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Process Evaluation

Final Report

U.S. Department of Energy
Bonneville Power Administration

October 1986

Bonneville Power Administration • Hood River Electric Cooperative
Natural Resources Defense Council • Northwest Public Power Association
Northwest Power Planning Council • Pacific Northwest Utilities Conference Committee
Pacific Power & Light Company

Suggested citation:

Flynn Brown, Cynthia (1983). Process Evaluation, Final Report, Hood River Conservation Project, DOE/BP-11287-6.

This document is part of a series of reports issued by the Hood River Conservation Project.

Research supported by the Bonneville Power Administration, U.S. Department of Energy, under Contract No. DE-AC-79-83BP11287. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.

PROCESS EVALUATION

Final Report

By
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October 1986

Work Performed Under Contract No. DE-AC-79-83B11287

Prepared for
U.S. Department of Energy
Bonneville Power Administration

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ACKNOWLEDGEMENTS

The Process Evaluation of the Hood River Conservation Project was the product of input from hundreds of sources. Those who agreed to be interviewed did so without compensation, and, in the cases of Project staff and the contractors, at some risk of being identified. I am most grateful for their willingness to speak freely.

I would especially like to thank Pacific's two contract monitors for the Process Evaluation, Susan French and Dr. H. Gil Peach, for their on-going feedback as the data were collected. In addition, the two Project administrators, Dr. John Jones and Dennis Quinn, provided detailed insights which helped to clarify and interpret the information. Finally, I would like to acknowledge my research assistant, Mrs. Meg Euwer, who conducted many of the interviews when the weather was especially bad, and did so to the highest professional standards.

ILLUSTRATIONS

Executive Summary

The Process Evaluation is designed to monitor the implementation of the Hood River Conservation Project from the points of view of the local community, the Project's staff, and the contractors who did the actual weatherization. It is designed to be read in conjunction with the Field Weatherization Logistics Report, which is Project management's summary of the process.

The source document for the Process Evaluation is Pacific Power & Light Company's "Hood River Conservation Program Proposal" to the Bonneville Power Administration, dated November 19, 1982. The Proposal describes the planned implementation strategy as of that date. The Process Evaluation compares how the Project was actually implemented to the Proposal.

Community Issues

The promotional efforts of the Project were an overwhelming success. Residents registered for the project very quickly. In addition to the normal media channels (newspaper, television, and radio), key factors in generating the large response were the one-on-one contact with the 10 percent of the community included in the end-use monitoring research study and the efforts of the local contractors. Analysis indicated that over time, the community became better informed about the specific features of the Project.

The Community Advisory Committee included a broad cross-section of the community, although minority groups were not represented. It functioned well during the first year of the Project, providing assistance and input to Project staff. However, since its key function was to provide marketing assistance, and assistance in this area proved unnecessary, participation in the group declined over time.

The attitudes of members of the community towards the Project changed over time. Initially, there was a lot of enthusiasm, and community's first contact with the Project (the auditors) tended to be positive. However, due primarily to the delays in processing the work for the large number of registrants, the poor workmanship of two contractors, and changes in Project policies, the community became less positive over time.

Staff and Administrative Issues

Staff who participated in the Project felt very fortunate to be working in a state-of-the-art program. Their work style was characterized by cooperation and task orientation.

The Project was understaffed during the first year, and the organization structure created disparities between authority and responsibility. However, these problems were corrected by the last year of the Project, so that the staff functioned efficiently.

The initial design of the tracking system was rigid, and it did not come on-line until several months after the Project had begun. Increased flexibility was obtained by the addition of an IBM-PC which provided real-time access to key data.

The Regional Advisory Group provided oversight to the research portion of the Project and input to weatherization problems as they arose. By the end of the Project this group, which was composed of traditional adversaries, had created strong working relationships which ensured the quality of the research.

Contractor and Weatherization Issues

Five local contractors were chosen to begin the Project as prime contractors. Much of their time during the first year was spent in clarifying the specifications for installation, devising a pricing approach, and training crews to meet the high standards of inspection used on the Project. During the first year, most contractors had cash flow problems due to the low volume of work. In two cases the cash flow problems were compounded by poor quality work which prevented their jobs from passing inspection at the normal rate.

Specifications for mobile homes and air-to-air heat exchangers were not received from Bonneville at the beginning of the Project. Both turned out to present technical problems for installers and concern from the community.

As the Project progressed, a second group of six contractors was added, the poor contractors were terminated, and policy and procedure changes were made. As a result, during the last year the contractors were able to weatherize the balance of the homes registered for the Project.

Summary

The Project was not implemented according to the Proposal, but rather adjustments were made over time which served to improve the Project's ability to complete its tasks successfully. The changes required flexibility on the part of all Project participants.

Chapter 1: Background of the Process Evaluation

As part of the research effort for the Hood River Conservation Project, an outside contractor was hired to monitor the implementation of the Project. The contractor was charged with recording the perceptions of the community, the contractors, and the staff over time in order to provide another perspective on the Project as a whole.

This report is intended to be read in conjunction with the Field Weatherization Logistics Report (Logistics Report) which is Project management's description of the project. The information contained in the Process Evaluation supplements that found in the Logistics Report. In some cases, material found in the Logistics Report is repeated in this report in order to provide continuity. However, many details are necessarily omitted in this report and the reader is referred to the Logistics Report for a more detailed history of the Project.

Purpose of the Process Evaluation

The Process Evaluation is designed to explain the causes behind the effects of the Project from the points of view of the community, the contractors, the staff, and an outside observer. The basic method for doing so is to examine:

1. what was intended to occur,
2. what actually occurred,
3. the barriers to effective implementation, and
4. the factors that facilitated effective implementation.

More specifically, several orienting questions were used to guide the analysis:

* What were the program's goals and objectives?
* How was the program organized?
* What were the organizational processes used to achieve program objectives?
* What factors might explain the differences between the actual and expected results?

* How could the program design have been changed to help it achieve its goals?
* Did the program have wide appeal to the customers? What factors might explain the participation or lack of participation that the program achieved?
* What changes in the program over time influenced the effectiveness of the program?
* How was the program perceived by the program participants?

(source: Evaluation Guidelines, Pacific Northwest Utilities Conference Committee, Conservation Assessment Work Group, 1986)

Time Frame

The process evaluation covers the period from May 1983, when the contract was signed between the Bonneville Power Administration (Bonneville) and Pacific Power & Light Company (Pacific), and the Closing Ceremonies for the Field Weatherization Office in March 1986. In addition, there are references to the planning period which preceded the actual signing of the contract.

The research portion of the project will continue for some months after the completion of the weatherization, but much of that activity is not covered in this report.

Data

The data used for the process evaluation were obtained from observation of project-related meetings, written reports summarizing those meetings, other printed materials relating to the project, including news releases, and in-depth interviews with project participants.

Written materials

There were several sources of written material used in preparation of this analysis. As part of its contract with Bonneville, Pacific submitted a Monthly Report to Bonneville, summarizing the key events which had occurred during the previous month. These reports provided a framework within which to fit other data. In addition, Project staff prepared several Weekly

Reports, especially early in the project, which were used at the joint meetings between Portland and Hood River staff. Other examples of written reports included minutes of meetings with the Project contractors, field office staff, Community Advisory committee, and Regional Advisory Group. In addition, the contractor attended a few project-related meetings and met informally with project participants.

Interviews

Over the three year period, periodic interviews were held with three groups of Project participants: community residents, contractors, and staff. In each case, an effort was made to make sure that those interviewed represented a cross-section of all those in the group, so that the diversity in the groups was represented in the diversity of those interviewed. Samples of respondents were not random, but rather judgement samples.

Community interviews

Prior to the signing of the contract, a Community Assessment was conducted in order to provide a description of the community. Among the findings was that the community could be divided into eight social groups: orchardists, settled-out Mexican Americans, migrant Mexicans, Japanese-Americans, business/professionals, counter-culture, blue-collar workers, and residents of Mosier. Members of each group tended to have similar social, political, and economic concerns.

The first community residents to be interviewed were suggested by local informants as people who belonged to the eight groups. At the end of each interview, the respondent was asked to suggest others who might be willing to be interviewed. These people were called and an interview was requested. The refusal rate was very low, less than five percent, and the majority of the respondents were glad to have an opportunity to provide input for the Project.

This "snowball" technique was used to maintain representation of each group in the total sample. The 359 members of the community who were interviewed for the Process Evaluation included members of each social group. The sample included mainly electric heat customers, but some oil and gas customers were included, and several respondents who use wood as their primary

source of heat were also included. All members of the Community Advisory Committee (CAC) were interviewed at least once.

Community interviews were conducted monthly or bi-monthly over the period September 1983 to February 1986. The interviews were open ended, and relatively unstructured. They lasted from a half hour to one and one-half hours, averaging about 45 minutes. The questions used for probes were:

1. How did you first hear about the Project?
2. What is your understanding of the purpose of the Project?
3. What is the history of your experience with the Project?
4. What do you think of the Project?
5. Do you have any questions about the Project?

The interviews were conducted so as to provide as much detail as possible about those aspects of the Project that the respondent was most familiar with. The majority of interviews occurred in the respondents' homes.

Twenty-four rounds of interviewing were conducted. Responses were content analyzed and coded. Multiple responses were allowed where they were given, so the number of coded responses varies from question to question.

Staff and contractor interviews

Beginning in the fall of 1984, staff and contractors were also interviewed, approximately quarterly. Since both of these groups were much smaller, the need for and difficulty of maintaining confidentiality was greater than for the community respondents. In the case of the staff, interviews were divided between Portland and Hood River staff, between career Pacific employees and newly hired staff, and between management and support staff. In the case of the contractors, interviews were divided between first-round contractors and second-round contractors, and between prime contractors and subcontractors. There were also interviews with crew members. There were a total of 32 interviews with staff and 14 interviews with contractors.

Again the interviews were open-ended, and averaged about an hour in length. The questions used for probes were:

1. How did you become involved in the Project?
2. What do you like about the Project? What does the Project do particularly well?
3. What do you dislike about the Project? What suggestions do you have for how it could be improved?
4. What changes have your noticed over time?

In all cases, only written notes from the interview were taken; no mechanical devices were used to record respondents' remarks.

Limitations

Samples

The community sample is not a statistically reliable sample of the community. Therefore, the findings from this sample may differ from the findings of other research studies. However, two quality control checks were made of this sample's representativeness. A random sample of Jobs in Progress and a random sample of persons listed in the telephone directory were drawn. Interviews conducted with these respondents showed that their experience did not differ noticeably from the judgement sample.

The formal staff and contractor interviews did not begin until the fall of 1984 (more than a year after the contract was signed), although some informal interviews were conducted earlier. Thus, much of the information from these sources about the early stages of the project are based on recall, rather than on real-time responses.

Scope

Interviews were confined to those in the geographic area covered by the Project and Project employees in Portland. Many other people in the region were involved in the Project, but their opinions were not solicited. In particular, there were no formal interviews with the members of the Regional Advisory Group (RAG), Bonneville staff, or higher management in the Pacific corporate office. Thus, information about the activities of these groups are based primarily on written materials, observation, and interviews with others.

Chapter 2: History of the Hood River Conservation Project

Pre-Project Planning

The Pacific Northwest Electric Power Planning and Conservation Act mandates that conservation be given top priority when considering alternative sources of new generation resources. The Hood River Conservation Project (the Project) was designed to be a methodologically sound examination of the potential of the conservation resource in a typical Northwest community.

From the beginning, the design of the project was a cooperative effort among several groups who are often adversaries: Bonneville, Pacific, the Hood River Electric Coop (HREC), Pacific Northwest Utilities Conference Committee (PNUCC), Natural Resources Defense Council (NRDC), the Northwest Power Planning Council (Regional Council) and the Northwest Public Power Association (NWPPA). It was agreed that Pacific would administer the program and that Bonneville would sponsor it, with some cost-sharing by Pacific. The first proposal was submitted to Bonneville in early 1982. The proposal went through several drafts before an agreement was signed in May 1983.

Goals of the Project

The primary reference document for the goals of the project is the "Hood River Conservation Program Proposal" (the Proposal) which was submitted to Bonneville on November 19, 1982. The focus of the Project was to "demonstrate and document the conservation potential of a limited geographic area over a short period of time ...[in order to] provide information for long-range regional conservation planning and future modifications to model conservation standards included in the Regional Plan ...[and] identify reasonably achievable penetration levels through vigorous marketing of residential conservation services and measures." (p.1-1) The five major objectives of the Project (p. 1-2) were to:

1. determine the impact of residential retrofit conservation measures on the transmission and distribution system, individual customer load characteristics, and kilowatt hour savings;
2. determine the maximum reasonable penetration rate of the Program and levels of potentially cost-effective weatherization measures;

3. determine the relative effectiveness of varied approaches to conservation marketing;
4. assess the characteristics of community social interaction and impacts under maximum conservation program conditions; and
5. determine the costs associated with the development and implementation of a maximum conservation effort.

A summary of the objectives, the actions to be taken to achieve the objectives, and the research products associated with each objective can be found in Appendix A.

Planned Implementation Strategy

Details of the implementation strategy can be found in Pacific's Proposal for this project. Key features of the Proposal's strategy are summarized below. Although the implementation strategy continuously evolved over time, and some changes were made in the strategy before it was actually implemented, the Proposal is used as the primary resource document for purposes of the Process Analysis.

Description of the Project

At a cost of $20 million, the Project was designed to give free home energy audits to all of the approximately 6,300 residences in Hood River and Wasco Counties served by Pacific and HREC and describe the effects of the weatherization. Those electrically heated households that elected to participate in the Project would be offered free weatherization beyond the level of other Bonneville programs (see Table 1).

Houses without electric space heat were to receive fewer benefits. All were to receive a home energy audit, hot water pipe wraps, outlet and switch-plate gaskets, and low flow shower heads. Those with electric water heaters were also to receive a hot water heater wrap.

However, by the time the contract between Pacific and Bonneville was signed in May 1983, only electrically heated homes (about 3,100) were included. Oil-heated homes were referred to the Oil Heat Institute, which performed the audit (using the same company that won the contract to do audits for the Hood River Conservation Project). With their existing person-

nel, the local gas company did not have sufficient auditing staff to provide comparable service.

Figure 1. Measures and levels of installation.

*Full cost reimbursement to be used as an appropriate customer incentive to test maximum market penetration of conventional conservation services and measures.

*Measures selected for implementation reflect cost effectiveness levels consistent with reasonable long term resource acquisition (35 years) during periods of expected shortage.

*Cost effectiveness will be calculated on a house-by-house basis. Preliminary analysis indicates that the following list of measures and levels should meet cost effectiveness criteria when considered in appropriate combinations:

Residential	Target Levels
1. Home energy audit	All residential customers
2. Ceiling insulation and appropriate ventilation	R-49
3. Floor insulation	R-38
4. Wall insulation	R-11 to R-19
5. Cold and hot water pipe insulation	R-3
6. Dehumidifiers and air-to-air heat exchangers	As required
7. Clock thermostats	Where applicable
8. Duct insulation	Crawl space R-11; Attic R-30
9. Storm windows and thermal replacement sash and glazing	Triple glazing
10. Storm doors, thermal doors and sash and glazing	Where applicable
11. Caulking and weatherstripping	Where applicable
12. Outlet and switchplate gaskets	Where applicable
13. Heat pump conversion of existing electric furnace systems	Where appropriate conventional measures can not be installed
14. Electric water heater wraps	R-11
15. Hot water flow regulators	As required

Source: Proposal to Bonneville, p. 4-7

Budget

The intent of the Project was to eliminate the customer's ability to pay as a barrier to participation in the project. Therefore, the budget included full cost reimbursement to Pacific for the energy conservation measures

installed. By virtually eliminating the customer's ability to pay as a barrier, the project could test two other potential barriers to 100 percent penetration, viz., the physical limitations of the structures and any non-economic customer resistance. This design permitted a test of the conservation potential in the region which was more comparable to the potential of other resources, in that normally the individual customer is not asked to participate (except through the rate structure) in the cost of the acquisition of energy resources.

Management

The Proposal emphasized that the "Hood River Conservation Project management responsibilities will conform to the existing corporate organization and structure...[and] conform to standard procedures and practices of the Energy & Conservation Services [E&CS] Department" (pp. 5-3,4) Thus, Pacific's vice president for Consumer Affairs had executive authority over the project, the manager of E&CS had general management authority, and the director of the weatherization programs served as manager for the Project. Program management was housed in Portland, Oregon.

Program administration reported to program management and was housed in Hood River (p. 5-4). The basic structure of program administration is shown in Figure 2. Job descriptions are contained in Appendix B.

Although it was not shown in detail in the Proposal to Bonneville, a parallel organization was responsible for the research and evaluation segments of the project, and was housed in E&CS (see Logistics Report, p. 12).

Staffing

The budget in the Proposal funded five positions at a level of 50 percent or more: the Project administrator, the field coordinator, an administrative secretary, a computer clerk, a general clerk, and a full-time member of the E&CS Staff. In addition, the Project manager was funded at 25 percent and token amounts were included for other Pacific management. Much of the planned work was to be subcontracted to outside services.

Advisory groups

Finally, the proposal indicated that two advisory groups would be formed to guide the Project. First was a Contract Oversight Group (later called the Regional Advisory Group), composed of representatives of the groups who had developed the Proposal, and second was the Community Committee (later called the Community Advisory Committee), composed of representatives of the Hood River community (see Figure 3).

Marketing

It was expected that the Project would open with an intensive marketing campaign to achieve "the maximum possible penetration of a very aggressive weatherization program," according to Steve Hickok, Bonneville's assistant administrator for conservation. "If we need to, we'll be going door-to-door knocking in order to get the pitch across to every single household in the county and try to talk them into participating." (NW Energy News, March/April 1983).

In order to achieve maximum penetration, it was expected that a substantial amount of time and energy would need to be allocated for marketing. In the Proposal, it was "anticipated that a major portion of those expressing a willingness to participate in the HRCP [would] do so as a direct consequence of personal contact [by the Project] (p. 5-6).

Selection of Hood River

The area encompassing the Hood River Valley and nearby Mosier was selected as the project site because of its proximity to Portland, where Pacific's corporate headquarters are located, its clear geographical boundaries, its diversity of climate-types, its diversity of housing stock, the availability of both a private and public utility, and both urban and rural areas (see Figure 4).

End-use monitored (EUM) homes

Approximately a 10 percent random sample of the estimated 3,100 electric heat customers in Hood River were to be selected for end-use monitoring of their electricity usage. One hundred of the EUMs with wood stoves were also

monitored for the heat contribution of wood. The research design called for these customers to be sub-metered for a year prior to being weatherized, and a year after weatherization. The EUM data could be used for detailed studies of before and after weatherization usage in order to calculate the energy savings due to the project.

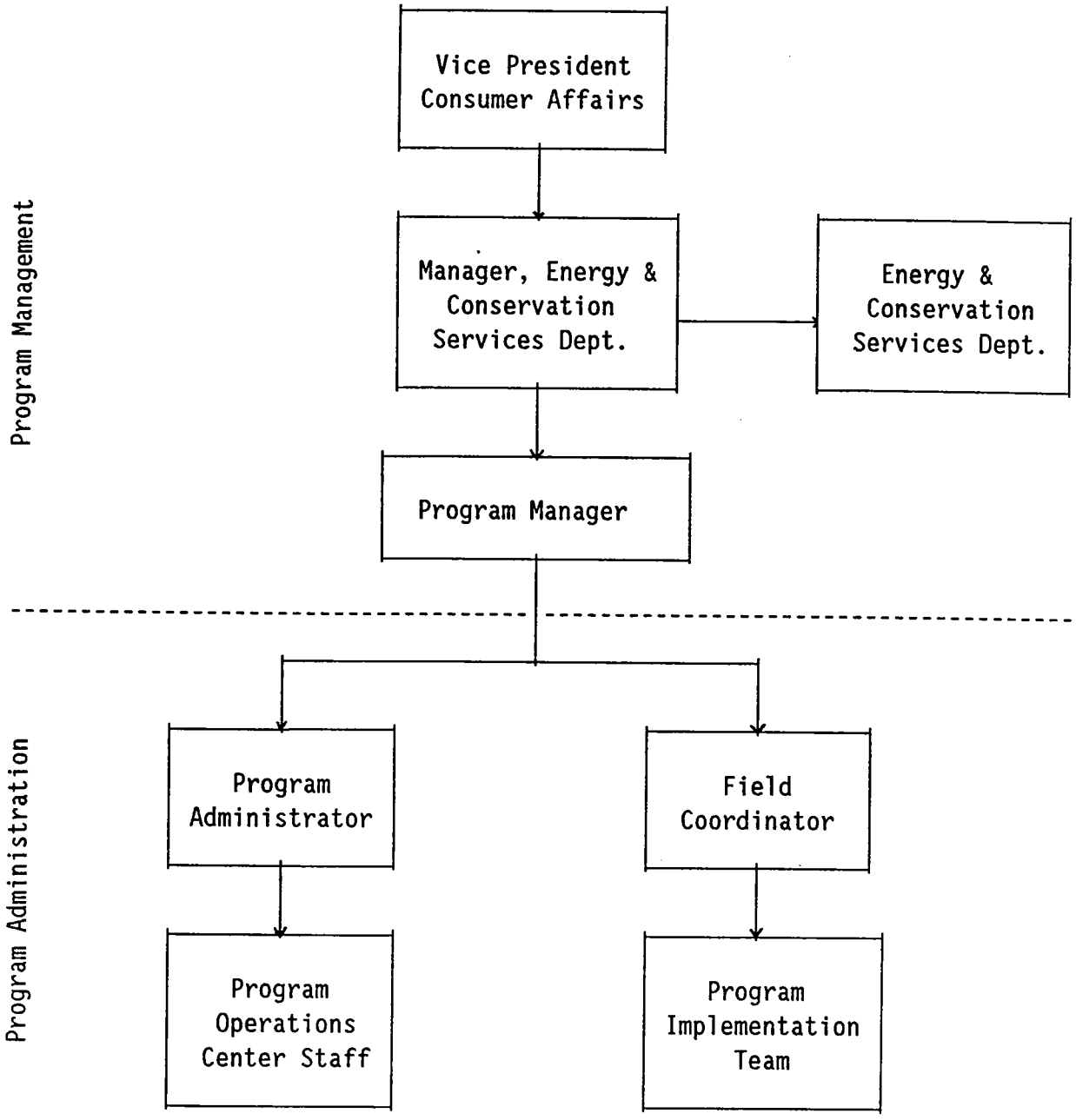

Figure 2. Program organization/management and administration.

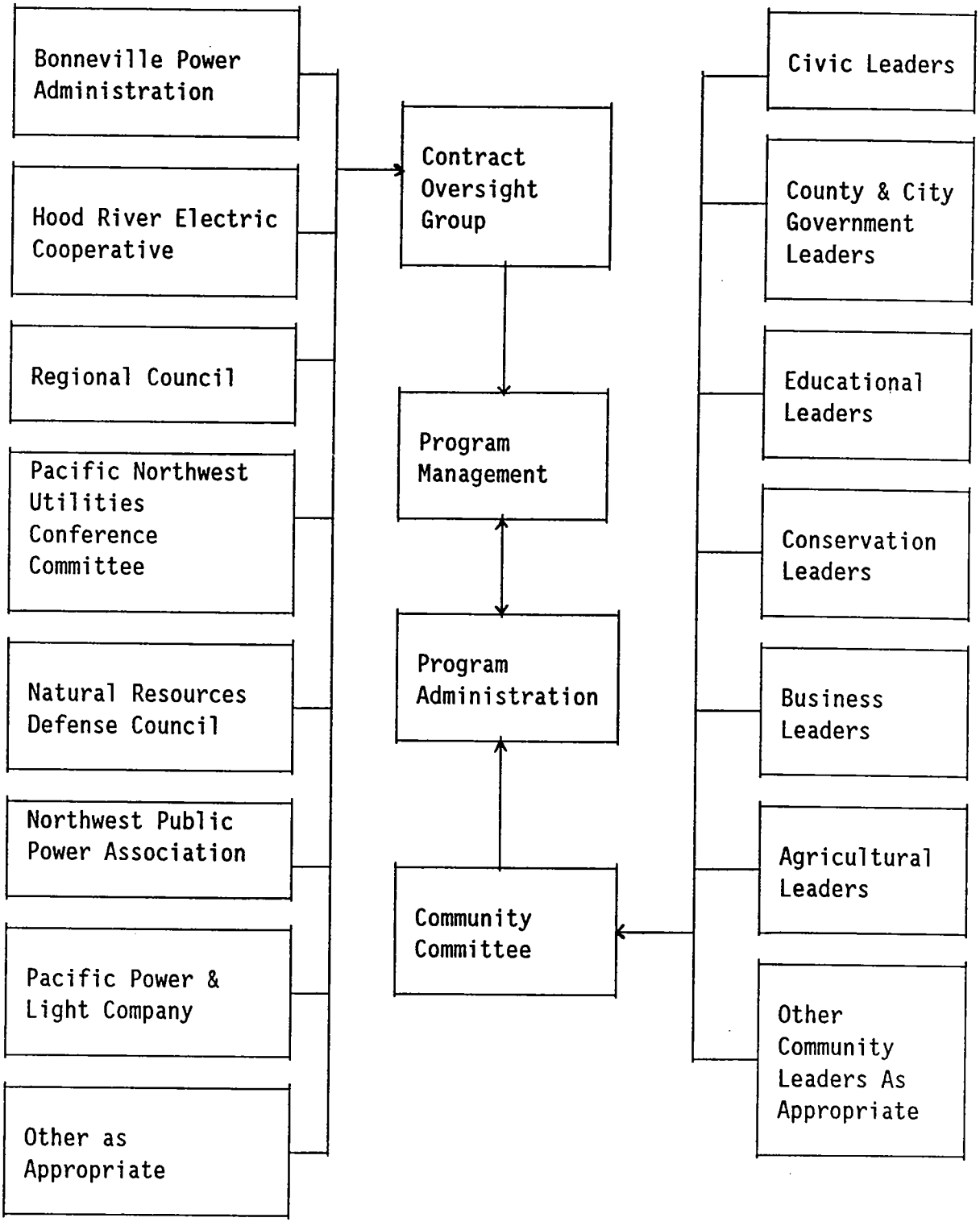

Figure 3. Advisory groups.

Source: Proposal to Bonneville, p. 5-2.

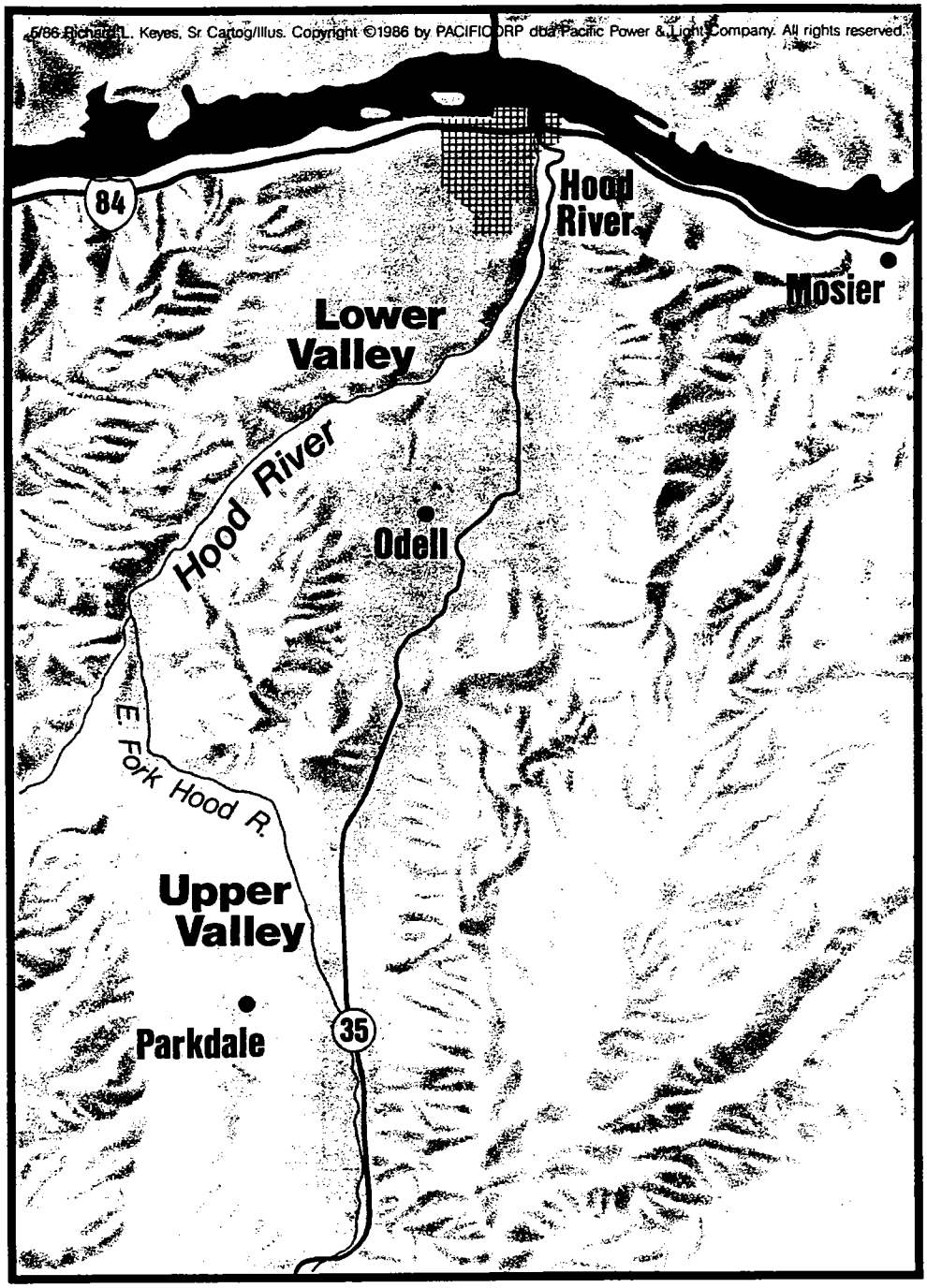

Figure 4. Study area.

Control groups

Two study areas, Pendleton and Grants Pass, were selected as comparison communities in order to provide protection against unusual events which might distort estimation of savings due to the Project (see Figure 5). In addition, a random sample of residential customers from throughout the Pacific Power service area within the Bonneville region was chosen as a further control, and to permit generalizability of the findings.

The random samples of residents in the three control groups were to be surveyed before and after the weatherization in Hood River in order to determine any change in their demographic and other background characteristics and to determine any change in their energy usage patterns.

Figure 5. State of Oregon.

Chapter 3: Phase I, May 1983 - May 1984

The discussion of Phase I is divided into three sections: 1) Community Issues; 2) Staff and Administrative Issues; and 3) Contractor and Weatherization Issues.

Community Issues

This section covers the promotional efforts of the Project and the interaction of the Project and its staff with the community during the first phase of the Project. Much of the information for this section is drawn from interviews with the residents of the community. The discussion is divided into an analysis of the introduction of the Project to the community, its early promotional success, the activities of the Community Advisory Committee, the effect of delays in the timeline on the community, and the attitudes of the community towards the Project.

Introduction of the Project to the Hood River community

During the planning period, several steps were taken to facilitate maximum penetration of the Project. A Community Assessment was completed in April 1983. A slide show describing the Project was produced which used information from the Community Assessment to make sure all groups were represented in the slide show. Also, the logo for the Project was developed, again encompassing many of the cultural facets of the valley. Billboards advertising Hood River as the Conservation Capitol of the Nation were put up which repeated the logo theme. These efforts appear to have had a positive effect on the image of the Project in the community, according to interviews with members of the community.

The first formal presentations of the Project were made in Hood River to the Chamber of Commerce and the County Commissioners in the spring and early summer of 1983. In August, approximately 40 citizens attended an informational meeting hosted by the NRDC in Hood River. These first meetings were the sources of the earliest "word-of-mouth" dissemination of Project information. Interviews with residents noted that the NRDC-sponsored meeting, in particular, was viewed as well-done, because all the participants were prepared and willing to answer the residents' questions.

In addition, the Project began a media campaign to disseminate information about the Project. This effort included articles in The Hood River News, spots and interviews on the local radio station, and news spots on Portland TV stations.

Because Hood River is a small town, much of the coordination with local media was done by the local Project administrator. This eventually led to difficulties when the division of labor between management in Hood River and Portland was not clear (see below, Management policies).

Promotional success

During the fall of 1983, the name recognition of the Project was low in the community. Even those who had a vague idea of what the Project was about did not associate the name with the Project. As would be expected, there were misconceptions about the nature of the Project as well (see Figure 6). Some of the common myths concerned what it took to qualify for the Project and the geographical area that was included in the Project. Many who were in fact eligible thought they were excluded because their income was too high, they did not use enough electricity, they had other heat sources (primarily wood), or they lived outside of the town of Hood River.

As early as the end of 1983, respondents were reporting that it was too late to sign up for the Project, and passing this information along to their friends. There was also confusion about the benefits for participating in the EUM study. Some thought that they would receive enhanced benefits for their participation, and others thought they would be weatherized first. Community perceptions of the total cost of the Project ranged from $500,000 to over $200 million, and residents did not understand what measures were to be paid for with the funds.

Still, registration for the Project was dramatic during the fall of 1983. Out of the estimated 3,100 electrically heated homes in the valley, almost half had already signed up by the end of the year, with virtually no formal marketing effort. The four local auditors were able to keep up with the registrations only by working six day weeks; by the end of 1983 they had completed over 800 audits.

The interviews with community residents asked respondents where they had first heard about the Project. Many respondents cited more than one source. As shown in Figure 7, the most frequently cited sources were the media -- The

Hood River News, followed by radio and TV. However, what was also clear from the interviews was that the media sources were only secondary sources of information, and that these sources were frequently ignored until after the respondent had heard about the Project by word-of-mouth.

In fact, the interviews indicated that the most effective promotional device was the one-on-one contact of Project staff with the 10 percent of the community included in the EUM study. These residents were given detailed information about the Project's weatherization and research goals, usually in their own homes. They then passed this information along to their friends, neighbors, and relatives. In a small community, it was news that the EUM residents had been "selected by the computer" as key participants. Once people had heard about the Project from their friends, they were more likely to read any articles in the newspaper in detail, rather than just skipping over them.

As a consequence of the unexpectedly high registration rate, the types of promotional efforts that had been planned for at the time the Proposal to Bonneville was written were severely curtailed. The number of paid advertisements appearing in The Hood River News dropped significantly soon after the Open House in October. Radio and TV coverage were limited during this period. Active outreach to civic groups was reduced. In fact, the most serious public relations problem of the first year was not in achieving penetration, but rather in managing the delays in audits and weatherization in light of the deluge of sign-ups in the fall of 1983.

By early 1984, problems with name recognition for the Project appeared to be greatly reduced and the residents were much better informed. With a large volume of registrations for the Project, and over 1,000 audits completed, most people in the community had a good understanding of the basics of the Hood River Conservation Project. Although there continued to be scattered individuals throughout the Hood River Valley who knew nothing about the Project, the main concentration of people who were not informed were located in Mosier, a small town in an adjacent county. The reasons for their lack of information and participation were: because the Project was called the Hood River Conservation Project, they did not think it applied to them; they were more likely to read The Dalles Chronicle than The Hood River News; their children did not attend Hood River Schools; and the population included more elderly people who did not leave their homes frequently.

Figure 6. Misperceptions, Phase I.

	N	%
Qualification criteria	10	22
Geographical criteria	6	13
EUM benefits, selection process	5	11
Sign-up date is past	5	11
Contractor selection process	4	9
Measures included	4	9
Total cost	4	9
Purpose of the study	3	6
Timing of the project	2	4
Other	3	6
TOTAL CODED RESPONSES	46	

Source: Monitoring Reports 1-8, 97 respondents

Figure 7. Sources of information, Phase I.

	N	%
The Hood River News	35	30
End-use monitored home resident	15	13
Radio, TV	13	11
Word of mouth	12	10
Billboard	11	9
Staff	11	9
Work	7	6
Citizens' Advisory Committee Member	5	4
Weatherized friend or family member	2	2
Other	7	6
TOTAL CODED RESPONSES	118	

Source: Monitoring Reports 1-8, 97 respondents

Community Advisory Committee (CAC)

The Community Advisory Committee (CAC) was formed in the summer of 1983. The CAC's primary charge was to serve as counsel to those directing the marketing and communications aspects of the Project. It was composed of 14 members, designed to represent a cross-section of the community geographically and sociologically. Rather than just including "City Fathers," as was suggested in the Proposal to Bonneville, the Community Assessment results were used in forming the committee so as to represent most groups in the area

and a diversity of points of view. For instance, not all of the members had electric space-heating, and several were fiscally conservative in their views regarding government "give-aways" such as the Project. Although the CAC represented most of the groups in the area, no minority members were included, even though the community includes large number of Spanish- and Japanese-speaking people.

The CAC began meeting in the fall of 1983. Typically, dinner was provided for the members. Following dinner, the formal meeting would begin with reports from various Project staff about the progress of the Project and issues that needed consideration. The reports would be followed by comments and questions about the reports from the CAC members. Then, the floor would be open for discussion of other issues.

There was some initial confusion regarding the scope of the meetings and the group's authority. Members of the community had been led to believe that the meeting would be open to the whole community and provide a forum for community input. However, there were problems in adequately publicizing the first meetings, and the lengthy agendas did not provide for broad community input until quite late at night. Although the meetings were always "open," after the first few meetings there was little community participation beyond the CAC members and representatives of the contractors doing the weatherization.

The CAC accomplished several things during the fall of 1983. Members provided input on how best to communicate with those who had been audited but not yet weatherized, on how to avoid "carpetbaggers" with initials similar to Bonneville coming into the area to sell weatherization at a "small cost" while delivering a minimal amount of work for a large sum of money, and on the agenda for the Open House. Some members of the committee volunteered to serve as greeters for important guests at the Open House. The Open House was perceived by the community as appropriate and well-executed, and the CAC members felt involved and useful.

The CAC was also helpful in defining and clarifying policy issues of concern to the community. They wondered how contractors were selected, whether homeowners could supplement the approved Project investment, whether homeowners could do the work themselves, and how "cost-effectiveness" was calculated. During the first months of the Project, the CAC was needed for input on specific issues and to help with start-up activities, and their assistance was appreciated by Project staff.

One of the major accomplishments of the committee during the first months of 1984 was to assist in relieving Project bottlenecks caused by the slow turnaround from Bonneville regarding interpretations of Project specifications. Committee members were very concerned about the slow progress of weatherization activities. At one point, the Chairman of the CAC wrote a letter on the committee's behalf to the Bonneville Administrator which was instrumental in alleviating some of the bureaucratic requirements which had stalled work on a high percentage of jobs.

The CAC continued to meet monthly throughout Phase I, and receive information from Project staff about the progress of the Project. The CAC turned out to be one of the few proposed communication devices that continued to be used by April 1984; the feeling of Project management was that with over 1,900 people signed up for the Project and only 35 homes completely weatherized, it was best to restrain direct promotion activities.

Delays

By early 1984, it was clear that for hundreds of households, there would be a considerable delay between the time of registration and the time of the audit and again until the time of the weatherization. Early registrations had far exceeded expectations, and even with a six-day week, the contractor employed by the Project to perform the initial audits was about four months behind. Some residents in the EUM study had deduced as early as October that their study would not be completed on schedule due to delays in the installation of monitoring equipment.

Homeowners who were registered for the Project were sent a letter on January 19, 1984 explaining what they should expect and what the general procedure would be: an audit (including water heater wrap, wrapping water heater pipes, low flow shower heads and outlet gaskets), a computer check of the audit for accuracy, bids by the weatherization contractors, selection of the winning bid, a discussion of the selected proposal between the office and the homeowner acceptance of the work, and a final inspection of the work by the Project. It was emphasized in the letter that there would be no lien on homeowners' property and no cost to them for the weatherization. A letter was also sent to the EUM homes on February 8, explaining that there would be a delay in installing about half of the equipment.

Understandably, respondents to community interviews had many questions about the Project during Phase I (see Figure 8). The majority of the questions were regarding who qualified for the program, how to sign up, and what measures would be available. There were also a substantial number of questions about who was paying for the Project, what the cost was, and what the purpose of the Project was. By the end of the first year, there were questions specifically about the research design, and even early on, homeowners wanted to know how they could obtain the results of the study, or at least results for their own homes. Several of the questions related to concern about how the work would be done at specific houses: how the contractors would be chosen, whether the homeowner could decline certain measures and not others, whether the homeowner could pay for supplemental work (especially wooden window frames), and how quality control would be ensured.

Attitudes towards the Project

Overall, the community's attitude towards the Project during its first year was positive. Most of those expressing positive attitudes made general statements to the effect that they thought the Project was a good thing (see Figure 9). Some made more specific comments, such as that they felt fortunate to be living in Hood River, which was chosen for the Project, and felt that it enhanced the image of the town, Pacific, and Bonneville. They were glad that the Project had been designed to be totally free to the homeowner, which most found hard to believe.

Another positive comment was that the staff was particularly helpful, and had been instrumental in changing many who were doubtful about the Project to either a "wait and see" attitude or a positive attitude. Early in the Project, the auditors were mentioned as creating a positive attitude towards the Project, since they were professional, prompt, and courteous.

Many residents were looking forward to savings on their electric bills and the increased comfort that would result from the weatherization. They felt that the research results of the Project would benefit the region and the nation, and that the multiplier effects of the jobs created by the Project would benefit the local community. Some mentioned that they felt the Project was a better way to spend money than building nuclear plants or new hydroelectric facilities.

Figure 8. Questions about the Project, Phase I.

	N	%
Qualifications, sign-up procedures	46	20
Measures available	42	18
Sponsorship, cost	31	13
Purpose of study, research design, management plan	27	12
Time frame	24	10
Selection of contractors	13	6
Reason for delay	10	4
Homeowner control of measures, supplementals	8	3
Cost-effectiveness	7	3
Quality control	6	3
Access to research results	5	2
Tax effects of Project	5	2
Why Hood River was chosen	4	2
Air-to-air heat exchangers	3	1
Effect on building codes	2	1
TOTAL CODED RESPONSES	233	

Source: Monitoring Reports 1-8, 97 respondents

Figure 9. Positive attitudes towards the Project, Phase I.

	N	%
General positive statements	51	35
Lucky it's in Hood River	16	11
Staff	13	9
Value of the research data	10	7
Save energy/money; comfort; noise	10	7
Auditors	8	5
Free is great!	8	5
Good for local economy	6	4
Preferable to nuclear plants, more hydro	3	2
Other positive comments	20	14
TOTAL CODED RESPONSES	145	

Source: Monitoring Reports 1-8, 97 respondents

Those who had negative comments about the Project tended to have specific complaints (see Figure 10). Many mentioned that the Project was not equitable and discriminated against those without electric space heating or those who had participated in earlier weatherization programs that involved

cost-sharing by the homeowner. They argued that there was "no free lunch," and that the Project would indeed have a rate impact, which was particularly inappropriate at a time when the region had an energy surplus. They felt that the cost was excessive for the expected returns, both in kWh and in research results.

Figure 10. Negative attitudes towards the Project, Phase I.

	N	%
Costs and Inequity	74	53
Inequity, discrimination	24	17
Rate impact, "No free lunch"	22	16
Cost	20	14
Poor timing, we have a surplus	5	4
Paid for ZIP,* other weatherization	3	2
Weatherization Process	38	27
Delays	16	11
Intrusion, inconvenience	14	10
Quality of work	8	6
Rationale for Measures	15	11
Measures selected	6	4
Poor information from Project	5	4
Cost-effectiveness	4	3
General Negative Comments	13	9
TOTAL CODED RESPONSES	140	

*Zero Interest Program (Pacific)

Source: Monitoring Reports 1-8, 97 respondents

Even though the weatherization process had just begun, the community had opinions about that process. There were complaints about the long delays after registering for the Project and after the auditor had visited, the intrusiveness of the contractors and the quality of the work done in the name of the Project. Those with complaints felt that the measures being installed were either excessive or not the best value for the expenditure.

They also mentioned that they were getting different information from the auditors and Project staff about what would be cost-effective for their houses. In retrospect, the differences between what the auditors said would be cost-effective and what later turned out to be offered to homeowners

appeared to be attributable to two sources: 1) inaccurate audits, and 2) changes in Project policies regarding specific measures (e.g., replacement doors).

Staff and Administrative Issues

This section describes staff and administrative issues for the Project during the first year. The source of much of the information for this section is interviews with the staff over time, both in the field office in Hood River and in corporate headquarters in Portland, Oregon. Again, the benchmark for evaluation of the implementation of the staff and administrative aspects of the Project is the November 1982 Proposal to Bonneville. The discussion is divided into an analysis of the Project's personnel, the records management and tracking system, and the research requirements of the Project.

Project personnel

Many of those who were assigned to the Project began work when the Project was still a proposal under consideration by Bonneville. Although Pacific made several revisions in response to feedback, it still took over a year before the contract with Bonneville was signed (see Logistics Report, p. 8). Both Pacific management and Bonneville were perceived by staff as extraordinarily slow in reviewing proposals and in working out the final contract, which was signed in May 1983. These staff were heavily invested in the success of the Project before it even began.

By the end of May, management and administrative staff from Portland began commuting regularly to Hood River. Because the Project was known to have a finite duration, career Pacific staff did not relocate to Hood River. The Project administrator and the field administrator (referred to as the "Field Supervisor" in the Proposal) shared an apartment in Hood River during the week and returned to their families in Portland on the weekend. Personnel requisitions were submitted for the three budgeted new staff positions in the Hood River office in the spring of 1983. During the summer of 1983, much of the activity centered around start-up activities.

As became clear almost immediately, the Project had been understaffed. The staff, both in Hood River and in Portland, was increased. However, Pacific was undergoing a reduction-in-force at the time, and it was difficult

to get the requisitions for additional staff through the corporate system. Therefore, the Project decided to contract for the audits it would require, using a competitive bid system, rather than assigning trained and experienced Pacific auditors to the Project.

The contractor who won the auditing bid had its regular staff conduct the first audits, and then trained local people for the bulk of the audit work for the Project. The first audits were conducted on those homes that were selected for the EUM study. By the end of 1983, all of the homes selected for special research studies had been audited.

At the same time that the field office was being organized, the support structure for the Project was forming within the corporate office in Portland. The basic accounting system for the Project was set up within Pacific, with categories for such areas as administration, evaluation, marketing, tracking, and weatherization activities. Staff from throughout the corporate headquarters were assigned support responsibility for the Project. Contracts for most aspects of the evaluation were either signed or in the final stages of negotiation.

The staff continued to expand, both in Portland and Hood River, as it became clear that the administrative needs of the Project were larger than anticipated. Staff were hired in Portland to handle Project scheduling and budget control. A general secretary and two Project inspectors were hired in Hood River. The staff was increased again during early 1984. Two field specialist were added to the Project office to handle the homeowner agreements (see Logistics Report, p. 46 for description of staffing by the end of Phase I).

These early staff who were hired for the Project were extremely enthusiastic about their new jobs. Staff could see immediately that they had the latitude to really provide input into the design of the Project, and felt that some of their talents that had not been used elsewhere in Pacific were advantageously exploited for the Project. Unlike the routine of many other Pacific jobs, this Project moved much more quickly than other Projects. Hours were necessarily flexible, with staff sometimes putting in 10-12 hour days and weekends, and other times taking a "mental health" day. The high pressure, challenging, busy, problem-solving environment was perceived as attractive to those who joined the Project in its early stages. There was a deep commitment to quality, and the staff strongly believed in the goals of the Project. The Project was perceived as a "one of a kind, chance of a lifetime" Project.

One attraction of the Project was the teamwork required in the early stages, which required that staff take into account each others' strengths and weaknesses. There were special challenges in developing a tracking system (see below), developing the contractors' bidding system, and hiring on a short time line. Staff operated in a consensual mode to solve these problems, but also felt that they had enough authority to solve many problems on their own.

Some of the new staff also felt confused. It seemed like there was no set goal for each day and no one was in charge of the field office. Many parts of the overall Project seemed to be working, but not together. There were no real job descriptions, and in fact many staff were just doing whatever needed to be done without adhering to a strict division of labor.

One explanation for the lack of division of labor was that the Project was still seriously understaffed. For instance, the Proposal suggested that the field administrator would handle responsibilities that it eventually took five staff to handle (coordinator, bid desk, and three field specialists).

A helpful feature of the early management of the Project was the regular team meetings held in Portland. These meetings were organized by the Project administrator and included field staff, research staff, and corporate staff involved in the Project. These meetings provided an opportunity for people involved in the Project to learn how all the parts of the Project fit together, to get to know the individuals who had responsibilities that affected their own performance, and to keep the communication lines open.

However, there were also numerous problems with the management of the staff the first year:

Use of resources. There were problems with the management of time and scarce human resources. For instance, as it became clear that the Project was not going to be administered in the fashion specified in the Proposal, and that more staff and a longer time period would be required, Pacific asked Bonneville for modifications to its contract. A large amount of "research" staff time was allocated to preparing the budget modifications. Such administrative time had not been included in the research budget and using research staff for this purpose meant they were not available for other duties.

As a result, there were instances when a research deadline was known months in advance, but the necessary work for meeting that deadline was not begun until weeks or days before the deadline. The unique demands for administrative time for this experimental program were not anticipated and provided for at the Proposal stage. Many staff felt that the only way they could meet the Project's competing expectations was to work a significant amount of (unpaid) overtime.

Inflexibility. As is the case with most large corporations, Pacific's expenditure decisions are made within the context of an annual budgeting cycle. Given that the majority of the activities that a utility engages in are similar from year to year, most budget needs can be anticipated or covered by appropriate contingency funds. Compared to many industries an electric utility does not normally require a great deal of flexibility; policy decisions can be made and adhered to over relatively long periods of time.

The Hood River Conservation Project was an unusual project for Pacific to undertake. It was an experimental program, and therefore its budgetary needs were difficult to anticipate in the ordinary way. Since this was a pilot project, things frequently did not work out as they had been planned for months earlier. Much greater flexibility was required for this project than for a typical utility special project.

Pay and productivity. Initially, staff for the Project were hired at entry-level pay scales within Pacific. However, given the fast pace of the Project and the understaffing, most staff members had mid-level authority and resonsibility very quickly. There was no provision within the Pacific pay-grade system for a correlation betwen the productivity of the staff and their rewards. Some made less than they did when they worked elsewhere for Pacific, yet the frustrations and pressures of working on the Project made this a much more demanding job.

Some of the early hires were not able to afford to continue with the Project; all those who were interviewed after they left the Project mentioned that though they liked the work, they were not able to support their families indefinitely on the offered pay. Also, it was felt that very specific agreements that had been made regarding the timing of raises were not honored. To make matters worse, overtime pay was not authorized, even though the Project was clearly understaffed.

Project basis of employment. Pacific had Project staff sign a form stating that the company had no commitment to staff beyond the life of the Project. Everyone, including career Pacific staff, who agreed to work for the Hood River Conservation Project was on a "project" basis and could be terminated when the Project was over. Thus, the Project was clearly distinguished from other employment at Pacific and was structured in such a way that: 1) for those who expected to leave at the end of the Project, there was a limited investment in Pacific as a whole, and 2) for those who expected to have to "look for a new job" within Pacific when the Project was over, there was a limited investment in the Project, and the Project consequently lost some of its early staff.

Management policies. Initially, there was not a clear division of responsibility and authority between Portland staff and Hood River staff. To lower level staff, it didn't look like the managers in Portland and those in Hood River agreed on how to run the Project; there was no clear direction for the Project from the top down. Things that a staff member felt were their responsibility were perceived as badly handled by people elsewhere (both in Portland and in Hood River) who took authority that they should not have had. For instance, because the Project administrator did not have authority for Project expenditures, he could not commit to even small ($10.00) expenditures for Project advertising. This hampered his ability to work with the local newspaper editor to get a mix of news coverage and advertising about the Project. A common complaint of staff both in Portland and Hood River during Phase I was that there did not seem to be a good fit between their authority to make decisions and their responsibility to get their job done.

Performance evaluation. When the evaluations were first done for Project staff in the spring of 1984, a disproportionate percentage of staff (as compared to the rest of the employees of Pacific) received "Exceeds Expectations" ratings. Part of the impetus for these rankings by the supervisors was that they wanted to be able to justify pay raises so their staff could be compensated at a level commensurate with their actual duties. Even if these high ratings were warranted, the staff correctly perceived that they were all being ranked similarly, which meant that the supervisors were not really making distinctions among Project staff.

As a result, for the 1985 evaluation, the company restricted "Exceeds Expectations" ratings for people on the Project to the normal company percentage. Project staff perceived that the top rating was in fact disallowed, thus truncating the possible distribution of ratings and penalizing those who had shown improvement or made an extra effort over the

year. It is not clear to staff that they were really given a fair evaluation in either year. Some supervisors devised their own supplementary systems, which the staff knew would be used in addition to the Pacific system, because the Pacific system was not designed to measure performance on this unique, experimental, fast-track Project.

Organizational structure. The Project manager was based primarily in Portland, although he commuted to Hood River regularly. This arrangement was consistent with the plan specified in the Proposal to Bonneville; the Hood River Conservation Project manager was budgeted for only 25 percent of his time to the Project, and had other responsibilities at the corporate office in Portland.

However, this meant that there was no one based in and living in Hood River who had authority over and responsibility for the Project as a whole. Expenditures were all approved in Portland; questions regarding specifications were referred to Bonneville via Portland; hiring decisions were channelled through the normal Personnel process in Portland. In fact, there was no one based in the field office in Hood River who had overall responsibility for that office (see Figure 2, p. 10). Given the size, complexity and uniqueness of the Project, such a structural arrangement was not optimal.

The initial structural organization of the Project personnel located in the corporate office was also consistent with the Proposal to Bonneville, but it was not likely to function easily. The Hood River Conservation Project Manager and the Manager of the Research and Evaluation Team occupied parallel positions on the organization chart (see Logistics Report, p. 12). However, there was no overall director for the Project who could coordinate both the research and operations needs. The two managers did not report to a common director for the Project.

The structure did not provide for the needed full-time, hands-on Director of the entire Project who had responsibility and authority comparable to a Vice President within the corporate structure. Therefore, when unanticipated gaps in the design of the Project appeared, it was difficult to create timely solutions.

One perceived advantage of <u>not</u> having an overall Project director was that the research side of the Project was able to maintain more independence because it did not report to other Project staff, but rather to the director of market planning (see Figure 2). However, the primary disadvantage of the arrangement was predictable: there was an initial tension between the field

staff and the research staff. Operations people did not understand the value of the research staff's activities and felt that the research staff should remain objective scientists and let them organize weatherization operations as efficiently as possible. Research staff were frustrated because it was hard to get information from the operations people, and to get them to spend the necessary time to collect research data in a usable form. Teamwork within groups was excellent; teamwork between groups was not as good.

Nor did the structure provide for a separate manager of administration. The staff who were called administrative staff for the Project were in fact responsible for field operations. The Proposal said that the Project manager was to perform the typical administrative responsibilities of a project, and be responsible for "schedule maintenance, fiscal control and process and progress reporting (p. 6-6)." De facto, the Research and Evaluation Team came to assume that responsibility, in addition to their research responsibilities, because they were the only organized unit within the corporate structure that was assigned to the Project.

Pacific's Project administrator resigned at the end of May 1984, about one year after the contract was signed. He had been heavily involved in developing the Project's proposal to Bonneville and in the start-up phase of the Project. In addition to the personal hardship that accompanied a weekly commuting pattern, the main reason for his resignation was the awkward structural organization of the Project, which made it difficult for him to do his job.

Record management and tracking system

Considerable effort was put into development of the tracking system, which would be used to store all the audit and weatherization information for the houses in the Project. Some 122 reports based on 21 carefully developed data-collecting and transmitting forms were identified; each of the reports and forms had to then be drafted and reviewed before the programming could begin. Project management thought that the system that had been designed was complete and appropriate, and chose to have the software custom designed specifically for the Project. It was expected that the final analysis documentation would be published before the end of August 1983, and be available well before the actual weatherization began.

The mini-computer did not even arrive in Hood River until October 1983. It had to be tested (initial arrangement, component linkages, and reliance)

before any data could be loaded. At the same time, acceptance testing of the tracking system proceeded. The acceptance testing continued through the end of the year and into the next year. The tracking system was not fully operational until March 1984, some eight months after it was expected to be. However, not all of the reports that the Project would need were operational by this time, and key data (barriers, feeder area, and weather station identification) were not yet on line.

Many of the reasons for the delay in getting the tracking system operational are outlined in the Logistics Report. However, it could be argued that the design of the tracking system was faulty in the first place. The assumption was made that it was possible to design all the reports that would be needed for any purpose before the Project started. Therefore, the tracking system design was relatively inflexible. Each time it was discovered that there was a new need, the contractor had to reprogram whole sub-systems. In some cases, the need simply could not be met (accessibility by either bid or account number, for instance), or could not be met in a timely fashion.

Because the tracking system was not on-line, the initial tracking of the weatherization was done manually. Packets for each residence were stored in a main filing area. Staff needed to pull the physical packet each time they reconciled audit and contractor measurements, met with a home owner, met with a contractor, or answered a question about the progress on a job. Given the fact that most staff were operating with large backlogs, and therefore had many files on their desks, it was often impossible to find a particular file.

Research and administrative requirements

In order for the Hood River Electric Coop (HREC) to agree to be included in the Project, it was reimbursed by Bonneville for a portion of the estimated revenue loss to the Coop which would result from the weatherization.

The sample of end-use monitored homes was drawn to include some 120 homes within the HREC service area and 200 homes within the Pacific service area. Since many of the HREC's billing records were not computerized, the sample had to be drawn by hand and the billing data keypunched into a computer file.

The basic sampling design was for a 10 percent simple random sample of the homes in the area. This sampling design was modified in several ways.

Disproportionate weight was given to homes on the feeder line in Hood River which was to be used for the Feeder Line study. In the HREC service area, there was some difficulty in drawing a truly random sample. Although 460 names were randomly drawn to achieve the required 120 participants, over 160 of those considered could not be included because of technical problems. Staff were barely able to secure the required 120 participants.

One of the major technical problems in securing sample points was that any home with a "branch circuit" had to be eliminated from the sample. Branch circuits occur when: 1) old service is upgraded by adding a second box, rather than upgrading the first, or 2) service is provided not only to a single-family dwelling, but also to migrant laborers' cabins, workshops, cold storage facilities, and other outbuildings which have high electricity use. Exclusion of all such customers from the EUM study probably eliminated many of the largest users of electricity from the population. Finally it was politically difficult for the Electric Cooperative to refuse some of the "volunteers" who wished to be included in the EUM study.

Energy consultants from throughout Pacific's territory were enlisted to assist Pacific and HREC staff in signing up the sample points. The individuals who were used were cycled into and out of Hood River on a two-week rotation, and given a quota of homes to sign up during that period. Contacts with residents to secure their cooperation were very positive, and most signed the contract agreeing to be monitored on the first contact. However, some of the misinformation later reported by the residents was a direct result of the sign-up procedure, which encouraged exaggeration of the benefits of participating in the EUM study in order to meet quotas.

By September, it was clear that two key pieces of monitoring equipment, those for the temperature sensing and for the wood heat sensors, would not be available prior to the 1983-84 winter. This had the effect of requiring the research component to have an entire extra heating season for evaluation purposes. The change necessitated a Budget Modification, which required considerable administrative effort (see above).

Several other administrative issues were also resolved during the fall of 1983. The most critical was that the two-year weatherization period for the Project was changed from "September 1983-August 1985" to January 1984-December 1985." This change was necessary because unit prices had not been worked out with the weatherization contractors so that the actual weatherization could begin. Again, changing the weatherization contract required a Budget Modification which was performed by the research staff.

Action to revise the contracts of the end-use monitored homes began in April 1984. Without baseline monitoring during the 1983-84 heating season, conservation measures could not be installed in those homes between June and September 1984, as specified in the EUM participants' contracts. New contracts with the homeowners were needed so that the monitoring equipment could be left in place for the 1984-85 heating season, and weatherization could be deferred to mid-1985.

Fortunately, a member of the research staff had grown up in Hood River, and knew many of the EUM participants personally. She was able to negotiate the revisions to the contracts more easily than others might have. The negotiations also provided a second opportunity for EUM participants to meet with Project representatives and ask questions or express feelings about the Project. Management used this feedback as support for changing some of their procedures, especially with regard to the contractors who were performing poorly.

Regional Advisory Group (RAG)

Once the Project was underway, there were requests that additional research data be gathered. Examples were requests to monitor humidity and water heaters. Such requests were referred to the RAG. The RAG did not agree to add research projects to the study, because its members felt that the sixteen studies that they had originally designed for the Project needed to have priority.

The RAG also considered using weatherization contractors from outside the local area, but it was recommended to limit the initial work to local contractors. Other issues that were discussed at the RAG meetings included the methodology for calculating savings due to the Project and how to handle the renegotiation of the EUM contract (for a fuller discussion of the function of the RAG, see Peach, 1983, 1985).

Contractor and Weatherization Issues

Because of the complexity and innovativeness of the Project, there were many operational issues to work out during the first year. These issues are discussed in sections covering contractor selection, the effect of the Project on business in the local area, pricing issues, delays, cash flow, specifications, inspections, and quality control.

Contractor selection

The Project identified five contractors who 1) had previous weatherization experience with Pacific, Bonneville or the HREC and 2) whose businesses were established in the Hood River area before May 1, 1983. The first formal meeting with the prospective weatherization contractors was held on August 16, 1983. All five of those who had been invited attended and indicated an interest in participating. The meeting discussed contract specifications and the level of compliance that would be required for this Project.

The first selection criterion, previous weatherization experience, was of limited usefulness for this Project. Because of the unique nature of this Project, there were unusually high R-values to be installed and very high inspection standards. Even those with previous experience required extensive training with the new specifications. Perhaps more important criteria would have been evidence of management capacity, quality work, and flexibility; those contractors who had these characteristics performed well on the Project.

The other key selection criterion, that the contractor be local, was quickly subverted by the subcontracting arrangements. Three of the five contractors chosen elected to use subcontractors to handle the increased work load. There was no requirement that the subcontractors be local, and in fact two were not.

Even using the two primary criteria for inclusion, utility or Bonneville weatherization experience and being local, at least one contractor was not included among the first five contractors. The local Community Action Program (CAP) had experience with Bonneville weatherization programs, operated in the Hood River area as part of its service territory although its headquarters were some 20 miles away in The Dalles, had Bonneville-trained auditors on its staff, and had a record of good work.

The CAP requested that they be allowed to check the list of those residences that had registered for the Project against their list of low-income families, and be allowed to weatherize the low-income homes. The CAP argued that by participating in the Project, the CAP would be able to do some of the required repair work using other funds administered by the CAP, and thus assist the Project in helping many who were most needy in a timely fashion.

The State of Oregon had instructed the CAP not to begin work on any more electrically heated homes, since they might later be included in the Project.

This meant that low-income electric heat customers who had been on the CAP's waiting list were no longer eligible for CAP benefits, even if they were not registered for the Project. However, the Project refused the CAP's request to be included before other "second-round" contractors were added. One of the reasons was the resistance of the other five contractors to having the CAP included. They did not want to bid competitively against a government-subsidized organization, and did not feel that it was fair for the CAP to receive all the low-income jobs without having to compete for them.

The contractors who were not chosen as prime contractors were assured that the limitation to the five "first-round" contractors was only temporary. As soon as the Project was underway and the staff's management systems were in place, others would be given an opportunity to be included, especially if it turned out that the original five contractors could not handle the necessary volume of work.

Early negotiations between prime contractors and subcontractors were necessarily conducted without sound information about the Project. In several cases, early negotiating efforts broke down without an agreement. Examples of problems that arose for the potential subcontractors were the personality of the prime, provisions for maintaining quality control, pay scales for crews, and the prime's ability to maintain appropriate cash flow. For those negotiations that were successful, the arrangements varied widely. They included percentages of both net and gross profits; a percentage of gross profits only; and a percentage of net profits.

Effect on business in the local area

Even before the weatherization began, local contractors noticed a slump in their normal business. Residents were waiting for the Project to do their weatherization for free, rather than providing a normal work flow for the contractors. This was an especial hardship for those contractors not participating in the Project, but was also noticed by those who were included and gearing up for the Project to start.

The contractors themselves were partly responsible for the slump. Many of the local contractors advised customers coming to them for weatherization to visit the Project office and see if they qualified to participate. Contractors constituted yet another marketing device for the project, and did their part to promote its success.

Pricing

The five "first-round" contractors had several meetings with Project staff and Bonneville staff in the fall of 1983 to go over the items to be included in the unit pricing schedule. As documented in the Logistics Report (p. 34), Project management and the contractors were not able to agree on a schedule of unit prices.

Contractors felt that Pacific and Bonneville had seriously underestimated the incremental costs for the extra R-values, especially since the technology for installing some of the proposed measures did not exist when the Project began. Contractors felt that they had an unusually high level of exposure on this project, and priced their services accordingly. Bonneville and Pacific felt that the contractors' prices were far in excess of what was paid for other weatherization projects, and the contractors' bids were unreasonable and not affordable.

It was clear that some form of trial period to calculate actual costs was required, because other programs had not required the contractors to install R-49, triple panes, or to drill and plug the walls. One solution that was proposed would have been to agree on unit prices to start with, and then audit contractors' books after 90-120 days and re-negotiate the prices. However, this system would have involved an "invasion of privacy" that most contractors were not comfortable with; not only were they leery of having the Project inspect their books, they were fearful that other contractors might inadvertently get access to privileged information.

The solution was to change to a system of competitive bidding for a 90-day trial period, scheduled to end and be evaluated on March 15, 1984. The plan was that two contractors would be randomly selected to submit itemized bids on each home, and the bids would be tracked for the trial period. At the end of the bidding phase, new unit prices would be instituted, based on the actual experience of the contractors.

The whole bidding issue was a problem for staff from the beginning. They had planned to use the unit pricing system to control how many houses each contractor had in process. With unit pricing, the Project could have given each contractor ten homes at a time (ideally within a defined geographical area), and when these were finished satisfactorily, ten more could have been assigned. This system was virtually impossible with the competitive bidding system, since the Project could not identify in advance who would provide the low bid.

The competitive bidding system was expensive both for the contractors and for the staff. For the contractors, the costs were both direct and indirect. The direct costs included not only the time spent to prepare the bid (and in some cases, resolve differences with the original audit) for winning bids, but also for losing bids. The indirect cost arose from the fact that an experienced person was required to make the bids. For most contractors, this meant that the owner and/or key supervisor was occupied virtually full-time with the bidding system, and not available to manage the weatherization crews. The result was poorer quality work and increased re-inspections.

For the Project staff, the paperwork under the bidding system was dramatically greater than had been anticipated under the unit price system. Since the computer system was still not operational, all the paperwork involved in issuing bid requests, tracking the requests, comparing the bids to the audit and choosing a contractor was done by hand. Given the varying amounts of time that it took the contractors to complete the bid process, it became virtually impossible to schedule work flow.

Contractors were aware that under the competitive bidding system, there were actually two criteria which determined which jobs they received: 1) the other contractor's bid amount, and 2) the cost-effective amount allowed by the Project for the measures at a given house. De facto, variability in bid prices was reduced because contractors gave more weight to the second criterion than the first. Each attempted to bid the maximum they could without going over the cost-effective amount, and assumed that they would get their fair share of jobs over the long run. It was rumored that one contractor even developed a computer program to estimate the Project's cost-effective ceiling and shared the results with other contractors. Consequently, bid prices did not come down.

Eventually, the system began to break down as one of the five contractors tried to increase his volume by reducing his bids. However, this did not occur until well past the original 90-day trial period for the competitive bidding system.

At the end of the trial period, with only seven homes completed under the competitive bidding system, Project management decided that more homes were required in order to establish a reliable baseline for the unit prices. The competitive bidding system was therefore extended.

Delays

When the contract was signed in May 1983, the expectation by all was that the weatherization work would begin in the fall, and that a high level of productivity would be required in order to complete the Project. By mid-summer, it looked as if there would be five contractors initially, and these contractors felt that if they performed satisfactorily, they might well get all the work for the Project. With an estimated 3,100 homes to complete in 24 months, contractors could see that they would have to average some 25 completed homes per month (or more than one per working day). This was a substantially greater volume than any of the contractors were handling prior to the Project.

The contractors began gearing up to handle the increased load in the fall of 1983. Some contractors were more cautious than others, and did not expand their crews or increase their inventories; others felt that they would do better to be well-prepared as soon as the work began, and began hiring and training crews and making capital expenditures.

However, the problems with the unit pricing system and the implementation of the competitive bidding system delayed the commencement of the weatherization. Only seven homes had been completed by March 1984. Contractors had made capital expenditures on the basis of a stated start date in the fall, but because of the delays there was no Project income to cover the cost of the loans. Also, crews hired in the fall did not have enough work to keep them busy, and many went on to other work. The sunk costs of hiring and training them were lost to the contractors (see Logistics Report, p. 41). Some contractors anticipated this problem inherent in government projects, and planned in advance to use subcontractors until the work flow was established and they could provide steady work for their own crews.

Cash flow

The established billing procedure used by the local contractors was to either: 1) charge half the estimated cost of the work in advance, 2) charge the cost of materials in advance, or 3) invoice step payments as portions of the work were completed. For the Hood River Conservation Project, a contractor could not invoice the Project until the entire job was completed and passed inspection.

At the beginning of the Project, the delay in getting the Project to schedule even the first inspection was often substantial. Then in spite of the fact that the work had passed inspection, there were still often delays in processing the checks; contractors were told that the problem was "in Portland." Contractors felt that the physical separation of Pacific's Treasury Department from the field staff increased the turn-around time and the possibility for errors and delays in payment.

The time between when the contractor received materials from his supplier for a particular job and when he was paid for that work was usually 60-90 days if no major problems were encountered. If there were problems or the job did not pass inspection, the cash flow problems were increased. From the contractor's point of view, even if he performed well, his financial exposure was large in the best of circumstances, and nearly unmanageable if there were difficulties beyond his control.

Soon, it was not unusual for a contractor to have close to $100,000 in completed work that he had not been paid for. Since none of the local contractors had sufficient unused capital to meet this need, they were forced to either take out a bank loan or obtain special credit lines from their suppliers. One contractor solved part of the problem by having his crews work for a percentage of the total job cost on a contingency basis: when the contractor got paid, i.e., when the job passed inspection and the invoice was processed, the crew got paid.

For some types of suppliers, such as electricians and sheet metal shops, the contractors eased their liquidity problems by dealing with more than one supplier, and never getting too far behind with any one of them.

The one glass supplier that could manufacture double-pane storm windows was the Portland branch of a national company, but it had relatively inflexible credit policies. The credit need was met by a small glass company that started up in direct response to the Project, right across the Columbia River from Hood River. Although the company had initial quality control problems, they were willing to "make good" on the problems quickly and were generally much more flexible and accessible than the national company. Most glass contractors used both the local and the national supplier.

Specifications

Because of the higher than usual energy conservation measures included in the Project, unusual installation problems arose which were not clearly covered by the Bonneville specifications (specs). For instance, before this Project, it was simply not known how to get R-38 installed in many floors. Also, the housing stock was in poorer condition, on the average, than for the weatherization programs the contractors had worked on. Usually, there is some homeowner participation in the cost, and therefore a better quality of housing stock is encountered because the participant has the resources to cost-share. For the Hood River Conservation Project, the entire community was to be weatherized, and therefore the Project included the full range of quality of construction. The specs had not been designed for the unusual construction methods found in some of the Hood River housing stock.

Before the actual weatherization got underway, the contractors spent many hours in meetings with Pacific and Bonneville to develop clear, complete specs, pricing policies, cash-flow policies, and procedures in general. They were not compensated for their time. The contractors felt that given the unique aspects of this Project, Bonneville should have hired experienced contractors as consultants ahead of time to work out these problems, rather than using the first-round contractors for this purpose.

The meetings between the contractors and Pacific and Bonneville continued as the work got underway. "Clarifications" in the specs were being made at the same time that the work was being done, and the result was that some jobs did not pass inspection due to spec changes that were not in effect when the job was begun. For other jobs, the contractors had sunk costs in bidding the job and even materials costs, but the job would be stalled pending a clarification of the specs from Bonneville.

Inspections

On most Bonneville Projects, contractors were used to being able to come along on the inspection of their work. What happened on this Project was that the contractor would do the job quickly, and then see what the inspector caught. Then he would pressure the inspector to pass the job anyway or to wait around while the contractor took care of the problem. Finally, the Project had to prohibit any contractor from being present while the inspections took place.

Although the two inspectors on the Project had passed Bonneville certification course, neither had extensive installation experience. It was difficult for the inspectors to learn all the specs, keep up with the changes in the specs, and make interpretation decisions with limited previous experience. There was some turnover of inspectors the first year, so there was usually an inspector "in training" who did not understand that "by the book" did not always work for a particular house. Also, experienced weatherization contractors said that the inspection standards for the Project were higher than on previous Bonneville weatherization Projects they had worked on; every screw and square foot of insulation was checked to make sure it conformed to the bid sheet and the specs.

As a result, there was a fair amount of tension between contractors and inspectors in the first few months. The failure rate for the first inspections was estimated at about 50 percent. The first suspension of issuance of Notices of Work for Bid was sent at the end of April to a contractor who had a poor inspection and re-inspection record. Most contractors eventually solved these problems by being or hiring their own "inspectors" who were very familiar with the specs and who checked the jobs thoroughly before the Project inspector was called.

Quality control

On previous Pacific and Bonneville weatherization projects which were smaller in scale, the contractors were part of the crew; for this large-scale project, they were administrators who handled all the Project paperwork, preparation of bids, negotiating with suppliers and bankers, fluctuating crews and work flows, and so on. Most contractors did not replace themselves with good supervisors, and it showed. Turnover problems with employees only made matters worse.

As the weatherization got underway, repeated quality control problems with certain contractors were frustrating to the Project staff. There didn't seem to be any way to get rid of them, or even suspend them in a way that made a difference. The original agreement with the contractors was that two major job failures (i.e., jobs that required several thousand dollars worth of repairs) would result in suspension from the Project. However, the specific grounds for suspension had not been spelled out, and all five contractors had problems when the weatherization first began. There was no attempt to enforce the original agreement for most of the first phase of the Project.

The lack of specific performance criteria affected the staff's ability to reward the better contractors or discipline the poor ones. There were no standards for acceptable re-inspection rates, jobs that were overdue (late), customer complaints, refusals of customers to use a certain contractor, or overbillings. The Project didn't initially keep any records of such problems, nor did it have standards about the things that could be used to remove contractors from the Project. Both Portland staff and Hood River staff were frustrated at the lack of documentation; they felt they had no legal basis for dismissing poor contractors.

Initially, the only procedure available to staff to deal with poor contractors was that when the contractors' suppliers got to the point where they were sending notices of intent to place a lien on the homeowners' houses, contractors could then be removed from the Project. However, the suppliers never actually exercised that option, and the Project itself had no disciplinary procedure.

The lenient policy of Project management towards the poorer contractors contributed to disillusionment and near-rebellion among some staff in the Hood River office, especially those who were permanent members of the Hood River community. Rumors were widespread in the community as to who the poor contractors were. The field specialists finally refused to say that the poorer contractors did a satisfactory job if they were asked by homeowners.

When there were problems with a contractor or his crew, it was often the customer who bore the brunt of the problem. In some cases, the workmanship was poor or the structure suffered damage, in others, it was a matter of missing household items, such as tools, guns, liquor, antiques, or medications. In still other cases, it was the unprofessional behavior of the crews: in this rural community, most homeowners were not used to having long-haired, unshaven, marijuana-smoking people in their homes and near their children, but some contractors found that such "scuzzies," as they came to be called, were an inexpensive source of labor. These representatives of the Project were a marked contrast with the auditors, who were perceived by the community as very professional and well-trained.

Initially, the policy was that the homeowner was expected to work out any problems with the contractor (unless the problem was so serious that the home would not pass inspection), and the homeowner had to continue to work with a proven poor contractor to get the problems solved. Even if the inspector failed the job, the homeowner still had to suffer any inconvenience until the contractor got around to fixing the problem. In many cases, it was

easier for a contractor to complete a new job that would pass inspection quickly than to make the needed "fixes" on a job that had failed inspection. Thus, the poorer contractors built up a "bank" of incomplete homes.

Part of the difficulty for the homeowner arose from the contractual arrangements for this Project. For most Bonneville weatherization Projects, the fundamental contract is between the homeowner and the contractor, and the homeowner is responsible for ensuring the quality of the work. The Bonneville inspection occurs after the fact and is designed only to assure minimum contract compliance, not quality work. Since the homeowner shares in the cost of the weatherization, he has both an investment in and a mechanism for assuring quality.

For the Hood River Conservation Project, the homeowner was required to sign an authorization for the work to be done by the Project. However he or she did not choose the contractor, supervise the contractor, nor pay the contractor; these functions were performed by the Project staff. The Project inspectors performed the function normally done by the homeowner, and the Bonneville audit was, as usual, done after the fact -- in this case, well after payment for most jobs was made. The Project assumed much of the authority typically held by the homeowner, but did not assume the corresponding responsibility. It referred most customers with complaints to the contractor, even though the customers had no leverage with which to ensure satisfaction.

On the other hand, the customer had no real incentive to keep the contractor's cost down, as he or she was not paying the bill. One thing the customers did that increased contractors' costs was to leave home in the middle of a job that required access to the interior of the home, and require that the contractor leave also. It was not unheard of that a customer would turn a one-day job into a four-day job. Since the contractors were in effect, working on a fixed fee basis, such customers had a noticeable effect on profits.

One solution to the various contractor management problems would have been for the Project to have hired a good local general contractor to take care of the paperwork, the quality control, and allocation of work flow. Then, the other five contractors could have been subcontractors. This would have freed the management of the five first-round contractors to supervise their crews more diligently and would have solved the supply and credit issues.

However, these types of problems had not been anticipated by management when the Project was proposed. The delay in dealing with the problem contractors could be attributed partly to the fact that early in the Project, key management personnel were not in Hood River, where they could see the frustration of the field staff in dealing with the poor contractors on a daily basis. The problems persisted to the point where they were critical for two contractors by the end of Phase I.

Chapter 4: Phase II, June-December 1984

Phase II began with the hiring of a new Project administrator. Most of the start-up problems were addressed in an improved way during this phase, but new problems arose as the pace of the actual weatherization increased. The discussion of Phase II is divided into three sections: 1) Community Issues; 2) Staff and Administrative Issues; and 3) Contractor and Weatherization Issues.

Community Issues

During Phase II, it was clear that the promotional efforts of the Project were going to be successful. The community was much better informed about the Project. During this period, the community had an opportunity for greater first-hand experience with the Project. In some cases, the experience was most positive; in others, there were problems. The discussion of community issues includes an analysis of the Community Advisory Committee, the promotional efforts during this period, the attitudes of homeowners towards the Project, including their attitudes towards the costs they incurred, and indoor air quality issues, which surfaced at that time.

Community Advisory Committee

During Phase II, interviews showed that the community continued to view the CAC favorably. It was seen to be a good cross-section of the occupations in the area and the major geographical divisions: the Upper Valley (Parkdale) and the Lower Valley (Odell) which are oriented towards agriculture; the town of Hood River, which is the trade center; and Mosier, in Wasco County. Those that attended meetings provided feedback on the choice of second-round contractors and how to deal with the poorer contractors.

But by the summer of 1984, attendance at the CAC declined to about one third of the members. Those who continued to attend said they felt a little silly, since so few others were attending. By the end of summer, the CAC had been meeting monthly for a year, and some members had only attended one meeting. The failure of the staff to replace members who were not committed to active participation was just one more indication that during this period, the CAC was not really critical to the success of the Project, except as a legitimizing public relations tool.

With the early success of the marketing program, the CAC's purpose was no longer clear. The general feeling was that the CAC did not have a job to do, and was just a "rubber stamp". Participants felt more "lectured to " than "listened to", and had no real input into Project policy, even in an advisory capacity. Most who continued to attend said nothing or very little at the meetings. It was noticed by some of the better-informed members that the staff reports were not complete, but rather represented management's "public" version of what was happening on the Project.

CAC meetings were not organized by its members. Although a member was elected Chairman and he presided at the meetings, the agendas were prepared by Project staff and Project staff "suggested" that meetings not be held in some months. Members were given more reading material from staff than they were able to absorb, but members were never asked to prepare a report for the staff. At their August meeting, staff and the members decided that the CAC would only meet irregularly on an "as needed" basis in the future. When his first year's term was completed, the Chairman of the CAC chose not to be re-nominated for a second term.

By the fall, staff recognized that there was a serious problem with the committee, and decided to take action to try to increase participation. For instance, the CAC was asked to help the Project draft a letter to those registered for the Project regarding air-to-air heat exchanger policy changes. Attendance rose briefly. However, because Pacific did not continue to ask the committee to perform any specific tasks, participation fell off again.

Promotional efforts

During Phase II, Project staff concentrated on just a few vehicles for reaching the remainder of the community. The Project had a booth at the County Fair, targeted ads for the 600 electric heat customers who had not registered were run in the newspaper, and residents of Mosier had a bill insert promoting the Project (see Logistics Report, p. 47).

The results of the promotional efforts were clear in the interviews with community members. The misperceptions about the Project declined noticeably (see Figure 11). There continued to be false rumors about the cost of the Project and the criteria for qualifying for the Project, and some thought that the Project would not finish all the homes in the area, especially

mobile homes. But overall, citizens were much better informed than in Phase I.

As before, a key source of information was The Hood River News (see Figure 12). However, equally important were various forms of word-of-mouth, especially at work, from friends and family who were already being weatherized and from those in the EUM study. Also, the staff of the Project continued to play a relatively important role in disseminating information. A new source of information was the realtor who either listed or sold a resident's home. Since FHA required that homes be weatherized to a certain level, realtors were usually aware of the Project status of homes they were dealing with, and used participation in the Project as a selling point where possible.

Still, many of the same questions persisted among those who were interviewed (see Figure 13). About a third of the questions dealt with the background of the Project (sponsorship, cost, purpose, research design, management plan). Residents still wanted to know who was paying for the Project and how much it would cost. They didn't understand the need for this research design, since the effects of various levels of weatherization had already been documented and it wasn't clear why so many more houses needed to be done. Respondents asked about the time frame for the Project, and wondered whether management would be able to finish all the houses at the rate they were going.

Figure 11. Misperceptions, Phase II.

	N	%
Total cost	8	23
Qualification and geographical criteria	7	20
They won't finish/are cutting back	5	14
Nothing for mobile homes	4	11
Measures included	4	11
EUM issues	2	6
Timing	2	6
Cost to the homeowner	2	6
Purpose of research	1	3
TOTAL	35	

Source: Monitoring Reports 9-14, 110 respondents

Figure 12. Sources of information, Phase II.

	N	%
The Hood River News	33	38
Work	15	17
Word-of-mouth	10	11
Project staff	8	9
Weatherized friend, relative	5	6
Radio, TV	4	5
Civic meeting	4	5
End-use monitored home	3	3
Realtor	2	2
Billboard	2	2
Citizens' Advisory Committee member	1	1
TOTAL	87	

Source: Monitoring Reports 9-14, 110 respondents

Figure 13. Questions about the Project, Phase II.

	N	%
Sponsorship, cost	27	17
Purpose of study, research design, management plan	26	17
Qualification criteria, sign-up procedure	19	12
Measures available	16	10
Delays	16	10
Time frame	10	6
Cost effectiveness	7	4
Contractors, selection and quality	6	4
Access to research results	6	4
Homeowner control of measures, supplementals	5	3
Air-to-air heat exchangers	5	3
Cost to homeowner	3	2
Indoor air quality	3	2
Liability	2	1
Other	5	3
TOTAL	156	

Source: Monitoring Reports 9-14, 110 respondents

An additional 40 percent of the questions dealt with aspects of the weatherization per se. Homeowners wanted to know what measures would be available for their homes, how it was decided what measures would be offered (cost-effectiveness methodology) and whether they would have any choice of

contractor. By Phase II, there was a clear concern for quality control, and homeowners asked how the Project ensured that quality work was done. They wanted to know how much it would cost them to participate.

Costs to the homeowner

When the Project had been designed, it was anticipated that the cost-effective ceiling of $1.15 per kWh saved during the first year would be sufficient to ensure that most houses in the study area would receive all the major measures (the "full package") since the ceiling was considerably higher than that used for other Bonneville residential weatherization programs. Homeowners were informed in a January 19, 1984 letter that there would be no cost for participation.

The "full package" was found to be cost-effective for many homes where there was very little previous insulation. Installation of the insulation package would create excess savings over the cost of the job. The excess savings could then be used to "carry" other measures for the house, particularly the glass measures (see Logistics Report, p. 32). In homes that received the "full package", all the target measures could usually be installed at a cost less than the $1.15 ceiling.

However, it turned out that the cost-effective criterion was a barrier for the major measures included in the Project for many homes in the area. Homes that already had insulation to code typically could not generate enough excess savings from the insulation to carry the glass measures, and/or additional insulation from the Project was itself not cost effective (NCE). In this study area, the newer homes or those which had had recent extensive remodelling were more likely to be NCE and not eligible for any of the major measures. About six percent of the homes in Hood River were NCE for all but the auditor-installed measures.

When a measure or an entire home was found to be NCE, the homeowner was sometimes offered the chance to pay the difference between the amount the Project would pay and the amount necessary to do the job. Thus, for a fraction of the actual cost, the resident could still obtain benefits from the Project. Costsharing received mixed reviews from the residents who participated: some thought it was wonderful that the Project paid anything towards NCEs and others resented the fact that they had to pay when others did not. However, some residents could not afford their portion, and had to forego the measures altogether.

Another potential cost to the homeowner was the cost of required preparation before the Project could begin work. For instance, any broken window panes had to be replaced, dry rot had to be repaired, vermin had to be exterminated, and in some cases old insulation had to be removed. There were some homeowners who were so angry to find out that the Project did not cover these costs, and that it was not therefore "free", that they refused to make the repairs. For others, the repairs constituted a genuine economic barrier, contrary to the Proposal to Bonneville.

There were also less obvious unanticipated costs for the homeowners. By summer 1984, word was getting around the community as to which contractors had quality control problems. If one of the poorer contractors won the competitive bid, then the homeowner who did not want that contractor to work on his or her house would have to pay the difference to get another contractor with a higher bid. If he or she elected to remain with the poorer contractor, trusting that the Project's inspection process would ensure quality in the end, then he or she incurred the "cost" of being at home for the repeated re-inspections of his or her home, and the inconvenience of having an incomplete job until the contractor chose to address the failed portions.

Another unanticipated cost occurred during early December. The weather in Hood River was exceptionally cold that month. Due to the venting required by Bonneville, dozens of homeowners' pipes froze for the first time in decades. Pacific advised homeowners to cover their vents for 2-3 of the coldest months in the future, contrary to Bonneville specifications. They also agreed to pay to have Project contractors fix the pipes, or to pay local plumbers to do the work, but the homeowners bore the "cost" of doing without water until the repairs were made. For months to come, residents joked about the incompetence of Bonneville bureaucrats writing specifications from behind their desks, instead of using common sense.

As one staff member quipped, during Phase II the Project's marketing emphasis gradually changed from: "We have something free -- you may already have won a complete weatherization package" to "We need your help, and you may get something at very little cost or free". Although the Project had been designed to remove economic considerations from the decision to participate, for some homeowners these types of costs proved a barrier.

Attitudes toward the Project

Interviews with community residents during Phase II (June-December 1984) showed that many still had positive attitudes. Nearly half the positive comments were of a general nature, such as the respondents thought the Project was a good idea (see Figure 14). These respondents had had good experiences with their contractors, and remarked about the quality of the work done and the extra effort that had been taken to make the process a positive experience for them. And by the end of Phase II, many homeowners had noticed a distinct change in the comfort level in their homes, especially reduced noise and drafts. They felt they were saving energy and money (and sometimes wood) because of the Project. The staff and auditors continued to receive good marks from the community.

Figure 14. Positive attitudes towards the Project, Phase II.

	N	%
General positive comments	81	46
Contractors	25	14
Save energy, money, increase comfort, reduce noise	20	11
Project staff	16	9
Auditors	8	5
Free is great!	7	4
Value of the research data	6	3
Clean-up of contractors	3	2
House value	3	2
Other	7	4
TOTAL	176	

Source: Monitoring Reports 9-14, 110 respondents

However, during Phase II more negative than positive comments were recorded (see Figure 15). As a group, comments about the costs of the Project and its unfairness dropped from the most frequent category in Phase I to the least frequent category in Phase II (53 percent of the total to 22 percent of the total). Instead, during Phase II residents had more complaints about the weatherization process itself. They did not like the quality of the work done on their homes, the delays before the work was done, and the intrusion and inconvenience of literally dozens of people traipsing through their homes (one respondent counted 26).

Figure 15. Negative attitudes towards the Project, Phase II.

	N	%
Weatherization Process	74	35
Quality of work	38	18
Delays	20	9
Intrusion, inconvenience	10	5
Contractors	6	3
Rationale for Measures	65	31
Measures selected, omitted	31	15
Poor information from Project	14	7
Cost-effectiveness	11	5
Customer costs	5	2
Research design	4	2
Cost and Inequity	46	22
Rate impact, "No free lunch"	21	10
Total cost	13	6
Inequity, discrimination	8	4
Paid for ZIP*, other weatherization	4	2
Indoor Air Quality	5	2
Other	21	10
TOTAL	211	

*Zero Interest Program (Pacific)

Source: Monitoring Reports 9-14, 110 respondents

Respondents also did not necessarily agree with the choice of measures for their homes and felt that some measures which were denied would have been more cost-effective than those that were included. Some did not understand why the Project had been designed as it was in the first place. Homeowners felt that the information from the Project was confusing and misleading, and often contradictory. They did not understand how "cost-effectiveness" was calculated and they resented the inconsistency in what they were told by various Project staff. They did not like being told that the Project was "free" only to be informed of the expenses they would incur by participation. Generally, the negative comments reflected an increased disillusionment with the Project based on the community's experience with the contractors, as compared to their experience with the auditors.

Indoor air quality (IAQ)

The original Proposal to Bonneville recognized that because of the extra house-tightening measures provided for by the Project, indoor air quality was a greater concern than with other Bonneville weatherization projects. Bonneville was in the process of writing an Environmental Impact Statement to assess the need for mitigation, but the report was not complete.

The Proposal to Bonneville estimated that about half of the 3,100 electric-heated homes in Hood River would require an air-to-air heat exchanger (AAHX) for mitigation. However, installation of AAHXs was still a relatively new technology, and Bonneville had not written the specifications for this portion of the program before the weatherization began.

When the first few houses were completed, the office in Hood River began receiving calls from homeowners with complaints about indoor air quality. In June 1984, staff requested that the contractor for the Process Analysis include interviews with five of the homeowners along with the standard monitoring interviews, for the purpose of obtaining more detailed information about the extent of the IAQ problem.

Those that were interviewed mentioned a variety of complaints, including burning and watering eyes, stuffy noses, formaldehyde smell, and bad headaches. All of those interviewed had either a fireplace insert or a wood stove, and two of the five said that their symptoms seemed worse when they were using wood heat. In most cases, the problems could be mitigated with no effort or by cracking a window. However, in one case, the mother regularly had to go outside with her crying small baby for about a half hour in order to relieve a severe headache. These residents were especially interested in progress on the specifications for AAHXs.

Staff and Administrative Issues

Considerable progress was made during Phase II to resolve the staff and administrative issues raised during Phase I. The discussion of the changes is divided into those concerning Project organization and personnel, the records management and tracking system, and the research requirements of the Project.

* Does the home have a wood stove or fireplace?
* How can the system tell when a home is complete?
* What are the estimated saving for auditor-installed measures?
* How are supplemental payments to the contractor coded?
* How does the system track which contractor did which portions of a job, especially if it is re-assigned?

The de-bugging and reprogramming of the tracking system continued through the summer, and the first attempts to correlate output from the system with manual records showed little discrepancy. Gradually, the staff was able to phase out many of the manual records that had accumulated and came to rely on reports generated by the computer. In fact, the computer made it possible to generate useful management reports that were a practical impossibility with manual records. Still, the system was not flexible, user-friendly or able to accommodate changes in information needs easily, such as changes in the bidding system.

Research requirements

During the summer, contracts with the 320 load study participants were re-negotiated by the Research and Evaluation staff so that the weatherization of the EUM homes could be done in May/June of 1985. These 320 customers were also surveyed with a modified form of Bonneville's Regional Survey in order to find out how generalizable the results from the end-use monitored homes would be to the rest of the region. The monitoring of the community showed that citizens did not understand the broader purpose of the survey and felt that some of the questions were not relevant to the Project.

By early fall, all 320 of the end-use monitored homeowners had signed contracts agreeing to the year's extension until they would be weatherized. A newsletter was sent to these homes in October updating them on progress on the Project. The newsletter covered maintenance of the monitoring equipment (nicknamed "E.T."), eligibility requirements, weatherization of mobile homes, and Project sponsorship. A second newsletter was published in December and covered radon monitoring, air-to-air heat exchangers, cost-effectiveness, and answers to frequently asked questions. EUM customers appreciated the communications. Not only did the newsletters provide useful information, they also indicated a concern on the part of the Project staff for the EUM participants.

By the beginning of the 1984-85 heating season, all the monitoring equipment was installed and de-bugged. In most cases, it had been operating successfully for several months by the time the weather turned cold. Consequently, excellent data were collected for the entire heating season. It would have been difficult to be so well-prepared for the previous (1983-84) heating season, given that the contract was not signed until late May, 1983. To have the equipment ordered, delivered, installed, and tested and de-bugged in three to four months was probably not possible.

The equipment that was installed was good and coordination between Portland and Hood River was excellent. Because the basic system had been used in enough previous studies, the system worked well. Experienced staff had input into the design of the system, which meant that their work later was much easier. The data came on-line much quicker than in other Pacific projects, two months versus the standard six or more months.

Contractor and Weatherization Issues

During Phase II, pressure mounted to add the second-round contractors and discipline the poor first-round contractors. The pricing system was changed and other procedural changes improved the ability of the staff and contractors to increase productivity. These issues are discussed in sections on: second-round contractors, specifications, unit prices, contractor terminations, procedural changes, air-to-air heat exchangers, and mobile homes.

Second-round contractors

The Project staff decided to defer adding the second-round contractors for a few more weeks until more jobs were complete. The first meeting with potential second-round contractors was not held until May 30, 1984. Contractors who were interviewed reported that they felt that the delay was unduly long, especially in light of the performance of the first-round contractors. Six additional local contractors were selected to be included in the second round of contractors and were asked to sign contracts. The first bids went out to the second-round contractors at the end of July 1984.

The CAC approved, in principle, that non-local contractors also be added as soon as possible, in an effort to increase the production of completed jobs and to increase price competition, but the six second-round contractors were all local. As with the first-round contractors, several of the new

Project organization

When the new Project administrator was hired, the basic structural problem with the organization of the field office was addressed and solved. The organization chart was changed so that all staff in the office reported to the Project administrator, rather than half to the Project administrator and half to the field administrator. Along with overall responsibility for the office, the Project administrator was also given greater authority. The new Project administrator was able to increase the staff size in Hood River to accommodate the increased needs for support staff. He had budgetary authority for day-to-day operation in the office, subject to review by the Project manager. The Project administrator resided with his family in Hood River, and was available to make a full commitment to the Project.

It was recognized that the Project was seriously behind on the actual weatherization. With only 18 months remaining, the Project had completed only 66 of the estimated 3,100 homes, and work had not begun on any of the air-to-air heat exchangers. The new administrator was encouraged to "get the job done" and was given the authority and resources to do so, both by Pacific and by Bonneville. For instance, during the summer of 1984 requests from contractors for interpretation of specifications started to be addressed to the Project office, rather than to Bonneville via the Portland office of Pacific. This greatly facilitated the resolution of problem areas. The Project administrator was perceived by his staff and the contractors as both tough and fair, which they appreciated.

With the hiring of the new administrator, there was a greater division of labor between Portland and Hood River. For instance, the Project Manager handled the regional contacts and contacts with people outside Pacific; he assumed a much lower profile in the field office. The Project administrator handled the day-to-day office matters, the weatherization and the CAC, and all the local matters. Although he sought guidance from the Project manager, as anyone new to the Project would, the administrator was encouraged to develop solutions appropriate to the situation.

Within two months after the new Project administrator was hired, and just as the second-round contractors were coming on board, one of the Project's two inspectors and the field administrator resigned. The field administrator was replaced by a field coordinator who reported to the Project administrator. The change in title corresponded to a change in authority and responsibility.

Project personnel

During the early stages of weatherization, when the productivity of the contractors had been lower, the Project had functioned with two inspectors for five contractors. By August 1984, with eleven contractors on board and increased productivity of the contractors as a group, the Project had only one inspector. A replacement was hired as soon as possible, and through the early fall of 1984, the Project attempted to function with only two inspectors for the eleven contractors. This resulted in a backlog of some 30 days between submission of the invoice for completed work by the contractor and inspection of the job by the Project, even though the re-inspect rate dropped noticeably.

Part of the reason that the productivity of the contractors increased was because bottlenecks on the front end of the process were reduced by the addition of a bid desk clerk. This enabled the office to issue more Notices to Proceed each week. Even so, the number of completed homes was still far behind schedule. The slippage in the rate of completions threatened to impact the weatherization schedule for the various research studies.

By September, Bonneville was very concerned about the slippage, and again met with Pacific officials to discuss what might be done to improve performance. One change was to hire four more inspectors, bringing the total to six, and an additional field specialist, bringing the total to three. All these new staff were hired by early December.

During December, Pacific completed budget reviews with Bonneville with the idea of requesting additional funds for staffing requirements necessary to meet Project deadlines. Once again, extensive work began in the Portland office for a budget modification. By the end of Phase III, the Research and Evaluation staff had completed nine separate modifications to the original contract.

Records management and tracking system

The tracking system continued to experience difficulties. The system crashed twice, numerous modifications were required, and the need for design changes became apparent. There were many examples of questions that arose that the tracking system was not designed to handle. Some examples were:

prime contractors on the Project subcontracted with firms from outside the local area to do part of the work.

The Community Action Program was still trying to become involved in the Project, and sent a letter to all its electric heat customers who were not yet weatherized, suggesting that they register for the Project immediately, as the Project was weatherizing on a first-come, first-served basis. They also pointed out to their clientele that the Community Action Program wished to be included as a contractor on the Project, but had been denied. They encouraged their clients to inform them if they had any problems qualifying for the Project, and they would serve as advocates for the homeowners.

Later in the fall, the Community Action Program was added to the Project. It agreed to weatherize low-income homes using the same unit price schedule (see below) as the other contractors. However, after receiving the list of low-income houses to weatherize, the Community Action Program was busy with other work and never participated in the Project.

Specifications

There continued to be clarification of the specifications through Phase II. However, since many houses were unique, a particular home often required that the specifications be interpreted for the specific job. A problem arose when someone from the office, typically a field specialist, would work out an acceptable solution with the contractor, but would not record it in the file. When the inspector came, the job would not be passed. It was then incumbent on the contractor to get the inspector and the office staff to agree that the initial interpretation of the specifications was indeed acceptable. With the changes in staff, particularly inspectors, such negotiating consumed time for the contractors and delayed payment.

Contractor meetings continued to be held weekly, with emphasis on clarification of the specifications. Minutes of the meetings show that some issues came up repeatedly and the explanations were the same three and four times. Even so, at the end of the summer, one of the first-round contractors was still not complying with Project specifications, and received a formal reprimand.

Unit prices

Although the 90-day period for competitive bids of jobs had expired, unit pricing for the weatherization was not reinstated in March because an insufficient number of jobs had been through the bid system, weatherized and passed inspection. It was estimated that given the diversity of housing types in Hood River, at least 100 jobs would need to be completed in order to derive meaningful unit prices.

By the middle of summer, with only 150 jobs complete and some 1,000 jobs out for bid, there was a large backlog that the original five contractors had been unable to complete. As mentioned above, the first-round contractors had built up a "bank" of homes that they had started or that had failed inspection and which they were not finishing, but the contractors continued to receive new jobs to bid on.

Analysis of these first 150 jobs showed that there was considerable variation among the winning bids in terms of the cost per square foot of doing the weatherization. For most measures, the variation was in the range of 50 percent. Differences were attributed to the wide variety of housing stock in Hood River, and the variation in the difficulty of installing measures. However, even with such a variation in the costs of weatherization, by the end of the summer it was felt that there were sufficient data to re-institute unit pricing, thus eliminating the cost to the contractor and the Project of submitting bids.

The August 1984 Unit Price Schedule was substantially lower than the one that was used at the beginning of the Project and it was not acceptable to the contractors. After consultation with the contractors, a revised Schedule was developed which, it was estimated, would save the Project some 25 percent over the competitive bid amounts for each job. Also, the paperwork in the office was considerably streamlined, and the Project's ability to audit jobs was enhanced. Under the competitive bidding system, the field specialists checking invoices had had to refer to the individual bid sheet for each house to see whether it was invoiced correctly, rather than to a master unit price list.

However, unit prices were resumed at a time that was difficult for the second-round contractors. Most had been on the Project for about six weeks, and had spent that time competitively bidding jobs. Due to the complexity of the specifications and the fact that not all of the interpretations of the specs were in writing, the second-round contractors had won very few jobs.

Those that they did win received very close scrutiny by the inspectors until a trust relationship was formed. The inspectors were especially conscious of quality control problems at this time, and initially the second-round contractors' jobs were not passed unless every single specification was met perfectly.

So at a time of very poor cash flow, the procedures were changed to unit prices which were noticeably lower than the typical winning competitive bids. The first-round contractors could make the transition to the lower prices more easily, because they could draw on their "banks" of jobs they had won under the better-paying competitive bidding system.

The flow of new jobs from the office was still very uneven as late as the end of 1984, and the second-round contractors had as many problems planning a steady flow of work for their crews as the first-round contractors had had in the beginning. They could not find out until the morning of one day what their crews would be doing the next day, and were working on that basis of verbal Notices to Proceed, rather than written authorizations. Again, the first-round contractors could draw on their "bank" to keep their crews busy. But even the first-round contractors had trouble maintaining a steady work flow through the coldest months of the winter.

Both staff and contractors recognized that there were problems with the specific payments in the unit price schedule. For instance, materials for weatherstripping cost about $6 and took about 10 minutes to install. A door threshold cost $12-15, and took up to 4 hours (1 hour minimum) to install. Yet the contractor was paid $25 for each job. Further, the Project did not really commit to a true unit price. If a contractor was able to get volume discounts for materials by buying in quantity (and bearing the carrying costs), the Project expected the contractor to pass on the savings to the Project, rather than adhering to the unit price. Some adjustments were made to the unit price schedule over time, so that some of the more obvious inequities were resolved.

Contractor terminations

Because of continued quality control problems, credit difficulties with their suppliers due to failed inspections, poor management, and lack of sufficient capitalization for a Project of this scope, two contractors were terminated from the program in the fall of 1984. In one case the company was sold to another contracting firm which was certified to participate in the

Project. The buyer picked up all the terminated firm's work in progress. In the other case, the firm's primary subcontractor arranged with the terminated firm to assume responsibility for most of the outstanding jobs. In all, several hundred customers were affected by the terminations.

The second-round contractors or subcontractors who assumed work that had been started by others accepted a major challenge. In some instances, it was simply not possible to find out what all the rules had been when each job was bid, especially if it had been started before the staff changes of June 1984. It was also not clear which products were acceptable, since there were changes back and forth over time about whether a particular product could or could not be used. In some cases, it was easier to negotiate with the Project to simply re-bid the house and start over, especially if the job was not too far along.

For the homeowner, the changes were confusing and bothersome. Usually, the new contractor had to re-inspect the home before he could resume work. Frequently, the new contractor told the homeowner that different measures were needed or possible than the homeowner had been told by the terminated contractor. Also, the changeover often resulted in further delay in getting the job finished. Most residents were not even informed that their job had been re-assigned, and did not know the reason for the delay. However, many were relieved to be rid of the poorer contractors and their crews.

Procedural changes

The termination of the two contractors was difficult for all the parties involved -- the contractors themselves, who lost their businesses; the other contractors, who could see the risk they were taking by participating in the Project with less than perfect internal management controls and inadequate capitalization; the Project staff, who had to execute the terminations; Bonneville and Pacific's corporate staff, who were concerned about liability issues; and the community as a whole. Several new procedures were instituted which were designed to prevent a recurrance, including the "speedy memo", fines for invoicing measures that were not installed and repeated inspections, and withholding of Notices to Proceed for poor performers (see Logistics Report, p. 57).

The "speedy memo" was seen as understandable and helpful by the better contractors, but it created costs. The contractor who received one had to schedule someone to go out and fix the problem, which might be as small as a

two minute job fixing a sticky latch, pay the worker transportation and time to go out and back to fix it, and keep track of all the paperwork associated with scheduling the fix and notifying the office that the fix had been made. Sometimes, when the contractor went to fix the "problem", neither he nor a second inspector could find the "error". The Project was not "fined" for such mistakes that cost the contractor. Thus, the contractor had an incentive to have the job passed the first time and productivity did improve.

For its part, the Project staff recognized that with its inadequate inspection staff, completed jobs were not being inspected in a timely fashion. They agreed that they would pay invoices for jobs not inspected within 20 days of completion, subject to a later audit. This change was appreciated by the contractors, because it improved cash flow and indicated increased sensitivity to the contractors' point of view. This policy change on the part of Pacific indicated far greater flexibility than either the contract required or the company's normal operating procedures. However, the contractors had to monitor the Project to make sure that the invoices were paid within the agreed-upon twenty days and the Project was not fined for late payments. Contractors who did good work felt that they had to incur yet another "paperwork" cost to track the payments they deserved.

With the removal of the poor contractors, the addition of the second-round contractors, a return to unit prices, and the changes in procedures, relations between the contractors and the staff were perceived by all parties to be much improved. Houses were only being assigned to one contractor, on a unit price basis, so the contractors only had to do one set of measurements. The specification ambiguities had been clarified with experience. There was a clear system for the evaluation of contractors, with appropriate penalties built in. The quality of the weatherization work was much improved, so the inspections were going significantly better; the percentage of homes that passed the first inspection increased noticeably to over 80 percent. The improvement in the "pass" rate relieved the time pressure on the inspectors, who had to do far fewer re-inspections, and also speeded up the average time until payment for the contractor.

Air-to-air heat exchangers (AAHXs)

On December 14, 1984, participants in the Project were sent a letter stating that AAHXs would not be installed routinely in tightened homes, but rather would be installed only at the homeowner's request or if the radon reading was high (see Logistics report, p. 59). The policy change served to

increase residents' confusion and decrease the credibility of the Project. Many had been told categorically by the auditors (and later by the contractors, in some cases) that their homes would definitely need an AAHX and that the Project would be installing it as part of the package. Many thought the December 14 letter indicated that the Project was running out of funds and did not intend to honor their agreement. Eventually, the public became better educated about the scientific issues involved and made their decisions accordingly.

The first air-to-air heat exchanger jobs were assigned to contractors in August. Although the staff had tried using a competitive bid system, the bids received had so much variation that it was decided to begin installations on a cost-plus basis, with the idea of going to a unit price system once the program had more experience with their installation.

There was evidence that the Project was not charged on an ordinary "cost-plus" basis for AAHX jobs. The contractors did not charge their actual costs, as reflected in what they paid out. For instance, the Project was charged the retail or list price for materials, even if the contractor's cost was only wholesale. Similarly, the Project was charged "prevailing wage rates", not the contractors' actual costs for labor.

Eventually, one of the prime contractors got a subcontractor from Portland who specialized in AAHX jobs. The subcontractor was able to bid at prices substantially under the other contractors. This subcontractor was awarded an increasing percentage of the jobs. As a result, he had a highly trained crew and could keep his volume and quality up while still making a profit at a lower price.

When the AAHXs went on unit prices in the spring of 1985, the unit prices were based on the average of the winning competitive bids, and were therefore lower than many contractors' costs. Some of the local contractors decided they could not afford to do AAHX jobs at the new unit prices, and did not continue to do these jobs.

Mobile homes

Work continued through Phase II on the development of specifications for the weatherization of mobile homes. The RAG met with Owens-Corning specialists in this area to discuss the technical options available for mobile homes. Meanwhile, the audit contractors started work on the backlog

of audit requests from mobile home owners. The first mobile homes were weatherized on a test case basis in October 1984. By the end of 1984, a year and a half into the Project, there were still no specifications available from Bonneville for the weatherization of mobile homes. Staff found that this created a serious credibility problem for them with the public, as they were still unable to say what would be done for mobile homes or when it would be done.

Chapter 5: Phase III, January-December 1985

The majority of the weatherization activity was completed during Phase III. Although there were still some problems, once good management systems were developed and a stable, competent group of contractors and staff were in place, the Project proceeded much more smoothly. Again, the discussion of Phase III is divided into: 1) Community Issues; 2) Staff and Administrative Issues; and 3) Contractor and Weatherization Issues.

Community Issues

During Phase III, the community had much more experience upon which to evaluate the Project. Given the long delays typical of the earlier phases, it was not until Phase III that the Project became a reality for most of the participants. The analysis of Community Issues covers the Community Advisory Committee, promotional efforts directed towards the community, the results of the Non-Participant Survey, and the attitudes of the community towards the Project. This section also includes a summary of the comments made by the community over the three phases of the Project.

Community Advisory Committee

The Community Advisory Committee turnout continued to decline during the last year of the Project. An effort was made to contact each member and determine his/her priorities in order to stimulate greater involvement but attendance did not average even half the members during Phase III. The meetings were held irregularly, and consisted primarily of presentations by the staff of their progress on the weatherization.

Promotional efforts

Marketing efforts aimed at the community as a whole were terminated at this time. Instead, all remaining electric heat homes that had not registered for the Project were contacted directly, either by phone or in person, in order to get a firm response as to whether they wished to participate. By the end of March, the total number of requests for participation from electric heat customers exceeded the initial goal of 3,100 homes.

Residents were informed that the last day to sign up for the Project was July 31, 1985. By that time, most of those who were going to participate had already agreed to do so, and there were very few "last minute" sign-ups. This is consistent with the fact that interviews with residents showed that there were very few misperceptions of the Project remaining by Phase III (see Figure 16), and residents were well-informed long before the deadline.

Figure 16. Misperceptions, Phase III.

	N	%
Qualification criteria	8	35
Inadequate funding for all the homes	4	17
Other	11*	48
TOTAL	23	

*No category had as many as three respondents for the year (10 Monitoring Reports)

Source: Monitoring Reports 15-24, 149 respondents

Again, the sources of information mentioned by those interviewed were The Hood River News, especially as a secondary source, and word of mouth, especially from someone who had had their home weatherized (see Figure 17). The efforts of the staff to contact the remaining electric-heat homes that had not signed up is reflected in the fact that about twice as many (16 percent vs. 8-9 percent) mentioned staff as a source of information during Phase III as in earlier phases. The only area where there were new misperceptions concerned whether there was adequate funding to complete all the houses that had registered to participate.

A second indication of the improved knowledgeability of the community about the Project is that the number of questions respondents had about the Project decreased and the content of the questions changed (see Figure 18). By Phase III, nearly a fifth of all questions had to do with access to the results of the Project and an additional 15 percent had to do with the purpose of the research and how the results would be used. The community is very interested in finding out what savings had been generated by the Project. Nearly half of the questions about qualification criteria or sign-

Figure 17. Sources of information, Phase III.

	N	%
The Hood River News	41	28
Word-of-mouth	28	19
Staff	24	16
Someone being weatherized	14	10
Radio, TV	11	7
Civic meeting	7	5
Billboard	7	5
Work	6	4
Other	9	6
TOTAL	147	

Source: Monitoring Reports 15-24, 149 respondents

Figure 18. Questions about the Project, Phase III.

	N	%
Access to results	29	18
Qualification, sign-up procedures (early)	25	15
Purpose of the Project, research design	24	15
Measures selected	18	11
Timing	18	11
Sponsorship, cost	14	8
Choice of Hood River	8	5
Selection of contractors	5	3
Air-to-air heat exchangers	4	2
Cost to homeowner	4	2
Other	16	10
TOTAL	165	

Source: Monitoring Reports 15-24, 149 respondents

up procedures occurred in the first two months of the year; by March 1985 most people were informed about the basic procedures used by the Project. The questions the community still asked were typical of those asked earlier, but considerably fewer in number.

The final public relations effort in the community was the Closing Ceremony, held in early March 1986. It included participants similar to those who attended the Open House at the beginning of the Project. The luncheon acknowledged key participants in the Project, including those who

had conceived it. Although the ceremony was only designed to give credit for completion of the weatherization portion of the Project, the participants were well aware of the fact that the Project was only half finished, and there were many references to the anticipated research results in the informal discussions.

Non-participants

Interviews by the Process Evaluation contractor with community residents revealed many reasons why homeowners chose not to participate in the Project. Those who eventually agreed to participate said that they had not signed up earlier because: they thought they would be individually contacted (which they were); they thought the Project would not be able to do anything for them; or they were waiting for the Project to complete houses of people they knew before they agreed to participate.

Three classes of non-participants were surveyed by the Research staff in November: customers who did not contact the HRCP Project office; customers who refused an audit; and customers who refused weatherization (see Kaplon, 1986). The responses of the 200 non-participants were compared to earlier surveys of participants.

The main reasons non-participants gave for not registering for the Project were: they didn't need it (44 percent); they thought they were not qualified (14%); they were never contacted (13%); and they missed the deadline (10%). Those that did not participate were much more likely than those who participated (73% vs. 29%) to say that they had already done all the weatherization that could be done. Non-participants were more likely to have high education and high income than participants, which suggests that many of their homes might indeed have proved not to be cost-effective.

Attitudes towards the Project

As in earlier Phases, the community had much to say about the Project that was positive (see Figure 19). More than a quarter of the positive comments expressed general attitudes rather than making a specific statement. Customers were pleased with the results of the weatherization; they mentioned increased comfort (especially reduced drafts), energy savings, and lower electric bill for the future. These respondents also commended the quality of the work done by the contractors. Many felt their contractors had gone

"above and beyond" their contractual requirements to accommodate the homeowner.

Figure 19. Positive attitudes towards the Project, Phase III.

	N	%
General	105	28
Increased comfort, save energy or money	86	23
Quality	80	21
Project staff	21	6
Good for economy	14	4
Value of research data	11	3
House value, time on market	10	3
Fortunate it's in Hood River	9	2
Auditors	8	2
Glad it's free	8	2
Air-to-air heat exchanger	8	2
Measures included	6	1
Conservation is good	6	1
Other	8	2
TOTAL	380	

Source: Monitoring Reports 15-24, 149 respondents

However, among those interviewed, even those who were generally pleased with the Project had complaints, and the negative comments far exceeded the positive (see Figure 20). Over 40 percent of the problems were with the weatherization process: although there was some improvement after the poor contractors were terminated, quality control continued to be the single biggest concern. Delays were a problem, especially for mobile home owners. Homeowners were unhappy about the types of people hired for the crews, and complained of theft. In some cases there was actual property damage done by contractors' crews.

As in Phase II, about a third of the negative comments concerned the rationale for the measures that were included in the Project. Specifically, the usefulness of the air-to-air heat exchangers was questioned, as they appeared to the community to be noisy, costly, and inefficient. The number of holes that the contractors cut in order to meet Bonneville's venting requirements seemed much too high and the fact that care was not taken by all the contractors to cut the vents square or in a straight line was irritating.

Even during Phase III, the effect of the auditors giving misinformation about the measures that would be included for a particular house was still a problem. Those who had thought that their very leaky doors would be replaced could not understand why the Project would spend thousands of dollars to weatherize their homes and then decide in the middle of the Project not to include new doors. Costs and inequity issues declined in relative importance by Phase III.

Figure 20. Negative attitudes towards the Project, Phase III.

	N	%
Weatherization Process	219	42
Quality of work	87	17
Delays	46	9
Intrusion, inconvenience	34	6
Theft, or fear of theft	21	4
Quality of crews	20	4
Property damage	11	2
Rationale for Measures	179	34
Measures selected	62	12
Poor information from Project	37	7
Customer costs	34	6
Research design	14	3
Cost-effectiveness	14	3
Air-to-air heat exchangers	9	2
Frozen pipes	9	2
Costs and inequity	63	12
Inequity, discrimination	22	4
Rate impact, "No free lunch	21	4
Total cost	20	4
Staff	33	6
Poor planning and management	17	3
Auditors	9	2
Office staff	7	1
Indoor air quality	10	2
Other	20	4
TOTAL	524	

Source: Monitoring Reports 15-24, 149 respondents

It was during Phase III that the public first mentioned complaints about the office staff. They felt that the staff did not communicate clearly, did

not keep all their agreements, and management had planned the Project poorly to start with.

Finally, it was common during Phase III to hear people in the community say, "if you get something for nothing, you can't complain." There were complaints that the staff's attitude was that the Project was doing the homeowner a favor, and he or she should take whatever was offered. The respondents who had this attitude did not feel that the Project had received a professional job for its money, but they really had little control over the quality of work that was done in their houses, since they paid none of the costs of the work.

Figure 21. Summary of citizens' comments over time.

	PHASE I	PHASE II	PHASE III
Percent Misconceptions	8	6	2
Percent Questions	42	27	15
Percent Positive Attitudes	26	30	35
Percent Negative Attitudes	24	37	48
TOTAL CODED COMMENTS*	559	578	1,092

* Excludes responses regarding where the respondent first heard about the Project.

Source: Monitoring Reports 1-24, 359 respondents

Summary of the community interviews

Figure 21 summarizes the comments made by the 359 residents who were interviewed over the two and a half year period. Several trends are reflected in the table. The percentage of misperceptions about the Project declined steadily over time, as would be expected. Similarly, the percentage of the comments that were questions about the Project declined as the community became better informed. The percentage of both positive and negative comments increased over time, with negative comments increasing faster than positive. The increase in negative comments is largely attributable to the work done by the two contractors who were eventually terminated, but also reflects a lack of understanding and agreement about the procedures used by the Project.

Staff and Administrative Issues

During Phase III, the staff operated at an extremely efficient level, which was reflected in their overall performance. This section covers the Project personnel, records management and the tracking system, and the research requirements for the Project.

Project personnel

By early 1985, there began to be the feeling that the Project might get done "on time", according to the extended time schedule approved by Bonneville. Previously, many of the problems in getting houses completed were compounded by the lack of sufficient staff and the lack of clear, workable management systems. But by early 1985, the staff in Hood River was perceived to be large enough to get the job done, and the staff were consequently willing to be accountable for making the deadline.

The core staff in the field office remained stable throughout Phase III. For the most part, these were staff who had worked in the office for 3-6 months, who knew their jobs well, who were willing to be flexible at appropriate times and were also willing to draw a hard line if necessary, and who had above-average interpersonal skills. The stability of this exceptional core staff was instrumental in producing the needed results for Phase III.

Relations continued to improve between staff in Hood River and Portland. Several factors contributed to the improvement. The changes in the management structure during Phase II facilitated clear communications. The management systems had been modified to accommodate the research and operations need simultaneously. Staff assigned to Hood River for short periods made a greater effort to fit into the Hood River workstyle, which was appropriate for the job at hand and much less formal than what was appropriate as a "corporate Pacific" workstyle. The staff was large enough and well enough trained so that they could be productivity-oriented, rather than crisis-oriented. By the end of the summer of 1985, the staff reported that they felt they were being acknowledged by Bonneville and Pacific corporate management for their very real accomplishments that year. The staff morale problems evident during Phase I had improved markedly.

Relations with Bonneville also continued to improve. There was more openness and evidence of trust on both sides. Whereas at the beginning of

the Project, Bonneville and Pacific had operated strictly in a client-contractor mode, with neither side volunteering any information unless it was required by the contract, by the end of the Project communication was less formal and both sides operated more in a "team" mode.

However, there was also evidence of staff burn-out. Gradually, the staff became impatient with members of the community that they perceived to be ungrateful. They came to feel that they were doing the community a favor, rather than that the community was doing the Project a favor by agreeing to participate. Relations with the mobile homeowners were particularly strained through the spring and summer of 1985.

Plans were made to restructure the staffing in the field office as the Project was completed. The first permanent reduction in the Project office staff size occurred in September. As the weatherization activity drew to a close, personnel were transferred to other jobs within Pacific or found other employment. Although the staff had agreed to work on the HRCP on a "Project" basis, in fact the corporate Human Resources staff interviewed each Project staff member to find out what direction he or she wanted to go, and made an honest effort to place staff elsewhere within Pacific in an acceptable position.

Most staff had a good idea of the maximum time their job for the Project would last, and by Fall of 1985, most of the operations staff were open to other opportunities. By December 1, the Project administrator assumed duties elsewhere in Pacific and the field coordinator took over as head of the field office. Other staff were placed as opportunities arose.

As early as September 1985, the contractors noticed a change in the attitude of staff. Now that it was clear that the weatherization would be finished on time, staff took the vacation time that was due them, started taking classes, and did job interviewing -- activities that there was no time for previously. Perhaps the contractors had been spoiled in the past by a very committed staff that worked long hours, but they were not used to waiting until "next week" to get problems solve. As the staff decreased in size, there were fewer back-up staff to answer questions and settle issues for someone who was out of the office.

Records management and tracking system

Even into Phase III, there continued to be problems with the tracking system, and alternative means for transmitting data were explored. Although it was functional the majority of the time, the system that was originally designed was very time-consuming to back up, and data transmissions were difficult.

The Project office in Hood River installed an IBM-PC to assist in tracking and analyzing data. This was because as the Project progressed, it became clear that real time data were needed for Project management as well as the historical data required for the research needs of the study. The tracking system that had been designed at the beginning of the Project simply could not accommodate this need. With the IBM-PC the staff were able to lay their hands on information in a file quickly and answer any question. Such good communication was impossible earlier, and was especially appreciated by the contractors and customers checking on the status of a particular job. As more staff learned to access the information on the PC, many of the bottlenecks in the office were relieved.

Research requirements

An issue that had been raised by the staff in the fall of 1984 was that the end-use monitored homes had all been promised weatherization, at a time early in the Project when it was anticipated that the limit of $1.15 per kWh of savings for the first year would enable a major measure to be installed in virtually every home. Experience with the Project showed that this was not the case, and that it was likely that some ten percent of the EUM homes would not prove to be cost-effective. But there was concern that the EUM homes remain representative of the community and only be weatherized if they met cost-effective criteria.

After much discussion by the RAG, it was agreed that decisions would be made on a house-by-house basis, that an effort would be made to install at least one major measure for each EUM house, and that any exceptions to general policy would be documented in the database.

In the fall of 1985, one of the key challenges for the RAG was to resist the pressure to piggyback more research studies to the 16 being conducted as part of the Project. In one case, a manager in another section of Bonneville had let a contract which included wood stove research in Hood River without

consulting the Bonneville manager for the Project. RAG members had a special meeting with the contractor and the Bonneville manager to emphasize that given the significant investment that had already been made in the Project, it was important that the existing studies be given priority, and that the residents not be burdened with additional researchers.

The RAG also agreed to discipline itself not to "leak" the results of any of the 16 research studies until the other members had had a chance to review preliminary drafts of findings. By Phase III, the RAG functioned in a collegial fashion; discussions were spirited, but not acrimonious.

Contractor and Weatherization Issues

During Phase III, the contractors completed some 2,500 homes and met the Project goal. In doing so, they had to surmount some difficulties, which are detailed in this section. The contractor and weatherization issues that are addressed are: health considerations for contractors' crews, the weatherization of mobile homes and the installation of air-to-air heat exchangers, the weatherization of the end-use monitored homes, the closure of one of the glass plants, the wind-down of field activities, and the long-term benefits of the Project.

Health of the crews

Although Bonneville's specifications required that insulation crews wear protective masks, this was not always practical. Given the higher than usual levels of floor insulation installed for the Project, insulation crews found that the crawl spaces under many homes left virtually no clearance while the insulation was being installed. Even if an attempt was made to wear the masks, they often pulled loose from friction with the insulation. De facto, many of the crew members who most needed protection, i.e., those whose faces were closest to the fiberglass insulation, were not wearing masks.

Turnover on insulation crews tended to be high, because of the difficult working conditions and limited pay. However, there were persons who worked steadily on insulation crews for the Project for many months. Given the large volume of insulation work for the Project, these persons' exposure to inhaled particulates was perceived by crew members to be higher than usual.

Mobile homes

Weatherization of the test mobile homes was not finished until March 1985. The final specifications for mobile homes were received from Bonneville in April and an increasing number of mobile homes were weatherized. It was important that as many homes as possible be completed before the end-use monitored homes were weatherized so that potential problems with the mobile homes in the end-use monitored study could be anticipated. Many of the measures installed during this period were experimental, having never been attempted elsewhere. Consequently, the guidelines for installation evolved as the Project went along, particularly for exterior roof insulation applications.

As an increasing number of mobile homes were weatherized, the Project office received more and more complaints from residents of mobile home parks. Since many homes look similar from the outside, it was not clear why one would get one set of measures and those same measures would not be "cost-effective" for another. Also, it seemed to the mobile home residents that they were being asked to do more "cost-sharing" than the "stick built" homeowners had been asked to. Project staff held a meeting of mobile home owners to explain Project policy and answer questions.

This phase of the Project was difficult for the contractors. It was the contractors who had done much of the legwork on practical measures for mobile homes, such as the research that showed that adding a roof to mobile homes was too expensive and the walls could not stand the extra weight. Contractors who went to the extra effort were not compensated by the Project, even indirectly by being awarded extra stick-built houses. Further, because so many of these homes were not cost-effective under the unit-price guidelines, contractors were more often requested to do a job at less than the unit price so that the job could be done at all. Contractors who agreed to do mobile homes felt that they were unfairly penalized for their cooperation.

Air-to-air heat exchangers

Air-to-air heat exchanger installations were put back on a competitive bid basis in 1985. This resulted in a 20-30 percent cost reduction, attributed to a knowledgeable group of contractors, reduced volume of activity in response to the Bonneville Environmental Impact Statement, clear specifications, and the posting of the winning bids once the jobs were awarded.

End-use monitored homes

During early 1985, preparations were made to weatherize the end-use monitored homes. Proposals were collected from the contractors, customer agreements were signed, and materials were ordered so that all 320 jobs could be completed within as short a time-frame as possible.

The pre-weatherization planning done by the office was really appreciated by the contractors, as it meant that these jobs went particularly smoothly. The key factor was getting the Notices to Proceed out well ahead of time. Contractors had lead time to plan, both for crews and for materials, the work flow was steady and heavy, and the cash flow was good. The attitude of the staff was one of flexibility to get problems with individual houses solved very quickly. Both staff and contractors would have liked the entire Project to work like the EUM weatherization did.

Weatherization of the end-use monitored homes began on May 1, 1985. The quality of the work done on these homes was exceptionally high. The work was completed as scheduled within a two-month period, except for a few odd-sized glass orders.

Glass plant closure

When one of the two glass suppliers for the Project announced in the fall of 1985 that it was closing its Portland plant, contractors had materials that were back-ordered that they were counting on in order to make their due dates for the Project. Re-ordering from the other (local) supplier would have seriously jeopardized their cash flow. Contractors were also worried that warranties on installations that had already been made would not be honored by the parent company, or that they would need to ship defective materials to California in order to be reimbursed. Ordinarily, the contractor would be responsible for returning the defective piece to the plant in Portland and picking up the replacement. As it turned out, contractors were able to obtain all of their back-ordered materials, but were not able to place any new orders out of the Portland plant once the closure announcement was made.

The resulting increased production level and overhead costs for the second supplier threatened to impact its ability to deliver all the required glass by the Project termination date. The Project arranged a financial

assistance package for the supplier to ensure that delivery dates were kept (see Logistics Report, p. 70).

Wind-down of field activities

According to the contractors, after the End-Use Monitored houses were completed in the summer of 1985, the Project began the process of winding down. Most of the mobile homes still needed to be processed, but many of them were found not to be cost-effective. The volume of new Notices to Proceed for "stick-built" houses declined noticeably, and most contractors laid off help. As early as September, contractors who were planning to leave Hood River at the end of the Project met with other contractors who planned to stay in Hood River to work out a financial arrangement so that the local contractors would finish their jobs.

The Project office was concerned mainly with scheduling the remainder of the work, including heat pump installations, clock thermostat installation, radon monitoring, job packet reviews, and data clean-up. Goals were set for the time that each step of the field office's tasks would be complete (see Logistics Report, p. 22). With few exceptions, these goals were met.

Some customers who registered to participate in the Project could not be contacted by mail or phone to schedule the remainder of the work. These people were sent cancellation notices which stated that if they did not contact the office by a certain date, they would be dropped from the Project.

All invoices from the contractors for weatherization work had to be at the Project office by December 20 in order to be eligible for payment. The office assisted the contractors by setting up a supplemental tracking system which showed whether their production was on schedule so that all their jobs could be billed by the deadline.

The weather was particularly harsh in the fall of 1985. Production schedules of both contractors and Project inspectors were slipped due to sub-freezing temperatures, heavy snowfall, and icy traveling conditions. The deadline for weatherization was extended for one month.

The Bonneville preliminary audit of the Project began on February 17, 1986. Project staff accompanied Bonneville inspectors on field inspections of 140 homes (see Schoch 1987). The final data transmission to the evaluation contractor took place February 16-17.

Long-term Benefits

The Project was an important opportunity for contractors who plan to stay in business in Hood River. Contractors reported that the exposure to the community in general and to the homeowners they dealt with in particular will help their business in the long run. The Project gave the contractors an opportunity to make a lot of personal contacts in the community. Also, it educated the oil and gas customers in the valley as to the value of weatherization. The better contractors will benefit from this exposure and education for years to come.

The primary benefit to the homeowners in the study area was the weatherization of their homes. This will not only decrease their energy usage in most cases, it will also make homes in the area more comfortable and noise-free. The Project may also have had a small effect on property values, although this was not evident by the end of the evaluation period. Finally the residents of the study area benefitted by the intensive education program which was a concomitant of the Project. Residents are more "conservation-literate" than they were in 1983.

The benefits to the staff vary widely. Some saw the primary benefit to be the education they received while on the Project, which will serve them in the future. Others saw the Project as a way to advance within Pacific. The research staff is gaining national recognition for their work, and several have publications resulting from the Project. Finally, staff are proud to have been a part of such a unique and successful effort.

Chapter 6: Summary and Suggestions for Future Projects

This chapter is designed to highlight some of the lessons learned from the Hood River Conservation Project. Much of the previous discussion suggests that alternative procedures might have been considered, and all suggestions are not repeated in this chapter.

The Project was one of the largest conservation experiments ever undertaken in a single, defined geographical area of the United States. The fact that the Project was both a weatherization and research project presented special challenges for all involved.

Community Summary

Community Advisory Committee

The Community Advisory Committee should represent a good cross-section of the community in terms of geography, occupation, and value systems. It should have a clear mission, and be responsible to the project for fulfilling its mission. If the mission is accomplished prior to the termination of the project, the group should be formally dissolved. As long as the group functions, attendance should be expected, and the absentees replaced with persons of a similar background.

Promotion and marketing

Community Assessment

A Community Assessment is a valuable tool for positioning the project in the most advantageous manner so as to gain the widest possible acceptance of its goals.

Marketing tools

Standard media sources (newspaper, radio, and TV) can be used to provide on-going background information about the project, answer common questions, provide solutions to common complaints, and correct misconceptions. One-on-one meetings with a substantial, random minority of the community to explain the project, as was done with the EUMs, is a very effective way to

market a conservation project. Weatherization contractors in the area can also be used to help spread the word. For this project, the staff were a key factor in marketing.

Communication with the community

Care should be taken in what is promised homeowners. Unforeseen problems (monitoring equipment delay, mobile homes) or policy changes (door replacement, air-to-air heat exchangers, cost-sharing) can easily result in bad feelings on the part of the community. The residents should be given realistic time lines for when various steps will occur at the time they register for the project, and should be notified in writing if the time line needs to be changed. In particular, special populations whose support is critical to the project (EUMs in this case) should receive special attention, perhaps in the form of newsletters, if changes need to be made.

A common complaint of participants in research projects is that they never see the results. Special public meetings, the media, and regularly scheduled civic meetings can all provide forums for dissemination of key findings.

Staff and Administrative Summary

Project personnel

A project of this size, complexity, and uniqueness makes special demands on the staff involved and the corporate structure as a whole. There need to be clear lines of authority, with as much decentralization as possible and a good correlation between authority and responsibility. A consultant experienced in the management of large special projects should be retained to design the management system and ensure that adequate staff are budgeted for research, operations, and administration. Pay should be commensurate with comparable responsibility levels elsewhere within the organization. A project director should have responsibility for the project, and have authority similar to a vice-president in most utilities.

Good interface between the research and operations portions of the project is essential. On a project of this size, a permanent liaison person should be assigned the responsibility of providing good communications

between the two sides. Key people in the two groups should meet regularly to exchange information.

Within groups, good communication is essential so that the community and contractors always get the same messages from different project staff.

The audits should not be contracted. The communication required between the auditors, the inspectors, and the field specialists is extensive enough so that they should all be housed together. In fact, it is appropriate to consider the possibility of cross-training or use of common staff to perform all three functions. The auditors, the field specialists, and the inspectors must evaluate the homes in a consistent fashion. Previous installation experience or a training period working on installation crews should be required of inspectors.

All persons representing the project should act in a professional manner and be appropriately dressed for the task at hand; appropriateness will vary by community.

Records management and tracking system

The tracking system cannot be designed properly without giving careful thought to both the research and operations needs that it must meet. In both cases, preparation of dummy report tables prior to designing the data base is helpful.

The system must be available in real time to everyone involved in the project.

For the operations portion of the project, the system needs to be able to track which contractor or subcontractor did which part of a job.

The system must be flexible, because all the data needs cannot be anticipated in advance. If the software is custom designed (not recommended), the software contractor should be screened very carefully and be on a fixed fee contract, with final payment withheld until full acceptance testing is complete.

Research requirements

Regional Advisory Group

Early formation of a coalition of those who will evaluate the findings and support the research effort during program implemenation is a key factor in the success of a research project. For this project, the RAG was able to limit the scope of the research so that there was a good chance that all the included research would be completed successfully and according to the highest scientific standards. It also functioned as an advocacy group to protect the Project from being weakened as problems arose.

Contractor and Weatherization Summary

Selection of contractors

There are many benefits to using local contractors who have been in business locally for a long time before the project and who plan to remain in business locally after the project. They tend to be concerned about the quality of their work, customer satisfaction, and their reputation in general. However, it is not necessary to restrict participation in the project to local contractors. For the Hood River Conservation Project, many of the prime contractors (who were all local) had good success with subcontractors who were not local.

Nor is previous weatherization experience with a utility critical when the specifications are as different as those used for the Hood River Conservation Project. Remodeling experience appeared to be as important as weatherization experience, especially for window treatments. The number of experienced carpenters available to a contractor often determined the volume of work he was able to handle effectively.

Other characteristics that are valuable for contractors are general contracting experience and experience in dealing with large volume, accompanied by adequate capitalization for large jobs. The contractors who performed best on the Project had good internal management controls, trained and supervised crews, remodeling experience, and good credit.

Selection of measures

Given the large investment in other weatherization measures, the Project might also have included: door replacements for those with serious leaks; stationary storm windows over windows and doors that are never opened (if building codes permit); treatment of french doors as if they were windows; and blown-in insulation for sloping walls (treat as "walls" rather than "cavities"). There are advantages to designing a project to include measures and equipment that are readily available from multiple suppliers, especially if the project is on a tight time line; the Hood River Project had trouble because there was only one supplier of the monitoring equipment and, at various times one supplier of double-pane glass. There are also advantages to using such an opportunity to create a market for state-of-the-art products, even if only one manufacturer can supply the needed measures.

Homeowners should be informed of the policy regarding repairs early in the project. Money should be allocated for necessary repairs prior to the installation of retrofit measures or arrangements should be made ahead of time with other agencies (such as CAPs) to cover these expenses for those who cannot afford them.

The project needs to allocate sufficient time to educate the homeowner as to what exactly will be happening at his or her home. Many homeowners are ignorant of weatherization procedures, and the responsibility for informing them should not fall to the contractors.

Administrative procedures

Policies and procedures should be written down prior to the start of the project. With an experimental project, it may be difficult to write them in advance, but a working document which covers typical issues should be prepared prior to the inception of the project.

Work flow

The staff needs to develop a backlog prior to bringing the contractors on board, so that the contractors can be scheduled in one geographical area at a time. Then, if there are small corrections to be made on inspection work, it is not difficult or costly to make them.

Firm start dates for the contractors should not be made before the backlog is available.

Quality control

Contractors should be closely supervised from the beginning. There should be clear penalties for violations or poor work which are commensurate with the cost to the project for correcting the problem. Clear standards with which to evaluate contractors should be in place and tracked from the inception. Instituting a system of fines in Hood River corrected many of the previous abuses very quickly.

Unit price system

A project of this kind should give careful consideration to the use of unit prices. For the Hood River Conservation Project, the use of unit prices resulted in a substantial saving in the cost of weatherization and considerable time savings for both staff and contractors. However, the unit prices used for the majority of the weatherization were based on the experience gained through competitive bidding, and were substantially lower than the initial unit price schedule used at the beginning of the Project. This suggests that both methods may have a place in designing the optimum system.

Specifications and inspections

A clear set of specifications should be developed in advance in consultation with experienced contractors. For innovative applications, pilot projects should be run to test the flexibility of the specifications for a variety of housing stock. Specifications should be available in advance for all anticipated applications (in this case, specs for air-to-air heat exchangers and mobile homes were not available). Once the project begins, interpretations of the specifications should be decentralized as much as possible.

One hundred percent inspection of residences is crucial from the beginning. The inspector must look around the corner in each attic and actually crawl under the house to inspect the installation of the insulation.

Payment of contractors

Contractors need to make provision in advance for their cash flow needs, perhaps by working with project staff to ensure partial payment of work if sufficient capital is not available. Options not considered for this project but which might prove useful elsewhere include payment in advance for materials or a portion of the estimated invoice. By the end of this project, partial payments were being made for work that had not passed final inspection, which helped the contractors considerably.

Conclusion

The Hood River Conservation Project's weatherization phase was an overwhelming success. More homes were weatherized than was expected, and by Phase III, all systems were working relatively smoothly. The weatherization itself, the data that were collected, and the research that was conducted were all of the best quality. The Region has gained a cadre of trained weatherization installers of the highest caliber.

The actual implementation procedures for the Project were quite different than originally anticipated in the Proposal to Bonneville Power Administration. The procedures that evolved could have been anticipated in some cases, and in others the experimental nature of the Project precluded rigid pre-planning. For future projects, there is much to be learned about what works and what doesn't work from the experience of the Hood River Conservation Project.

However, perhaps the greatest lesson to be learned is that such a project requires great flexibility in order to achieve its goals. Both Bonneville and Pacific made many adjustments to their normal business practices in order to meet the needs of the Project. Meeting Project goals came to be as important as other considerations, and the resulting teamwork that evolved was crucial to the Project's success.

Appendix A: Summary of objectives

Source: Proposal to Bonneville, pp. 3-2 ff.

SUMMARY OF OBJECTIVES

OBJECTIVE	ACTIONS TAKEN TO ACHIEVE OBJECTIVES	RESEARCH PRODUCTS
OBJECTIVE 1: Determine the impact of conservation measures by:		
A. Evaluating the distribution and transmission system effects of a comprehensive conservation effort.	1) Monitoring of all distribution feeders. 2) End-use submetering of 325 individual households on a single feeder. 3) Contractor hired to evaluate data.	1) Measures of load characteristics at the feeder level. 2) Assessment of the effects of wide-spread conservation treatment. 3) Measures of inter-feeder diversity and the impacts from a comprehensive conservation program.

NOTE: Differences between feeders relating to the characteristics of the housing stock will be statistically controlled.

OBJECTIVE	ACTIONS TAKEN TO ACHIEVE OBJECTIVES	RESEARCH PRODUCTS
B. Evaluating individual customer load characteristics	1) Four-channel end-use metering of 325 households (space heat, water heat, total load and indoor temperature) before and after conservation treatment. 2) Samples will be drawn to ensure statistical validity. 3) Contractor will be hired to analyze the data.	1) Measurement of residential load characteristics by major end use. 2) Impact of conservation activities on residential load characteristics. 3) Measurement of demand diversity among residences and of contributions to aggregate feeder line load characteristics. 4) Impact of conservation program on aggregate feeder line load characteristics.

NOTE: Feeder line chosen for sub-metering will be selected to ensure the greatest generality and validity of results.

OBJECTIVE	ACTIONS TAKEN TO ACHIEVE OBJECTIVES	RESEARCH PRODUCTS
C. Evaluating actual versus estimated KWH savings.	1) A data base will be developed combining customer consumption records, survey information, and detailed weather data. 2) Household audits will include the survey instrument from the BPA/PNUCC Northwest Regional 1983 Survey along with a heat loss calculation from an approved heat loss methodology. 3) Two communities chosen for similar economic and demographic characteristics, Grants Pass and Pendleton, Oregon, as well as a random sample of households in PP&L's PNW service territory, will act as comparison groups to Hood River.	1) Evaluation of "before" and "after" weatherization energy consumption accounting for weather, behavior and structural changes. 2) Reconciliation of estimated program savings from heat loss methodology versus actual savings derived from program evaluation. 3) Development and comparison of alternative weather adjustment techniques.

OBJECTIVE	ACTIONS TAKEN TO ACHIEVE OBJECTIVES	RESEARCH PRODUCTS
	4) Consumption records, weather data, and survey data will be gathered for all comparison groups. 5) A contractor, reviewed by a PNUCC advisory committee, will be hired to analyze the data.	4) Energy savings contrasts of Hood River vs. comparison communities and PNW/PP&L random sample. 5) Attempts to identify energy savings from individual conservation measures as well as from total conservation packages.

NOTE: The end-use monitoring data of the 325 customers will be used to supplement the billing records and survey data in the evaluation process.

OBJECTIVE	ACTIONS TAKEN TO ACHIEVE OBJECTIVES	RESEARCH PRODUCTS
OBJECTIVE 2: To determine the achievable penetration rate of the Program and levels of potentially cost-effective weatherization measures.		
A. Program Penetration	1) A pre-program and post-program survey of Hood River and the three comparison groups will be implemented to 800 households in each area emphasizing customer attitudes towards energy conservation. 2) Tracking records will be kept on pre-existing structural characteristics and post-treatment changes. 3) Tracking records will be kept detailing implementation progress.	1) Measurement of Hood River Conservation Project penetration versus conservation activity in comparison groups. 2) Effects of selected community-specific influences on conservation activities of individual households. 3) Identification of customer barriers to the total treatment package.

OBJECTIVE	ACTIONS TAKEN TO ACHIEVE OBJECTIVES	RESEARCH PRODUCTS
B. Penetration and Levels of Measures	1) Data will be derived from the aforementioned surveys, audits and measure implementation records. 2) Pre-existing and post-treatment levels of conservation measures will be identified.	1) Identification and measurement of the frequency with which physical and attitudinal barriers to the application of conservation measures are encountered. 2) Measurement of the effects of physical and attitudinal barriers to the application of programmatic conservation measures. 3) Statistical description and measurement of structural barriers found to exist. 4) Description of how participants change over time.

OBJECTIVE	ACTIONS TAKEN TO ACHIEVE OBJECTIVES	RESEARCH PRODUCTS
		5) Estimates of the effects on energy savings of incremental additions to the conservation treatment of households. 6) Description and frequency of customer options for "beyond program" levels and measures (at cost to the customer).

NOTE: Special studies may be implemented to explore specific problem areas as they arise.

OBJECTIVE	ACTIONS TAKEN TO ACHIEVE OBJECTIVES	RESEARCH PRODUCTS
OBJECTIVE 3: To determine the relative effectiveness of vigorous conservation marketing.	1) Implementation to occur in two phases: Phase I - general media approaches based on existing practices (e.g. general advertising, bill enclosures, general direct mail); Phase II - personal approaches where necessary to achieve participation (e.g. personal letter from serving electric utility manager. door-to-door visit, telephone call). 2) Contractors will be hired to assist in the development of the advertising and communications activities.	1) Measurement of the effectiveness of elements and sequences of elements in the communications package to achieve the earliest and highest level of customer participation. 2) Recommendations for future marketing and communication efforts, referenced to empirical findings.

NOTE: Results from the community assessment component of this project will be used to develop the marketing strategies. In addition, an independent market consultant will review marketing/communications component for potential effectiveness.

OBJECTIVE	ACTIONS TAKEN TO ACHIEVE OBJECTIVES	RESEARCH PRODUCTS
OBJECTIVE 4: To determine the characteristics of community social interaction and impacts under aggressive conservation program conditions.	1) Consultant hired to write a non-quantitative story of the Hood River Conservation Project. 2) Consultant hired to identify the social and communication networks in the community through interviews, surveys, audits and interaction with established community organizations. 3) Tracking records kept on customers reactions (positive and negative) and on staff perceptions of the conservation project.	1) "The Hood River Story" - a narrative monograph on the history and experience of the conservation project and its impacts on the community. 2) A detailed narrative written in the form of a guide for utilities concerning the implementation of a community conservation campaign. 3) Identification of the formal and informal communication networks and power structures within the community.

OBJECTIVE	ACTIONS TAKEN TO ACHIEVE OBJECTIVES	RESEARCH PRODUCTS
		4) Description of the positive and negative effects from the community perspective of a widescale conservation program. 5) A report on staff and community perceptions of the progress of the project over time. 6) A comparison of Hood River and BPA Regional Survey results.

NOTE: Items within this component may comprise a single document and may be incorporated into other evaluation reports.

Appendix B: Principal program groups and individuals

Source: Proposal to Bonneville, pp. 6-5 ff.

Summary: Principal Program Groups and Individuals

GROUP/INDIVIDUAL	MEMBER(S)	RESPONSIBILITIES
I. Program Oversight & Advisory		
A. Contract Oversight Group	1. Bonneville Power Administration 2. Pacific Northwest Utilities Conference Committee 3. Northwest Power Planning Council 4. National Resources Defense Council 5. Hood River Electric Cooperative 6. Pacific Power & Light Company	The Contract Oversight Group reviews Program processes and progress; evaluates and distributes results, provides liaison between the Program and the respective participating groups and organizations. The Bonneville Power Administratin will exercise specific contract review authority.
B. Community Advisory Committee	1. Government officials 2. Civic leaders 3. Clergy 4. Educators 5. Agricultural leaders 6. Environmental organizations 7. Interested citizens	The Community Advisory Committee will serve in an unofficial liaison and support capacity to the Program management and administration. The contactee will provide Program progress reports to the Committee on a regular basis.

GROUP/INDIVIDUAL	RESPONSIBILITIES
II. Program Management & Administration	
A. Management	
1. Vice President for Consumer Affairs, PP&L	Conduct of the Hood River Program will be under the direction of Energy & Conservation Services, one of PP&L's Consumer Affairs Departments. As such, the V.P. for Consumer Affairs, will exercise primary executive authority over the responsibility for conduct of the Program under terms of the contract and policies of the corporation.
2. Manager, Energy & Conservation Services Department	Reports to the Vice President for Consumer Affairs and is Manager of the PP&L department charged with conducting the Hood River Program. As such, he will have general management responsibility for conduct of the Hood River Program.
3. Program Manager	Reports to the Manager, Energy & Conservation Services Department, PP&L. The Program Manager is responsible for carrying out the Program as specified by the contract and corporate policy, including general personnel direction, schedule maintenance, fiscal control and process and progress reporting.

GROUP/INDIVIDUAL	RESPONSIBILITIES
B. Administration	
1. Project Administrator	Reports to the Program Manager. Is responsible for daily on-site direction of Program support activities; including community liaison, administrative, materials and equipment supply, Hood River-Portland communications, community conflict resolution, reporting, and supervision of the Program Operations Center and staff. The Program Administrator will support the Program Field Coordinator as required.
2. Field Coordinator	Reports to the Program Manager. Supervises the Program Implementation Team in their assigned auditing, weatherization, and inspection duties. Specific responsibilities include job scheduling, contractor liaison, personnel deployment and performance assessment. Prepares daily progress/status reports and coordinates scheduled summary updates with the Program Administrator.
3. Implementation Team	Reports to the Field Coordinator. Conducts home energy audits, prepares weatherization plans, and negotiates acceptable plan of work with homeowner.
4. Inspectors	Reports to the Program Administrator. Responsible for determining whether a specified weatherization has been completed within the terms of an agreed plan.

GROUP/INDIVIDUAL	RESPONSIBILITIES
C. Program Operations	
Center Staff	
1. Administrative Secretary	Reports to the Program Administrator. Supervises the Program Operations Center staff. Primary responsibilities include general public contact, communications routing, facility maintenance, records supervision, and support of the data input clerk.
2. Data Input Clerk	Reports to the Administrative Secretary. Operates computer equipment, including daily data input, maintenance of records, and other duties as assigned.
3. Clerk-typist	Reports to the Administrative Secretary. Performs such secretarial and clerical duties as are assigned. Supports the Data Input Clerk as required.

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