27.50
At Ground Line (assumed)	70.00
Pole-End	80.00

Overall pole length is 80 feet. The above dimensions assume a 10.0 foot embedment depth for the concrete pole (using standard rule for wood poles of 10 percent pole length plus 2 feet). Assume top of the pole has a 12 inch diameter, and the groundline diameter is 30 inches.

Overload Factors (OLF's) used in this example:

From the 1997 NESC (All Loading Districts):

Vertical	1.50
Transverse Wind	2.50
Longitudinal Loads	1.65
Wind on Pole	2.50
Transverse Line Angle	1.65

For Extreme Wind Loads: 1.10

Conductor and OHGW Data:

OHGW:	3/8”HSS
	R.B.S = 10,800 lbs.
138 kV Conductor:	Drake (795 26/7 ACSR)
	R.B.S = 31,500 lbs.
Vertical Span	900 ft.
Horizontal Span	750 ft.
Line Angle	0 degrees

Load Cases:

Load Case A: NESC Medium District Loads with an unbalanced longitudinal load of 700 lbs. at each conductor

Load Case B: 80 mph Extreme Wind Load (1.1 OLF applied)

Loading Information (summary):

1997 NESC Medium Loading Data

	Cond. Tension (kips)	Transverse (lb./ft.)	Vertical (lb./ft.)
Drake – 138 kV	7.91	0.536	1.516
OHGW – 3/8 HSS	2.56	0.287	0.463

Extreme Wind Loading Data (16 psf)

	Cond. Tension (kips)	Transverse (lb./ft.)	Vertical (lb./ft.)
Drake – 138 kV	6.54	0.9091	1.0940
OHGW – 3/8 HSS	1.23	0.4800	0.2730

Calculate forces and moments at the groundline:

1997 NESC Medium District Loading

	Load Due to Wind on Wire (kips)	Load Due to Line Angle (kips)	Total Transv. Load W/OLF (kips)	Moment Arm (ft.)	Ultimate Moments @Groundline (ft.-kips)
OHGW	.22	0	0.54	69.75	37.5
Conductor 1	.40	0	1.01	62.5	62.8
Conductor 2	.40	0	1.01	52.5	52.8
Conductor 3	.40	0	1.01	42.5	42.7
Groundline				0.0	
Totals for Wire Loads			3.55		195.8
Wind on the Pole			1.23		36.8
Moments due to unbalanced vertical Wire Load					8.2
Moment due to deflection for weight of pole and for wires (p-delta moment) (Approximated)					29.1
Moments due to rise of insulators					negligible
Total Transverse Shear and Moments at Groundline			4.78		270.2

For the unbalanced longitudinal load, the shear is 2.1 kips and the longitudinal moment is 121 ft.-kips (0.7k @ each conductor.)

TOTAL RESULTANT GROUNDLINE MOMENT = 296 ft.-kips

Extreme Wind Load (no longitudinal load)

Similar calculations are performed for the extreme wind load.

TOTAL GROUND LINE MOMENT FOR THE EXTREME WIND LOAD = 324.1 ft.-kips

Conclusions: The Extreme Wind Loading load controls design.

Determine which "standardized" concrete pole design to use:

Distance 2 ft. from top to groundline = 70 ft. – 2.0 ft. = 68 ft.

Load 2 ft. from the top to cause a 324 ft.-kip moment
at groundline: = 324 ft-kips/68 ft. = 4770 lbs.

Based on the above calculated tip load, use a **C-04.7 pole**
(The strength is within one percent of the required strength)

Perform a quick check to verify the assumed embedment depth using Bulletin 1724E-205, "Design Guide: Embedment Depths for Concrete and Steel Poles."

<u>Example 2</u>: An existing 115 kV single pole line is composed of Douglas Fir wood poles. In several locations, concrete poles are to replace woodpecker damaged wood poles. The existing damaged poles are 80-ft class 1 wood poles with the TUS pole top assembly. Determine which standard size spun concrete pole should be used to replace the wood pole. Extreme wind design load is 16 psf (80 mph). The line is located in the heavy loading district. The conductor is 795 Drake and the overhead groundwire is 3/8" HSS.

1997 NESC heavy district loads with an overload factor of 4 controlled the design of the original wood pole line. A quick comparison of the unit loads for the extreme wind and the NESC heavy district load with overload factors for concrete, indicates that the 1997 NESC heavy district and not the extreme wind load will control the design of the concrete pole. Because extreme wind does not control the design, the engineer may use Table A-1.

Table A-1 indicates that a **C-02.8** may be used. However, in order to account for the additional moment due to deflection from the dead weight of the heavy concrete pole and the loaded weight of the conductors, the engineer should select a pole, one class greater in strength from this table. **A standard class C-03.4 should be used.**

Example 3: Same as example 2, except the line must sustain 100-mph extreme wind loads.

1997 NESC heavy district loads with an overload factor of 4 controlled the design of the original wood pole line. A quick comparison of the unit loads for the extreme wind and the NESC heavy district load with overload factors for spun concrete poles, indicates that the 100 mph extreme wind load will control the design of the spun concrete pole (an overload factor of 1.1 is used for extreme wind loads). Because the extreme wind load with an overload factor of 1.1 is greater than the 1997 NESC district load with an overload factor of 4.0, extreme wind will control the design. Table A-2 should be used to select the appropriate pole.

In order to account for the additional moment due to deflection from the dead weight of the heavy spun concrete pole and the loaded weight of the conductors, the engineer should select a pole class that is higher in Table 1. **A standard class C-04.0 should be selected.**

In example 2, calculations for the actual line conditions may actually show that a C-02.8 may be used to replace the 80 class 1 wood pole. Likewise, the engineer might find that a C-03.4 might be adequate for example 3 if calculations are performed using actual line conditions.

RUS Recognition and Acknowledgment- This bulletin is the result of considerable effort of the Transmission Subcommittee of the NRECA T&D Engineering Committee. Committee members include:

Dominic Ballard, **East Kentucky Power Coop.**, Winchester, KY

John Burch, **Florida Keys Electric Coop.,** Tavernier, FL

Doug Emmons, **Hoosier Energy REC,** Bloomington, IN

Donald Heald, **Rural Utilities Service, U.S.D.A,** Washington, DC

Bill Hetherington, **Lee County Electric Coop.,** North Fort Myers, FL

Robert Johnson, **Arkansas Electric Coop.,** Little Rock, AR

Charles Lukkarila, **United Power Association**, Elk River, MN

Charles "Bubba" McCall, **Georgia Transmission Company**, Tucker, GA

Robert Oldham, **Southern Maryland Electric Coop**., Hughesville, MD

Art Smith, **Patterson & Dewar Engineers,** Decatur, GA

John Twitty, **Alabama Electric Coop**., Andalusia, AL

David Turner, **Lower Colorado River Authority,** Austin, TX

RUS wishes to express special thanks to Working Group of this subcommittee who were especially instrumental in the preparation of this specification:

John Twitty Bob Oldham Bubba McCall Art Smith

If you would like more information or have any questions, please call Don Heald, Structural Engineer, Transmission Branch, at (202) 720-9102.

ICEA Issues New Standards for Power Cables

The Insulated Cable Engineers Association (ICEA) has issued several new standards for solid-dielectric insulated power cables. Several of these standards are joint-standards with the National Electrical Manufacturers Association (NEMA). The new standards have been submitted to ANSI for recognition as American National Standards.

The new ICEA standards reflect a change in ICEA's standards writing objective. They are written as "application standards" rather than "insulation material-based standards" of the past. These new standards have been updated to reflect the latest conductor constructions, insulations and jacket materials being used to manufacture wires and cables. The advantage of having an application standard is that all insulations suitable for use on a specific product are contained in one document. With material-based standards, only one type of insulation and its requirements are defined. If a different insulation was to be considered, a separate standard would be required.

The new ICEA / NEMA published standards are:

ICEA S-95-658 / NEMA WC70	Nonshielded 0-2 kV Cables
ICEA S-96-659 / NEMA WC71	Nonshielded 2001 V-5 kV Cables
ICEA S-93-639 / NEMA WC74	Shielded Power Cable 5-46 kV

New ICEA standards for power cables used by the electric utility industry are:

ANSI / ICEA S-94-649	Concentric Neutral Cables Rated 5-46 kV
ICEA S-97-682	Utility Shielded Power Cable Rated 5-46 kV
ICEA S-105-692	600 Volt Single Layer Thermoset Insulated Utility Underground Distribution Cable
ICEA S-81-570	Direct Burial, 600 Volt, Ruggedized Insulation

ICEA / NEMA joint-standards and ICEA standards are available from Global Engineering Documents at the following address:

GLOBAL ENGINEERING DOCUMENTS
15 Inverness Way East
Englewood, CO 80112 USA

Telephone: (800) 854-7179 or (303) 397-7956
E Mail: global@ihs.com
http://global.ihs.com (go to Doc.Search, ICEA or NEMA WC)

As a result of the new ICEA / NEMA application standards being issued, the older, more-familiar materials-based ICEA / NEMA standards are being withdrawn. This is necessary to

eliminate duplication and because the materials-based standards are no longer being maintained. The withdrawn ICEA / NEMA standards are :

ICEA S-66-524 / NEMA WC7	Cross-Linked-Thermosetting-Polyethylene Insulated Wire and Cable
ICEA S-68-516 / NEMA WC8	Ethylene-Propylene-Rubber Insulated Wire and Cable
ICEA S-61-402 / NEMA WC5	Thermoplastic-Insulated Wire and Cable
ICEA S-19-81 / NEMA WC3	Rubber-Insulated Wire and Cable

ICEA recently issued several other application standards for wire and cable, a standard for test methods and for test frequency. These standards are also available from GLOBAL. The titles of these standards are:

ICEA S-75-381 / NEMA WC58	Portable and Power Feeder Cables for Use in Mines and Similar Applications
ICEA T-26-465 / NEMA WC54	Frequency of Sampling Extruded Dielectric Cables
ICEA S-76-474	Neutral-Supported Power Cable Assemblies With Weather-Resistant Extruded Insulation, 600 Volts
ICEA S-73-532 / NEMA WC57	Control Cables
ICEA S-70-547	Weather-Resistant Polyolefin-Covered Wire and Cable
ICEA S-82-552 / NEMA WC55	Instrumentation and Thermocouple Wire and Cable
ICEA T-27-581 / NEMA WC53	Standard Test Methods

Contact GLOBAL for copies of these standards and a complete listing of ICEA standards and NEMA standards.

These changes are summarized in the table that follows. If you would like more information or have any questions, please call Trung Hiu, Electrical Engineer, Distribution Branch, at (202) 720-1877.

MATRIX – ICEA WIRE & CABLE STANDARDS

WITHDRAWN STANDARD	TITLE	REPLACEMENT STANDARDS	TITLE
ICEA S-66-524 / NEMA WC7	Crosslinked-Thermosetting-Polyethylene Insulated Wire & Cable	ICEA S-95-658 / NEMA WC70	Nonshielded 0-2 kV Cables
		ICEA S-96-659 / NEMA WC71	Nonshielded 2001 V-5 kV Cables
		ICEA S-93-639 / NEMA WC74	Shielded Power Cable 5-46 kV
		ICEA S-94-649	Concentric Neutral Cables Rated 5-46 kV
		ICEA S-97-682	Utility Shielded Power Cable Rated 5-46 kV
		ICEA S-105-692	600 Volt Single Layer Thermoset Insulated Utility Underground Distribution Cable
		ICEA S-81-570	Direct Burial, 600 Volt, Ruggedized Insulation
ICEA S-68-516 / NEMA WC8	Ethylene-Propylene-Rubber Insulated Wire & Cable	ICEA S-95-658 / NEMA WC70	Nonshielded 0-2 kV Cables
		ICEA S-96-659 / NEMA WC71	Nonshielded 2001 V-5 kV Cables
		ICEA S-93-639 / NEMA WC74	Shielded Power Cable 5-46 kV
		ICEA S-94-649	Concentric Neutral Cables Rated 5-46 kV
		ICEA S-97-682	Utility Shielded Power Cable Rated 5-46 kV
		ICEA S-105-692	600 Volt Single Layer Thermoset Insulated Utility Underground Distribution Cable
ICEA S-61-402 / NEMA WC5	Thermoplastic-Insulated Wire & Cable	ICEA S-95-658 / NEMA WC70	Nonshielded 0-2 kV Cables
ICEA S-19-81 / NEMA WC3	Rubber-Insulated Wire & Cable	ICEA S-95-658 / NEMA WC70	Nonshielded 0-2 kV Cables
		ICEA S-96-659 / NEMA WC71	Nonshielded 2001 V-5 kV Cables
		ICEA S-93-639 / NEMA WC74	Shielded Power Cable 5-46 kV
		ICEA S-94-649	Concentric Neutral Cables Rated 5-46 kV
		ICEA S-97-682	Utility Shielded Power Cable Rated 5-46 kV
		ICEA S-105-692	600 Volt Single Layer Thermoset Insulated Utility Underground Distribution Cable

Coop Supply *Professionals?*

Managerial experts believe that in today's dynamic business climate, only those organizations with trained and proven professionals will survive. If so, then some of today's cooperatives must rethink current attitudes towards staffing, developing and endorsing professional supply management (purchasing, warehousing, etc.)

Supply personnel are a vital link in any successful operations chain and yet cooperative supply functions usually have fewer human and physical resources when compared to other departments. An electric system's procurement function should be adequately staffed so as to seek out greater sources of supply, maximize existing ones, closely administer contracts, forecast material requirements and anticipate market conditions. Increased efficiency is obtained by having a board-sanctioned centralized materials management program. Note the word centralized? It is the root core of any successful effort, of which the *American Management Association* states: "Multiple purchasing authority is inefficient because it results in duplication of efforts, dilution of the benefits of concentrated purchasing strength, demoralization of purchasing personnel, and confusion among company employees and vendor's representatives."

So how do today's coops promote this enhanced agenda? Well first, each coop should take a good close look at its existing processes and ask questions such as: Are purchasing, inventory control, and warehousing/stores represented in top level planning affecting future operation's procurement needs? Is the professional development and certification of supply personnel encouraged? Is there a formal inventory control system in place? Are competitive procedures used? Are purchasing and materials management policies and procedures documented?

Once established, an effective procurement program should be perceived as a source of revenue rather than an expense. Here's how: Say for example your coop's last reported percentage of gross profit was 8% (margins/income), meaning that in order to make one dollar of profit, your coop had to generate $12.50 of revenue. Fact: $1 saved through effective purchasing is equal to $1 free and clear of true profit. If efficient purchasing reduces your coop's cost of goods (for example…$7 million annually) by only one 1%, this savings of $70,000 is equal to the purchasing function alone generating revenues of $875,000 annually! ($70,000 saved x $12.50).

There is an organization that is uniquely committed to the education, certification and enhanced professionalism of cooperative supply personnel. The *Rural Electric Utilities* affiliate of the National Association of Purchasing Management (NAPM-REU) has been doing this since 1992. Since then, NAPM-REU has gained national recognition for having the largest percentage membership growth, exceeding Certified Purchasing Manager certification goals, and being a "best in class" affiliate. Many of its members have gained individual national recognition. Cooperative employee Dick Rich of Seminole Electric Cooperative in Tampa, Florida, recently served as president of NAPM, a 47,000 member international organization founded in 1915. To find out more about NAPM, please visit its web site at: www.napmreu.org.

If you would like further information or have any questions, please call Carl Liles of Western Farmers Electric Cooperative at (405) 247-3351, E-mail C_Liles@wfec.com, or Harvey Bowles, Chair, Technical Standards Committee "A" (Electric), at (202) 720-0980.

Close the Loop On Recycling: Buy Recycled

As many of you may know, the President issued Executive Order 13101 which directed the Federal Government to begin purchasing products that contain recycled content. The reason behind this Executive Order was to help create markets for the variety of goods and services being recycled throughout the United States today.

Many of us participate in recycling by neatly placing our cans, bottles, newspapers, and plastic containers into our recycling bins once a week or twice a month. However, this is only the first phase of recycling, and without available markets to reutilize these items all we've really done is neatly piled garbage into separate bins. With the purchasing power and clout of the Federal Government, the Executive Order stimulates markets and provides vendors with a demand for products made with recycled content. It is important to note that by using recycled content products, manufacturers save not only energy but also precious raw materials.

One of the best examples of recycled content material is copier paper. As a result of the Executive Order, the Federal Government now utilizes recycled content paper for 98% of its copier paper usage. Additionally, many items have always contained recycled content, from aluminum beverage cans to products made from steel.

RECYCLED CONTENT

Many of the components and materials utilized in the utility industry have the potential to contain recycled content. Products made from the following materials may have recycled content as indicated:

- Aluminum - 0% to 100% recycled content (depending on manufacturing process).
- Concrete - that contains recovered coal fly ash (Recycled content varies by product as specified by ASTM standards and specifications from the American Concrete Institute).
- Fiber Glass - 0% to 95% recycled content (depending on manufacturing process).
- Glass - 0% to 25% (depending on manufacturing process).
- Plastic (PVC, LDPE, HDPE, PET) - 0% to 100% recycled content (depending on manufacturing process).
- Steel - 25% or 100% (depending on manufacturing process. Products made from steel always have recycled content).

In summary, it's up to each of us to direct our purchasing offices to preferentially select products made with recycled content as long as they fulfill the needs of the particular function, performance, durability, price, and meet applicable specifications. As more and more recycling happens throughout the United States, our leadership in buying recycled content products will help to create the necessary markets so that we can close the loop and ensure that recycling works and that we are buying recycled.

If you would like further information or have any questions, please call Chip Foley, Director, Government Relations, Steel Recycling Institute, at (202) 496-9686, E-mail wjfoley@worldnet.att.net, or Harvey Bowles, Chair, Technical Standards Committee "A" (Electric), at (202) 720-0980.

ENVIRONMENTAL

Environmental Report Preparation

On December 11, 1998, the Rural Utilities Service (RUS) revised its environmental compliance regulation 7 CFR Part 1794, "Environmental Policies and Procedures." This new environmental regulation replaced the previous version that was published on March 13, 1984. A substantial number of changes affecting the Electric Program and its applicants were included in the new Regulations. For example, only those actions subject to direct approval of financing assistance are subject to environmental review - the approval to use general funds not subject to reimbursement and approval of a lien accommodation are no longer subject to environmental review. In addition, a number of projects classified as categorical exclusions requiring the preparation of an environmental report have been downgraded to categorical exclusions normally not requiring the preparation of an environmental report. Most notably are the following project types:

- Rebuilding of power lines or telecommunications cables where road or highway construction requires the applicant to relocate the lines either **within or immediately adjacent to the new road or highway easement or right-of-way**. Refer to §1794.21(b)(14).

- Phase or voltage conversions, reconductoring or upgrading of existing electric distribution lines or telecommunication facilities, provided that the project remains in the same right-of-way and is not relocated.) Refer to §1794.21(b)(15).

Construction work plans and amendments with only these types of projects and no new construction will only require a project description of the proposed facilities. Even though an environmental report is not necessary, the applicant is still responsible for considering impacts to threatened and endangered species, if applicable. The U.S. Fish and Wildlife Service **may** be the only agency that need be contacted.

For construction projects requiring the preparation of an environmental report, applicants should follow guidance in RUS Bulletin 1794A-600, "Guide For Preparing the Environmental Report for Categorically Excluded Projects". The Guide, along with the Environmental Regulation, is available on the RUS web site at

http://www.usda.gov/rus/electric/bulletins.htm

The following is a summary of guidelines for environmental report preparation and common problems found in the review of environmental reports

GENERAL ENVIRONMENTAL REPORT PREPARATION GUIDELINES

1. Project Description

This section should contain a brief description of the facilities proposed in the construction work plan. Specific project codes 200, 300 (if relocated), 400, 800 and 900 will require the preparation of an environmental report. The method of construction should also be described briefly. The amount of area to be cleared for a project should be described.

Common Problems and Solutions

Problem: Projects in the ER are not specifically identified or do not match the projects identified in the CWP and listed on the RUS Form 740c. *Solution:* Identify the projects in the ER and ensure that all projects are included. Carry over projects from previous CWP's should be identified as previously approved projects.

Problem: Location relevant to road right-of-way is not always included. *Solution:* Define whether the projects are located within or immediately adjacent to the road right-of-way or some distance from the edge of the right-of-way.

2. Project Alternatives

The no action alternative discussion should include the potential impacts of not providing service or improving facilities and should be tied to the need for the project. Alternative transmission routes and substation sites may need to be identified especially where condemnation may be necessary to obtain the required easements.

Common Problems and Solutions

Problem: Alternative transmission line routes/substation sites not identified on a map or evaluated, especially if such projects are expected to be controversial or cause adverse impacts. *Solution:* Ensure that the projects/alternatives are located on the U.S. Geological Survey (USGS) map and appropriately evaluated.

3. Existing Environment Description

Information should be presented that will enable RUS to make a determination of potential impacts of the projects. The approximate locations of the proposed projects and alternatives should be shown on USGS maps. Photocopies of the maps are acceptable. The specific location of any substation site should be identified and described.

Common Problems and Solutions

Problem: USGS maps with the projects identified are not included in the ER. *Solution:* Include the appropriate map in the document. A USGS map contains information that is useful in evaluating impacts.

4. Environmental Impacts Discussion

At a minimum there should be a discussion of the non-NEPA issues. Agencies contacted should include, but are not limited to the following: National Conservation Resource Service (wetlands, important farmland, prime rangeland and forest land), State Historic Preservation Officer (cultural resources), U.S. Fish and Wildlife Service (threatened and/or endangered species, their critical habitat and wetlands), Army Corps of Engineers (floodplains and wetlands), and State Wildlife Agency (threatened and/or endangered species and wildlife concerns). These are the minimum agencies to contact.

Other areas of potential impacts include land use, vegetation, socioeconomics, and coastal barrier areas, if applicable. Note that projects crossing federally managed lands should be identified. Projects crossing lands managed by the Forest Service, Bureau of Land Management, Bureau of Indian Affairs, or the National Park Service may require additional environmental review before a Special Use Permit is issued by the agency. Borrower response to Federal, State and local agency comments should be included in this section.

Common Problems and Solutions

Problem: The same standard letter is sent to all agencies contacted. *Solution:* Letters to the agency should be specific as to the information required, i.e., cultural resource information should not be requested from the U.S. Fish and Wildlife Service. Information concerning mitigation measures currently used should be included in the discussion.

Problem: Borrower correspondence to the agencies not included in the ER. *Solution:* Copies of borrower's letters to each agency requesting information should be included along with the agency response. The cooperative should keep the original copies of agency correspondence.

Problem: Not all agency response letters are included in the ER. *Solution:* All responses should be received and included in the ER before the ER is sent to Washington for review and approval. Some agency responses are not included in the ER because response was not received within 30 days. If an agency does not respond within 30 days, a follow-up contact should be made by telephone to ensure the letter was received and to determine if the agency had

comments or not. Written documentation of follow-up telephone conversations or meetings with agencies should be included in the ER.

Problem: **Agency responses are not addressed in the ER either in the appropriate impact sections of the ER or in a separate section.** *Solution:* After receiving the appropriate information from an agency, the applicant/consultant should analyze the information and appropriately address any comments the agency includes in its response. It is not enough to just contact the agency and get a response. Commitments to conduct surveys for threatened and/or endangered species or cultural resources should be addressed along with commitments to mitigate impacts to specific resources.

Problem: Public notification has not been completed where projects will impact wetlands, floodplains or cultural resources. *Solution:* Contact RUS if there is a question on the need for a notice.

If you would like more information or have any questions, please call Dennis Rankin, Environmental Protection Specialist, Engineering and Environmental Staff at (202) 720-1953 or E-mail: drankin@rus.usda.gov or Larry Wolfe, Senior Environmental Protection Specialist at (202) 720-5093 or E-mail: lwolfe@rus.usda.gov.

Environmental Review of Minor Projects

On December 28, 1999, the Rural Utilities Service (RUS) published a direct final rule regarding post-loan policies and procedures for Insured Electric Loans. It increased the allowable amount for minor projects from $25,00 up to $100,000. The effective date of this direct final rule was February 11, 2000. Minor projects are defined as projects costing less than $100,000 that are not included in an RUS approved borrower's construction work plan.

These projects still require environmental approval before funds can be advanced. The borrower must check the applicable environmental statement on the RUS Form 219 – Inventory of Work Orders (IWO). A project description must be provided and the borrower must do one of the following to satisfy RUS's environmental requirements.

- If applicable check the statement that the project is a categorical exclusion of a type described in §1794.21(b) which normally does not require the preparation of an environmental report (ER); or

- If applicable, state that the project is a categorical exclusion of a type that normally requires the preparation of an ER and the ER is attached to the IWO. **Note that projects that would normally be classified as a project code 200 will require an ER. Also conversion projects (project code 300) will require an ER if the project is to be relocated on a new right-of-way.**

The following items represent common problems that will cause processing delays, may cause an IWO for minor projects to be returned for additional information or may cause the project to be disallowed:

- The cost of construction in column 4 on the RUS Form 219 is greater than $100,000.
- The project description is inadequate or so vague that the reviewer cannot identify the project or determine its proper classification.
- The manager does not sign the environmental certification.
- The appropriate environmental certification is not checked.
- If the second certification is checked, the ER is not attached to the RUS Form 219.
- An ER is not provided for projects classified as code 200 projects (new tie lines) or 300 projects (conversions) that will be relocated.

If you would like more information or have any questions, please call Dennis Rankin, Environmental Protection Specialist, Engineering and Environmental Staff at (202) 720-1953 or E-mail: drankin@rus.usda.gov.

Summary: The State of the Art in Raptor Protection - A Historical Perspective

The following table represents a brief historical perspective of raptor electrocution/collision issues. Sheila Fazier of Southern Engineering presented the information in detail at the Raptor Electrocution and Collision Prevention Workshop in Alaska on April 13-14, 2000.

DATE	EVENT
1860	First reports of collisions
1922	First reports of electrocuted eagles
1928	First perch guards installed
1940	Re-designed perch guards installed
1960	Osprey nesting hazards identified
1972	REA Bulletin 61-10 published
1973	Additional studies identifying at-risk poles
1975	"Suggested Practices For Raptor Protection On Power Lines" published
1977	Effectiveness of perches recognized
1978	Nesting platforms installed
1980	Studies identifying at-risk behavior
1981	"Suggested Practices for Raptor Protection – The State of the Art in 1981" published
1982	Recommendations for routing new lines
1984	Transmission tower benefits recognized
1988	Studies identifying collisions risks done/transmission routing bibliography developed
1991	Use of suspended insulators recommended/Wind turbine risks identified
1994	Mitigating Bird Collisions With Power Lines: The State of the Art In 1994 published/ Animal Caused Outages published
1996	"Suggested Practices For Raptor Protection – The State of the Art in 1996" published
1997	Southern Engineering Web Site developed
1998	Steel distribution pole hazards identified
1999	Awareness and mitigation efforts increase, but electrocutions still a problem

If you would like more information or have any questions, please call Dennis Rankin, Environmental Protection Specialist, Engineering and Environmental Staff at (202) 720-1953 or E-mail: drankin@rus.usda.gov or Sheila Frazier, Southern Engineering Company at (404) 352-9200 or E-mail: pwrsup@soeng.com.

Migratory Bird Treaty Act Enforcement

Disturbed by the continuing large numbers of raptors, particularly eagles, electrocuted along power lines, the U.S. Fish and Wildlife Service (USFWS) has begun to step up enforcement of the Migratory Bird Treaty Act (MBTA), the Bald and Golden Eagle Protection Act (BGEPA), and the Endangered Species Act (ESA). The first utility cited for violation of the Migratory Bird Treaty Act was Pacific Gas and Electric of California. In 1993, the utility was fined $1,500 for violations and agreed to retrofit lines to safer standards. In 1998, Sand Point Electric of Alaska was fined $500 and was likewise compelled to retrofit dangerous structures. Most recently, however, a plea agreement between the United States Department of Justice and the USFWS with Moon Lake Electrical Association (MLEA) of Utah ushered in an entirely new era of enforcement. Under the agreement, MLEA was given three years of probation, ordered to pay $100,000 in fines and restitution, and was required to retrofit structures dangerous to migratory birds. MLEA was also required to enter into a Memorandum of Understanding (MOU) with the USFWS and to hire a qualified consultant to develop an Avian Protection Plan.

MLEA was charged with six counts of violating the MBTA and the BGEPA. Although the MLEA was charged with killing 17 large raptors (including, but not limited to, golden eagles), at least another 21 raptors in excess of the 17 enumerated in the charges had been electrocuted over a period of several years and found under the MLEA's power lines. In a pre-trial motion, MLEA argued that it had not deliberately killed any of the raptors and was, therefore, not liable to charges under either the MBTA or the BGEPA. MLEA argued, in part, that the MBTA and BGEPA were intended to apply only intentionally harmful activities such as those entailed in hunting, poaching, and trapping. District Court Judge Lewis Babcock denied this motion. Judge Babcock found that the language of the MBTA stated that it shall be unlawful at any time, by any means, or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill any migratory bird. It does not restrict application to deliberate types of killing normally associated with poaching or hunting. While Judge Babcock allowed that a small fine might take care of innocent technical violations, a case such as that of MLEA raises more serious issues. Specifically noted by the judge was the fact that MLEA failed to install inexpensive retrofits on 2,450 of 3,096 poles in the area in question. Additionally, Judge Babcock also rejected MLEA's claim that it was subject to selective enforcement of the law, noting that conscious exercise of some selectivity in enforcement is not in itself a federal constitutional violation so long as the selection was not deliberately based upon an unjustifiable standard such as race, religion, or other arbitrary classification (45 F. Supp. 2d 1070).

Violations of the MBTA are examples of strict liability crimes, meaning that a party can be convicted under the statute without demonstration of specific intent or guilty knowledge. In contrast to the MBTA, the BGEPA proscribes behavior by which an entity knowingly or with wanton disregard for the consequences of its act takes a bald or golden eagle. Citing numerous precedents, Judge Babcock ruled that “take” includes any act of killing without respect to method. Further, the judge found that a determination of whether or not MLEA had acted knowingly or with wanton disregard in the killing of the eagles was a matter for the jury's determination and therefore not subject to challenge by a pre-trial motion (45 F. Supp. 2d 1070).

This is the first significant case law of a utility being criminally prosecuted under the MBTA and BGEPA.

If you would like more information or have any questions, please call Dennis Rankin, Environmental Protection Specialist, Engineering and Environmental Staff at (202) 720-1953 or E-mail: drankin@rus.usda.gov or Richard Harness of EDM International, Inc. at (970) 204-4001 or E-mail: rharness@edmlink.com.

Raptor Electrocution/Collision Workshops

The Rural Utilities Service (then REA) participated in a number of raptor electrocution/collision workshops in the late 1980's. These workshops, which were sponsored by the U.S. Fish and Wildlife Service (USFWS), were held in Nebraska, Colorado, Wyoming, Texas, and South Dakota. In addition, REA held environmental workshops in Nebraska (2), Kansas (3), New Mexico (2), Arizona (1), Colorado (1), Texas (4), Montana (1), Utah (1), and Oregon (2). Raptor electrocution prevention was discussed at each of these environmental workshops. Due to recent developments with the raptor electrocution concerns, including the legal decision involving Moon Lake Electric Cooperative, a number of recent raptor electrocution/collision workshops were held. A summary of these workshops follows:

RAPTOR PROTECTION ON POWER LINES: THE STATE OF THE ART IN ARIZONA. Phoenix, Arizona. April 30, 1999.

- The workshop was sponsored by the Arizona Public Service Company (APS), the Salt River Project, the Western Area Power Administration (Western) and the USFWS.

- The purpose of the workshop was to discuss the problem of raptor electrocution and bird collisions in the state of Arizona.

- Approximately 150 people representing Federal and State agencies, utilities, consultants, conservation groups, suppliers, wildlife rehabilators, and interested individuals attended the workshop.

- There was a discussion of enforcement laws, both Federal and State. Reporting forms and methods were discussed. Wildlife rehabiltators indicated a willingness to help in the identification and collection of birds.

- High risk factors such as large species, immature birds, wet weather conditions, social behavior, lack of alternative roosts and nesting problems were discussed. Low risk factors included small birds and forested areas.

- Electrocution problems were usually found on 69 kV and lower voltage lines.

- Radio and television interference, compact line designs and new construction designs were considered in developing new mitigation. APS has developed a new pole top perch for Harris hawks.

- Existing mitigation measures, such as pole top caps, perch guards, insulating wraps, alternative designs and pole top pins, and their effectiveness were discussed

- The development of an information management system including standardizing reporting forms and methods and identifying utility structures and their locations were discussed.

RAPTOR ELECTROCUTION PREVENTION WORKSHOP. Denver, Colorado. November 17-19, 1999.

- The workshop was sponsored by the Rural Utilities Service (RUS) and Western.

- Approximately 55 people representing Federal and State agencies, consultants, rural electric cooperatives (CO, NE, NM) and suppliers attended the workshop.

- The purpose of the workshop was to discuss raptor electrocution prevention policies and measures, bird collisions, and nest removal policies and permits for cooperatives in Colorado.

- The video "Raptors At Risk" was discussed. Also, other reports/videos on raptor electrocution were identified.

- The USFWS discussed raptor protection laws and voluntary compliance procedures for states in USFWS' Region 6.

- Some of the actions that hamper efforts to obtain a realistic identification of the extent of the electrocution problem include carcass removal by scavengers, the feather trade (killing birds illegally and selling the feathers), the general lack of reporting dead birds, and the lack of standardized reporting procedures.

- The different types of permits (salvage and depredation) were discussed and possible procedures/problems were identified.

- Steel distribution poles and raptor protection measures were discussed

- Data collection procedures and raptor reporting forms for Colorado were discussed. RUS and USFWS are working on a reporting form.

- Two cooperatives presented their raptor protection policies that were approved by their respective boards as standard operating policies. The USFWS also talked about the development of either a nationwide or statewide memorandum of agreement for raptor electrocution prevention.

AVIAN INTERACTION WITH UTILITY STRUCTURES. Charleston, South Carolina. December 2-3, 1999.

- The workshop was sponsored by the Electric Power Research Institute.
- The purpose of the workshop was to evaluate the state of the science with regards to bird collisions, causes and prevention measures of bird electrocutions, impacts of bird activities on power delivery, methods to assess the extent of avian interactions/mitigation effectiveness and to identify research priorities for electric utilities.
- Approximately 100 people representing Federal government agencies, utilities, consultants, suppliers, educational institutions, conservation organizations attended the workshop.
- Twenty-five formal presentations were made covering a wide variety of topics dealing with avian interactions with utility structures.
- Results of the workshop will be available on EPRI's website (http://www.epri.com) under the environmental section or contact rcarlton@epri.com.

RAPTOR ELECTROCUTION AND COLLISION PREVENTION WORKSHOP. Seward, Alaska. April 13-14, 2000.

- This workshop was sponsored by EDM, International, Inc., in cooperation with the Alaska Rural Electric Cooperative Association, Darden & LaRue, Kaddas Enterprises, RUS, Southern Engineering, USFWS, University of Montana, and Western.
- The purpose of the meeting was to discuss the problem of raptor electrocutions/collisions in the state of Alaska and develop preventive measures to minimize the problem. In the previous year, a number of bald eagles had been electrocuted and the USFWS is currently investigating the situation.
- Approximately 100 people representing Federal and State agencies, utilities, consultants, suppliers and educational institutions attended the workshop.
- Topics included types of raptors and electrocution factors, preventive measures, case studies, reporting forms, RUS raptor guidelines, laws and permit requirements, use of steel distribution pole, collision problems, and electrocution problems associated with the canning industry.
- Reporting forms and procedures were identified and are currently being developed for utilities in the state of Alaska
- At all these workshops, the USFWS reported that it is serious about enforcement of raptor/bird protection laws; however, it is willing to work with utilities to aleviate the problem. Only three species of birds (starlings, sparrows and pigeons) are not protected

by the Migratory Bird Treaty Act. Standard reporting forms and methods need to be developed. RUS is currently working with the USFWS and other groups to develop reporting forms that can be used by rural cooperatives and other utilities. Utilities need to be proactive in their approach to the raptor electrocution/collision problem.

If you would like more information or have any questions, please call Dennis Rankin, Environmental Protection Specialist, Engineering and Environmental Staff at (202) 720-1953 or E-mail: drankin@rus.usda.gov.

Raptors at Risk Video

Raptor electrocution continues to be one of the major wildlife concerns of the U.S. Fish and Wildlife Service (USFWS), especially in states west of the Mississippi River. Raptors (birds of prey) are a group of birds, which includes eagles, falcons, owls, kites, osprey, and vultures. The USFWS Division of Law Enforcement has documented the electrocution of 1,030 migratory birds from the states of Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah and Wyoming. These birds of prey are protected through several laws, which include the Eagle Protection Act, the Endangered Species Act and the Migratory Bird Treaty Act. Violations of these laws can result in fines and/or imprisonment.

The USFWS has elevated the electrocution issue to one of its top priorities. The recent court decision involving Moon Lake Electric Association has given the raptor electrocution/bird collision issue high visibility. News articles discussing the Moon Lake court decision, the raptor electrocution problem and solutions to make power line structures raptor friendly on the have appeared in major newspapers throughout the country. In addition, the Cable News Network (CCN) aired a segment on the electrocution problem and its potential solutions.

When the Western Area Power Administration (Western) was been asked by some of its customers for guidance on raptor electrocution prevention, Western formed the Raptor Protection Video Group (Group) who developed an excellent video for these customers and others. The Group consists of consultants, wildlife organizations, utilities, and Federal agencies, including EDM International, Swift Creek Consulting, Sonora Environmental Consulting, Southern Engineering Company, the North American Falconers Association, the National Audubon Society, Southern California Edison, Montana Power Company, the Rural Utilities Service (USDA), the USFWS (USDI) and Western (DOE). Many other organizations and individuals contributed to the cost of making this video.

The purpose of the video is to educate the public and the industry about this issue and identify inexpensive, easy to install solutions to minimize/prevent raptor electrocution.

There is a nominal charge of $12.00 for production, shipping and handling. Checks should be made payable to EDM International, Inc. The video can be obtained at the following address:

EDM International, Inc.
4001 Automation Way
Fort Collins, CO 80525-3479

Phone: (970) 204-4001
Fax: (970) 204-4007

If you would like more information or have any questions, please call Dennis Rankin, Environmental Protection Specialist, Engineering and Environmental Staff at (202) 720-1953 or E-mail: drankin@rus.usda.gov; Richard Harness of EDM, International at (970) 204-4001 or E-mail: rharness@edmlink.com; or John Bridges, Western Area Power Administration, at (720) 962-7255 or E-mail: bridges@wapa.gov.

ADMINISTRATIVE and OTHER

The RUS Website

The World Wide Web is the gateway to the information highway. The use of a personal computer that is connected to the World Wide Web enables one to easily find and retrieve data, rules, regulations, periodicals and other publications. The Rural Utilities Service maintains a website that serves its borrowers and others interested in the rural utility infrastructures. The website is not static, but rather it is dynamic, changing sometimes almost daily, to provide up-to-date information.

RUS Website: http://www.usda.gov/rus

The Electric Staff Division has responsibility for the Electric Program portion of the website. This allows us to better respond to your needs and to post information to the webserver in a more timely fashion. The Electric Program home page is found at:

http://www.usda.gov/rus/electric

To help you navigate around the Electric Program web pages, the home page provides a description of the various pages.

Visit the **Loans/Rates** page which provides a "thumbnail sketch" of the Electric Program's loan offerings and includes a table showing municipal rates for the current quarter. This page is updated at the beginning of each quarter. Although this information is printed in the Federal Register, it is available first on the RUS website.

The **Service** page provides an overview of the Electric Program, its customer – oriented program delivery, outlines the various divisions and their roles, and provides "box scores" of the Electric Program's current Fiscal Year loan program. The box score is updated at the beginning of each month.

Have you wanted to contact RUS, but did not know where to start? The **Contacts** page starts off with the office of the Assistant Administrator. Each division – Northern Regional Division, Southern Regional Division, Power Supply Division, and the Electric Staff Division – has a listing of the staff within that division. You may also select a particular state to see a listing of the staff responsible for that state. These pages have names, titles, phone numbers, fax numbers, and E-mail and postal mail addresses.

The **Regulations** page contains RUS regulations affecting electric borrowers as well as proposed regulations that are open for public comment.

The **Bulletins** page contains RUS Electric Program bulletins in various formats – Word, PDF, text, and HTML. New bulletins are generally available on the website prior to the printed copies being distributed.

Looking for engineering information? Check out the **Engineering** page. It contains various items of interest to the rural electric engineering community.

A number of forms are available in Excel format on the **Forms** page thanks to the Southern Regional Division. Also available are various model documents used in your loan package. There are also links to the RUS Forms 7 and 12 data collection support and **F**requently **A**sked **Q**uestions pages.

Do you need a copy of the latest List of Materials? Check out the **List of Materials** page. The List is available in Adobe Acrobat PDF format and is updated after every meeting of the Technical Standards Committees. The file includes bookmarks and links to help you find what you are looking for. We hope to convert the List to a database format during the year 2000. This will provide search and query capability and you should be able to link to it from other software.

Have you ever thought about putting your talents to use for RUS or know someone that would? Consider working for the Rural Utilities Service. Check the **Employment Opportunities** page for Electric Program vacancy announcements.

As you leave the Electric Program web pages, the **Exit/Links** pages provide you with links to a number of RUS electric borrowers (both distribution and G&T), as well as electric industry and government resources, including state commissions, Federal agencies, and other sites of interest.

Do your kids know about RUS? Invite them to look at the RUS “kids page” - http://www.usda.gov/rus/educate.htm and meet Rus the Surfin’ Squirrel. There are safety tips, games, as well as other information about the RUS programs.

Be sure to check out the rest of the RUS website for information about the other RUS programs - Telecommunications Program (including the RUS Distance Learning and Telemedicine Grant and Loan Program) and the Water and Environmental Programs.

The RUS Electric Program website is a work in progress. It is in a state of constant revision. Check it often. If you have trouble finding what you want, send an e-mail to:

electric@rus.usda.gov

Please include your name, e-mail address, telephone number, and company affiliation in the body of your message so that we may be able to contact you for additional information, if necessary. The RUS website is your website and we want to provide the information you need. Please provide us with your suggestions.

If you would like further information or have any questions, please call Harvey Bowles, Chair, Technical Standards Committee "A" (Electric), at (202) 720-0980.

New Data Collection System

RUS is developing a new "Web Enabled" Data Collection System (DCS) to collect and validate the RUS borrowers' operating report data (Forms 7, 12 and 479). RUS has been collecting operating data by mailing a floppy disk to borrowers and having them mail the information back on a floppy disk for several years. The new system will save time by using the Internet to communicate. The new system is modeled after the one developed by the Federal Energy Regulatory Commission (FERC) to collect several of their forms including FERC Form 1. RUS is planning to deploy the new system in November, 2001.

When the RUS system is complete, a letter will be sent to all borrowers informing them that they can obtain the new system from the RUS Web Site. Borrowers will then be able to download and install the system on their local computer or their network. Each time borrowers run the program it will check across the Internet to see that they have the latest version of the program. When they have completed the form they will submit the information across the Internet to a secure RUS server using a PIN issued by RUS. To meet the requirement for a signed copy, we are investigating the use of electronic signatures. The server will then execute a program, which will check to see that the report is complete. The server will then E-mail the borrower and an RUS analyst the results of this check. The RUS analyst will then execute a program that will bring the information across the USDA firewall and perform a complete set of checks on the data. If problems are encountered at any stage of the review process, an E-mail will be sent to the borrower and the borrower will need to amend and resubmit the form.

The Form 7 and Form 12 are being revised and the revisions will be included when the new system is complete. The amount of data required on the Form 7 is being significantly reduced. The Form 12 is being revised to have a special plant form for Combined Cycle plants and the

Sales and Purchases information is being revised to include information about the type of sale or purchase and the energy and demand charges.

If you would like further information or have any questions, please call Marshall Duvall, Staff Engineer, ESD, at (202) 720-0096.

RUS Electric Engineering Seminar and NRECA's TechAdvantage

The RUS 2000 Electric Engineering Seminar was held in Kissimmee, Florida, on March 14-15, 2000 in conjunction with NRECA's TechAdvantage 2000. Presentations were made concerning changes in RUS regulations, industry restructuring, and RUS' telecommunications and water programs as well as discussion of new technology. Copies of the seminar papers are available on the RUS website at:

http://www.usda.gov/rus/electric/engineering/eng-sem-2000.htm

This seminar, along with NRECA's TechAdvantage, gives the rural electric engineering community an outstanding opportunity to meet and discuss topics that affect the rural electric cooperatives and their member-consumers every day. TechAdvantage 2001 will be held in St. Louis, MO, from March 7-11, 2001. For more information about TechAdvantage, see its website at:

http://www.techadvantage.org

RUS is planning to hold its 2002 Engineering Seminar in Dallas, TX, in March, 2002, in conjunction with NRECA's TechAdvantage 2002. We will provide more information about this seminar as it becomes available.

If you would like more information or have any questions, please call Fred Gatchell, Deputy Director, ESD, at (202) 720-1398.

RUS Technical Publications

RUS has issued a number of technical publications recently. These publications include:

RULES:

- **7 CFR 1710, Subpart E, "Load Forecasts and Market Analysis."** This final rule, published March 20, 2000, changed RUS' load forecasting regulations. The changes are intended to reduce the overall administrative burden of reporting load forecasts to RUS. The changes will also allow RUS to accept less detailed analysis for smaller borrowers.

  For more information, please call Georg Shultz of ESD at (202) 720-1920.

- **7 CFR 1721, "Post-Loan Policies and Procedures for Insured Electric Loans."** This direct final rule, published December 28, 1999, changed RUS' regulations concerning advance of funds. Specifically, we have changed the rules as follows:

  * The threshold limit for a "minor project" has been increased from $25,000 to $100,000, and

  * The limitation of RUS funding to 130% of the project cost estimate without prior RUS approval has been eliminated.

  A minor project can be funded from an RUS loan even though it was not included in a borrower's approved loan, Construction Work Plan (CWP), or CWP amendment. By increasing the threshold limit for a minor project to $100,000, borrowers will have more flexibility to use their RUS loan funds for priority projects that were not anticipated at the time of the loan or CWP. A minor project must be consistent with the purposes permitted by the loan contract, and total advances cannot exceed the total loan amount.

  RUS implemented the "130% rule" in 1985 to improve control over use of RUS loan funds. In recent years, the majority of cases of noncompliance with this rule relate to distribution line extensions and miscellaneous equipment needed to serve new consumers. Since borrowers have little or no control over how many new customers will need to be connected and have no choice but to connect them, RUS approval to exceed 130% of the original estimate for this type of work is superfluous. For other major projects, borrowers have been providing good cost estimates unless the project has been changed significantly, in which case borrowers generally submit a CWP amendment for RUS approval. Since total advances still cannot exceed the total loan amount, we have determined that the 130% rule is no longer needed and that the associated administrative burden on the borrowers can be eliminated.

  Since no adverse comments were received, this direct final rule became effective on February 11, 2000. See also the related article in this issue of the Items of Engineering Interest, "Environmental Review of Minor Projects." For more information, please call Charles Philpott of the Northern Regional Division at (202) 720-1432.

- **7 CFR 1724, "Electric Engineering, Architectural Services and Design Policies and Procedures."** This proposed rule, published April 24, 2000, will revise the requirements regarding RUS approval of plans and specifications for buildings. RUS is proposing that the requirement for RUS approval of architectural plans and specifications for buildings be eliminated and that instead the borrower's architect or engineer be required to state that the design complies with certain specific standards. This change is being made in order to provide better service to borrowers.

  No comments have been received, so the final rule should be published shortly. For more information, please call Fred Gatchell at (202) 720-1398.

- **Bulletin 1728F-806, "Specifications & Drawings for Underground Electric Distribution"** (incorporated by reference). The final rule covering the revision of this bulletin was published on May 26, 2000. This is an update of an existing bulletin, which was known as Bulletin 50-6 with the same title.

  This bulletin provides the specifications and drawings that are to be used by borrowers in the construction of underground distribution facilities. It is one of the RUS standards that help borrowers build safe, reliable, and economical electric facilities in rural America.

  We have made a number of changes to this bulletin, including the addition of two new drawings (UC2-1 and UC2-2) which provide alternative construction arrangements for the interface between overhead and underground facilities. We have also deleted 23 drawings and the URD Inspection Form, which are obsolete and no longer needed.

  We have also incorporated a number of design changes in the drawings, including some that were recommended by the Underground Subcommittee of the NRECA T & D Committee and some suggestions that we received through the public comment process. We have also revised some of the clearances to conform to the latest code requirements.

  We have updated the references to the referenced codes, specifications and standards to reflect the latest editions of these documents. Changes to a number of drawings showing caution, warning, and danger signs were needed to reflect the latest codes and standards concerning signs. Finally, we have revised or redrawn a number of drawings for greater clarity and ease of use.

  For more information, please call Trung Hiu of ESD at (202) 720-1877.

- **7 CFR Part 1792, Subpart C**, "**Seismic Safety of Federally Assisted New Building Construction."** This proposed rule, published May 26, 2000, would revise the existing regulations concerning seismic safety. The proposed revision would update and simplify the seismic safety requirements for new building construction using RUS or Rural Telephone Bank (RTB) loan, grant, or guaranteed funds or funds provided through lien accommodations or subordinations approved by RUS or RTB.

The Earthquake Hazards Reduction Act of 1977 and its associated Executive Order require that federally assisted new building construction meet certain seismic safety standards. These requirements are intended to reduce risk of loss of life and property damage caused by earthquakes. The Interagency Committee on Seismic Safety in Construction and the National Earthquake Hazards Reduction Program (NEHRP) have been created to coordinate these efforts. 7 CFR Part 1792, Subpart C, which was originally issued in 1993, implements these requirements for RUS.

The proposed revision changes the list of acceptable model codes and standards that new buildings need to conform to in order to meet seismic provisions. In order for a model building code to be acceptable, the code must contain requirements equivalent to the 1994 NEHRP Recommended Provisions. The 1997 ICBO Uniform Building Code (UBC) and ASCE 7-95, Minimum Design Loads for Buildings and Other Structures, have been found to be acceptable for seismic safety purposes.

The proposed revision also eliminates the post-construction seismic certification and simplifies the requirements concerning the acknowledgement that the seismic safety provisions of the applicable model code are incorporated in the design of the building.

For more information, please call Don Heald at (202) 720-9102.

GUIDANCE DOCUMENTS:

- **Bulletin 1724E-104, "Reduced Size Neutral Conductors for Overhead Rural Distribution Lines,"** dated September, 23, 1999. This bulletin covers the principal considerations applicable to reduced size neutral conductors and outlines a procedure for their selection and installation. This is an update of an existing bulletin, which was known as Bulletin 61-4 with the same title.

  The bulletin includes suggested procedures for the selection of neutral conductor size under various loading scenarios. It also provides guidance concerning line staking and conductor sagging when using reduced size neutral conductors. Tables of the more common conductor combinations used in RUS standard construction are also included in the bulletin.

  For more information, please call Jim Bohlk of ESD at (202) 720-1967.

- **Bulletin 1724E-216, "Guide Specification for Standard Class Spun Prestressed Concrete Poles,"** dated July 6, 2000. This guide specification provides a basis for procuring direct embedded standard class spun prestressed concrete poles. For more information, see the article of the same title included in this issue of the Items of Engineering Interest.

  For more information, please call Don Heald of ESD at (202) 720-9102.

- **IP 202-1, "List of Materials Acceptable for Use on Systems of RUS Electrification Borrowers,"** published in July, 2000, and its quarterly supplements. This document provides a convenient listing of the materials and equipment that have been accepted by RUS.

If you need any of these publications, please contact RUS' Program Development and Regulatory Analysis staff at (202) 720-8674. Many RUS publications are also available via the Internet at:

For Rules: **http://www.usda.gov/rus/electric/regs.htm**

For Bulletins: **http://www.usda.gov/rus/electric/bulletins.htm**

PUBLICATIONS IN PROGRESS

Timber Specifications: RUS is in the process of revising the following three bulletins that cover pressure treating of poles and crossarms, and their respective quality control:

- **1728F-700, "RUS Specification for Wood Poles, Stubs and Anchor Logs,"**
- **1728H-701, "RUS Specification for Wood Crossarms (Solid and Laminated) Transmission Timbers and Pole Keys"** (7 CFR 1728.201), and
- **1728H-702, "RUS Specification for Quality Control and Inspection of Timber Products"** (7 CFR 1728.202).

Topics currently being considered for revision include:

1. Elimination of the requirement for borrowers to notify RUS of their timber product purchases during the previous year,
2. Reinstatement of the acceptance and listing of inspection agencies in the RUS List of Materials,
3. Requirement for a heat sterilization during kiln drying or steam conditioning of poles,
4. Requirement for inspection agencies to have their company designation branded or tagged on the pole face,
5. Elimination of the 10 percent allowance of preservative retention reduction at the time of shipment to the borrower,
6. Requirement for all independent inspectors and plant quality control personnel to be trained and certified by x-ray fluorescence instrument manufacturer,

7. Requirement for treating plants and inspection agencies to maintain certain levels of liability insurance and errors and omission insurance, and

8. Include butt treating of cedar poles as an acceptable method of treatment for poles.

RUS is hereby soliciting input from electric borrowers and others as to necessary changes to the aforementioned bulletins. Comments or suggestions should be sent to H. Robert Lash, Chief, Transmission Branch, RUS, Stop 1569, 1400 Independence Ave SW, Washington, DC 20250-1569, E-mail: blash@rus.usda.gov. All comments are welcome.

RUS is also working on the following publications:

- **7 CFR 1710, Subpart H, "Demand Side Management and Renewable Energy Systems."** This proposed rule will reflect the changes in the electric utility industry and provide borrowers with more flexibility in obtaining RUS financing for demand side management and renewable energy projects. Criteria for an integrated resource plan acceptable to RUS will also be reduced.

  For more information, please call Georg Shultz of ESD at (202) 720-1920.

- **RUS Bulletin 1724D-101B, "System Planning Guide, Construction Work Plans."** This bulletin provides guidance to borrowers and engineers in the preparation of Construction Work Plans (CWP). This revision will update and simplify this document.

  For more information, please call Jim Bohlk of ESD at (202) 720-1967.

- **Bulletin 1724D-112, "The Application of Shunt Capacitors to the Rural Electric System."** This bulletin examines the application of shunt capacitors on rural distribution systems and serves as a general guide for capacitor applications to RUS borrowers and others. The System Planning Subcommittee of NRECA's T&D Committee has been instrumental in the development of this bulletin. This is an update of an existing bulletin, which was known as Bulletin 169-1 with the same title.

  For more information, please call Chris Tuttle of ESD at (202) 205-3655.

- **RUS Bulletin 1724D-114, "Voltage Regulator Application on Rural Distribution Systems."** This bulletin will examine the application of voltage regulators on rural distribution systems and serve as a general guide for voltage regulator applications to RUS borrowers and others.

  For more information, please call Harvey Bowles of ESD at (202) 720-5082.

- **Standard Contract Forms.** RUS is planning to update, consolidate, and streamline our standard forms of contracts. This would include the elimination of unneeded forms, making forms suitable for "subject to" or "not subject to" RUS approval, making

construction contract forms suitable for "labor only" or "labor and material," standardizing tables and information pages and incorporate them as separate attachments, maximizing consistency among forms, and updating and clarifying contract provisions as necessary. These changes are being made to improve the usefulness of the standard forms of contract.

For more information, please call Fred Gatchell of ESD at (202) 720-1398.

Transmission and Distribution Engineering Committee

In 1991, NRECA established its Transmission and Distribution Engineering Committee (T&D Committee) to work with RUS (then REA) in the development and maintenance of electric transmission and distribution standards and specifications, and the exchange of engineering information of mutual interest to rural electric utilities. The T&D Committee is composed of some of the most dedicated and talented individuals from NRECA and from electric cooperatives all across the United States. These individuals routinely donate several weekends and considerable amounts of other personal time each year to fulfill their commitments to the Committee.

We want to use this opportunity to thank these individuals and the organizations that sponsor their participation. See Appendix B for the T&D Committee Roster.

If you would like more information or have any questions, please call Harvey Bowles, Chair, Technical Standards Committee "A" (Electric), at (202) 720-0980.

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Exhibit 1

TABLE VII

MAXIMUM LINE ANGLES ON SPOOL INSULATOR ASSEMBLIES

(ANSI Class 53-4 Spool Insulator)

Designated Maximum Transverse Load = 2,250 Lbs./Conductor

	WIND SPAN (feet)					
CONDUCTOR SIZE	150	200	250	300	350	400
LIGHT LOADING DISTRICT						
4 ACSR (7/1)	60	60	60	60	60	60
2 ACSR (6/1)	57	57	56	55	55	54
2 ACSR (7/1)	44	43	43	42	42	41
1/0 ACSR (6/1)	36	35	35	34	34	33
123.3 AAAC (7)	35	35	34	34	33	33
2/0 ACSR (6/1)	35	35	34	34	33	33
3/0 ACSR (6/1)	28	28	27	27	26	26
4/0 ACSR (6/1)	28	27	27	26	25	25
246.9 AAAC (7)	27	26	26	25	25	24
336.4 ACSR (18/1)	26	26	25	24	24	23
336.4 ACSR (26/7)	18	18	17	17	16	16
MEDIUM LOADING DISTRICT						
4 ACSR (7/1)	60	60	60	60	60	60
2 ACSR (6/1)	57	56	55	55	54	53
2 ACSR (7/1)	44	43	43	42	41	41
1/0 ACSR (6/1)	36	35	35	34	34	33
123.3 AAAC (7)	35	35	34	34	33	33
2/0 ACSR (6/1)	36	35	34	34	33	33
3/0 ACSR (6/1)	28	28	27	27	26	26
4/0 ACSR (6/1)	28	27	27	27	26	26
246.9 AAAC (7)	27	27	26	26	25	25
336.4 ACSR (18/1)	27	26	26	25	25	24
336.4 ACSR (26/7)	19	18	18	18	17	17
HEAVY LOADING DISTRICT						
4 ACSR (7/1)	60	60	60	60	60	60
2 ACSR (6/1)	56	54	53	52	51	49
2 ACSR (7/1)	43	42	41	40	39	38
1/0 ACSR (6/1)	35	34	34	33	32	31
123.3 AAAC (7)	34	34	33	32	31	31
2/0 ACSR (6/1)	35	34	33	32	31	31
3/0 ACSR (6/1)	28	27	26	26	25	24
4/0 ACSR (6/1)	27	27	26	25	25	24
246.9 AAAC (7)	27	26	25	25	24	23
336.4 ACSR (18/1)	26	25	25	24	23	22
336.4 ACSR (26/7)	18	18	17	17	16	16

Replace Table VII in RUS Bulletin 1728F-803, Specifications and Drawings for 24.9/14.4 kV Line Construction, with this table.

Exhibit 2

Selected Metric Conversion Factors

TO CONVERT FROM:	TO:	MULTIPLY BY:
Inch (in)	Centimeter (cm)	2.54
Foot (ft)	Meter (m)	0.3048
Mile (mi)	Kilometer (km)	1.609
Kip (1000 lb)	Newton (N)	4,448
Pound (lb)	Newton (N)	4.448

APPENDIX A

RURAL UTILITIES SERVICE
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Updated August, 2000

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APPENDIX B

NRECA TRANSMISSION & DISTRIBUTION ENGINEERING COMMITTEE

MEMBER	ORGANIZATION	LOCATION
Committee Chair		
Overt L. Carroll	Clark Energy Co-op.	Winchester, KY
NRECA Staff Coordinator		
Steve Lindenberg	NRECA	Arlington, VA
Materials Subcommittee		
Michael Pehosh, Chair	Ozarks EC	Fayetteville, AR
Harvey Bowles	RUS	Washington, DC
Charles Emerson	Trico EC	Tucson, AZ
Phil Gelhorn	East Central EA	Braham, MN
Charlene Ham	Rusk County EC	Henderson, TX
Joseph Jones	McCall-Thomas Engr. Co.	Orangeburg, SC
George Keel	RUS	Washington, DC
Carl Liles	Western Farmers EC	Anadarko, OK
John Mitchell	Rappahannock EC	Fredericksburg, VA
Glenn Sell	Union Rural EC	Marysville, OH
Scott Wehler	Adams Electric Co-op	Gettysburg, PA
Overhead Distribution Lines Subcommittee		
Allan Glidewell, Chair	Southwest Tennessee EMC	Brownsville, TN
Jim Bohlk	RUS	Washington, DC
James Byrne	Poudre Valley REA	Fort Collins, CO
Jim Carter	NRECA – WQC	Spartanburg, SC
Weldon Gray	Concho Valley EC	San Angelo, TX
Jon Hodge	Trinity Valley Electric Co-op	Athens, TX
Tom Hoffman	Agralite Electric Co-op	Benson, MN
Gregory Lindsly	Dixie EMC	Baton Rouge, LA
Brian Nelson	Intercounty ECA	Licking, MO
Gene Smith	SGS Witter, Inc.	Lubbock, TX
Terry Rosenthal	Laclede EC	Lebanon, MO
James Stewart	Stewart Engineering, Inc.	Anniston, AL
Tom Suggs	Natchez Trace EPA	Houston, MS

APPENDIX B

NRECA TRANSMISSION & DISTRIBUTION ENGINEERING COMMITTEE

MEMBER	ORGANIZATION	LOCATION
Substation Subcommittee		
Bill Kahanek, Chair	Lower Colorodo River Auth.	Austin, TX
Jim Bardwell	SGS Witter, Inc.	Albuquerque, NM
George Chapman	Patterson & Dewar Engr.	Decatur, GA
Mike Eskandary	RUS	Washington, DC
Jerrod Howard	Central Electric Pwr. Co-op	Columbia, SC
Ken Malone	Middle Tennessee EMC	Murfreesboro, TN
Tom Myers	Berkeley EC	Moncks Corner, SC
Paul Rupard	East Kentucky Power Co-op	Winchester, KY
System Planning Subcommittee		
Kenneth Winder, Chair	Moon Lake Electric	Roosevelt, UT
Mark Evans	Volunteer Electric Co-op	Decatur, TN
Ronnie Frizzell	Arkansas EC Corp.	Little Rock, AR
David Garrison	East Central Oklahoma EC	Okmulgee, OK
Wayne Henson	East Mississippi EPA	Meridian, MS
Troy Little	Four County EPA	Columbus, MS
David Moore	Tri County EC	Azle, TX
David Obenshain	Piedmont EMC	Hillsborough, NC
Michael Smith	Singing River EC	Lucedale, MS
Brian Tomlinson	Conserv Electric	Corinth, TX
Chris Tuttle	RUS	Washington, DC
Fred Twilliger	Central Electric Co-op.	Parker, PA
System Protection Subcommittee		
Chair (Vacant)		
Alan Blackmon	Blue Ridge EC	Pickens, SC
Harvey Bowles	RUS	Washington, DC
Ed Giesler	Tri-County EC	Portland, MI
Ron Gunnell	Randolph EMC	Asheboro, NC
Terry Lee	South Mississippi EPA	Hattiesburg, MS
Ken Murphy	Tallapoosa River EC	LaFayette, AL
Jim Newberg	Missoula EC, Inc.	Missoula, MT
Joe Perry	Patterson & Dewar Engr.	Decatur, GA

APPENDIX B

NRECA TRANSMISSION & DISTRIBUTION ENGINEERING COMMITTEE

MEMBER	ORGANIZATION	LOCATION
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Mike Smith	SGS Witter, Inc.	Albuquerque, NM
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Dominic Ballard	East Kentucky Power Co-op	Winchester, KY
John Burch	Florida Keys EC	Tavernier, FL
Doug Emmons	Hoosier Energy REC, Inc.	Bloomington, IN
Don Heald	RUS	Washington, DC
Robert Johnson	Arkansas EC Corp.	Little Rock, AR
Charles Lukkarila	Great River Energy	Elk River, MN
Charles (Bubba) McCall	Georgia Transmission Corp.	Tucker, GA
Bob Oldham	Southern Maryland EC	Hughesville, MD
Art Smith	Patterson & Dewar Engr.	Decatur, GA
David Turner	Lower Colorado River Auth.	Austin, TX
John Twitty	Alabama EC	Andalusia, AL
Underground Distribution Subcommittee		
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Keith Bartels	Martin & Associates, Inc.	Mitchell, SD
Russ Dantzler	Mid-Carolina EC	Lexington, SC
Berl Davis	Palmetto EC	Hilton Head, SC
Vince Heuser	Nolin RECC	Elizabethtown, KY
Trung Hiu	RUS	Washington, DC
William Murray	Berkeley EC	Moncks Corner, SC
Ace Necaise	Singing River EPA	Lucedale, MS
David Rudolph	Cass County Electric Co-op	Fargo, ND
Blaine Strampe	Federated REA	Jackson, MN
Ed Thomas	Utility Elec. Consultants	Raleigh, NC
Keith Thomason	Middle Tennessee EMC	Murfreesboro, TN