

# FINAL TECHNICAL REPORT

**EMD**  
New Mexico  
Energy & Mineral  
Department

## EXECUTIVE SUMMARY

DEVELOPMENTAL STATE PROGRAM  
FOR INSTITUTIONAL CONSERVATION



October 1, 1986  
to September 30, 1988

**MASTER**

DOE Grant No. DE-FG01-86CE64615

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## ACKNOWLEDGEMENTS

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Special recognition and appreciation also are given to the organizations which helped conduct this project. Entities which provided their experience and expertise in their commitment to the New Mexico project include:

- \* New Mexico Department of Education
- \* New Mexico School Administrators Association
- \* New Mexico School Boards Association
- \* Cooperative Educational Services, Inc., Dr. Max Luft, Executive Director
- \* Mechanical and Electrical Engineering, Inc.
- \* Frank Bolek and Associates
- \* W. Reed Edgel, Consulting Engineer
- \* Charles Pruet, Consultant
- \* New Mexico Research and Development Institute  
Communications Office, the University of New Mexico

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## **PREFACE**

The New Mexico Energy, Minerals and Natural Resources Department (EMNRD) was established in 1978 as the state government agency responsible for the development and management of New Mexico's energy, mineral and natural resources. This document is the department's report on an innovative project initiated in 1986 entitled "Developmental State Programs for Institutional Conservation."

## INTRODUCTION

In July, 1986, the New Mexico Energy, Minerals and Natural Resources Department (EMNRD) submitted a proposal to the United States Department of Energy (DOE) which provided for the development and implementation of an innovative program to increase energy efficiency in the institutional building sector. EMNRD submitted this proposal to DOE in response to DOE Solicitation No. DE-PS01-86CE64606, "Developmental State Programs for Institutional Conservation."

In October, 1986, New Mexico was one of 12 states selected by DOE to receive financial assistance to implement proposals submitted in response to the solicitation. Other states selected were Colorado, Nebraska, New York, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Utah, Vermont and Wisconsin.

The purpose of the DOE solicitation was to generate more non-federal resources in addressing institutional energy efficiency needs. To achieve this goal, DOE's Institutional Conservation Program (ICP) was chosen to serve as a catalyst by providing seed money for expanded assistance and investment in institutional energy efficiency by non-federal entities. To supplement the limited federal resources available, DOE believed it was critical that the state-coordinated programs generated by the solicitation be designed to involve, on a continuing basis, other public and private sector resources to the maximum extent possible. The seed project philosophy also implied that programs undertaken be replicable, and therefore fully documented from inception to completion by the project team.

DOE provided that the generic approaches to be used in the programs could include any or all of the following:

1. State coordination of technology transfer and financial counseling programs;
2. Association networking and "heroes" programs, and
3. Capital pooling programs.

These developmental and seed programs -- called "Tier 1" programs under the ICP multi-year strategy -- were intended to address the major needs of the institutional building sector for energy management expertise, information and financing. Activities also were planned at the national ICP level, working in partnership with non-federal entities, to complement those being conducted under this project. Quality programs, efficient program management and effective coordination remained DOE energy program priorities.

EMNRD's program was targeted at the sector that historically most often has lacked the resources to participate in ICP activities in New Mexico: small, public school districts. A variety of strategies were used to implement the New Mexico program including:

1. Establishing partnerships to deliver information and services;
2. Providing energy evaluations of school buildings and equipment;
3. Providing energy management training for school staff;
4. Providing financial counseling for energy efficiency improvements;
5. Establishing networking and "heroes" projects to promote energy efficiency successes;
6. Developing and demonstrating state-of-the-art computerized preventive maintenance software programs;
7. Providing "mini-grants" as seed money for energy efficiency improvements;
8. Establishing an energy maintenance "circuit rider" who visits each school on a regular basis;
9. Providing design assistance to help ensure that new construction projects are energy-conscious, and
10. Providing energy education curriculum materials for students.

Capital pooling programs also were considered. But public school finance officials advised EMNRD that New Mexico's state constitution, one of the most conservative among the 50 states, effectively precluded public school districts from participating in capital pooling activities.

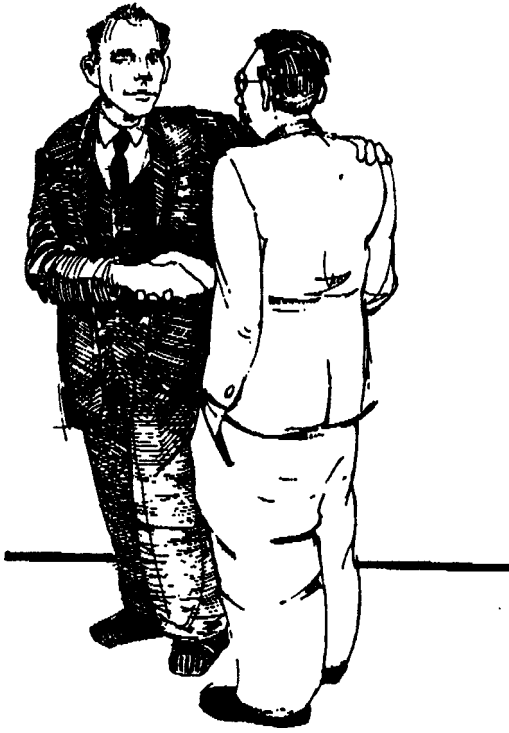
New Mexico provided an ideal setting for the demonstration of developmental state programs for institutional conservation. The state's diverse characteristics provide a microcosm for the rest of the nation in terms of geographic, ethnic, climatic and economic diversity.

New Mexico is a place where edges meet. In the north, the Rocky Mountains reach into the state with 13,000 foot peaks that are often snow-capped year-round. In the east, the Great Plains sweep into the state providing the basis for an agricultural economy comparable to many midwestern states. In the south, the Sonoran Desert rolls out of Mexico producing a sub-tropical climate where years can pass between snows. In the west, basins and ranges alternate to create one of the most scenic regions in the western states.

New Mexico has the largest minority population percentage of any of the 50 states. Almost 50 percent of the state's people are of Hispanic, Native American or Afro-American heritage. The public school districts participating in the ICP Tier I Project reflected this rich cultural diversity. ICP Tier I Project school districts included all-Indian communities, 17th century Hispanic villages, Mormon farming settlements, oil towns, ski resorts, mining towns, ranching hubs, trading posts, industrial centers and farming communities.

EMNRD is scheduled to initiate a comprehensive evaluation of its ICP Tier 1 Project in 1989. The evaluation is scheduled to be conducted by a contractor who specializes in program planning and evaluation.

Presented on the following pages of this Executive Summary are brief descriptions of the major components for the New Mexico ICP Tier 1 Project. More detailed information is presented in the other volumes of this final technical report.



## **SCHOOL ENERGY PROGRAM :**

### **PARTNERSHIPS TO DELIVER INFORMATION**

#### **DESCRIPTION OF PROGRAM COMPONENT**

The New Mexico Energy, Minerals and Natural Resources Department (EMNRD) sent letters to four educational organizations inviting each entity to serve as partners in the New Mexico Institutional Conservation Program (ICP) Tier One Project. All of the organizations accepted the invitation to serve as co-sponsors for the program. These organizations are:

- New Mexico Department of Education
- Governor's Office of Education
- New Mexico School Administrators' Association
- New Mexico School Boards' Association

It should be noted that two of the above organizations -- the New Mexico Department of Education and the Governor's Office of Education -- were consolidated into a single institutional unit effective July 1, 1987.

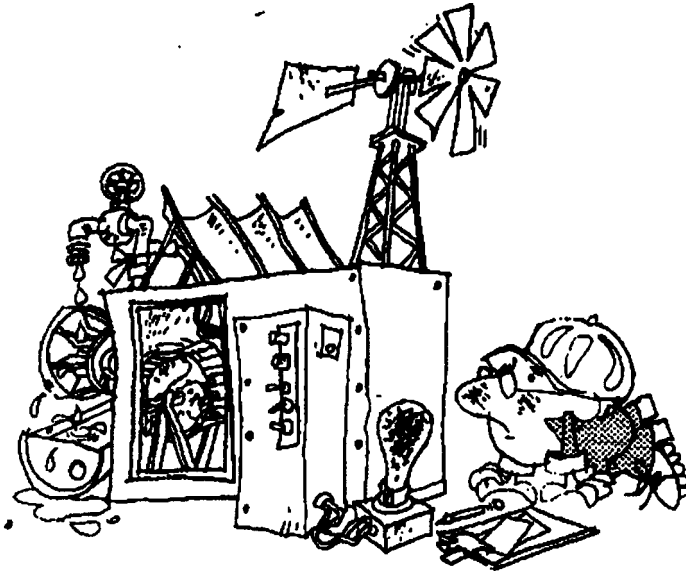
The organizations helped EMNRD identify all 50 New Mexico public school districts with average daily student memberships of less than 1,000 students. The announcement of services available under the New Mexico ICP Tier 1 Project was made in: (1) Letters EMNRD sent to each district's superintendent inviting their districts to participate in the new program, and (2) Newsletters published and distributed by the project's co-sponsors.

#### **COST**

None.

## **RESULTS**

A total of 40 of the 50 public school districts eligible to participate in the program submitted written responses to participate. The high response rate of 80 percent was one of the highest response rates New Mexico has ever experienced for any energy efficiency program. It should be noted that of the 50 small public school districts targeted by this program, less than one percent had participated per year in the ICP grant program since that program began 10 years ago. EMNRD believes that participation by the ICP Tier 1 Project co-sponsors not only facilitated delivery of information and services but added credibility to the project as well in the eyes of the target audience.



## **SCHOOL ENERGY PROGRAM :**

### **BUILDING AND EQUIPMENT EVALUATIONS**

#### **DESCRIPTION OF PROGRAM COMPONENT**

EMNRD requested proposals from professional engineering firms to conduct the following tasks at each of the 40 participating public school districts:

- Analyze each building's energy consumption and compare those costs to those of energy-efficient buildings of similar size, taking into account geographic location, climatic conditions and other relevant data;
- Conduct a survey of each building's functions, mechanical and electrical systems, building envelope and maintenance history with the goal of reduced energy usage;
- Inventory and tag all energy equipment;
- Develop recommendations for energy efficiency improvements, and
- Provide energy management training to each institution's staff.

Of the 13 vendors who submitted proposals to conduct the work, three were selected by EMNRD to provide the services: Frank Bolek and Associates, Albuquerque; M&E Engineering, Inc., Santa Fe, and W. Reed Edgel, Consulting Engineer, Albuquerque.

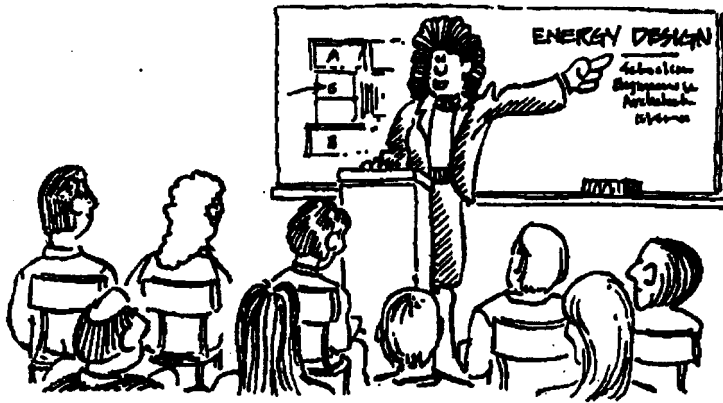
An engineering team typically spent two days conducting building surveys, inventorying equipment and identifying needed energy improvements in each school district. The team, consisting of two individuals, returned to the vendor's office to draft a final technical report for submittal to EMNRD for review and approval prior to transmittal to the school district.

## **COST**

Approximately \$0.05 per square foot including training (ICP Tier 1 funds)

## **RESULTS**

The building and equipment surveys provided technical data which served as the foundation for almost all other activities conducted under the ICP Tier 1 Project. Average potential utility bills reduction identified for each school district was 23 percent and is based on a conservative methodology.



## **SCHOOL ENERGY PROGRAM :**

### **ENERGY MANAGEMENT TRAINING FOR STAFF**

#### **DESCRIPTION OF PROGRAM COMPONENT**

EMNRD requested proposals from professional engineering firms to provide energy management training to school staff after conducting building and equipment evaluations at each of the 40 public participating public school districts. The training consisted of the following components:

- An engineering team provided approximately 90 minutes in training to school leaders typically consisting of the superintendent, all principals, the business manager, the high school counselor, the head teacher and student leaders including the student body president. The training team discussed the role each attendee should play in implementing an effective energy management program.
- The engineering team then presented a six hour training seminar to the school district's maintenance and custodial staff. The training was highlighted by walking through the school facilities identifying and demonstrating recommended operations and maintenance improvements.
- Following the two training sessions, the engineering team met with each district's superintendent to brief him or her on their findings and recommendations. The team then prepared a final technical report describing their work and submitted it to EMNRD.

#### **COST**

Approximately \$0.05 per square foot including building and equipment evaluations (ICP Tier 1 funds)

#### **RESULTS**

The engineering teams believed the energy management training component was the single most valuable service they provided during the project. The following publications also were provided by EMNRD for use in training activities:

- **How to Reduce Energy Costs in Your Building -- Tips for New Mexico Businesses and Institutions** -- This 54-page booklet describes fast and easy ways to save energy. Lavishly illustrated.
  
- **Managing Energy Efficient Buildings** -- This brief manual describes maintenance procedures for energy equipment typically found in New Mexico institutions. Procedures are presented in a simple, user-friendly format.

Four videocassettes also were provided for training activities on boiler maintenance, hot water reset for hydronic systems, economizer testing and tune-up, and unit ventilator reconditioning.

Other materials procured by EMNRD for use in the training activities included caulking, low-flow showerheads, and caps silk-screened with energy-efficiency slogans for school maintenance personnel.

Existing training materials were used as much as possible including videocassettes from the California Energy Extension Service, slides from the Michigan Office of Energy Programs and publications from the Texas Governor's Energy Management Center.



## **SCHOOL ENERGY PROGRAM :**

### **FINANCIAL COUNSELING FOR ENERGY IMPROVEMENTS**

#### **DESCRIPTION OF PROGRAM COMPONENT**

EMNRD entered into an agreement with a public entity, Cooperative Educational Services, Inc. (CES), to provide financial counseling services to the 40 participating public school districts. CES:

- Contacted public school superintendents in all 40 school districts and offered to provide financial counseling to school administrators for the purpose of implementing energy conservation improvements.
- Provided on-site financial counseling upon request of a school administrator.

The financial counseling was provided by Charles Pruet, CES consultant and retired assistant superintendent of finance for the Clovis Municipal Schools. Clovis was the first New Mexico school district to initiate a comprehensive energy management program and has been featured nationally by DOE as a model for others.

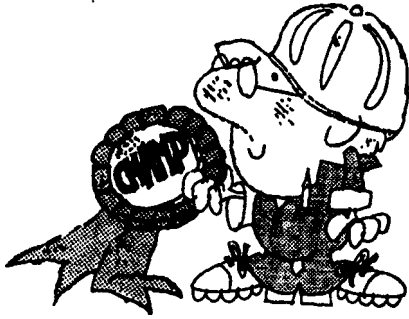
#### **COST**

Approximately \$200 per district including travel costs (ICP Tier 1 funds).

#### **RESULTS**

Superintendents of all 40 participating small public school districts requested at least one on-site visit from the financial consultant. CES identified a smorgasbord of funding options for each school district

to initiate recommended energy improvements. The superintendents -- who often had expertise in areas other than public school finance -- were very receptive to these services. Many seeds were planted by the CES financial consultant during the project period, and EMNRD is optimistic that much of this work will bear fruit in the near future in terms of producing energy savings.



## **SCHOOL ENERGY PROGRAM :**

### **ASSOCIATION NETWORKING AND "HEROES" ACTIVITIES**

#### **DESCRIPTION OF PROGRAM COMPONENT**

EMNRD strongly emphasized association networking and "heroes" activities during the program. In addition to enlisting prominent educational organizations to serve as co-sponsors for the program, EMNRD conducted the following activities:

- Developed a 46-page booklet spotlighting successful energy management projects in New Mexico and distributed the publication to institutional leaders.
- Provided a major seminar at the 1988 Annual School Administrators meeting in Albuquerque sponsored by the New Mexico School Administrators Association and the New Mexico Department of Education. The seminar was provided by Zachar Burns Energy Associates, Inc. of New York and Phoenix.
- Provided a workshop in Las Vegas, New Mexico for northern New Mexico superintendents in cooperation with Cooperative Educational Services, Inc. The training was provided by Zachar Burns Energy Associates, Inc.
- Provided funding assistance to the Farmington Municipal Schools to develop a case study of its energy management program. Farmington is one of New Mexico's largest public school districts and its energy management activities have received national recognition from the U.S. Department of Energy and other groups. A report was prepared and made available to other institutional leaders. A presentation on the project was made by Farmington officials at the annual convention of the New Mexico school superintendents.
- Provided funding assistance to the Santa Fe Public Schools to evaluate the results of the district's energy conservation efforts and to create a tool for monitoring. Santa Fe is one of the state's largest school districts and has initiated a myriad of energy efficiency activities including constructing school buildings with passive solar designs. A report was prepared and made available to other institutional leaders. A presentation on the project was made by Santa Fe officials at an annual convention of the New Mexico school superintendents.

## **COST**

\$19,000 was invested in these activities (ICP Tier 1 funds)

## **RESULTS**

EMNRD received a favorable response from all of these activities. The energy management seminar at the 1988 Annual School Administrators Meeting, for instance, was one of the highest rated at the convention based on written evaluations obtained from attendees by the New Mexico Department of Education.



## **SCHOOL ENERGY PROGRAM :**

### **COMPUTERIZED PREVENTIVE MAINTENANCE SOFTWARE**

#### **DESCRIPTION OF PROGRAM COMPONENT**

EMNRD developed an agreement with Cooperative Educational Services, Inc. (CES) to:

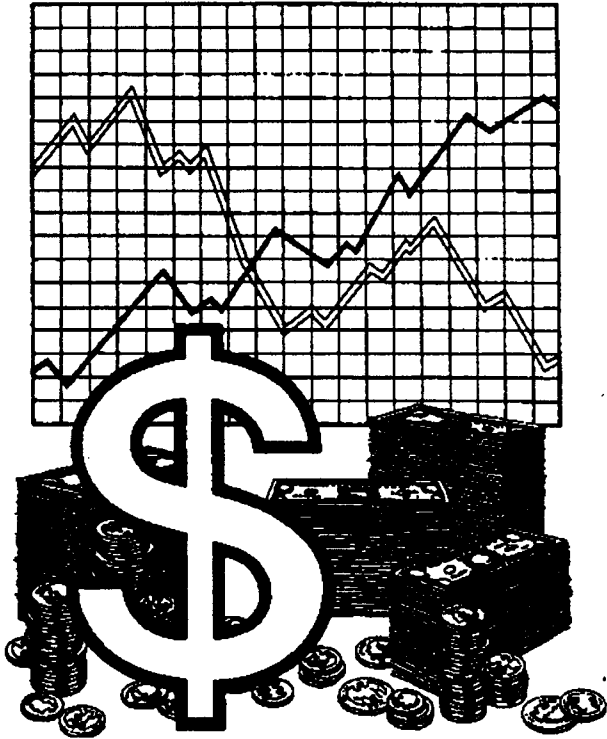
- Develop a computerized preventive maintenance software package for use in small institutions. EMNRD and CES had tried to use commercially available software for ICP Tier 1 activities but failed because existing software was inappropriate for small institutions.
- Establish the software program in four small school districts participating in the ICP Tier 1 Project: Carrizozo, Cimarron, Hagerman and Jemez Mountain. Each of these school districts is located in a different region of New Mexico. These districts represent a cross-section of the state's diverse geographic, cultural and economic characteristics.
- Gather specific data and service procedures for all energy equipment and systems at the four school districts, and store this information on a hard copies and 5 1/2-inch floppy disks for use on an IBM PC XT in ASCII. This work was conducted by employees of the Clovis Municipal Schools, a large New Mexico school district which had been successfully using a computerized preventive maintenance program for several years.
- Installed an in-state toll-free number between the four pilot districts' computer systems and CES's computer system and manager to facilitate the computerized preventive maintenance program at the four districts.
- Provide a preventive maintenance software workshop for large school districts using commercially available software. The 2 1/2 day training course was held in Albuquerque and was conducted by Creative Management Systems of Jacksonville, Florida. Representatives of 10 large school districts attended, and six committed themselves to initiating the program after the training was completed.

## **COST**

\$16,500 was invested in these activities (ICP Tier 1 funds)

## **RESULTS**

A computerized preventive maintenance software package was successfully developed and established at four small public school districts. Further, six large public school districts committed themselves to initiating their own computerized preventive maintenance programs after attending the 2 1/2 day training course. The progress of this work is being monitored.



## **SCHOOL ENERGY PROGRAM :**

### **"MINI-GRANTS" PROVIDED FOR SEED MONEY PURPOSES**

#### **DESCRIPTION OF PROGRAM COMPONENT**

EMNRD offered "mini-grants" of up to \$5,000 to each of the 40 small school districts participating in the ICP Tier 1 Project. The purpose of the "mini-grants" was to provide seed money to stimulate energy improvements recommended in the ICP Tier 1 building evaluations. Each application was evaluated by EMNRD engineers to ensure technical and economic merit.

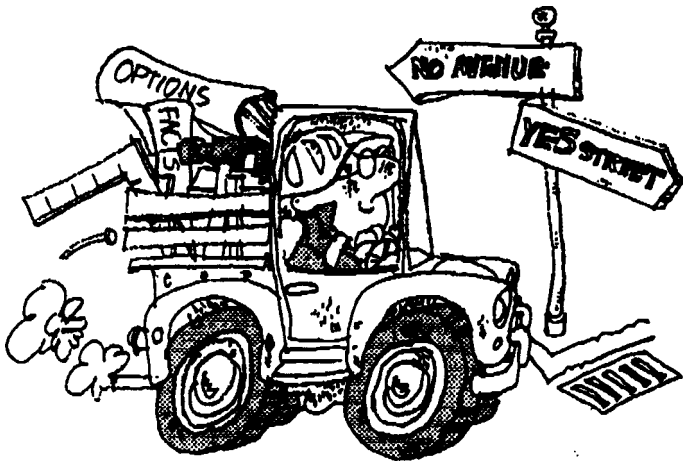
This program component was based on a similar project successfully initiated by the Washington State Energy Office.

#### **COST**

A maximum of \$5,000 per public school district (Stripper Well funds)

#### **RESULTS**

A total of 14 public school districts had applied for "mini-grants" as of December 31, 1988. The average request totaled \$4,990. Although cost-sharing was not required, the average request was using the "mini-grants" to leverage additional funds for energy improvements at a better than 2:1 ratio.



## **SCHOOL ENERGY PROGRAM :**

### **ENERGY MAINTENANCE "CIRCUIT RIDER"**

#### **DESCRIPTION OF PROGRAM COMPONENT**

EMNRD issued a competitive solicitation for firms to provide energy maintenance "circuit rider" services for the 40 small public school districts participating in the ICP Tier 1 Project. From the four proposals received, EMNRD selected a proposal submitted jointly by Cooperative Educational Services, Inc. and TCI, Inc., a major energy services firm which proposed to conduct the project through personnel in its offices in Albuquerque and El Paso, Texas. The program provides for the following:

- An energy systems technician shall provide energy management training to maintenance personnel and energy equipment repair services at each school district.
- The technician shall spend approximately one day in each school district every calendar quarter.
- The technician shall provide regional workshops on appropriate energy topics.

The purpose of these services is to: (1) Conserve energy and reduce utility costs; (2) Improve environmental health, comfort and control; (3) Decrease equipment failure rate and accident risk, and (4) Increase operator skill levels.

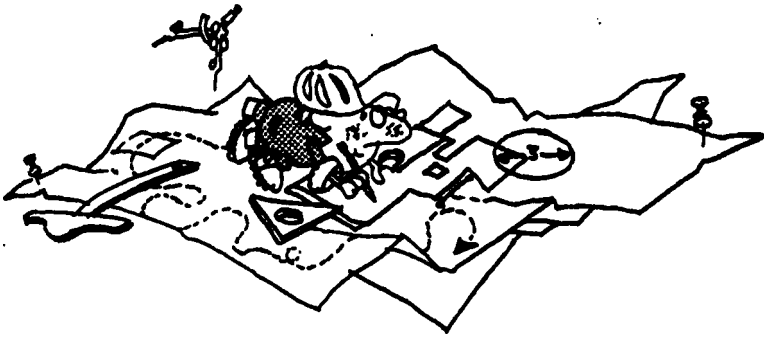
#### **COST**

Approximately \$1,000 per public school district per year (SECP oil overcharge funds). Individual school districts are sharing the cost of the program by providing: (1) \$200 each year; (2) All parts and equipment, and (3) All major repair costs.

#### **RESULTS**

Almost all of the 40 small public school districts participating in the ICP Tier 1 Project are participating in the "circuit rider" program. Of all the activities initiated under the ICP Tier 1 Project, EMNRD believes the "circuit rider" program may have the potential to be the most effective and most economic for the target audience.

It should be noted that many of the ICP Tier 1 school districts typically paid \$700 per day for an energy technician's services before the "circuit rider" program was initiated. And some of the school districts are so isolated geographically that they reported they had trouble obtaining energy technician services at any price.



## **SCHOOL ENERGY PROGRAM:**

### **ENERGY CONSCIOUS DESIGN ASSISTANCE**

#### **DESCRIPTION OF PROGRAM COMPONENT**

EMNRD secured a \$30,000 award from the U.S. Department of Energy Western Area Power Administration (Western) through the New Mexico Rural Electric Cooperative Association to establish an energy conscious design program. The purpose of the program is to provide technical assistance to ICP Tier 1 school districts which are planning on constructing or remodeling school facilities.

The technical assistance would be provided by highly qualified energy engineers and architects with experience in energy-efficient design. Similar programs have proven to be very successful by Bonneville Power Administration in the Pacific Northwest and by the Texas Governor's Energy Management Center.

#### **COST**

Approximately \$8,000 is the estimated average cost per project (Western and other funds)

#### **RESULTS**

Bonneville Power Administration estimated that energy conscious design can typically reduce a building's energy consumption by 15 to 20 percent. EMNRD is in the process of obtaining matching funds for the Western funding award at the time this executive summary is being prepared.



## **SCHOOL ENERGY PROGRAM:**

### **ENERGY EDUCATION MATERIALS FOR STUDENTS**

#### **DESCRIPTION OF PROGRAM COMPONENT**

During the energy management training sessions provided by energy engineers to school faculty at the 40 school districts which participated in the ICP Tier 1 Project, many teachers expressed a need for high quality energy education curriculum materials. As a result, EMNRD procured copies of the Energy Source Educational Council curriculum materials for distribution to interested school districts.

These critically acclaimed curriculum materials were developed for grade levels K-12. The materials were distributed to 28 public school districts requesting this information. A total of 19,700 students received individual instructional materials under the program. Teachers' guides and audio-visual materials also were included.

#### **COST**

Average cost per student was about \$1.30 to establish the program. Average cost per student for refill materials is about \$0.85. Funding for these materials was provided by Energy Extension Service oil overcharge funds, Atlantic-Richfield Corporation and Four Corners Pipeline Company.

#### **RESULTS**

A comprehensive evaluation of the program is scheduled to be conducted by EMNRD in the spring of 1989 through teacher questionnaires.