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A Catalogue of

Rural Electric Utility and Small Hydropower Training Programs

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International Programs Division
National Rural Electric Cooperative Association
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INTRODUCTION

Training of management and technical staff is crucial to the effective development of reliable rural electric systems and has a high priority among NRECA's services to its member systems. This catalogue of management and technical training courses is designed to describe in detail the full range of training programs NRECA currently offers to overseas participants through its International Programs Division.

About the Organization

The National Rural Electric Cooperative Association (NRECA) was founded in 1942 to represent, on a national level, the interests of cooperative and other rural electric systems in the United States which were at that time expanding rapidly with the assistance of the federal government. Over the years, NRECA has evolved into a national service organization for the more than 1,000 rural electric systems currently operating in the United States with more than 50,000 employees. These cooperative and other organizations provide electric power to 25 million rural Americans in areas of 46 states covering approximately 75% of the U.S. land mass. NRECA's services include legislative support and representation of member interests at both state and federal government levels, management consulting, management and technical training programs, insurance, public relations, advertising, and research on the environment and on alternative energy systems.

Policy and Operations

More than 950 of NRECA's member systems are cooperatives. Most of these are distribution systems, although 53 are generating and transmission cooperatives. Other NRECA members include rural public power districts, statewide rural electric organizations, and cooperative groups working in the rural electric field. NRECA policy positions are determined through a resolutions process that begins in each member system, proceeds through state and regional meetings, and culminates in an annual nation-wide meeting. Representatives to NRECA's 46-member board of directors —one for each state in which member systems are located—are elected at statewide meetings and certified at regional meetings. They elect the officers of the Association at the annual meeting. Directors are also elected annually. There are more than 300 employees in NRECA's national headquarters in Washington, organized into five departments:

- Management Services
- Government Relations
- Energy and Environmental Policy
- Public and Association Affairs
- Retirement, Safety, and Insurance.

Member Training Programs

Among its many services to members, training of both management and technical personnel ranks as one of NRECA's highest priority functions. In response to member demand, NRECA has established during the past 25 years a regular and comprehensive program of training activities aimed at developing the technical and management skills required for efficient and effective operation of rural electric systems. This series of ongoing activities, which includes institutes, conferences, seminars/workshops, and courses organized and conducted by NRECA's Management Services Department, is widely recognized for its high quality and relevance to the management and operational problems of rural electric systems. More than 12,000 participants are trained in some 60 programs annually.

Annual conferences are organized for senior managers, board directors, and board chairmen on matters of current interest and on general problems of cooperative management. Conferences, workshops, and seminars are also held annually for managers and technical personnel on particular subjects such as data processing, materials management and purchasing, rate design, and engineering and operations. An annual legal seminar is offered to attorneys representing rural electric systems.

The core of NRECA's management development program, however, is the series of 38 2- and 3-day institutes for management personnel, board members, and first-line supervisors that comprises the Basic Management Curriculum. This curriculum, taught by trainers from NRECA's Management Services Department, offers a wide range of short courses on supervisory management, organization and planning, finance and accounting, and board management. Participants who complete specified course requirements are certified by NRECA—a formal measurement of achievement greatly valued by member cooperatives as a career development milestone.

NRECA also offers a Management Internship Program and an Advanced Management Curriculum. The Management Internship Program is a 6-week program for newly appointed, designated, or potential future managers focusing on the basic functions of management. Conducted at the University of Nebraska, it includes lecturers from both NRECA and university faculty specialized in management training. The curriculum of this program is considered the equivalent of 30 semester hours of university training.

The Advanced Management Curriculum focuses primarily on operating situations that require an understanding and utilization of the various functions of management theory (*i.e.* the curriculum explores the application of theory to the practical operation of rural electric systems). Participation in the Advanced Management Curriculum is limited to management personnel with a certificate in either the Basic Management Curriculum, the Management Internship Program, or the equivalent. The program is offered in a regular cycle in cooperation with, and on the campus of, a participating university or other recognized educational instituion.

International Programs Division

In 1961, NRECA established an International Programs Division (IPD) for the purpose of assisting the development of reliable rural electric systems utilizing a decentralized management approach in Third World countries.

By assisting these programs, NRECA sought to contribute to an increase in the standard of living of rural people in such countries. The motivation for these international efforts was straightforward—member systems had established cost effective procedures for building and operating electric

generating and distribution systems and wanted to share this knowledge with others striving to bring electrification to rural people. In pursuit of this goal, IPD has from its inception worked in close partnership with the United States Agency for International Development (USAID). More recently, IPD has provided support to projects financed by the World Bank and other international financial institutions.

Through its IPD, NRECA has undertaken more than 300 technical advisory assignments in 48 countries of Latin America, Asia, and Africa in planning and implementing rural electric and other energy systems, including national electrification programs as well as small decentralized hydropower systems. More than 200 rural electrification specialists, drawn from NRECA's member systems and its own professional consulting staff, have helped to develop nearly 200 rural electric systems in 15 countries overseas directly serving over 15 million rural consumers. IPD's advisory and consulting services include:

- identifying areas for development
- appraising the potential for, and impact of, rural electrification
- completing engineering, financial, and economic feasibility studies
- helping plan the institutional framework for successful projects
- preparing project loan applications.

Although NRECA has a particular orientation toward the cooperative form of energy system rooted in the experience of rural America, it fully recognizes the need for each society to develop organizational forms best suited to its own socio-economic environment. IPD's experience abroad has consequently involved a range of organizational approaches for rural electric systems. Whatever the form, IPD has focused its attention and resources on obtaining the most efficient and effective operation of those systems and has sought to ensure that such systems are put to the broadest and most productive economic, as well as social, uses.

Electricity is important for purposes

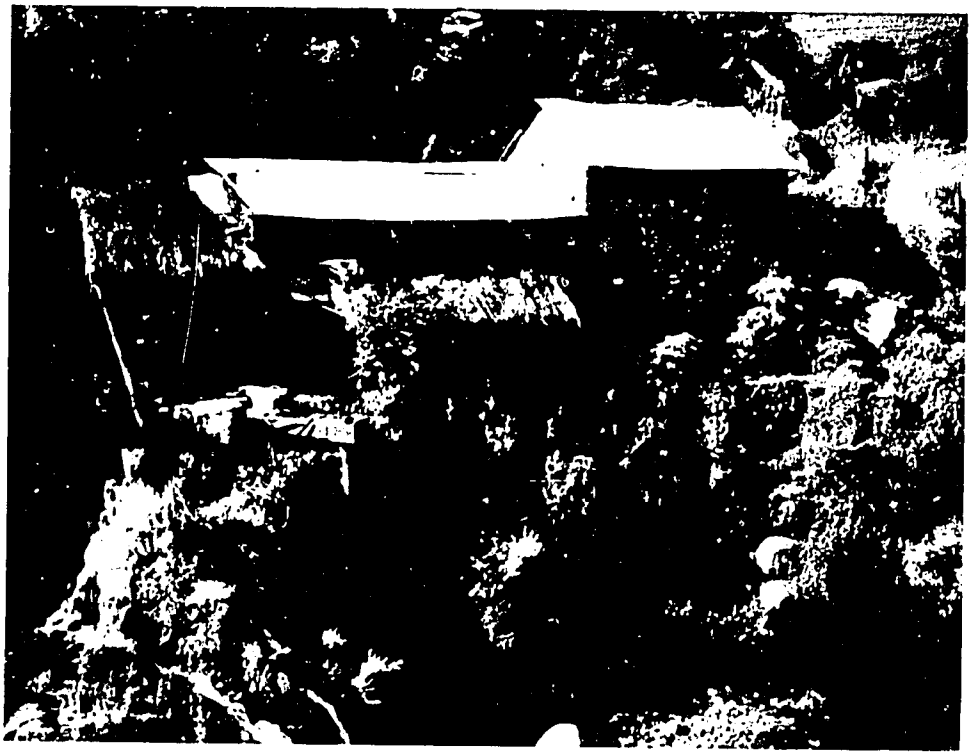
of general convenience, such as lighting rural households, but, in view of the scarcity of developmental investment resources, the primary thrust of electrification efforts must be to enhance productive social and economic uses. Consequently, NRECA programs increasingly target the use of electricity specifically for the development of light industry, agricultural production, processing, and storage, and the provision of essential community services. Through industrial development, NRECA aims to generate employment and raise income levels for the rural poor. Agricultural production, particularly through electric pump irrigation, increases food levels. By making possible home lighting, potable water, health clinics, night education classes, and increased security through street lighting, the organization hopes to raise standards of living directly and measurably.

NRECA recognizes that, to accomplish these policy goals, requires not only an appropriate institutional framework but also knowledgeable policymakers and cadres of well-trained management and technical personnel to support the system. As in the United States, therefore, NRECA has emphasized skills training in its programs for the developing countries.

Education for Development

Skilled manpower in management and in diverse technical areas is a prerequisite to the successful establishment and operation of rural electric, or other energy, systems. A principal element in the formation of such institutions is training—training for the initial design of the institution or system and for its management, operation, and maintenance. Training for institution building is as important as the follow-on training of organization personnel for the operation and maintenance of rural electric schemes. Limited capacity exists in the developing countries, however, to provide such training.

To respond to this need, IPD began to develop, in its earliest stages, a range of training programs both



overseas and in the United States. Training initially consisted of imparting technical and management skills through on-the-job experience provided by NRECA advisors on assignment in a particular country. Later, the IPD began to offer, with USAID support, short in-country management institutes and seminars to train members of boards of directors, managers, and other key personnel. Advisors have also assisted in the development of indigenous training programs. In addition, two distinct types of training activities have been organized by IPD in the United States—annual management courses and periodic observation/study tours. Participation in these programs has been financed by USAID, governments, and other donor agencies.

Annual offerings include a 6-week course, "Operations and Management of Rural Utility Systems," conducted in cooperation with the U.S. Department of Agriculture and the U.S. Rural Electrification Administration. There is also a program of 3 weeks' duration organized in conjunction with the University of Missouri-Rolla which includes two courses—"Management Concepts Applied to Utility Operations" and "System Planning for Electrical Distribution." Observation tours in the United States are oriented toward the benefits gained from "hands-on" practical experience. They typically last approximately 3-8 weeks and can include classroom instruction and on-the-job training with an operating utility. Visits to rural electric programs in other developing countries may also be organized for participants.

During the past 20 years, IPD has arranged, through the programs described, management and technical training in the United States for more than 400 participants from 34 countries. Thousands more have been trained overseas on the job and in periodic workshops, including 400 attendees at three regional workshops IPD has organized recently in Latin America, Asia, and West Africa on small decentralized hydropower. Training capability in this highly specialized area has been developed through the support of an agreement with USAID signed in 1980.

New Initiatives

As the establishment of rural electric and other energy systems in the Third World has proceeded, it has become apparent that further skills development is required to ensure that these systems continue to be operated efficiently and that the energy generated by them be put to the most productive use. NRECA has consequently expanded and developed its educational programs for developing country participants to respond to this need. In addition to the mostly U.S.-based offerings, NRECA now offers comprehensive basic and advanced curricula of management and technical courses that can be organized and conducted either in the United States or overseas and which essentially parallel in content and approach the broad range of courses provided in the United States to member organizations.

Courses are typically 1-5 days in duration for most management and technical courses. A full curriculum of 15 courses is also offered by the recently established Small Decentralized Hydropower (SDH) Program. The 15-course SDH Program curriculum can be given in an integrated 6-week program or in modules of lesser duration. Also, "working" internships for periods up to one year can be arranged. Finally, specialized courses in such subjects as wood preservation of utility poles and wood pole maintenance can be provided on request. All programs offered are listed in this catalogue.

Instructional Staff

Instructors for the courses and programs offered are drawn from the 10 full-time professional trainers employed by NRECA's Management Services Department, the 33 full-time

professional trainers attached to IPD, and IPD's own staff, all of whom are accomplished and experienced professional managers and technicians as well as trainers. Noted professional consultants, members of leading university faculties, and respected operating managers of electric utilities supplement NRECA s own staff of instructors. NRECA's over 1,000 member rural electric systems represent a particulary rich supplemental source of skilled engineers, managers, and planners for preparing course material as well as classroom instruction.

In addition to these many resources, the training program in small decentralized hydropower can draw on NRECA's member systems which currently operate 18 small hydropower plants, with 3 under development, and, ultimately, 100 additional plants proposed for construction. The SDH Program also has access to a worldwide network of hundreds of professional contacts and an available talent bank of more than 200 engineers, many with developing country experience. When necessary, NRECA can provide instructors, with the appropriate language capabilities, to conduct training programs in French and Spanish.

Course Materials and Other Instructional Resources

NRECA possesses a wide range of training materials from its own and IPD's extensive technical libraries and from the wealth of training experience in management and technical areas gained in the last 25 years both in the United States and abroad. Moreover, the SDH Program has already compiled a substantial library of manuals, methodologies, reports, documents, and publications which form the basis for courses offered in this subject area. Many of these publications have been developed specifically as training tools by NRECA and include: methodologies for hydrologic survey, environmental assessment, country-wide survey, and prefeasibility studies; a directory of manufacturers of small hydropower equipment and their equipment lines; a micro-hydropower sourcebook, including case studies on innovative approaches in Pakistan and Nepal; and others.

Location

NRECA anticipates that most of the new courses it offers will be organized and taught in-country. On request, however, courses can also be arranged in the United States. For reasons of cost, U.S.-based programs generally require larger numbers of participants, which in turn translates into multinational course participation. Such progams tend to be organized for more senior managers and technical personnel and address broader, policy-oriented issues. Although U.S.-based training permits the involvement of a greater number of technical resource people and a greater variety of field experiences, it is generally restricted to those who speak English. In-country training tends to be more narrowly technical in orientation and to be aimed at more junior and middle-level personnel.These programs also have the advantage of serving more individuals at less cost in a familiar environment and with more attention to the specific problems of the utilities or systems from which participants are drawn. The choice of location in the final analysis will depend on the needs and circumstances of the country and institution concerned, as determined in consultation with NRECA.

Program Organization

NRECA recognizes that no single course curriculum presented in this catalogue is likely to correspond in every respect to the particular needs of a specific institution. Consequently, NRECA anticipates tailoring training programs of varying length, duration, and program content, in close consultation with interested local institu-

tions, to meet the requirements of each situation.

In general, a program will be organized for a minimum period of one week and a miximum of 6-8 weeks, whether in-country or in the United States. Programs may be organized to address whatever combination of needs an organization seeks to satisfy. Particular disciplinary or technical topics may be emphasized or certain themes or subject areas may be explored from a multi-disciplinary approach. For courses conducted in-country, local organizations will be expected to arrange the necessary classroom facilities, including simultaneous translation, and field site visits, to select and ensure the attendance of qualified participants, and to accommodate the housing requirements of participants from outlying areas.

Methods of Instruction

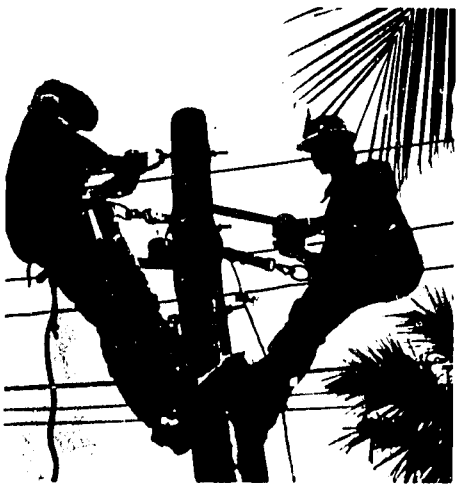
In conducting the courses offered in this catalogue, NRECA utilizes a variety of training methods and techniques. Instructors may incorporate both lecture and question and answer formats, workshop/group exercises, case studies, individual work, programmed instruction, films, audio-visual presentations, game simulation, computer simulations, role playing, etc. to facilitate the learning experience. Field exercises are included wherever possible to ensure the practical relevance of materials being used. Specific teaching methods and techniques are employed as deemed appropriate to each instructional environment to ensure maximum learning.

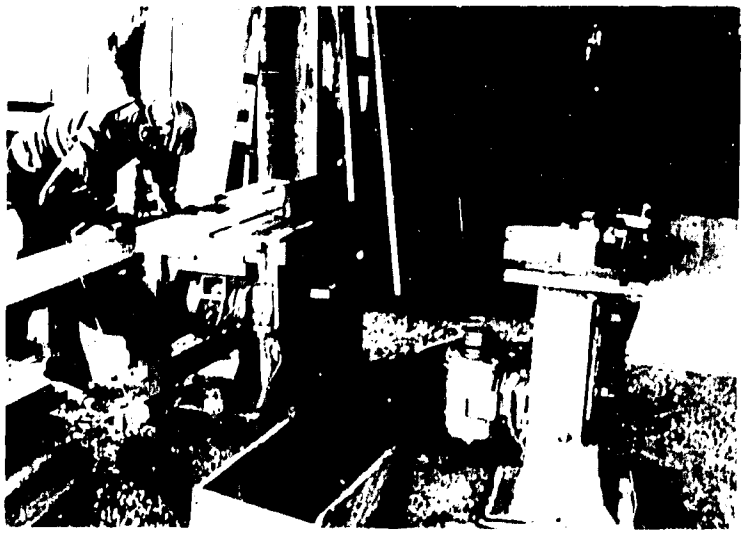
NRECA Certification

The NRECA Management Services Department offers certificates of course completion for all courses. Certification of course completion is considered an important incentive to regular class attendance and participation. It also offers participant sponsors tangible evidence of positive participant motivation and performance.

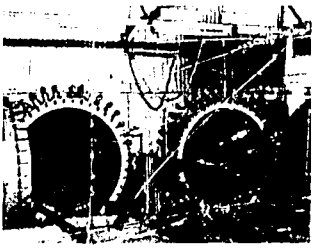
Costs and Funding

The costs of organizing and conducting in-country training programs will vary widely from country to country and will depend on the length of a course, its location, and the number of NRECA resource personnel required. These costs can only be calculated once the essential organizational and programmatic outlines of the program have been set. Formal U.S.-based classroom training programs generally cost approximately $800-$1,200 per student per week depending on the number of students enrolled, exclusive of travel arrangements. Funding is not available through NRECA for this training. Funding should be sought through international donor agencies, government agencies, or wherever possible, through fees charged for participation.





COURSES OF INSTRUCTION—U.S. Based Programs



Most of NRECA's training services described in this catalogue are to be conducted within the developing countries on request and are listed below. Over the years, NRECA has offered a series of more formal training courses each year which are conducted within the United States in cooperation with other training institutions. These courses, lasting 10 days to 6 weeks each, are described below. In addition, NRECA conducts informal observation/study tours on request to expose managers and engineers first-hand to U.S. methods and practices in developing, managing, and operating rural electric systems.

101. Operations and Management of Rural Utility Systems. This course is presented annually in collaboration with the U.S. Department of Agriculture and the U.S. Rural Electrification Administration. It addresses the major issues associated with the operation and management of a rural utility system in the United States and aims to develop skills applicable to rural electric systems development and operation in Third World countries. The course is 6 weeks in duration and is conducted in Washington, D.C. Field observation/study visits to selected rural electric systems comprise a portion of the program.

102. Management Concepts Applied to Utility Operations. This course is part of a one-month training package provided collaboratively by NRECA and the University of Missouri at Rolla. It provides participants with an overview of planning—the first and most basic management function. The course reviews the process of selecting enterprise objectives and departmental goals and programs, and ways of achieving them. The 5-day classroom program is followed by a 5-day program of field training in which participants visit and observe all aspects of both large and small electric utilities in rural and suburban areas. Following field training, participants attend the NRECA annual meeting.

103. System Planning for Electric Distribution. This course is given by the University of Missouri-Rolla following the NRECA annual meeting. It provides engineers/managers with an outline for long-range engineering planning and short-range construction planning. It lasts 10 days and covers the following subjects: strategies for system planning; system design details; computer applications to distribution system design, analysis, and protection/coordination; load management, distribution automation; and a case study of a distribution system plan.

Observation/Study Tours. These tours are organized to provide Third World managers of rural electric systems with the opportunity to examine comparative operational modes and techniques employed in organizing and managing rural electric cooperatives and systems including small hydropower systems, in the United States. Formal classroom instruction and on-the-job training with an operating utility can be included as needed. Visits to rural electric programs in other developing countries can also be organized for participants in conjunction with the visit to the United States.

COURSES OF INSTRUCTION—Overseas Programs

Basic Management Curriculum

The Basic Management Curriculum offers participants an introduction to, and fundamental understanding of, the full range of planning, management, and operational functions and responsibilities assumed by the rural electric utility. Subjects included are grouped under the following general headings: Management, Accounting, Engineering, Construction, Technical, and Operations and Maintenance. Courses generally last 3-5 days each.

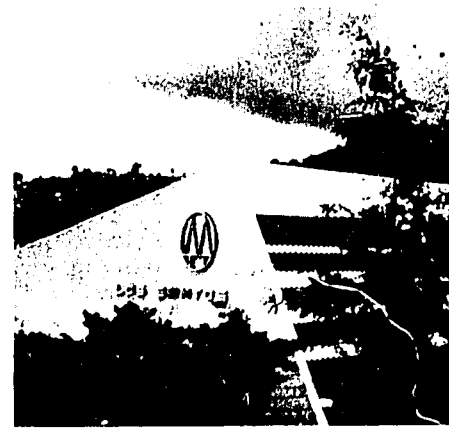
I. MANAGEMENT

The management courses are for personnel at top-level positions in the organization such as managers, department heads, and intermediate supervisors. The courses are designed to provide a fundamental understanding of management theory and practice. A wide range of basic management issues is discussed as are current trends in management science. Course material is built around case studies adapted to local conditions and customs, as appropriate. All basic management courses offered are conducted over a 5-day classroom period.

111. Orientation for New Managers. This course gives new managers the basic training needed for managing an electric utility. It covers such subjects as electric utility organization, structure, and function; financial management; role of policy and management; and management and leadership skills required of the manager.

112. Management—Its Nature and Scope. An introduction to modern management concepts and practices, this course is designed to acquaint the participant with the basic functions of management, planning, organization, directing, and controlling. Participants have the opportunity to improve their management skills through both group and individual exercises. The course utilizes case studies adapted to local culture and customs.

113. Principles of Organization. The purpose of this course is to help the electric utility manager and key employees develop an in-depth understanding of the basic principles of organization. The participant is introduced to organization policy, structure, planning, staffing, position descriptions, and wage and salary programs as functions of organization planning and staffing.



114. Planning and Organizing for Electric Operations. This course is designed to help the electric utility manager and key employees improve their skills in the planning and organizing functions of their jobs. The participant learns the importance of planning, planning work programs, using objectives as an organizational tool, delegation and authority relationships, and staffing and maintaining the organizational plan.

115. Interpretation of Financial and Statistical Reports. This course helps managers and key employees to understand utility financial and statistical reports. It covers many of the accounting procedures that are used to make up these reports. The participant learns how to interpret data and then use it to improve utility operations, financial planning, and control.

116. Member (Customer) Services. Customer services is an important, although often one of the least appreciated, functions of an electric utility. This course takes the participant through the steps of planning, organizing, and conducting an effective member (cutsomer) service program. Emphasis is given to conducting customer meetings, developing effective information programs, customer sign-up, customer contacts, and developing an effective productive uses program.

117. Human Relations Skills. Participants in this course gain insight into human behavior that will help them develop the communication and human interaction skills needed to work with associates, superiors, subordinates, officials, and customers of the organization.

118. Effective Learning. This course is intended to "sharpen" a manager's training skills. It covers such subjects as the nature of learning, psychology of learning theory, instructional methods, and preparing course curricula and materials. Participants are introduced to techniques that will assist them in improving their teaching skills.

II. ACCOUNTING

Accounting courses are designed for personnel at the department level and for key accounting employees. Because of their complexity, these courses are taught over periods of time, to be determined by a consultant in consultation with the participating institution, depending on the level of accounting skills of the participants and conditions within the elelctric utility. Course material is modified to meet local customs and conditions, as appropriate. The Uniform System of Accounts course is the most complex and requires the most classroom time. Since all other courses in the series depend on the knowledge gained in this course, it is recommended that this course be the first taught and that all employees involved in the subsequent training in utility accounting should participate. The Uniform System of Accounts course is presented in a series of 5-day periods; all other courses are offered in a 3-5-day basis, as appropriate.

311. Uniform System of Accounts. The Uniform System of Accounts is recognized throughout most of the world as the best accounting system available to electric utilities. This curriculum consequently comprises the basic and most important elements in training utility accounting personnel. It is designed to give the participant a comprehensive overview and understanding of electric utility accounting. All subsequent accounting courses listed are related to procedures in the Uniform System of Accounts.

312. Accounting Procedures. Participants in this course learn the procedures used by electric utilities to obtain the flow of data needed in the Uniform System of Accounts. The

course covers such topics as payroll, billing, accounts receivable, cash receipts, accounts payable, cash disbursements, work orders, and journal vouchers.

313. Continuing Property Records. This course gives the participant guidelines and procedures for establishing and maintaining a property record system as required in the Uniform System of Accounts. This system provides the electric utility with current information concerning the location, description, number of units, and cost of property composing the electric plant.

314. Audit Procedures. Auditing of electric utility accounting records is important for control purposes. This course gives the participant the standard procedure recommended by the Uniform System of Accounts used in auditing electric utilities. Although the basic course is designed for those assigned to audit electric utilities, it can also benefit utility accountants.

315. Accounts Receivable. This course is designed to help electric utility accounting departments establish accounts receivable procedures and controls as recommended in the Uniform System of Accounts.

316. Work Order Inventories. In this course, participants learn work order procedures as prescribed in the Uniform System of Accounts. The course covers such topics as the use of work order numbers, work order log book, material requisitions, material charge and credit tickets, staking sheets, and other work order control and accounting procedures.

III. ENGINEERING

Engineering courses are designed for engineering department heads and key engineering personnel. The length of the course and the course materials used depend on the level of skills as determined in consultation with the client. Course material is adapted to the engineering practices of the participating institution, as appropriate.

411. Engineering Design and Staking. To a large degree, the success of an electric distribution system depends on proper design and construction at the lowest possible cost consistent with projected loads and good electric service. This course is designed to give the participant the opportunity to learn theory of system design as well as practical design, construction units, materials, and staking procedures.

412. Secondary (Low-Tension) Design. This course deals with both the theory and practical side of secondary distribution design. It covers subjects such as transformer loading, grounding, materials and conductors, service drops, and meter entrances.

413. Construction Supervision. An electric system must maintain control over construction by using trained supervisory personnel. This course provides practical training for construction supervisors including design and specifications, materials, interpretation of staking sheets, construction techniques, and inspection procedures.

414. Construction Close-Out. This is a course for the utility engineering staff on a standard procedure used to ensure that the entire requirements of a distribution and transmission construction contract have been fulfilled. It covers all the paperwork on construction close-out including such items as certificate of inspection, construction inventory, final detail staking sheets, tabulation of staking sheets, inventory of work orders, and more. For electric utilities involved in substantial construction, this course helps to ensure that high construction standards are met and proper accounting controls are maintained.

IV. CONSTRUCTION

Construction courses are designed to meet the needs of personnel at various levels within the construction department. Course materials and length of instruction depend on the level of skills of the participants and are adjusted to utility practice and customs in consultation with the participating institution.

511. Contractor Principles Orientation. In many countries, it is difficult to find contractors qualified to construct an electric distribution system. Consequently, when contractors are used, they must be properly trained to construct an electric distribution or transmission system. This orientation course for contractors begins with very basic information on bidding, estimating, materials and conductors, unit design, tree clearance, construction methods, and more. Contractors taking this course acquire enough knowledge to carry out construction activities competently under proper supervision.

512. Construction Supervision. This comprehensive course on construction supervision deals with such subjects as conformance to construction standards, field construction procedures, care and security of material, work quality control, and meeting the requirements of the contract. This is an important course for any electric utility which wants to set and maintain construction standards and ensure quality control of construction.

513. Stores Control (Material Management). Material and supplies handled by the warehouse represent a large investment. Consequently, it is important that adequate procedures be adopted to maintain controls over the materials that enter and leave the warehouse. This course addresses the subject by teaching participants the procedures recommended in the Uniform System of Accounts for stores control including the use of recommended forms, warehousing methods, and inventorying.

514. Foreman Training (Construction Only). This course is aimed at training

linemen to be effective foremen in the construction program. It reviews the traditional supervisory skills of planning, organizing, controlling, and directing, and also addresses the human element of work and supervision. Technical aspects of construction, such as interpreting staking sheets and familiarization with construction units, are covered as well.

515. Lineman Training (Construction Only). This course addresses the needs of the construction lineman who deals only in construction and is not involved in operations or maintenance. It is geared strictly to training in all aspects of construction and is a hands-on course offering the lineman actual field experience with poles, materials, and construction methods. Participants learn about staking sheets, construction units, and tree-clearing practices.

V. TECHNICAL

These courses are designed to improve technical skills of utility personnel. The lineman training course is the most complex and longest course offered in this category and involves several levels of classroom work, home study, and field experience over a 4-year program. The course material and length of instruction of lineman training and other courses offered are adapted to meet the level of skills, culture, and customs of the participants, as appropriate, in consultation with the participating institution.

611. Village Electrician Wiring (Basic Wiring). To a large degree, the success of an electric system in a developing country depends on the training of village electricians. Since this responsibility falls generally on the electric system, this course is designed for the personnel who will be training these electricians. It covers subjects such as electrical terms, basic mathematics for electricians, understanding electrical circuits, wiring materials, wiring skills and practices, grounding, fusing, and service entrances.

612. Lineman Training (4-Year Course). The quality of electric service and operation of the distribution system depend on adequate training of the electric system linemen. This course is offered in stages, based on the lineman's development, over a 4-year period, and is the same as that used by electric utilities in the United States and many other countries throughout the world. It is designed to give the participant knowledge of the fundamentals of electricity, line construction, operation and maintenance, and safe working practices.

613. Meter Test and Repair. The electric meter is the cash register of an electric utility and requires expertise to install, test, and repair. This course offers the participant the opportunity to learn metering mathematics, metering practices, instrument metering, and test and repair procedures.

614. Advanced Inside Wiring. The purpose of this course is to increase the level of skill of those people involved in electrician training or in installing residential and commercial electrical wiring.

VI. OPERATIONS AND MAINTENANCE

Operations and maintenance courses are designed for department heads and key employees involved in the particular subject matter of each course. The course material is built around case studies adapted to local customs and practices, where appropriate. Length of instruction and the course materials are adjusted to the level of skills of the participant. Generally, 5 days of instruction is sufficient for each course.

711. Procurement Procedures. Because electric utilities spend a substantial amount of their money on materials, supplies, and equipment, it is vitally important that proper procurement

procedures be established. In this course, the participant learns how to develop procurement policies and procedures to establish necessary records and effective controls.

712. Materials Management. This course, designed for the department level supervisor, presents an overview of all aspects of materials management. It included procedures for procurement, shipping, receiving, warehousing, issuing of material, and methods of accounting and control.

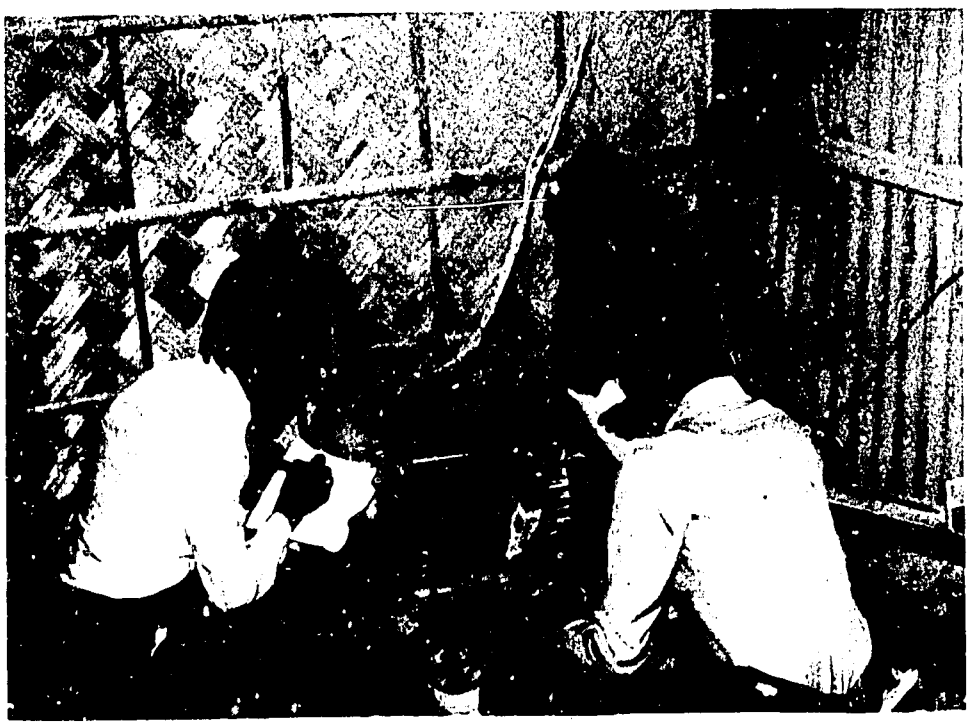
713. Stores Control. Materials used in construction and operation of electric systems represent a very large investment. It is, therefore, vital that adequate procedures be established and records kept to permit the maintenance of proper control. In this course, the participant is exposed to the stores control procedures recommended in the Uniform System of Accounts and gains practical experience using the information and forms that are used on the job.

714. Distribution System—Operations and Maintenance. The proper operation and maintenance of an electric distribution system will provide high quality electric service to customers at less cost of operating and maintaining the system over a period of years. This course is designed to train the participant in the latest methods of utility operations, including such subjects as sectionalizing, transformer loading, pole treatment, tree clearing, and line sagging. Since operations and maintenance are often given too little emphasis, this course reemphasizes both and demonstrates the value of a comprehensive O&M plan.

715. Substation Operation. Substation operation is highly technical and requires specialized skills. Linemen are often poorly trained in this area of electric transmission and distribution. This course provides participants with the theory and practice of proper substation operation and safety. It also gives the participant a chance to

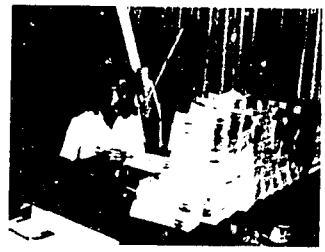
learn about different substation configurations, design, and equipment, as well as the operation of unmanned substations.

716. Transformer and Oil-Circuit Reclosure Maintenance. Many electric systems either fail to maintain their own transformers and oil circuit breakers at all or maintain them poorly. This course is designed to give the participant hands-on experience in actually performing maintenance on this equipment.



Advanced Management Curriculum

The Advanced Management Curriculum is for those who have taken the NRECA Basic Management Curriculum or have completed similar basic training courses in preparation for advanced training. NRECA, in consultation with the participating institution, will review previous training and determine which advanced courses are appropriate.



I. MANAGEMENT

Advanced management courses are for personnel at the top level in the organization such as managers, department heads, and intermediate supervisors. The curriculum is developed around current trends in management theory and practice. Wherever appropriate, instruction will utilize case studies reflecting local customs and culture. The advanced management courses are taught over a 5-day classroom period.

121. Managing in a Changing Organization. This course is the foundation of the entire advanced management curriculum. It provides an overview of the modern fundamentals of electric utility management, stressing the application of modern management theory and offering a productive philosophy of management. Key topics include contingency leadership, value systems, and time management.

122. Career Awareness. Developing effective employees in an organization involves concentrating on behavior and skills of individuals, especially those of managers. This course introduces the importance of career development for individuals as well as for organizations. It is designed to heighten self-awareness and interpersonal skills. Key topics include the management of change, the impact of life styles on the workplace, "career" vs. "job," and the concept of the helping relationship.

123. Organizational Planning. This course takes a comprehensive look at all elements of the planning process. It provides participants with the opportunity to explore the theoretical aspects of planning as well as experience the planning process through simulation and problem-solving exercises. Key topics include the planning process in an electric utility organization, strategy planning, the decision-making process, contingency management, and creative problem solving.

124. Understanding Accounting—Use of Accounting Data in Utility Management. This program is for electric utility management personnel who lack formal training in accounting principles and practices. The participant learns about the nature of financial statements, such as the balance sheet, earnings and operations statements, and cash fund and cash flow statements. Key topics include financial statements, information systems, and statements analysis techniques.

125. Managerial Accounting—Use of Financial Data for Planning and Control. This course is designed to introduce the basic concepts and principles of managerial accounting. It aims to develop understanding of the techniques and practices which are necessary to operate a business effectively. Accounting practices are identified which are especially applicable to the management of electric systems. Key topics include the annual budget,

budget plan, cash planning and management, and capital budgeting.

126. Financial Planning—Cash Management Workshop. This course examines a wide variety of financial subjects including forecasting, sources of revenue, and return on available cash. Participants leave the program with a working knowledge of how to develop financial objectives for the utility and how to bring them to fruition. Key topics include the financial profile, margin policies, methods of forecasting, and cash management.

127. Organizational Dynamics. This course addresses the need for division of labor and organization of both human and non-human resources. It also discusses the dynamics of organizational behavior. Key topics include the diagnosis of organizational problems, team building, conflict resolution, and changing organizational behavior.

128. Organizational Evaluation. In this course, participants learn how to evaluate objectively the rural electric system's performance and how to apply that information to improve the system. Information, feedback, evaluation, and control are discussed. Key topics include standards of performance, organizational evaluation and control, financial control and statistical analysis, and management information systems.

129. Human Resources Management. This course explores the idea that an electric utility, as a business organization, is a social system which requires considerable commitment to the organization's objectives and goals and effective management of its human resources as the means of accomplishing those goals and objectives. Key topics covered in this course include the quality of work life, management development and training, and the economics of human resources management.

II. FIRST-LINE SUPERVISORS

First-line supervisor training courses are designed for people who are responsible for directing the performance of one or more workers to accomplish organizational goals. Issues pertinent to supervisors, such as planning, organizing controlling, communications, instructing, disciplining, leading, decision-making, problem solving, delegating, coordinating, and evaluating, are all highlighted in these courses. Wherever appropriate, case studies using local situations, customs, and culture are used in the instruction. Generally, the length of each course is 5 days of classroom instruction.

221. Supervisory Management. This course is an introduction to NRECA's supervisory/first-line management training series. It provides an overview of traditional supervisory skills of planning, organizing, controlling, and directing prescribed within the contex of the human element of work and supervision. Key topics include the supervisory management process, the supervisor as a leader, and recognizing change as an opportunity.

222. Planning and Organizing for Supervisors. This course is designed to equip supervisors with an understanding of the planning process as well as to increase their ability to implement this knowledge. The planning skills learned in this course are to be used on the job to achieve successful results. Key topics include the planning process, contingency management, and organizing work.

223. Controlling Work Activities. The control function of the supervisory management process primarily guides the supervisor and the work unit to the stated goals and standards of the organization. This course highlights the interrelationships between planning and controlling. Topics include key performance areas, standards and controls, and checking progress.

224. The Human Side of Supervision. This course concentrates on the complexity of human nature as it relates to the workplace. The course stresses the need for supervisors to be aware that the quality of human relations affects the effectiveness of their supervision. Key topics include the rewards of rewarding, the correct way of correcting, and leadership styles.

225. The Communication Process. Because communication is the basic element of any transaction, the quality of communication should be a primary concern for supervisors. This course highlights the communication process and provides opportunities for participants to test and improve their own communication skills. Key topics include the communicating process, nonverbal communication, and the "ups" and "downs" of communication.

III. ACCOUNTING

The advanced accounting courses are for department heads and key management personnel. The course material presented is based on the Uniform System of Accounts. However, instruction can be adjusted as appropriate to the utility's accounting system and practices. Each of these courses is taught over a 5-day period.

321. Cash Management. Cash management is an often neglected, but important, aspect of electric utility management. This course gives the participant a working knowledge of the techniques used by money managers in forecasting their cash-flow requirements and obtaining a return on available cash.

322. Financial Planning—Role of the Accountant. An important element of the accountant's responsibility is financial planning. This course is designed to give the electric utility accountant a working knowledge of how to forecast financial requirements, develop financial objectives, and implement a financial planning program.

IV. ENGINEERING

Engineering courses are for engineers at the department-head level and for key engineering personnel. The course

material is based on current techniques in system planning, operations, and retail rate design. The lecturer, wherever appropriate, uses case studies based on local engineering practice and customs. The length of instruction is generally 5 days, depending on the level of skills of the participants.

421. Planning—Feasibility Studies. Feasibility studies are the basis of management decision-making regarding the construction or extension of electric distribution systems. This course introduces the participant to the methodology and economics of undertaking and analyzing feasibility studies. Included are topics such as engineering design and analysis, energy/load forecasting, and operating revenue estimates.

422. Operations—Outage Reports, Sectionalizing, and System Controls. The goal of any electric system should be to provide the best possible electric service to its consumers. This course demonstrates the latest operating techniques and procedures regarding outage reporting, right-of-way clearance, current and voltage measurement, distribution equipment operations and maintenance records, service instructions, and sectionalizing.

423. Retail Rate Workshop. Today, with generating and operating expenses increasing rapidly, the principles of designing retail rates that adequately and fairly recover revenue from various classes of consumers are more important than ever. This course gives the participant practical experience in developing retail rates as well as the theory and philosophy of rate making. Some topics included are capital costs, cost of service, rate design, and rate research.

V. CONSTRUCTION

The course offered under the construction category is designed for department heads and other key personnel in electric utilities with responsibility for the administration of construction contracts. This course lasts 5 days.

521. Contract Administration. To ensure that a contractor fully carries out the obligations of the contract, managers and key employees must understand contract administration. This course aims to provide such understanding. Some of the topics included in the course are bidders' qualifications, engineering services, subcontracts, payments to contractors, equipment subcontracts, materials, and close-out procedure.

VI. OPERATIONS

Operation courses are for department heads and key personnel in various departments of the utility. The subject matter includes the latest information and techniques that have been gained by NRECA consultants working overseas. The curriculum and the length of the course are adjusted to local customs and culture and to meet the existing conditions within the utility, in consultation with the participating institution.

721. Member (Customer) Services. An energetic and creative Member (Customer) Relations Program demonstrates its worth over the years through harmonious customer/utility relations. This course provides the participant with new ideas for establishing and implementing a successful Customer Relations Program and includes subjects such as communicating with customers, handling complaints and customer contacts, improving customer (member) meetings, signing up customers, and member and productive uses programs.

722. Productive Uses. Most electric utilities are concerned with the standard of living of their customers and the economic development of their service areas. The productive use of electricity to improve the economic conditions of people should be an important goal—one that not only benefits the customers, but helps to ensure the financial viability of an electric utility through increased kWh sales. This course addresses methods of establishing a successful productive uses program and includes such topics as program planning and policies, personnel requirements, coordinating with other agencies, establishing an information/resource base, identifying potential productive uses, technical assistance, and credit programs.

723. Load Management. Many electric systems have load factor and peak demand problems caused by seasonal conditions or the types of loads served. This course explores ways that have proved successful by other electric systems in managing loads and improving system load factor. Topics discussed include system load analysis, identifying peak loads, improving load factor, and recent load-management equipment technology and application.

724. Safety. All electric systems should be concerned with the protection of their emeployees and the public. Operating an electric distribution system is a hazardous business unless employees are well trained in safe operating procedures. This course demonstrates ways for an electric utility to establish or improve its safety program. The participant is introduced to such subjects as available written safety material, accepted safe operating procedures, accident reporting, format and content of safety meetings, pole line rescue, hot-line safety procedures, employee safety awareness, and developing a first aid training program.

Small Hydropower Curriculum

The curriculum of courses in small hydropower provides participants with an introduction to a wide range of technical, economic, and managerial aspects of small hydropower development. The technology of small hydropower plants has been well-developed for many years, but recent technological developments have enhanced the ability of developing countries to implement cost-effective small hydropower systems. These include techniques to manufacture equipment domestically using locally available materials and semi-skilled labor. This curriculum is designed for engineers, planners, and technicians in developing countries. Courses typically last 5 days each.

801. Introduction to Site Assessment. This course focuses on techniques used in conducting an appropriate site assessment, from the initial survey phase through the feasibility stage, including: what kinds of data are essential to conducting an investigation; how to organize a data search of existing hydrologic, cost, and demographic data, maps, and other materials and sources of pertinent information; techniques to estimate data if there are no readily available sources at hand; how to conduct a preliminary selection of sites; how to assess the environmental and socio-cultural impacts; and other considerations, such as minimum needs vs. maximization of flow, problems of access to site, proximity to grid, and potential uses and load growth, which the site assessment should focus on. The course provides the participant with a basic understanding of requirements for, and value and application of, carefully planned and conducted site assessments.

802. Hydrologic Analysis. This course covers the hydrologic cycle and its application to decentralized hydropower development, including: precipitation; runoff analysis; water quality; streamguaging techniques, with and without instruments; data collection and data requirements; flow duration curves—what they are, how they are developed, and how they are applied; techniques to synthesize flow duration curves from limited streamflow records, precipitation data, and watershed characteristics; and the importance of minimum, peak, and mean flows. This course provides participants with a basic understanding of the components of, and need for, adequate hydrologic analysis.

803. Energy and Power Computations. This course presents an overview of the relationships at a hydropower site of potential power, energy, and load demand. It includes: methods to measure gross head, with and without instruments; relationships between total and net head; methods to develop and apply headwater and tailwater curves; how to compute available power and energy based on available head and flow; and how to estimate power use based on load duration curves. Participants obtain a basic understanding of how to measure head, compute capacity, and estimate plant factors.

804. Turbine Selection. This course describes turbine types, performance,

and selection. It includes: a description of turbine classification (the range of turbines available), applications (appropriateness of each for sites), and performance characteristics and efficiencies (head and flow needed for optimal operation); description of turbines and packages available from U.S. manufacturers and appropriate applications; description of cavitation, problems caused by it, and methods of determining turbine setting to avoid it; discussion of model testing and applications; and operation and maintenance of turbines. The course acquaints the participant with the kinds of turbines available, efficiency range of each type, appropriate site applications, and the various sources of U.S. manufactured equipment.

805. Manufacture and Fabrication of Turbines. This course outlines the elements needed for manufacture and fabrication of turbines, including: the kinds and level of skills needed for designing, fabricating, casting, foundry work; the typical problems associated with each (problems with designs, metals, quality control); the kinds of materials required and where they can be obtained; the steps involved in fabrication/manufacture/casting; when a region should consider local fabrication; and the workshop equipment needed and the support services required. Participants learn the basic elements of fabrication/manufacture/casting of turbines.

806. Electro-Mechanical Equipment. This course offers an overview of the components of electro-mechanical equipment for a small hydropower plant and the function of each. It focuses on: generators; electronic governors and load controllers; switchgears; transformers; description of problems of interconnections; and operation and maintenance of electro-mechanical equipment. The course enables participants to select and specify appropriate electro-mechanical equipment.

807. Electrical Distribution Planning. This course provides an overview of system planning for electrical distribution systems. It includes strategies for system planning including long- and short-range forecasting methods, planning methods and techniques, and system design details including system protection, system performance evaluation, underground and overhead systems, and equipment protection. Participants are given a framework for long-term engineering planning and short-range construction planning for electrical distribution.

808. Preparing and Evaluating Bid Specifications for Turbogenerating Equipment. This is a "how-to" course in preparing bid specifications ("specs") for turbogenerating equipment for decentralized hydropower plants. It focuses on common mistakes in developing specs and how to avoid them, examining case studies and actual examples of bid specs for decentralized hydropower plants in the United States and in developing countries. The course equips the participant to analyze bid specifications—an essential capability since the cost of turbogenerating equipment is a major contributor to the overall cost of a decentralized hydropower plant.

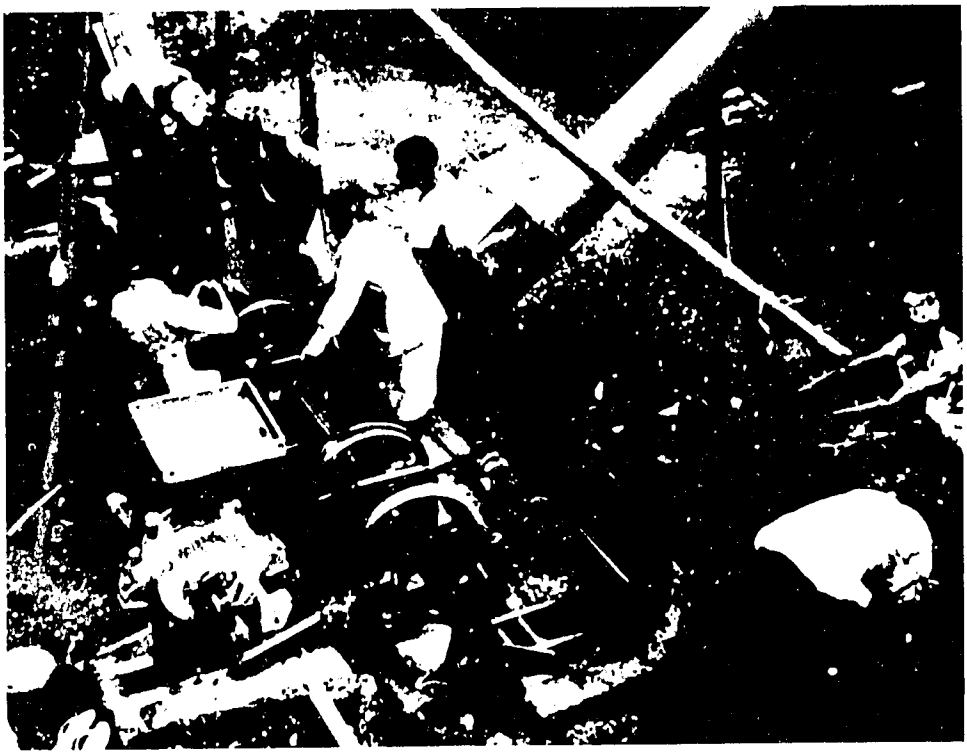
809. Civil Works Designs and Considerations. This course focuses on the components of various civil works designs and the appropriateness of each for particular sites. It includes: an overview of civil works designs with impoundments vs. run-of-the-river schemes and examples of appropriate characteristics of each; description of civil works components including dam, weir, intake structure, forebay, headrace/power canal, trashracks, penstock, powerhouse, and tailrace; description of basic layouts and appropriate and inappropriate application for each; and description of alternative, less-costly (*i.e.* locally available) construction materials and under what conditions they should be

considered (*i.e.* PVC pipe, gabion structure). Participants gain a working knowledge of the components of the civil works required for decentralized hydropower plants, along with alternatives to expensive building materials and overdesigned plants and their appropriate application.

810. Cost Analysis. This course reviews alternative costing methodologies for decentralized hydropower plants including: costs for planning, feasibility, and design; civil components; turbogenerating and accessory equipment; switchgear and electrical distribution equipment; operation and maintenance; and other factors influencing project costs. The course exposes participants to costing techniques most appropriate to developing country conditions.

811. Demand Forecasting and End-Use Planning. This course reviews methods of assessing present and future demand for power and examines various considerations for developing mechanical and electrical power uses of decentralized rural hydro plants. It focuses on: institutional requirements to promote load growth and development; base-load and load-leveling application that yield "productive" or income-generating benefits; and potential uses for agricultural production and processing, light industrial, and commerical uses, household and community service uses, and special applications, with specific examples in each category and their respective power requirement ranges. The course is specifically designed to expose participants to typical power needs and end-use options for rural communities in the Third World.

812. Financial Analysis. This course unit provides instruction in conducting financial analyses of decentralized hydro projects and exposes participants to various forms and sources of financial packages for projects and the criteria that are typical for each. Financing is a key element in planning decentralized hydro projects, both in



terms of developing a realistic financial plan and in identifying financial sources, and may be arranged in a number of ways, depending on project circumstances. Participants are shown how to conduct a basic financial analysis for a project, and given a range of different financing approaches and the type of funding criteria of various financial institutions that may become involved, including multilateral banks, the United Nations, national development banks, and private financial institutions.

813. Socio-Economic Analysis. This course reviews the fundmental elements of an economic analysis of a project, including: a methodology for data collection and analysis; levels of economic analysis (prefeasibility/feasibility); alternative computations for assessing net project return (IRR calculations, benefit/cost calculations, net present worth, shadow pricing); and external costs and benefits and how to include such factors in the overall economic analysis. Socio-economic analysis of projects is an essential step in selecting and ranking sites for investment decisions. Participants review standard procedures for conducting economic analysis, and are exposed to analytic methodologies that provide a broad scope of economic assessment of a project's overall net value.

814. Introduction to Administrative Planning and Implementation. This course provides an overview of the fundamentals of planning decentralized hydropower programs and projects, and reviews the basic steps for preparing and executing projects during feasibility, design, construction, and project management stages. It looks at: how to establish an organizational framework for planning and executing programs and projects; how to formulate a statement of goals and purposes for the organization; policy formulation and procedures (implementation frameworks and schedules); resource identification and utilization (personnel and material); budgeting (short- and long-term financial planning, cash management); the proper procedures for data collection and analysis; program/project evaluation based on stated goals, purposes, and outputs; and how decentralized hydropower integrates with an overall national or regional energy development program. This course unit is designed to familiarize participants with the basic components of the planning process and its stages and how plans should be designed and implemented.

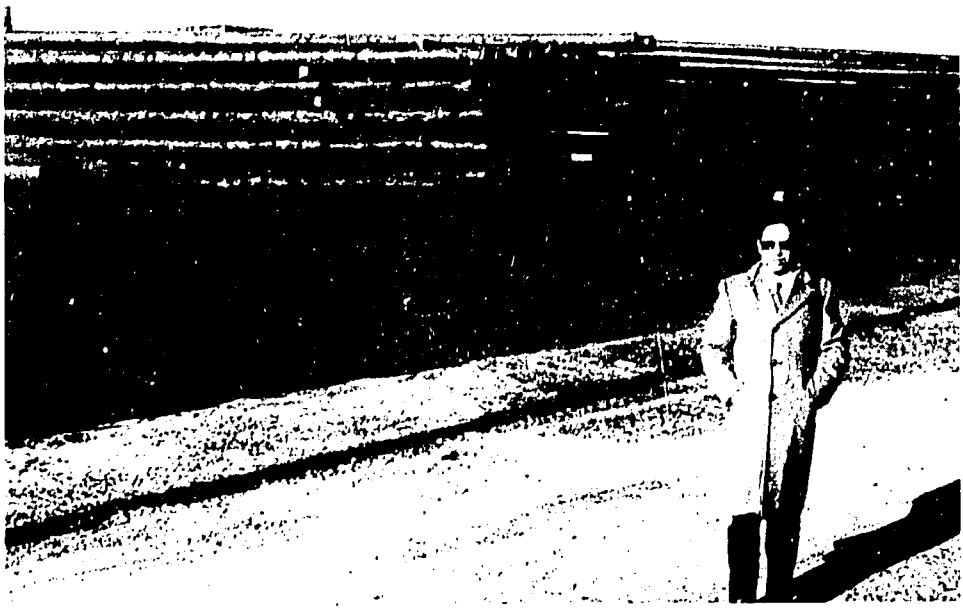
815. Organizational Development and Management Considerations. This course provides an in-depth look at various organizational structures, institutional frameworks, and management problem areas. If focuses on: descriptions of organizational structures (centralized vs. decentralized) and case studies showing possible national, regional, and local options for institutional development; analysis of leadership models and supervisors' roles and responsibilities including when and how to delegate responsibility; and negotiating within the organization, with outside contractors (*i.e.* engineering firms—local and international), and with other agencies involved. Effective administrative planning relies on the creation of an appropriate institutional framework. This course permits the participant to view the current management scheme in which he operates from a new perspective and to consider alternative options for developing institutional infrastructure needed in the planning and execution of decentralized hydropower projects.

Specialized Training Courses

In addition to basic and advanced courses on rural electrification, NRECA recognizes the need to include course topics in specialized fields such as wood-pole selection and treatment. Listed below are specialized training courses which are being offered during the current calendar year.

901. Wood Preservation of Utility Poles. This course is given in two phases. The first phase gives management and staff level personnel a basic knowledge of the principles of selecting and preserving wood poles. The second phase is an in-depth study of the subject. Topics covered include: basic selection of wood species; calculating pole sizes; seasoning of wood; manufacture and treatment; quality control and pole inspection; and on-the-job training. The second phase includes classroom and field sessions wherever possible. The first phase is a 2-day course and the second phase lasts 8 days.

902. Wood-Pole Maintenance. This is a 6-week course which is designed to acquaint electric utility managers and key personnel with the principles of wood-pole maintenance and pole management to increase the service of wood poles in the electric utility plant. The subject matter addresses wood-pole inspection, statistical methods of projecting the life expectancy of wood poles, and the economics of wood-pole maintenance. This is basically an on-the-job training program with field and classroom training including the latest techniques and instrumentation, compiling field records, and how data can be computerized.



INSTRUCTIONAL STAFF

The following instructors are drawn from the ranks of highly experienced and distinguished professionals currently operating in the field of rural electric and other energy systems, particularly small hydropower, and are representative of the specialists available to NRECA to serve as instructors for the training programs listed in this catalogue.

Daniel Babcock is Professor of Engineering Management and Chairman, Graduate Program Committee, at the University of Missouri-Rolla. He has consulted with a wide variety of industrial and governmental organizations, including Rockwell International, Dow-Corning, and the Air Force Business Research Management Center. Dr. Babcock holds a Ph.D. from the University of California, Los Angeles.

John Bogert is the Project Coordinator and Senior Engineer for James Hansen & Associates in Springfield, Vermont, a hydroelectric consulting firm. He has experience in all phases of small hydropower development, including hydrologic investigations, engineering layout and design, and economic analysis. Mr. Bogert received his B.S. in engineering from Princeton University, his M.S. in educational administration from New York University, and his M.S. in electric power engineering from Rensselaer Polytechnic Institute.

Samuel Bunker, Division Administrator, is responsible for the overall management of NRECA's IPD. Mr. Bunker has had over 20 years of management and policy-level experience in development assistance programs, including 15 years with Ford Foundation (the overseas portions of which included 3 years in Egypt; 1 year in Lebanon; and 6 years in India). These programs have encompassed project activities in agriculture and natural resource management, development planning, public management, environmental research, and rural energy development. Having earned his B.A. in international relations from Yale, Mr. Bunker received his M.A. from Harvard's John F. Kennedy School.

Paul Clark, Training and Information Specialist with NRECA's Small Decentralized Hydropower Program, is responsible for the collection and dissemination of information about the Program and the technology, assisting in developing appropriate training programs, and for developing economic analysis of small hydro development. Mr. Clark received his B.A. from Colorado College and his M.A. in economic development/Middle East studies from The American University.

Philip Costas, Assistant Administrator for Economic Analysis, has more than 15 years of consulting and international experience. He serves as primary rural electrification planning specialist, financial analyst, and economist for NRECA's IPD. Mr. Costas has his M.B.A. and has undertaken other advanced studies from Indiana University.

James Cudney, Assistant Administrator for Development for NRECA's IPD, has had 30 years of overseas development experience, having lived and worked in Asia for 14 years. He currently has responsibility for

developing new programs on a worldwide basis. He has his B.S. in electrical engineering from Northwestern University and his M.A. in economics from the University of Maryland. Mr. Cudney assists in the planning and implementation of workshops, seminars, and curriculum content.

Charles Dawsey, as the Manager for Engineering and Operations at Fall River Electric Cooperative in Idaho, is responsible for the day-to-day operation and maintenance of a 3 MW hydroelectric powerplant. Mr. Dawsey is charged with the supervision of the plant's operating personnel, maintenance schedules, and its overall operation. He has experience in handling most types of equipment and machinery used in repair shops and during construction. He holds a B.S. in electrical engineering from Montana State University.

George Doud is the Regional Administrator for Africa and the Middle East for IPD and has been with NRECA for more than 10 years. He is responsible for NRECA's rural electrification efforts in those regions including two large, multi-million dollar projects in Yemen and Egypt. Mr. Doud has his B.A. in business administration from the University of Minnesota.

Edward Gaither is NRECA's Regional Administrator for Asia and the Pacific, and recently completed an assignment as team leader on NRECA's rural electrification project in Bangladesh. He had particular responsibility for developing a training institute to support project implementation. He has previously been a management instructor at the University of Southern Colorado and has served as general manager of electric cooperatives. He has his B.S. in electrical engineering from the University of Missouri and is a Registered Professional Engineer in Colorado and Missouri.

Jerry Harvey is Professor of Management Science at the George Washington

University in Washington, D.C. He has consulted with a wide variety of industrial and governmental organizations, including IBM, Heinz-USA, and the U.S. Department of the Interior. He has written a number of articles on management, education, and organizational development. Dr. Harvey holds a Ph.D. from the University of Texas.

Eugene Hunt is a Professor of Management at Virginia Commonwealth University in Richmond, Virginia. In addition to conducting training programs, he was instrumental in redesigning several NRECA management development programs. He has his Ph.D. from the University of Maryland.

Allen Inversin is the Micro-Hydro Engineer for the Small Decentralized Hydropower Program. He is responsible for gathering and evaluating technical and field information on small hydro developments for application in the developing world. He has 10 years of overseas experience serving with voluntary organizations conducting research, teaching, and providing technical assistance in micro-hydropower. He has his S.B., S.M., and Engineer's Degree in aeronautics and astronautics from the Massachusetts Institute of Technology.

Bard Jackson is Principal Engineer in NRECA's Small Decentralized Hydropower Program. He worked for several years as an electrical engineer in the U.S. Navy, the Rural Electrification Administration, and the Department of Energy before joining NRECA. He has recently managed assessments of small hydropower potential in more than a dozen countries in Asia, Latin American, and Africa. He has his B.S. cum laude from California State University and his M.S. from the Georgia Institute of Technology.

Wayne Johnson joined NRECA in 1978 and was formerly the General Manager of Whitley County REMC in Indiana. He is presently the Manager of Training and Technical Services as well as the Executive Vice-President of NRECA's Wood Quality Control Program. He holds a B.A. from Butler University and his M.B.A. from the University of Chicago.

James Kelly is Senior Management Consultant and rejoined the staff at NRECA in 1977 after a 13-year interim. In addition to his training duties, he coordinates the Management Internship Program, the Advanced Management Program, and the Staff Assistants Seminar. He received his B.A. and his M.B.A. from the University of Michigan.

Paul Kirshen is a consulting engineer and hydrologist who has served on a number of small hydropower field assignments for NRECA's Small Decentralized Hydropower Program. He is experienced in all aspects of water resources planning and has participated in river basin regional development projects in the United States, Yugoslavia, Sri Lanka, and several countries in Africa. Dr. Kirshen has served on the engineering faculties of the Virginia Polytechnic Institute and the Dartmouth College Thayer School of Engineering, and holds his B.S. in engineering from Brown University, and his M.A. and Ph.D. in civil engineering from the Massachusetts Institute of Technology.

Raymond Kluczny is Associate Professor of Engineering Management at the University of Missouri-Rolla. He has consulted with a variety of industrial and governmental organizations including the General Electric Company, A.O. Smith Corporation, and the U.S. Air Force. Dr. Kluczny holds a Ph.D. from Arizona State University.

June Lane is a Management Consultant who has been with NRECA since 1979. She conducts board, management and supervisory training programs. She is

also the editor of the Management Quarterly magazine. She holds a B.A. from Henry College in Virginia and her M.A. from Wesley Theological Seminary at the American University in Washington, D.C.

James Lay, Regional Administrator for Latin America and the Caribbean for IPD, has over 10 years of international expeience in Latin America. Mr. Lay has his B.A. in government from George Washington University and has undertaken graduate work in utility management at the University of Nebraska and is responsible for coordinating NRECA's rural electification efforts in Latin America.

Gordon Lippitt is a Professor of Management at the George Washington University in Washington, D.C. He is Chairman of the Board of Organizational Renewal, Inc. and has worked with rural electric cooperatives in a training and consulting capacity for many years. He has published over 300 articles, pamphlets, and books in the field of organization development, leadership, and management. His most recent work, **Organizational Renewal,** was published in 1982 and has received acclaim from management authors and critics. He has his Ph.D. from The American University.

John Mashaw is member of NRECA's Consulting Division as a Management Consultant. He provides consulting services to rural electric cooperatives in such areas as management audits, compensation and organization studies, and manager search. Prior to joining NRECA, he was employed by the Memphis Light, Gas and Water Division, a municipally owned utility company. He holds a B.A. from Memphis State University.

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Henry Metzner is Associate Professor of Engineering at the University of Missouri-Rolla. He has consulted with a variety of industrial and governmental organizations including Hughes Aircraft Company, Douglas Aircraft Company, and the U.S. Small Business Administration. Dr. Metzner holds a Ph.D. from the University of Utah.

John Morgan is Chairman of the Electrical Engineering Department at the University of Missouri-Rolla. He has a distinguished record as an educator and consultant and has published numerous papers on power sector engineering. He is currently Vice Chairman of the IEEE Power Systems Engineering Committee and a member of IEEE's #4 Standards Committee on Dielectric Testing. He holds a Ph.D. from Arizona State University.

Jack Moris is Assistant Professor of Electrical Engineering at the University of Missouri-Rolla. He was formerly a design engineer with the General Electric Company, Aircraft Electrical Systems Division. He has directed numerous research projects and published several papers on power distribution system load management. He holds his M.A. in electrical engineering from the University of Missouri-Rolla and expects to receive a Ph.D. from the University of Missouri-Columbia in May 1983.

James Morriss is the Executive Vice President and General Manager of Texas Electric Cooperatives, Inc., the statewide service organization for Texas' 81 rural electric systems. He has considerable experience with rural electrification training programs and has

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Charles Overman is General Manager of Adams Electric Cooperative in Gettysburg, Pennsylvania. He has worked with NRECA's IPD on several short-term overseas assignments (Liberia, Indonesia, Sri Lanka, and Ecuador) providing technical and training assistance. He has been an instructor in the course, "Operations and Management of Rural Utility Systems," held in conjunction with NRECA, AID, and REA, and recently redesigned the entire curriculum for the course based largely on on-going research on organizational system development. Mr. Overman has his B.S. in agricultural engineering from North Carolina State University and has undertaken graduate studies in accounting and mathematics.

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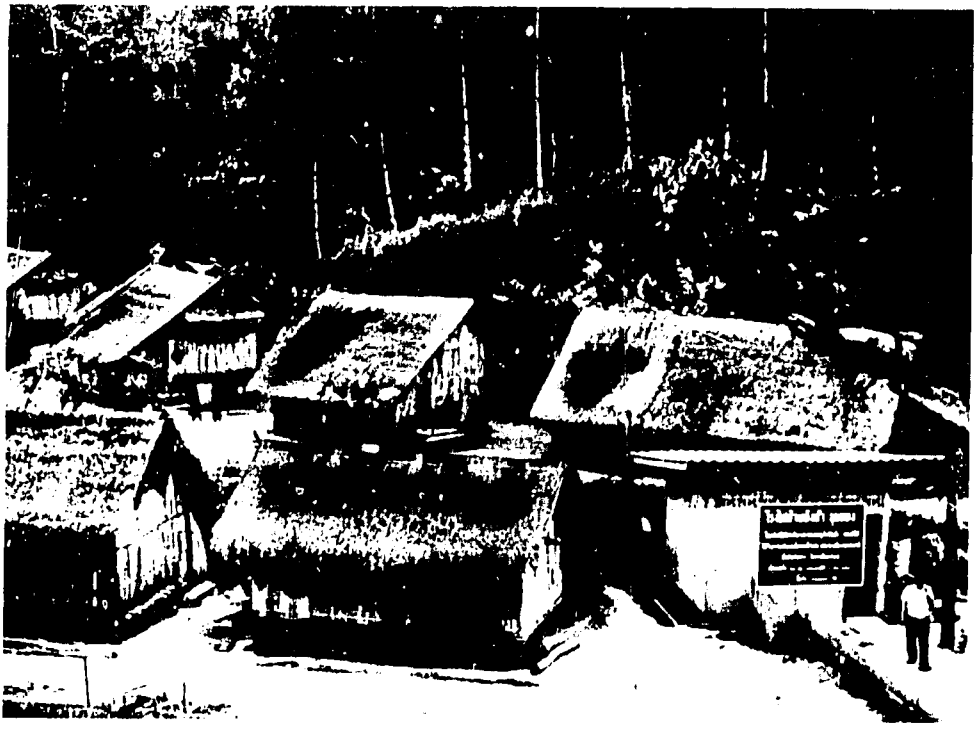
Earl Richards is Professor of Electrical Engineering at the University of Missouri-Rolla. He has consulted with a wide variety of industrial and governmental organizations including Emerson Electric Company, Wisconsin Electric Power Company, and the Missouri Public Service Commission. He holds a Ph.D. from the University of Missouri-Rolla.

Lloyd Seaton is Professor of Accounting at the University of Arkansas and is a Certified Public Accountant. His consulting and training activities with NRECA are concentrated in the areas of financial and management reporting systems and budgetary systems. He has a Ph.D. from the University of Arkansas.

Geoffrey Smith joined NRECA in 1975

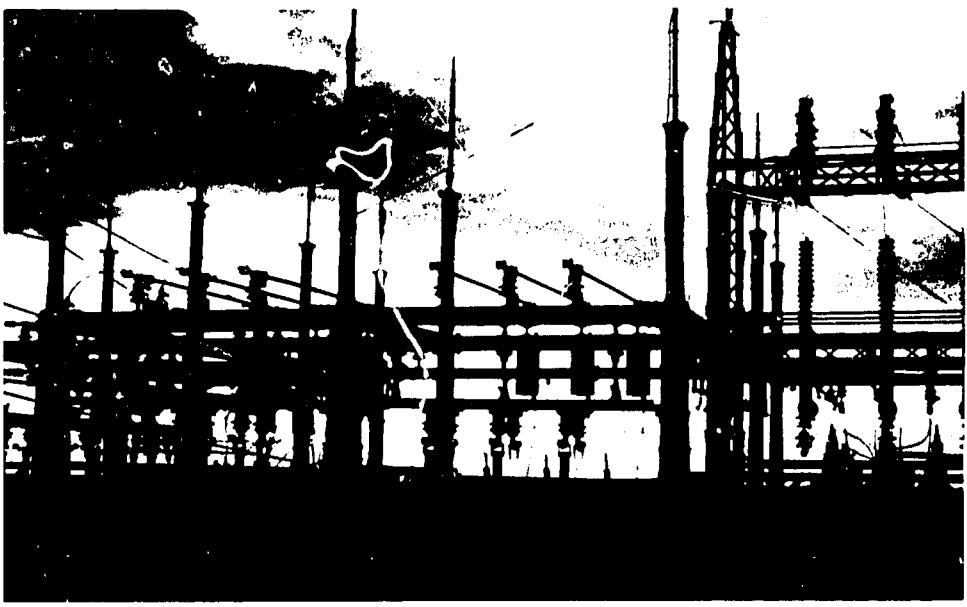


after working at Colorado-Ute Electric Association. As a Senior Management Consultant, he conducts training programs, manager searches, management audits, and organizational compensation studies. He holds his B.A. from Colorado College and his M.A. from Denver University.

Patricia Smith has worked in the rural electric program for over ten years and is presently an NRECA Management Consultant. She conducts management and member relations training programs and consults with systems utilizing Member Attitude Surveys. She holds her B.S. from the University of Tennessee.

Richard Snyder is a Senior Management Consultant for NRECA. He concentrates his work in the areas of management training, the Personal Improvement Program offered by NRECA and the Management Internship. He holds his B.A. from Murray State University in Kentucky.

Marcia Sokol has been with NRECA since 1979 as a Member Relations Consultant. She conducts management, supervisory, and director training programs for member systems. She holds her B.A. and her M.A. from Penn State University.

James VanCoevering, as the Manager of Transmission for Plains Electric Generation and Transmission Cooperative in Albuquerque, New Mexico, is resopnsible for the design, construction, and reconstruction of 115kV and above transmission lines. He is a former Peace Corps volunteer and has considerable experience oveseas as a consulting engineer. Mr. VanCoevering is a Registered Professional Engineer in Mississippi and New Mexico and has his B.S. in electrical engineering from the University of Arizona and his M.E. in electric power engineering from Rensselaer Polytechnic Institute.

David Zoellner is Assistant Administrator of NRECA's International Programs Division and is responsible primarily for the administration of IPD's Small Decentralized Hydropower Program. He is an experienced researcher, instructor, consultant, and administrator in the fields of small hydropower, water resources, and environmental quality. He holds his B.S. and his M.S. from the University of Alabama and a Ph.D. from Texas A&M University.