

---

UMR-MEC Conference on Energy / UMR-DNR Conference on Energy

---

12 Oct 1978

## Energy Audits In New Mexico: Plans and Programs

Thomas T. Shishman

Follow this and additional works at: <https://scholarsmine.mst.edu/umr-mec>

 Part of the [Energy Policy Commons](#), and the [Environmental Policy Commons](#)

---

### Recommended Citation

Shishman, Thomas T., "Energy Audits In New Mexico: Plans and Programs" (1978). *UMR-MEC Conference on Energy / UMR-DNR Conference on Energy*. 353, pp. 89-93.

<https://scholarsmine.mst.edu/umr-mec/353>

This Article - Conference proceedings is brought to you for free and open access by Scholars' Mine. It has been accepted for inclusion in UMR-MEC Conference on Energy / UMR-DNR Conference on Energy by an authorized administrator of Scholars' Mine. This work is protected by U. S. Copyright Law. Unauthorized use including reproduction for redistribution requires the permission of the copyright holder. For more information, please contact [scholarsmine@mst.edu](mailto:scholarsmine@mst.edu).

ENERGY AUDITS IN NEW MEXICO:  
PLANS AND PROGRAMS

Thomas T. Shishman  
Director  
New Mexico Energy Institute at  
The University of New Mexico

Abstract

New Mexico is planning and has implemented programs to provide Class A, B, and C energy audits to its citizens. These audits provide information to the owner/occupant of a structure about areas of energy waste and the economics of future actions and retrofit opportunities. Current programs include Class B audits for public schools and residences and Class C workbooks for schools, offices, and homes. Future projects will provide Class C workbooks for mobile homes and small businesses and development of a Class A program for non-residential structures.

1. INTRODUCTION

It gives me great pleasure to participate in your Fifth Annual Conference and Exposition on Energy and to report to you on what we feel are some very exciting and innovative programs in the area of energy conservation in the State of New Mexico. However, before addressing the specifics, I want to explain to you the role of the New Mexico Energy Institute (NMEI) at The University of New Mexico in our State's comprehensive energy conservation programs.

New Mexico is fortunate to have a State-sponsored Energy Research and Development Program created by the Legislature four years ago. As part of this activity, approximately two years ago, New Mexico Energy Institutes were established at our three doctoral degree granting institutions to address complementary areas of energy research, on a statewide basis, with the specific objective of providing solutions to the fuel and energy problems of the citizens of the State of New Mexico. Our Institute, the New Mexico Energy Institute at The University of New Mexico, has the responsibility for directing statewide research programs in energy conservation, socioeconomics, the nuclear fuel cycle and synthetic fuels. In response to the needs of the State, and as a result of extensive leg-

islative activities on the local and federal level, energy conservation has become the Institute's primary area of concentration. We have sponsored a multitude of research and development projects (1) in energy conservation, drawing together the outstanding resources of the State's universities to address a variety of problems, ranging from the development and implementation of the Energy Conservation Code for new building construction to analyzing the performance of heat pumps in our hot, dry and high altitude climate.

As a dynamic linkage connecting the various interests in the State, the NMEI has been able to bring about a highly cooperative research effort between the university community, the private sector, the public utilities, the national laboratories (Sandia Laboratories and Los Alamos Scientific Laboratory), and the various agencies of State government. I believe that the successful integration of the needs and efforts of these different groups has been the major factor in allowing the State of New Mexico to become aggressive and successful in the development and implementation of its many diverse energy conservation programs.

2. OBJECTIVES

The specific objectives of this presentation are to

report on:

- (1) Energy audits currently available in the State of New Mexico,
- (2) Energy audits planned during the next twelve months,
- (3) Information dissemination efforts to be accomplished through the Energy Extension Service in New Mexico.

### 3. ENERGY AUDITS IN PROCESS

#### 3.1 PUBLIC SCHOOLS

The implementation of energy conservation programs in public schools has a high priority in the State's Energy Conservation Plan. (2) Currently a Preliminary Energy Audit program is being implemented for the approximately 700 public schools and 20 selected private, non-profit schools in New Mexico. The specific objectives of the public schools audit program are to:

- (1) Further reduce energy consumption in schools through implementation of no-cost/low-cost energy conservation measures,
- (2) Satisfy State requirements for school Preliminary Energy Audits under the proposed National Energy Act (NEA),
- (3) Enable participating schools to be eligible for Technical Assistance programs and energy conservation projects under the NEA.

The schools program is computer-based, utilizing the latest version (GAP 4) of the Public Schools Energy Conservation Service (PSECS). PSECS input consists of data on the physical characteristics, schedule of use, and energy consumption of the school buildings. Following an edit of the input data, computations are made to determine the extent of savings possible (BTUs and dollars) if the school were operated at maximum energy efficiency by implementing simple operational and maintenance procedures. Assuming then that the operational and maintenance measures identified by PSECS will be implemented by the school, a cost-benefit analysis of selected capital modifications is made. This second step shows the payback of various capital improvements normally cost-effective for school buildings. These include addition of insulation, judicious use of glass areas, incorporation of night set-back control, and installation of variable speed pumps.

A monitoring capability within PSECS will use updated consumption data to evaluate the progress being made by the schools in reducing their energy consumption.

Initial collection of public school facilities infor-

mation and energy data was accomplished during the period of June through November, 1977. Data gathering involved input from school principals, administrators, operations and maintenance personnel, architects and engineers. The interaction among these people with various skills and responsibilities served to create a better understanding of the energy problems faced by each and also seemed to provide some motivation for the development of conservation plans.

The gathering of building use data from school principals and school administrators was completed during the fall of 1977. These data were field verified at the time that additional information from the operations and maintenance personnel of the school systems was collected. Our experience has been that the facilities reports produced were well received by the school administrators and have proven useful during the last twelve months.

In addition to the above efforts, mechanical engineers, architects, and building contractors were tasked with reviewing the schools' plans to acquire construction and energy system information for the audit. This last phase of the schools audit program is the one that is currently being enlarged and further developed. It is planned that by the April, 1979 completion date of this program, the gathering, field verification, and analysis of the public school data will have been completed, including the dissemination of all updated facilities and energy consumption reports to all of the schools involved.

For detailed information on this program, contact the New Mexico Energy and Minerals Department, P.O. Box 2770, Santa Fe, New Mexico 87503, (505) 827-2471.

#### 3.2 RESIDENCES

Effective May 1, 1978, the New Mexico Energy Extension Service (EES) introduced its unique Residential Energy Audit Program, as developed and implemented by the NMEI. Supported by a comprehensive and closely controlled and monitored marketing program, the EES will offer 20,000 residential audits to New Mexico citizens statewide, with a planned progression from the smaller communities for approximately 5 - 15% of the total program to the full-scale implementation and delivery of the remainder on a statewide basis around October 15, 1978.

Residential audits provided will satisfy the Class B audit requirements established in the federal legislation. Previous audits, such as Project Conserve

in 1976, were concerned only with evaluating the building envelope and as such did not account for effects of orientation, solar insolation, climate, differences in local terrain, and local variations in construction materials and techniques. To be effective, however, a Class B audit should include all of these factors if it is to accurately model energy losses inherent in the design of the building envelope. In addition, the audit should include consideration of the Total Home Concept (3) introduced by the NMEI, which states that overall energy consumption in a residence depends not only on the thermal characteristics of the building envelope, but also on the number of occupants, the lifestyles of the occupants, and appliance quantity and usage.

To accurately analyze each individual residence, the NMEI requests a significant amount of information from the homeowner. With the specific software program utilized, the following types of information must be supplied:

- (1) Demographic information - for follow-up and market factors analysis;
- (2) General construction data - to type the structure and identify some of the external features affecting energy usage;
- (3) Occupancy and appliance schedules - to calculate internal heating loads and electrical consumption;
- (4) Wall and window data - to determine heat losses and gains; and
- (5) Heating and cooling system information - to determine energy consumption and potential for savings.

The Residential Energy Audit Program analyzes the paths and patterns of energy consumption within the residence. The output of the program consists of two sections:

- (1) Heat loss mechanisms and energy requirements for the home, including information on
  - (a) Percentages of energy loss through walls, windows, ceiling, floor and by infiltration;
  - (b) Solar gain through the windows;
  - (c) Annual energy consumption assuming a pre-determined "typical" system efficiency; and
  - (d) An index describing energy efficiency of the building as presently constructed. This provides the homeowner with

an Energy Conservation Rating (ECR) of his house, compared to others in the State.

- (2) Analysis of capital costs, expected savings, and paybacks for modifications to reduce consumption. In this section are described six different possible modifications, capital costs for do-it-yourself or contractor installation, expected fuel savings during an average year, and probable payback periods based on expected fuel cost increases. For each of the modifications, the computer output is prefaced by general descriptive information. This provides the homeowner with information from the Total Home Concept to supplement the personalized, quantitative information that follows. Rather than providing the homeowner with a canned computer output, the NMEI provides an attractive package that provides specific information and analyses based on a definitive set of data as a reasonably accurate indication of that particular structure's energy use patterns. It is this personalized approach which makes our program unique and insures that the information a homeowner receives is helpful and of special appeal to him.

The analysis accounts for the effects of external factors on heating/cooling energy consumption, but the energy consumption calculated by the program is only a part of the total used in the residence. Although several lifestyle effects are included, many other major factors such as the activities of children and/or of pets are not quantifiable. Thus, the overall consumption experienced by the household is that calculated by the audit model and that due to lifestyle and other transient factors. As a result, the New Mexico Residential Energy Audit Program stresses that cost-effective modifications may lie in simple lifestyle changes rather than in costly retrofits. It is this special emphasis on the behavioral aspects of energy consumption that differentiates the Residential Energy Audit Program from other such projects of the past. By providing information to the homeowner on no-cost and/or cost-effective low-cost modifications and changes, the NMEI can assist the consumer in making decisions on the value of conservation actions in a most effective and intelligent manner.

Although hour-by-hour local weather data are used to calculate thermal loads for individual residences, in

a compromise between cost and accuracy, the NMEI has selected a seasonal simulation for the program. By using representative time periods for the heating and the cooling seasons, it is possible to extrapolate a full year's predictive consumption without large errors. The overall accuracy of such a method depends upon the number of samples for the extrapolation, a process developed during the field verification of the project. It is estimated that this extrapolation technique may increase the error in the thermal load calculation by two to three percent, a figure which is not expected to compromise the applicability of the audit to the homeowner's needs.

For additional information on the results and/or the availability of the Residential Energy Audit Program, please contact Mr. Kenneth C. McKenzie, Program Director, New Mexico Energy Institute at The University of New Mexico, 117 Richmond Drive, N.E., Albuquerque, New Mexico 87106, (505) 277-3661.

#### 4. ENERGY AUDITS PLANNED

##### 4.1 RESIDENCES

To complement the Class B Residential Energy Audit Program, the NMEI plans to introduce a Class C residential audit through the Energy Extension Service. Interested homeowners will be provided a simple yet constructive homeowner's questionnaire, as well as energy conservation manuals and workbooks, to allow them to complete their individual audits in accordance with the federal guidelines. In addition, the NMEI is developing and currently field-testing an innovative and unique audit capability utilizing hand-held calculators or mini-computers to provide field agents with a simple yet accurate Class A audit capability.

It is anticipated that the combination of these Class C and Class A audits in addition to the 20,000 Class B audits planned, will enable the State to provide an extensive residential energy audit capability to most of its citizens.

##### 4.2 MOBILE HOMES

Of the 300,000 households in the State of New Mexico, approximately 50,000 are mobile homes.(2) Since these units are built to be road transportable, they have design and materials characteristics which tend to make them energy inefficient all year around. As many of New Mexico's mobile homes are inhabited by persons on low or fixed incomes, it is essential to identify cost-effective retrofit measures which can help these occupants save money. Based upon research being con-

ducted at this time, the NMEI will prepare a Class C energy audit workbook for the use of mobile homeowners. To help owners implement low- or no-cost conservation measures, the New Mexico EES will conduct workshops in mobile home parks on a statewide basis. Practical information on energy conservation in mobile homes will be presented, and hands-on experience implementing weatherization techniques will be provided.

##### 4.3 SMALL BUSINESSES

A sizeable energy audit program for the small business sector is currently under development. Utilizing the Total Effective Energy Management (TEEM) concept throughout the program, (4) the NMEI will develop a comprehensive Class C audit package for eight different target audiences: 1) office buildings, 2) restaurants, 3) retail stores, 4) industrial plants, 5) hotels and motels, 6) hospitals, 7) warehouse facilities, 8) apartments. The State is approaching the introduction of energy audits in the small business sector as a marketing problem; in addition to Class C workbooks, a complete promotional package consisting of narrative slide cassettes, media materials necessary for illustration of the program, and fact sheets to be used by workshop trainers will be prepared and presented in a comprehensive workshop program. Supportive materials will include general informational brochures, individual posters for the respective programs and target audiences, a series of public service announcements for television and radio, and detailed instructors' guides and workshop outlines. As in all audit programs produced by the NMEI, the small business energy audit program will be developed with consideration of climatic and geographical differences for the various sections of the State.

##### 4.4 ARMORY BUILDINGS

New Mexico National Guard Armory Buildings will be audited in sufficient detail to identify opportunities for administrative and policy changes, operation and maintenance changes, and capital improvements that can be used to reduce energy consumption. Current plans call for walk-through audits of all 29 existing armory locations in the State. During the site visits, auditors will examine the shell of each building to identify potential architectural modifications, such as double glazing, additional insulation, weatherstripping, and caulking that could save operating costs. In addition, they will inspect the mechanical heating and cooling systems and will make recommendations for improved efficiency operations. All control systems will

also be inspected, and recommendations for repairs and improvements to increase operating efficiency will be made. Finally, field auditors will inspect lighting levels, lighting fixture efficiencies, and any obvious opportunities to use natural lighting. Specific administrative policies that are in effect with respect to energy conservation will be explored and discussed with the occupants in addition to a thorough review of operations and maintenance practices.

#### 5. INFORMATION DISSEMINATION AND DELIVERY

New Mexico is one of the ten pilot states selected by the U.S. Department of Energy for the introduction of the Energy Extension Service program. The NMEI participated in the development of the proposal for the EES and upon the awarding of the grant became one of the key subcontractors to the State's Energy and Minerals Department. The NMEI is responsible for the development of energy conservation informational materials and instructional programs to be used in the statewide EES program. All of the energy audit programs described will be delivered in an effective manner, utilizing not only on the capabilities of the organizations involved in their development, but also on the effectiveness and marketing capability of the delivery agencies. Integration of the Energy Extension Service activities with other on-going programs in the State has so far increased the overall effectiveness of such programs and is only expected to improve further as the EES matures.

#### 6. CONCLUSIONS

I have reported to you about a series of exciting, innovative, and extremely challenging energy audit programs in the State of New Mexico. Those of us directly involved in the planning, development and implementation of these audit programs recognize the importance of careful planning, imaginative marketing, and smooth delivery of technically accurate products, as the general public tends to view activities of this nature with a certain amount of suspicion as well as apathy. I therefore suggest that energy audit programs introduced on a large scale must be kept reasonably simple, practical, must provide useful and hands-on type recommendations, must utilize not only climatic but also economic information that is geographically specific and accurate, and must be delivered in an imaginative and sensitive manner. Since every one of those requirements represents a major challenge of its own, I also suggest that in order to have any kind of finite probability of suc-

cess, the typical energy audit program must be coordinated carefully and thoroughly throughout the entire infrastructure established in a given State for delivering such activities. The State of New Mexico is fortunate to have a flexible and responsive infrastructure to accomplish such objectives; I firmly believe that our objectives could not be reached, particularly in the tight time frames established, if it were not for the close cooperation of all organizations involved, such as the State agencies, the universities, the research laboratories, the utilities, and the private sector.

#### 7. REFERENCES

- (1) Research 1978, New Mexico Energy Institute at The University of New Mexico, Albuquerque, January 1978.
- (2) State Energy Conservation Plan for New Mexico, New Mexico Energy Resources Board, Santa Fe, July 1977.
- (3) Dritt, James O., The Total Home Concept, New Mexico Energy Institute at The University of New Mexico, Albuquerque, to be published.
- (4) Dritt, James O., Total Effective Energy Management: An Introduction, New Mexico Energy Institute at The University of New Mexico, Albuquerque, May 1978.