The 1992 Pacific Northwest Residential Energy Survey – Phase I

Book 1: Getting Started

- Volume A: Executive Summary
Concordance
Glossary
- Volume B: Report of Methodology
Technical Appendix

PNWRES92

*This document is a product of the
Energy Resources Development
and Implementation Process:*

Define Situation →
*Identify Alternatives
Select Strategies
Implement Strategies
Evaluate Performance*

Energy Resources Development and Implementation Process

The Energy Resources Program contains all the steps needed to plan for and manage energy resources. This chart reflects that process, with major tasks for each step. Though we display a linear process, it is a simplification; many interactions among the stages take place. Throughout the process, Bonneville asks customers, the Northwest Power Planning Council, utility and environmental groups, the public and others for their advice and comment.

*Customers
Northwest Power
Planning Council
Utility and
Environmental Groups
The Public*

Defining the Resource Picture

To define the resource picture, Bonneville assesses its customers' power requirements for the next 20 years and the supply of existing resources. Bonneville and the Northwest Power Planning Council publish energy demand forecasts, and analysts forecast how much power from existing resources will be available to meet projected uses. The difference must be met by new resources.

Identifying Alternatives

Analysts track potential resources and predict future supplies of conservation and generation resources, including imports and power exchanges. Analysts study all aspects of a resource: reliability, public opinion, cost, environmental impact, regulatory transmission and fuel constraints, and development time. Alternatives considered include opportunities for coordinating hydro system operations with Canada and for power purchases and transfers with Canadian and Southwest utilities.

Selecting Strategies

Using information on loads and resources, Bonneville weighs combinations of resources, their consequences, and public comment to choose the most appropriate and cost-effective resource strategy. The Resource Program documents this strategy.

Implementing Strategies

Fulfilling the plans in the Resource Program is the next step. Working with utilities, resource developers, interest groups, the public, and others, Bonneville sponsors conservation and generation programs and projects. BPA conducts environmental reviews of programs and projects and also provides oversight for generation projects. The result: megawatts of electricity generated or saved for the region.

Evaluating Performance

How well did actions meet BPA's objectives? Answering this question through program evaluation provides information on energy savings, energy production, costs and other measures of program quality. It is BPA's policy to evaluate all energy resource acquisitions.

The 1992 Pacific Northwest Residential Energy Survey - Phase I

(PNWRES92-I)

Book 1: Getting Started

■ **Volume A: Executive Summary
Concordance
Glossary**

■ **Volume B: Report of Methodology
Technical Appendix**

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DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

PREFACE

This book constitutes a portion of the *primary documentation* for the **1992 Pacific Northwest Residential Energy Survey, Phase I (PNWRES92-I)**.¹ The complete 33-volume set of primary documentation provides information needed by energy analysts and interpreters with respect to planning, execution, data collection, and data management of the PNWRES92-I process. Thirty of these volumes are devoted to different "views" of the data themselves, with each view having a special purpose or interest as its focus. Analyses and interpretations of these data will be the subjects of forthcoming publications.

Conducted during the late summer and fall months of 1992, PNWRES92-I had the over-arching goal of satisfying basic requirements for a variety of information about the stock of residential units in Bonneville's service region. Surveys with a similar goal were conducted in 1979 and 1983 and were respectively designated PNWRES79 and PNWRES83.

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¹ From its planning stages, PNWRES92 was conceived as and intended to be a two-phase study: Phase I, the Telephone Survey, was to provide a modest amount of data on a large number (some 20,000) of Pacific Northwest households; Phase II, the On-Site Survey, was to provide a great deal of data on relatively few (perhaps 2,000-3,000) of the households interviewed in Phase I. Phase I households were intended also to provide a "surrogate population" of the region's households for specially focused future surveys.

PNWRES92-I differed from its two predecessors in several ways. It was designed to ...

... be conducted as a telephone survey—in contrast to an on-site/in-person interview.

.... include all classes of housing units in the Pacific Northwest—in contrast to those that could be reached only through cooperating electric utilities.

... assure coverage of six geographic sub-regions² and three utility types³—in contrast, again, to depending upon the cooperation and effort of a selection of electric utilities.

... provide data on some 20,000 housing units—in contrast to some 4,000-5,000 housing units interviewed in PNWRES79 and PNWRES83.

... provide a surrogate population of Pacific Northwest households as a basis for future, fine-tuned surveys aimed at specific issues or limited data needs.

In order to provide a record of intention and achievement, the 33 coordinated volumes—designated **Volume A through Volume AG**—were prepared by PNWRES92-I's principal contractor, the Applied Management & Planning Group of Los Angeles, CA. These volumes are collected and published in a series of 12 "books," each of which contains a particular subgroup of the 33 volumes:

Book 1: Volumes A and B. The Executive Summary, the Concordance, and the Glossary (A) and the Report on Methodology and the Technical Appendix (B).

Book 2: Volume C. Item-by-item crosstabulations⁴ for the Pacific Northwest Region.

Book 3: Volume D. Item-by-item crosstabulations for the four Bonneville Area Offices (Puget Sound, Lower Columbia, Upper Columbia, and Snake River).

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² Western Montana, Idaho, Eastern Washington, Western Washington, Eastern Oregon, and Western Oregon.

³ Publicly-Owned Generating Utilities, Publicly-Owned Non-Generating Utilities, and Investor-Owned Utilities.

⁴ Item-by-item crosstabulations display all responses to each of 80 survey items (excepting confidential/sensitive items like names and addresses) for each of the 15 survey domains and for the Region (Volume C), Bonneville's four Area Offices (Volume D), and the four Pacific Northwest states (Volume E).

- Book 4: Volume E.** Item-by-item crosstabulations for the four Pacific Northwest states served by Bonneville (Western Montana, Idaho, Washington, and Oregon).
- Book 5: Volume F.** Selected crosstabulations⁵ for the Pacific Northwest Region.
- Book 6: Volumes G, H, and I.** Selected crosstabulations for the three publicly-owned *generating* utility domains: Eastern Washington (G), Western Washington (H), and Western Oregon (I).
- Book 7: Volumes J, K, L, M, N, and O.** Selected crosstabulations for the six publicly-owned *non-generating* utility domains: Western Montana (J), Idaho (K), Eastern Washington (L), Western Washington (M), Eastern Oregon (N), and Western Oregon (O).
- Book 8: Volumes P, Q, R, S, T, and U.** Selected crosstabulations for the six investor-owned utility domains: Western Montana (P), Idaho (Q), Eastern Washington (R), Western Washington (S), Eastern Oregon (T), and Western Oregon (U).
- Book 9: Volumes V, W, X, and Y.** Selected crosstabulations for Bonneville's four Area Offices: Puget Sound (V), Lower Columbia (W), Upper Columbia (X), and Snake River (Y).
- Book 10: Volumes Z, AA, AB, and AC.** Selected crosstabulations for the four states served by Bonneville: Washington (Z), Oregon (AA), Idaho (AB), and Western Montana (AC).
- Book 11: Volumes AD, AE, and AF.** Selected crosstabulations for the three categories of utilities in the Pacific Northwest: Public Generating (AD), Public Non-Generating (AE), and Investor-Owned (AF).
- Book 12: Volume AG.** A report of a post-survey study of PNWRES92-I non-respondents (conducted in late Spring 1993) and their reason(s) for not completing the original survey.

For additional information, comments, or data requests, contact David Mills: 503-230-7505.

To obtain copies of the reports, contact Kim Andersen, End-Use Research Section (RPEE), Bonneville Power Administration, P.O. Box 3621, Portland, OR 97208-3621: 503-230-5712.

Individually-bound copies of Volume A (Executive Summary, Concordance, and Glossary) may be obtained from Bonneville's Public Information Office: 503-230-3055.

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⁵ "Selected crosstabulations" refers to a set of nine survey items of wide interest (Dwelling Type, Ownership Type, Year-of-Construction, Dwelling Size, Primary Space-Heating Fuel, Primary Water-Heating Fuel, Household Income for 1991, Utility Type, and Space-Heating Fuels: Systems and Equipment) that were crosstabulated among themselves and thus yielded 36 two-way tables for each of the several views displayed in Volumes F through AF.

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EXECUTIVE SUMMARY

This Executive Summary outlines the general processes employed in and the major findings from the conduct of Phase I of the Pacific Northwest Residential Energy Survey (PNWRES92-I) during the last quarter of 1992. This study was Bonneville's third comprehensive residential survey of the region, conducted to provide data on energy usage, conservation awareness and behaviors, and associated consumer characteristics for use in forecasting and planning.

The summary is divided into four sections:

BACKGROUND sets the stage with respect to the need for the survey, relates it to previous work, outlines the implementation processes, and summarizes the data products.

PROFILING THE RESPONDENTS summarizes the survey results under these six categories:

Demographics
Housing Units
Room Inventory
Appliance Inventory
Air-Conditioning/Heating/
Water-Heating
Opinion

REPORTS AND CROSS-TABULATIONS describes the various individual documents.

BONNEVILLE POWER PLUS provides a short description of an Excel-spreadsheet-based software program that contains all of the tabulated material in a format that encourages browsing among the tables and charts, with special feature that they can be copied directly into other Windows-based documents.

BACKGROUND

A necessary element in Bonneville's forecasting and conservation planning is information about consumers' energy use and factors affecting energy consumption. Energy-use data from residential surveys conducted in 1979 and 1983 have been used extensively by Bonneville, the Pacific Northwest Utilities Conference Committee, the Northwest Power Planning Council, and several of the region's utilities.

Since 1983, both increased fuel prices and conservation programs have affected consumer behavior and have thus made it necessary to update the residential database used for energy forecasting. To improve the accuracy of these forecasts in the 1990s, more detailed information was required concerning the use of residential energy in the Pacific Northwest. The result was Bonneville's planning and implementing its third regional residential survey, PNWRES92-I.

A team of Bonneville staff members from the Office of Energy Resources designed the data collection as a telephone survey. The Applied Management & Planning Group (AMPG), Los Angeles, California, was selected to implement the survey, summarize the data, and prepare the primary documentation. Interviewing Services of America (ISA), Van Nuys, California, was subcontracted by AMPG to conduct the telephone interviews.

PNWRES92-I used random digit dialing (RDD) and computer-assisted telephone interviewing (CATI). The sample was stratified into 15 sampling domains defined by six geographic areas⁷ and three utility types.⁸ Interviews were conducted from September 3, 1992, to December 9, 1992. A total of 20,170 interviews were completed across the 15 domains. Population total weights were created for each domain by the dividing estimated⁹ occupied housing counts by the number of interviews in the survey in that domain.

As indicated in the **Concordance** (pages 18-19), the survey's full documentation is divided among 33 different volumes, each of which is designed to support the survey process or to address particular

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⁷ Western Montana, Idaho, Eastern Washington, Western Washington, Eastern Oregon, Western Oregon.

⁸ Public generating, public non-generating, and investor-owned. Because no public generating utilities operated in Western Montana, Eastern Oregon, or Idaho when PNWRES92-I was conducted, three of the utility/geographic cells were empty, and the sampling design contained a total of 15 domains.

⁹ Counts were taken from Bonneville's Financial and Operations (F&O) database for all utilities and adjusted by using state and sub-state vacancy rates as measured by the 1990 census. These calculations were done both at the sampling domain level and at the level of Bonneville's four area offices, yielding two sets of weights.

special interests in the region. For example, **Volume E** provides item-by-item crosstabulations of interviewees' responses for each of the four states, while **Volume K** is devoted to crosstabulations of nine special questions for public non-generating

utilities in Idaho. This Executive Summary, however, focuses on region-level estimates for a few selected items of general interest. This information appears in the section, **Profiling the Respondents**, starting on page 11.

PROFILING THE RESPONDENTS

This profile consists of a selection of PNWRES92-I variables and their region-wide estimates.¹⁰ The details are grouped into 6 subsets: **Demographics, Housing Units, Rooms, Appliances, Space-Heating/Water-Heating/Air-Conditioning, and Opinion.**

Demographics

Of the individuals considered *most knowledgeable* about energy in their households:

57% were female

30% had graduated from college, while 7% had not finished high school

36% lived in households with two people, while 16% lived alone

80% lived in households with no children under 6 years old

68% had no children aged 6 to 17 years

77% lived with no one aged 65 or older

61% would authorize release of their utility billing information

Median family income for 1991 was slightly larger than \$30,000.

¹⁰ More specifically, the quantifications used here are derived from the domain-weighted frequencies that appear in **Volume C: Item-by-Item Results: Region and Domains.**

PROFILING THE RESPONDENTS (continued)

Housing Units

In describing their housing units, respondents reported that:

72% of the households lived in single-family dwellings

22% of the housing units were constructed before 1950

74% of the respondents owned their homes

39% had moved into their homes since 1989

When Our Homes were Built

Of the Region's estimated 3.55 million homes, two-thirds were built between 1950 and 1985

	Pre-1950 (21.5%)	50-59 (9.7%)	60-69 (11.4%)	70-78 (19.5%)	79-85 (11.7%)	86-92 (10.8%)	Don't Know/ Refused (15.3%)
Single-Family (71.5%)	19.6%	8.9%	9.0%	13.0%	7.5%	6.2%	7.3%
Multi-Family (15.0%)	1.7%	0.6%	1.1%	2.0%	1.3%	1.8%	6.6%
Manufactured (12.3%)	0.1%	0.2%	1.3%	4.4%	2.9%	2.1%	1.3%
Other (0.5%)	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%

Note: Rounding has an effect on sums

21% of their dwellings had vaulted ceilings

37% of their dwellings were built on foundations with crawl space

25% did not know the floor area of their dwellings.

Of the 75% those who did know the floor area:

17% reported less than 92.9 square meters (1,000 square feet), while 28% reported more than 186 square meters (2,000 square feet).

26% had basements

Median dwelling size was 171 square meters (1,857 square feet).

PROFILING THE RESPONDENTS (continued)

Rooms

When asked about the numbers of types of rooms in their homes, respondents reported:

99.9% of the households had at least one bathroom, while 57% had more than one bathroom

99.9% had kitchens, but 1 in 1,000 had none

99.7% had at least one bedroom, while 65% had 3 or more bedrooms

99.9% had living rooms

60% had utility or work rooms

62% had dining rooms

34% had family rooms

25% had dens, studies, libraries, or sewing rooms

The "average" Pacific Northwest home had 2.86 bedrooms and 1.73 bathrooms.

PROFILING THE RESPONDENTS (continued)

Appliances

Regarding the types and numbers of appliances in their homes, the following percentages of respondents reported that they had at least one of the indicated types of appliances:

In terms of the *numbers of each type of appliance*, there was one reversal within the "possession" sequence given above:

The average number of televisions per household was 1.81, while the average number of refrigerators was 1.18.

PROFILING THE RESPONDENTS (continued)

Air-Conditioning, Space-Heating, and Water-Heating

Few respondents knew nothing about or refused to comment on their use of various domestic fuels for space-conditioning and water-heating. Thus, these summary percentages are estimates based upon an estimated 3.55 million households.

Air-conditioning System:

no air-conditioning	76%
window or wall units	8%
central electric system	7%
heat pump	6%
evaporative cooler	2%
central gas system	1%

Primary Space-Heating Fuel:

electricity	46%
natural gas	24%
wood or presto logs	16%
fuel oil, propane, or bottled gas	11%

Primary Water-Heating Fuel:

electricity	76%
natural gas	17%
wood or presto logs	0.2%
fuel oil, propane, or bottled gas	1%

PROFILING THE RESPONDENTS (continued)

Opinion

Asked to rate the seriousness of five socio-economic issues in their own state on a scale of 1 to 5, with 1 being "Not At All Serious" and 5 being "Extremely Serious," the following percentages of respondents gave "Extremely Serious" ratings to the issues:

Scarcity of Energy
13%

Cost of Energy
21%

Environmental
Pollution
29%

Crime
35%

Unemployment
38%

Asked about their exposure to several conservation-based programs:

- 54% had seen or heard about low interest weatherization loans
- 38% had seen or heard about utility or state weatherization programs
- 28% had seen or heard about efficient appliance programs.
- 16% had had their homes weatherized by the state or utility since moving in

Asked about the level of the energy efficiency of their homes:

- 26% replied that it was "as efficient as it can be"
- 31% replied that "little improvement can be made"
- 25% replied that "moderate improvement can be made"
- 10% replied that "a lot of improvement can be made"
- 6% replied that "a great deal of improvement can be made"

**Thus, 57% indicated that little or no energy efficiency improvement
could be made in their homes**

REPORTS AND CROSSTABULATIONS

Numerous reports and crosstabulations are available from this study. There are 33 printed volumes in the primary documentation; they are also accessible from menu-driven software (**Bonneville Power Plus**). **Volume A** includes this Executive Summary, the Concordance, and the Glossary. **Volume B** includes the Report on Methodology and the Technical Appendices. **Volumes C** through **AF** show tables and charts from the study.

Item-by-item crosstabulations are provided for the 15 sampling domains within the region (**Volume C**), the three utility types within the four Area Offices (**Volume D**), and the three utility types within the four states (**Volume E**).

Selected crosstabulations examine nine survey items: type of dwelling,

ownership type, years of construction, size (in square feet), type of space-heating fuel, type of water-heating fuel, household income, utility type, and type of space-heating equipment. These items are tabled separately for the region (**Volume F**), the 15 sampling domains (**Volumes G-U**), the four Area Offices (**Volumes V-Y**), the four states (**Volumes Z-AC**), and the three utility types (**Volumes AD-AF**). Each table is accompanied by a bar chart based on the weighted data.

Volume AG is a report on the non-respondents.

The **Concordance** (pages 18-19) provides an index to the various tables and reports of the study.

BONNEVILLE POWER PLUS

As part of its contracted work, AMPG developed a personal computer system to support the PNWRES92-I reports. Called **Bonneville Power Plus**, this system operates under Windows 3.1 and uses Microsoft's Excel 4.0 and Word for Windows 2.0c programs. The files consist primarily of a spreadsheet-based system of tabulations which are accessed through a menu-driven format. In addition to the data tables, **Bonneville Power Plus** provides menu-

accessible charts of the weighted data. Although the files used directly by **Bonneville Power Plus** are protected from being overwritten, each table and chart can be saved from the display screen to new files; from there they can be modified and used in any Windows application.

Documentation for **Bonneville Power Plus** is contained in **Volume B: Technical Appendices**.

CONCORDANCE

This **Concordance** is a "road map" to the material generated as primary documentation to PNWRES92-I.

Its basis is the set of 33 reports, **Volume A** through **Volume AG**, produced at the conclusion of the data-collecting activity.

These volumes are collected and published in a series of 12 **books** whose contents are indicated in the rectangle displayed in the **Concordance's** lower right corner. The **books** are available through the channels indicated at the end of the Preface.

Concordance

Tables

Key: PG = Public Generating Utility   PN = Public Nongenerating Utility   IO = Investor-Owned

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GLOSSARY

Acronyms, Initialisms, and Jargon

AMPG (See **Applied Management & Planning Group**)

BPA (See **Bonneville Power Administration**)

BPP (See **Bonneville Power Plus**)

CATI (See **Computer-Aided Telephone Interviewing**)

Crosstabs, Crosstabulations (See **Crosstabulation Tables**)

FSCF (See **Flagged Successful Completion File**)

ISA (See **Interviewing Services of America**)

OHUs (See **Occupied Housing Units**)

PNWRES92-I (See **Pacific Northwest Residential Energy Survey - Phase I**)

RDD (See **Random Digit Dialing**)

SAS (See **SAS**)

TCDF (See **Telephone Call Disposition File**)

TRIF (See **Telephone Respondent Information File**)

TDF (See **Telephone Data File**)

TSCF (See **Telephone Successful Completion File**)

General Terminology

Applied Management & Planning Group (AMPG) is a small business enterprise contracted by the **Bonneville Power Administration** to conduct the **Pacific Northwest Residential Energy Survey, Phase I (PNWRES92-I)**. AMPG is located in West Los Angeles, California.

Area Offices are four geographic-based entities (**Lower Columbia, Puget Sound, Snake River, and Upper Columbia**) which oversee the field operations of the **Bonneville Power Administration**.

Bonneville Power Administration (BPA) is one of the U.S. Department of Energy's five power marketing agencies. **BPA** supplies

power wholesale to utilities. Located in Portland, Oregon, **BPA's** main service territory includes Washington, Oregon, Idaho, Western Montana, and portions of surrounding states. **Bonneville** contracted the conduct of **PNWRES92-I** in order to support the forecasting of future energy needs in the Pacific Northwest. (See **States**)

Bonneville Power Plus (BPP) is a software system which allows personal computer access to the tables and reports of **PNWRES92-I** through a Microsoft Windows-based system.

Computer-Aided Telephone Interviewing (CATI) employs interactive computing systems to assist interviewers and their supervisors in performing the basic data-collection task of telephone interview surveys.

Concordance, as used here, is a specific text-and-graphics display which provides an index to **PNWRES92-I's** volumes of tables and reports; it appears in each of the 33 volumes.

Crosstabulation Tables show combined frequency distributions of two or more variables. In **PNWRES92-I**, item-by-item crosstabulation tables were produced for the 15 sampling domains, for the three utility types within **Bonneville's** four **Area Offices**, and for the three utility types within the four states. Crosstabulation tables also were produced to examine nine specific survey items: type of dwelling; ownership type; year of construction; size (in square feet); type of space-heating fuel; type of water-heating fuel; household income; utility type; and type of space-heating equipment. These are presented for the region, the 15 sampling domains, the four area offices, the four states, and the three utility types. (See **Frequencies**)

Data are those elements of information that are either

- (a) quantified by their basic nature (e.g., floor area or annual income) or
- (b) capable of being quantified (e.g., type of dwelling or strength of an opinion).

For the most part, the word "data" is used in these documents to refer to the values collected during the conduct of **PNWRES92-I**.

Domain is used in sampling and survey practice to designate a particular subset of a population that is of special interest. In **PNWRES92-I**, the domains (also called sampling domains) refer to the 15 strata of the initial survey design. These domains were determined by stratifying the target population of Pacific Northwest households according to three utility types (investor-owned, public generating and public non-generating) *and* six geographical areas (Idaho; Western Montana; the 19 Oregon counties west of the Cascade ridge; the 17 Oregon counties east of the Cascade ridge; the 19 Washington counties west of the Cascade ridge; and the 20 Washington counties east of the Cascade ridge). Three of the possible domains were empty (in late 1992, there were no public generating utilities in Eastern Oregon, Idaho or Montana); therefore, there were 15 active sampling domains in the survey itself. (See **New Domains**)

Dwelling (See **Housing Unit**)

Fieldwork is a term used to cover the data-collection aspects of a survey. For **PNWRES92-I**, the fieldwork consisted of telephoning residences in the Pacific Northwest to conduct the survey and recording the responses. The effort lasted approximately 14 weeks during the fourth quarter of 1992 and was conducted using **ISA's** **CATI** system. During fieldwork, a record of every call that was made was entered into one of five telephone-record files. (See **CATI**, **ISA**, **Telephone Call Outcome Files**)

Foundation refers to the survey's Question 26 in which respondents were queried regarding their dwellings' type of foundation. When respondents tried to give multiple responses, interviewers probed for the foundation of the largest area of the dwelling. The primary foundation types were concrete slab, crawl space, and basement.

Flagged Successful Completion File (FSCF) contained results of interviews which were completed but did not pass quality control (due to conflicting or illogical responses). ISA staff cleaned data and, when necessary, recontacted respondents to remove as many files as possible from the FSCF and place them in the **Telephone Successful Completions File**. (See TSCF, **Telephone Call Outcome Files**)

Frequencies are counts of individual values attained by a variable. (See **Crosstabulation Tables, Raw Data, Weighted Data**)

Fuel Type is one of the following commodities: electricity, wood, natural gas, fuel oil, propane/bottled gas, kerosene, and coal. Respondents were asked to name the fuel used most in their homes to heat space and water.

Group Quarters, according to the U.S. Bureau of the Census, "... are living arrangements for institutional inmates or for other groups containing nine or more persons not related to the person in charge...."¹¹

Household, according to the U.S. Bureau of the Census, "... consists of all persons who occupy a housing unit. By definition, the count of households is the same as the

count of occupied housing units."¹¹ (See **Occupied Housing Units**)

Housing Unit, according to the U.S. Bureau of the Census, "... is a house, an apartment, a group of rooms, or a single room occupied or intended for occupancy as separate living quarters. Separate living quarters are those in which occupants do not live and eat with any other persons in the structure and that have direct access from the outside of the building or through a common hall that is used or intended for use by the occupants of another unit or by the general public. The occupants may be a single family, one person living alone, two or more families living together, or any other group of related or unrelated persons who share living arrangements (except as ... group quarters)."¹¹ (See **Group Quarters**)

Interviewing Services of America (ISA) conducted the fieldwork for PNWRES92-I as a subcontractor to AMPG. ISA is located in Van Nuys, California. (See **CATI, Fieldwork**)

Lower Columbia Area Office is located in Portland, Oregon.

Methodology covers all activities related to the planning, design, data collection, analysis, and reporting of PNWRES92-I.

New Domains is a term coined during the processing of PNWRES92-I data. It was created to accommodate respondents whose data could reasonably place them in a different domain than expected by their telephone number. Thus, at the design stage, each possible telephone number was placed in one of the 15 "Design Domains." During fieldwork, respondents reported their actual domains when they were queried about their utility; these were used to determine each respondent's **New Domain**. Those respondents who were not queried about their utility were allocated to

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¹¹ Definitions adapted from *Supplement to the American Housing Survey for Selected Metropolitan Areas in 1988*, H171/88, U.S. Department of Commerce, Bureau of the Census, Washington, DC, 1993.

their **New Domains** according to their confirmed ZIP code.

Occupied Housing Units (OHUs), according to the U.S. Bureau of the Census, is the set of housing units that are " ... classified as occupied if a person or group of persons is living in [them] at the time of the interview or if the occupants are only temporarily absent, for example, on vacation.... By definition of the count of occupied housing units is the same as the count of households."¹¹

Quad-Weekly Reports refers to a series of documents, prepared for BPA and generated every four weeks by AMPG, which describe the progress-to-date for PNWRES92-I and projects and activities to be completed in the ensuing four weeks.

Pacific Northwest Residential Energy Survey - Phase I (PNWRES92-I) is the subject of this family of reports. It was a telephone survey that was conducted to obtain data on the energy use of residences in the Pacific Northwest. A total of 20,170 surveys were completed. The results of the study will allow the **Bonneville Power Administration** and other members of the Pacific Northwest's energy-planning community to forecast residential energy use in the region and to plan for appropriate conservation programs.

Pretest is a small-scale tryout of a survey's instrument and field methods. The pretest allows for changes and improvements to be made in the survey instrument and the methodologies prior to launching the full effort.

Puget Sound Area Office is located in Seattle, Washington.

Random Digit Dialing (RDD) is the process of dialing randomly-generated telephone numbers. Properly conducted, RDD planning yields a sample such that

every telephone number within the desired population has the same probability of being selected.

Raw Data are data generated during the conduct of a survey's fieldwork. With respect to PNWRES92-I, these data are maintained in SAS datasets in BPA's mainframe computer. The term also applies to the display of counts contained in the upper tables of **Volumes C-AG**. (See **Weighted Data**)

Residence (See **Housing Unit**)

Response Rate is the ratio of the number of respondents who completed the survey to the number of eligible residential telephone numbers which were dialed.

Return Rate is the ratio of the number of respondents who completed the survey to the total number of telephone numbers which were dialed.

Rounding, for this study, is the process of converting fractional numbers to whole numbers. Weighted estimates in PNWRES92-I are published as integers (i.e., they are rounded to the nearest whole number). (See **Weighted Data**)

Rounding Error is an error resulting from rounding.

Sample, as used in surveys, is a subset of a population under study. The population for PNWRES92-I was all housing units located in the Pacific Northwest which, at the time of the survey, had telephone service; the sample is the set of 20,170 household for whom completed surveys were obtained.

Sampling Domain. (See **Domain**)

Sampling Error, for PNWRES92-I, was defined to be the maximum standard error of an estimated binomial parameter. This

maximum is attained by setting the parameter to the value of 0.5.

PNWRES92-I's stated precision requirement called for each domain's binomial parameter to be estimated with as small a standard error as possible, adhering to the requirement that domains involving publicly-owned utilities would have standard errors half as large as those involving investor-owned utilities. Given an initial planned total sample size of some 20,000 completed interviews, this resulted in sample sizes of about 1,900 for publicly-owned utilities and 475 for investor-owned utilities. Thus, the maximum standard errors were 0.011 and 0.023, respectively, for the two types of utilities. (See **Survey Design**)

SAS is a commercial software system for data management and analysis with the capabilities of information storage and retrieval, data modification and programming, report writing, statistical analysis, and file handling. It is a product of SAS Institute, Inc., located in Cary, North Carolina.

Snake River Area Office is located in Walla Walla, Washington.

States, for the purposes of reporting this study, are those in the Pacific Northwest: Oregon, Washington, Idaho and Western Montana. Data from the surrounding states were incorporated into **PNWRES92-I** datasets in the following manner: responses from California and parts of Nevada were allocated to Western or Eastern Oregon, while responses from Nevada, Utah, and Wyoming were allocated to Idaho or to Western Montana according to their adjacencies.

Surveyhard is the computerized version of the survey instrument designed for use on ISA's CATI system. (See **CATI, Survey Instrument**)

Survey Design is a set of strategies and procedures for conducting a survey. The sample design for **PNWRES92-I** was a stratified random sample, conducted with CATI technology. In each of the nine public utility domains, a sample size of 1,905 housing units was sought. In each of the six private utility domains, a sample size of 476 housing units was sought. (See **Sampling Error**)

Survey Instrument is the script devised and used by the surveyors to elicit data.

Telephone Call Disposition File (TCDF) is the largest of five data files designed to track the number of telephone calls placed during fieldwork. This file contains the disposition of all telephone calls, including disconnections, fax machines, non-residential numbers, etc. It also includes the attempts made to potential respondents. (See **Telephone Call Outcome Files**)

Telephone Call Outcome Files are five files designed to document the outcome of every telephone call placed during the survey. The five files were the **Telephone Calls Disposition File (TCDF)**; the **Telephone Respondent Information File (TRIF)**, the **Telephone Data File (TDF)**, the **Telephone Successful Completions File (TSCF)**, and the **Flagged Successful Completions File (FSCF)**. (See **Telephone Call Disposition File, Telephone Respondent Information File, Telephone Data File, Telephone Successful Completions File, Flagged Successful Completions File**).

Telephone Respondent Information File (TRIF) provides a record of all respondents who expressed a willingness to begin the survey were included in the TRIF. This file primarily logged respondents who refused to complete after a certain question or who did not qualify to complete the survey due to the screening questions. (See **Telephone Call Outcome Files**)

Telephone Data File (TDF) contains records of interviews which were begun and in which respondents passed the screening questions but still for some reason did not complete the survey. (See **Telephone Call Outcome Files**)

Telephone Successful Completions File (TSCF) contains all completed surveys. (See **Telephone Call Outcome Files**)

Upper Columbia Area Office is located in Spokane, Washington.

Utility is an organization which sells energy to the general public. For the purpose of this study, three types of Pacific Northwest electric utilities were designated: public generating (TG), public non-generating (PN), and investor-owned (IO).

Weekly Reports is a series of documents sent to BPA by AMPG every week to report on the progress of PNWRES92-I. Information was reported by task and

included descriptions of work completed for the previous week and projections for work to be completed during the upcoming week.

Weights are values associated with respondents' raw data. They are used to estimate population and sub-population totals by "weighting up" the raw data. For PNWRES92-I, the designed weighting system was based upon regional and sub-regional counts of **Occupied Housing Units (OHUs)** that were derived from 1990 U.S. Census data and upon the sample frequencies in the **New Domains**. A second set of weights was developed for BPA's four **Area Offices**. (See **OHUs, Area Office, New Domains**)

Weighted Data are data which have been derived by applying a set of weights to the raw data. The weighted PNWRES92-I data are displayed in the lower tables in **Volumes C-AG**. (See **Raw Data, Weights**)

1992 Pacific Northwest Residential Energy Survey Phase I

VOLUME B

Report of Methodology Technical Appendices

Prepared for
Bonneville Power Administration
Portland, Oregon

by
Applied Management & Planning Group
Los Angeles

Contract No.: DE-AC79-92BP25174

PREFACE TO VOLUME B

Volume B plays a special role in the documentation of PNWRES92-I: it serves as the survey's "attic" by bringing pertinent planning documents, statements of work, and product lists into a single collection. Arranged in chronological order--except for **Part VII: Miscellany**--these materials illustrate and illuminate the deliberations and decisions of the PNWRES92 Task Force *at the time they were made*.

Because the documents were prepared at many different times and for many different reasons, Volume B is unpaginated even though some of its parts do show page numbers retained from their original configurations. The next section, **AN ANNOTATED GUIDE TO VOLUME B**, indicates and comments on the volume's seven major parts; you will find those parts individually identified and separated by colored divider sheets in the body of the volume.

AN ANNOTATED GUIDE TO VOLUME B

**Part I:
Third Pacific Northwest
Residential Energy Survey -
1/31/90**

"The purpose of this survey background report ... was to provide an overview of the conduct of the PNWRES83 [the Second Pacific Northwest Residential Energy Survey] which might be useful in planning for a repeat of the survey.... The review was based on available documentation related to the conduct of the PNWRES83."

**Part II:
Residential Energy Use Survey
Pre-Planning - Final Report - July
1990**

"The purpose ... is to assist the End Use Research staff in the initial planning for a proposed regional survey of residential end-use customers."

**Part III:
Memorandum: Planning for the
Next Residential Survey
(Appointment of PNWRES92 Task
Team) - 8/27/90**

"The new survey will focus on a variety of types of information for the households of the Pacific Northwest, including demographics, energy consumption, equipment inventories, and conservation activities. The collected data will provide a rich resource to support forecasting, resource planning, conservation assessment, and conservation program design."

**Part IV:
The Goal of the 1992 Pacific
Northwest Residential Energy
Survey (PNWRES92) Process and
Its Two Principle Objectives**

**Part V:
Statement of Work for Task Team
Planning Support - 5/1/91**

"The major purpose ... is to obtain specialized consulting services for the preliminary design stages of a third survey of Pacific Northwest residential energy users.... [T]his project is designed to provide the basis for the development of a highly reliable data base which is usable by a variety of interests, adaptable to many uses, and appropriate for the geographic areas of interest. A great deal of confidence must be placed in the survey results since many parties are expected to be interested in its outcome."

Principle Deliverables: Survey Instrument, Population Delineation and Frame Selection, Sample Selection, Pretest

**Part VI:
Statement of Work for
Implementation of the Telephone
Survey for the 1992 Pacific North-
west Residential Energy Survey
(PNWRES92 - Phase I, Part 2) -
7/5/92**

"This ... survey and the process leading to it are collectively termed the 1992 Pacific Northwest Residential Energy Survey [PNWRES92] .... Planning, oversight, and review of PNWRES92 reside in a Task Team of several senior Bonneville staff members. "PNWRES92 is designed so that ... it can be conducted in several phases. Phase I is a designed telephone survey of as many Pacific Northwest housing units as needed to obtain 20,000 completed interviews. The data collected in Phase I, in addition to having their own intrinsic values for forecasting and conservation programs, will provide a frame from which additional phases can be carried out. Thus, the results from Phase I can be thought of as providing a surrogate population to the entire set of Pacific Northwest residences. "The major purpose of this contract is to obtain specialized telephone surveying services for Phase I, Part 2: the implementation of the telephone survey. The survey is expected to lead to the further development of a detailed data base concerning the ways in which households use energy in the Pacific Northwest. This data base will be valuable for use by Bonneville and other interested parties in the conduct of a wide variety of energy analyses and forecasting efforts."

**Part VII:
Contractor-Prepared Documents**

Overview

Concordance

Report of Methodology

Introduction

1. Background And Purpose
2. Design Of The Survey

**Overall Project Management And Quality
Control**

1. Advance Planning
2. Preparing For Data Collection
3. Conducting Pretest
4. Conducting Fieldwork
5. Reducing Data
6. Producing Sample Statistics
7. Reporting

Technical Appendices

Final Work Plan
Survey Instrument
Training Materials
Training Report
Interviewer's Manual
Supervisor's Manual
Pretest Report
Power Plus Users Guide

Part VIII: Miscellany

1. Modification To Statement Of Work:
Implementation of the Telephone Survey for the 1992
Pacific Northwest Residential Energy Survey
(PNWRES92 - Phase I, Part 2)
2. Memorandum: Household Counts for PNWRES92
Survey - 1/25/93
3. Notes on PNWRES92, Phase I (with Special
Reference to Weighting the Data for both Domain and
Area Estimates - 3/5/93
4. The "Complex Question" Simplified ... - March 1993
5. The PNWRES92 Seminars - 9/21/93
6. PNWRES92-I Archives

Part I

Third Pacific Northwest Residential Energy Survey - 1/31/90

"The purpose of this survey background report ... was to provide an overview of the conduct of the PNWRES83 [the Second Pacific Northwest Residential Energy Survey] which might be useful in planning for a repeat of the survey.... The review was based on available documentation related to the conduct of the PNWRES83."

Bonneville Power Administration
Department of Energy

Third
Pacific Northwest Residential Energy Survey

Survey Background

Office of Energy Resources,
End-Use Research Section,
Documentation and Analysis

Task Order RPEE 1
January 31, 1990

Prepared by:
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INTRODUCTION

The Bonneville Power Administration (BPA), with the cooperation and assistance of the Pacific Northwest Utilities Conference Committee (PNUCC) and the Pacific Northwest Electric Power and Conservation Planning Council (Regional Council) conducted the Second Pacific Northwest Residential Energy Survey (PNWRES83) in 1983. The data collections were carried out by Louis Harris and Associates. The purpose of this survey background report, undertaken in 1990, was to provide an overview of the conduct of the PNWRES83 which might be useful in planning for a repeat of the survey, tentatively to be carried out in the early 1990's (PNWRES9X). The review was based on available documentation related to the conduct of the PNWRES83. The attempt was made to present information and materials which would provide the flavor of the conduct of the survey.

The PNWRES83 objectives have been listed and briefly discussed in the next section. Some administrative arrangements and procedures involved in carrying out the PNWRES83 have been described in a following section. A final section discussed how the PNWRES83 objectives and/or procedures might be amended for the PNWRES9X. The documentation reviewed in preparing this background report was listed (with some descriptive notations included) in the bibliography at the end of the text. Selected documents have been included as Attachments.

PNWRES83 OBJECTIVES

The PNWRES83 objectives were enumerated in a document entitled "Second Pacific Northwest Residential Energy Survey: Objectives and Data Justification" (BPA, November, 1982). The objectives were listed as falling into one of the three areas of:

- o substantive
- o methodological
- o technical

Objectives in each area have been described and discussed separately. The statement of some objectives has been paraphrased from the original.

A. Substantive Objectives

The substantive objectives included obtaining precise and timely data to "support" the following:

- o recalibration of the residential load forecasting model.
- o analysis of fuel consumption at the regional and climate zone levels.
- o analysis of conservation technology saturations.
- o analysis of fuel and equipment choices.

All the substantive objectives appear to be of interest for inclusion as objectives for the potential PNWRES9X. Since at least seven years will have past since the PNWRES83, repeating the collection of information about all the data elements included in the listed objectives would probably be useful.

B. Methodological Objectives

The PNWRES83 objectives related to methodology were:

- o establish regional benchmark results for comparative analyses at the utility, state and other subregional levels.
- o provide a sampling base for selection of residences to be selected for participation in an end-use metering load research survey.
- o provide a sampling base for selection of residences to be included in cost-effective focused surveys concerning selected well-defined topics.
- o provide a sampling base for initiating a survey panel to enable analysis of change in fuel consumption over time.

The first objective appears to be germane for the potential PNWRES9X, but greatly increased sample size requirements. It is unknown whether there is an interest in establishing a new sample of residences to be used in further studies such as was envisioned in the last three methodological objectives. These three objectives involve establishing a "system of records" as was done to save the PNWRES83 information on sampled utility customer name, address and other information.

C. Technical Objectives

The PNWRES83 technical objectives were:

- o support estimates with minimum bias and maximum precision.
- o support estimates valid for private versus public utility comparisons within states and climate zone.
- o support valid estimators for single family detached residences within each state and climate zone.

All the technical objectives appear to be germane for the PNWRES9X. As in the PNWRES83, trade-offs would be necessary in relation to the first objective to match the resources available with the desired (or minimally acceptable) level of precision. The second and third objectives, involving analyses at the state and climate zone level (like the first methodological objective), appreciably increased the sample size requirements as compared to

the sample size needed for analysis at the overall, regional,
level.

ADMINISTRATIVE ARRANGEMENTS AND PROCEDURES

A variety of organizations besides the cooperating organizations listed in the Introduction played a role in relation to the PNWRES83. Starting with organizations above the BPA in the federal hierarchy, the organizations and role of each was as follows:

- o Energy Information Administration - Provided concept approval of the overall survey plan, including a regional survey and followup surveys. Redelegated authority to collect energy related information to BPA for a limited time, enabling BPA to conduct the survey.
- o Office of Management and Budget (OMB) - reviewed and authorized use of the proposed survey instrument and associated utility billing data collection forms.
- o Department of Energy, Washington, D.C. (The Director of Administration, W.S. Heffelfinger) - Provided notice to government officials (G.H. Bush, T.P O'Neill, Jr., D.A. Stockman and Milton Jordan) of a "proposed new system of records." An OMB required narrative report on the system, including a description published in the FEDERAL REGISTER, was included with the letter of notice.

Internally, at the BPA, a "Transmittal for Administrator's Action" associated with the notice of the new system of records was initialed by 10 BPA personnel, starting with D.G. Hoffard and ending with acting administrator "J.J."

Other documentation related to internal BPA procedures indicates that a memo dated August 10, 1982 was sent from the Director of the Division of Power Requirements to the Assistant Administrator for Power and Resources Management thru the BPA Contracts Manager to obtain approval for the survey. The BPA business office and legal council were involved in preparation of a Request for Proposal in relation to the survey.

A total of \$450,000 was available for the survey (\$350,000 from the energy Modeling and Analysis Branch, \$50,000 from the ADP/Load

Research Staff budget, and \$50,000 was to be provided by the Office of Conservation). The sums available were not enough to obtain a sample as large as originally planned, so the survey sample size was decreased in the process of awarding and implementing the contract for the survey using Louis Harris as the contractor.

Documentation also shows that justification for use of Dr. Donald Dillman to conduct a pretest of the survey instrument, on a noncompetitive basis, was sought and approved. The draft survey instrument, developed by BPA personnel, was revised based on the report from the contractor giving the results of the pretest. The pretest also involved preparation of a document listing issues of special concern about the instrument, training of three pretest interviewers, and administration of the survey at 38 residences of varying characteristics (e.g. mobile home, single family, multifamily). The pretest cost (~~verify this~~) \$5,5¹³~~00~~⁰⁰.

CHANGES FOR THE PNWRES9X

Who will design the instrument and sampling design and materials? BPA performed these and associated tasks for the PNWRES83.

Will there be advance introductory and thank you letters?

Will there be substitution for nonresponse or 7 (or more) callbacks?

Should there be a collection of mail survey data?

Will there be a supplemental sample?

Will there be a system of records?

Will there be a wholistic plan for future surveys?

The contractor cost per interview was calculated for the PNWRES83 on the basis that data were collected from 5,369 respondents (4,703 interviewed respondents were in the regional sample; 514 interviews were carried out for the supplemental, conservation evaluation, sample; and 152 mail surveys were collected). The cost of the PNWRES83 contract was taken as \$450,000, nearly the amount called for in the contract with Louis Harris. Thus, the cost was just below \$84.00 per interview. This cost per respondent translates to \$124.00 in 1991 dollars (using 5% as an inflation rate and compounding). Thus, the PNWRES83 would cost about \$665,000 in 1991 dollars.

With a view towards estimating the sample size requirements and costs for the PNWRES9X, an analysis was done to assess the precision of the estimates obtained in the PNWRES83. The documentation of the PNWRES83 design effects in Table VIII-8 of the Harris Technical Report (p. 82) showed the lowest mean design effect (over seven measures) was 3.17 for the Idaho estimates and the highest such mean was 25.25 for the public utility estimates.

The mean design effect over 12 "Class Names" (e.g. Eastern Washington, Eastern Oregon) and the seven measures Harris used was 7.47. Thus, it was decided that sample size estimates made on the basis of the theory of simple random samples would need to be increased by at least a factor of three to provide a minimum adjustment due to design effects. Using a factor of seven would probably be more realistic.

Results for estimating a proportion were found to be as in Table 1.

Table 1. Sample Size Needed to Establish 95% Confidence Intervals for Proportions in Simple Random Sampling and in Cluster Sampling with Design Effects of Selected Magnitudes.

Proportion	Simple Random Sample	Cluster Sampling			
		Design Effect is 2	Design Effect is 4	Design Effect is 6	Design Effect is 8
0.50	384	768	1,536	2,304	3,072
0.40	369	738	1,476	2,214	2,952
0.30	323	646	1,292	1,938	2,584
0.20	246	492	984	1,476	1,968
0.10	138	276	552	828	1,104
0.05	73	146	292	438	584

The sample sizes in Table 1 apply at the regional level. The same sample sizes are needed at the finest level for which 95% precision is desired. Thus, if 95% precision were desired for breakdowns by utility type (public or private) and geographic region (in six groups), the total sample size would be twelve times those listed in the Table. If only public and private estimates were to be of interest, then the total sample size needed would be twice the entries of Table 1.

Table 2 combines the information on cost per respondent and sample size. It shows, in thousands of dollars, the cost for each of the sample sizes shown in Table 1 using the 1991 inflated cost per respondent obtained from the PNWRES83.

Table 2. Cost in Thousands of 1991 Dollars of Establishing 95% Confidence Intervals for a Proportion in Simple Random Sampling and in Cluster Sampling with Design Effects of Selected Magnitudes.

Proportion	Simple Random Sample	Cluster Sample			
		Design Effect is 2	Design Effect is 4	Design Effect is 6	Design Effect is 8
0.50	47.6	95.2	190.5	285.7	380.9
0.40	45.8	91.5	183.0	274.5	366.0
0.30	40.1	80.1	160.2	240.3	320.4
0.20	30.5	61.0	122.0	183.0	244.0
0.10	17.1	34.2	68.4	102.7	136.9
0.05	9.1	18.1	36.2	54.3	72.4

Bonneville Power Administration/Advanced Data Concepts
PNWRES9X Survey Background

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Part II

Residential Energy Use Survey Pre-Planning - Final Report - July 1990

"The purpose ... is to assist the End Use Research staff in the initial planning for a proposed regional survey of residential end-use customers."

RESIDENTIAL ENERGY USE SURVEY PRE-PLANNING

FINAL REPORT

Submitted to

**The Bonneville Power Administration
Portland, Oregon**

Pursuant to

Contract No. DE-AP79-90-BP08432

by

Phillip A. Windell

**O'Neill & Company, Inc.
Seattle, Washington**

July 1990

THE INNOVATION EXPERTS

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WHAT'S INSIDE THE RESIDENTIAL ENERGY USE SURVEY PRE-PLANNING FINAL REPORT

INTRODUCTION ... Page 1

"... to assist the End Use Research staff in the initial planning for a proposed regional survey of residential end-use customers."

GENERAL OBSERVATIONS ... Page 1

"The electric utility industry has experienced remarkable change in the past decade; the Pacific Northwest is perhaps the epitome of this whipsaw.... The survey industry in general, but particularly that segment devoted to the utility industry, has also changed in significant ways over the past decade."

NEW SURVEY TECHNIQUES AND TECHNOLOGIES ... Page 2

"The reduced size and cost of computers has affected both telephone surveys and on-site inspection surveys.... there are a number of reasonably powerful sets of data which may be of relevance to Bonneville in tracking residential electricity demand.... it seems worthwhile spending some time ... exploring the potential value of panel studies techniques to the improved understanding of residential energy consumption."

LINKAGES TO PREVIOUS REGIONAL SURVEYS ... Page 6

"... for both the selection of the sample and the construction of the instrument, the procedures used in 1979 were employed in 1983 unless there was good reason to change the procedure. It seems reasonable to adopt a similar position relative to the next regional residential survey."

GENERAL RECOMMENDATIONS ... Page 9

"... a brief list of some 'green flags' -- things which we have fairly strong opinions that should be done in the next regional residential survey; and some 'red flags' -- things which, in our opinion, should be avoided, if at all possible."

REFERENCES ... Page 12

INTRODUCTION

This report represents the third and final task under a contract executed by the Bonneville Power Administration on behalf of the End Use Research Section. The purpose of the contract is to assist the End Use Research staff in the initial planning for a proposed regional survey of residential end-use customers. The contract involved three tasks: review of documents from the 1979 and 1983 regional residential surveys in preparation for a day long pre-planning meeting; Participation in the meeting held at Bonneville headquarters in Portland, Oregon; and preparation of a report which summarizes past experience and provides recommendations for a new residential survey.

The contract was issued on May 14, 1990; the pre-planning meeting was held June 11. In attendance were David Mills, representing the Residential Forecasting group; Ruth Ann James, representing the interests of the conservation supply curves; Mike Newsham, representing Bonneville's residential retrofit conservation programs; Roger Moore, the coordinator of the project and Contracting Officer's Technical Representative (COTR) for the contract; and myself. It is appropriate here to also acknowledge the leadership and inspiration for this project which has been provided by Rich Gillman, Chief, End Use Research Section.

GENERAL OBSERVATIONS

The electric utility industry has experienced remarkable change in the past decade; the Pacific Northwest is perhaps the epitome of this whipsaw. For a variety of reasons, the environment surrounding nuclear power moved rapidly from open, unguarded acceptance in the late 1960's and early 1970's to deep suspicion in the late 1970's. As a result, the associated construction costs doubled and tripled as federal regulations became increasingly complex and time-to-license doubled and tripled. Attention shifted from generation resource to demand reduction, initially through sacrifice (recall the ban on hot water in federally owned buildings?) and eventually through increased efficiency. Within less than a decade, Bonneville established an Office of Conservation, ramped up programs to a budget well in excess of \$100 million per annum, and then ramped the programs down to an annual budget of less than \$50 million and reorganized and integrated the Office of Conservation with the Office of Power Resources.

REUS Planning

- In response to these programs and the general economic and social environment, the demand for electricity fell from growth rates in excess of 7 percent per annum to growth rates in the neighborhood of 2 percent per annum. This in itself raises challenging questions regarding the future of the PNW electric utility industry. For example, to what extent are the currently lower growth rates an artifact of the rapid increase in the thermal integrity of the existing housing stock as a result of utility programs, prices increases, and the general social atmosphere? Thus, what is the probability that growth rates will return, if not to the 7 per cent range, at least to the 4 percent or 5 percent range? How much of the growth is due purely to population growth; how much to changes in the demographic structure of the population; and how much to increased per unit consumption? In short, understanding the dynamics of the residential demand for energy is critical to the continued health of the Pacific Northwest electric utility industry.

The survey industry in general, but particularly that segment devoted to the utility industry, has also changed in significant ways over the past decade. Response rates generally, but particularly in telephone surveys, have plummeted. However, the technologies available for conducting detailed end-use monitoring have flourished and the associated costs have been substantially reduced. At the same time, the forecasters and modelers have become much more sophisticated in their approach to data collection. In addition, the focus of utility industry surveys has shifted from forecasting to customer relations and marketing, functions heretofore almost unknown in the industry. As a result, recent utility research efforts have involved interrelated studies employing a variety of techniques.

NEW SURVEY TECHNIQUES AND TECHNOLOGIES

The rapid evolution of microchip technology has affected the survey industry in at least two ways:

1. Reductions in the size and cost of computers provide an opportunity to reduce the distance between actual data collection and the placement of the data in a permanent storage medium.
2. Increases in computational speed and in data storage efficiency enable analysts to have more rapid and frequent access to greater volumes of data.

REUS Planning

Reductions in Computer Size and Cost

The reduced size and cost of computers has affected both telephone surveys and on-site inspection surveys. Most firms administering surveys over the telephone on a regular basis do so using some form of computer assistance -- Computer Assisted Telephone Interviews, or CATI. In many cases, the entire process is automated. When it is available, the list of sample sites is placed in magnetic form and accessed through software which presents the information relating to the site, including the telephone number, to the interviewer on the cathode ray screen at which s/he is sitting. If a random digit dialing procedure is used to select the sample, the appropriate software may be placed at the front end of the CATI system. In some cases, the software actually dials the telephone number and, in the most sophisticated software, places blocks or paths to the sites depending on the day-of-the-week and time-of-day of previous attempts. The software permits the interviewer to record the outcome of the attempt and, if successful, then passes the interviewer to the survey instrument itself. The software then presents each question, in sequence, and follows imbedded skip patterns based on the respondent's answers. The software will not permit the interviewer to proceed without indicating some answer to the question, even if it is "Don't Know." Once the interview is complete, the software writes the call-sheet data to one magnetic file and the interview data to a second file.

As a result, the amount of paper involved in the survey is substantially reduced, the incidence of errors due simply to improper administration of the instrument are reduced, and the supervisory staff are free to spend more time actually listening to the interviewers to ensuring high quality administration of the survey itself.

Increases in the reliability and power of lap-top computers and improvements in technology used to display the data have enabled professional observers to actually enter the data into magnetic form in the field and, in some cases, to transmit the data to a central computer via the telephone. In most cases, the software used to record the data includes initial checks for errors and discrepancies. As a result, errors and discrepancies can be identified, and corrected, early in the data collection process and at substantially less cost. Furthermore, the data can be processed and made available to interested analysts far more quickly and with a substantially reduced rate of error.

For a variety of reasons the costs associated with on-site interviewing have skyrocketed and, in consequence, the frequency with which this method is employed has decreased substantially. In those cases where personal interviews are employed, it is

REUS Planning

frequently not appropriate to use a computer to assist the interview process. As a result, changes in computational technology have had less impact on this form of data collection.

Increased Computational Speed and Data Storage Efficiency

In the previous section we alluded to the increased speed and reliability of lap top computers and the impacts of these improvements on survey data collection. Comparable improvements in computer technology have occurred throughout the industry with sometimes even more profound impacts on computational speed, power, and the efficiency with which data may be stored and accessed. As a result, government agencies as well as private firms are placing large volumes of data in machine-readable form. In some cases, agencies and firms have developed networks and consortia for the purpose of sharing data and, in some cases, explicitly developing integrated data bases. While the intentions are often of the highest form -- improved service, closing gaps, improved communications -- the potential impacts on individual privacy may be severe but have yet to be subjected to in-depth exploration.

In the private sector, firms such as Polk and Dunn and Bradstreet have published geo-demographic market segmentation systems for some considerable time. In recent years, several new firms have joined the industry based, at least in part, on advances in computational technology and their ability to access a variety of machine-based data sets. The author recently had the opportunity to test the veracity of one of these systems and concluded that the system presented a reasonably accurate portrait of the sample households. As a result, the sponsor has decided to purchase the system for its entire service territory.

The point, here, is that there are a number of reasonably powerful sets of data which may be of relevance to Bonneville in tracking residential electricity demand. A detailed investigation of these resources and the specific techniques involved in making use of them is unfortunately beyond the limited scope of this project. However, Bonneville may wish to conduct such an investigation either on its own or under a separate contract.

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Panel Studies

Although they are by no means new either in general or to Bonneville specifically, it seems worthwhile spending some time here exploring the potential value of panel studies techniques to the improved understanding of residential energy consumption.

The "technique," as it were, evolved in the late 1940's and, as described by one of its founders, "consists of repeated interviews made with the same group of persons" (Lazarsfeld, 1948, pg. 330). In the same article, Lazarsfeld describes, "two main types of research problems to which the panel technique is likely to be applied" (Ibid). The first sort of problem involves the study of "the effect of some specific event or series of events," while the second involves "The study of people under cross-pressures." (Op. Cit., pgs. 330-331).

Both situations seem to be of relevance for Bonneville. There is interest in better understanding the effects of specific events such as rate increases and specific program offerings on residential energy consumption. Because electricity does not come in cans, bottles or otherwise bundled, it is particularly difficult for the consumer to understand the direct impact of their own behavior on the rate at which they consume electricity. As a result, the impacts of rate modifications and demand management programs are particularly difficult to gauge.

Furthermore, consumers are subject to a variety of cross-pressures: On the one hand they are induced to purchase more and bigger electric appliances; on the other hand, they are frequently bombarded by messages directing them to use less electricity. To which are they responsive? Under what conditions? Within what time-frame? Which secondary and tertiary factors become relevant? Under what conditions?

In short, the study of residential electricity consumption appears to be substantively well suited to the application of panel techniques. In addition, there are likely to be distinct and measurable cost-savings to be realized from the use of panel techniques. The costs associated with sample selection would, of course, be substantially reduced. In addition, individual surveys could focus on specific issues, devoting only minimal time and effort to the collection of background data which could be extracted from the underlying database.

LINKAGES TO PREVIOUS REGIONAL SURVEYS

In the design of the 1983 regional residential survey, Bonneville adopted the methods employed in the 1979 survey as a starting point. Thus, for both the selection of the sample and the construction of the instrument, the procedures used in 1979 were employed in 1983 unless there was good reason to change the procedure. It seems reasonable to adopt a similar position relative to the next regional residential survey. Here, we shall attempt to review the procedures used previously and to identify the potential benefits and costs associated with the use of similar procedures in the next survey.

Sample Selection

Both the 1979 and the 1983 surveys employed a two stage cluster design for the selection of the sample. In each case, the stages involved electric utilities and then meter reading routes within the utilities with individual residential accounts as the ultimate unit of analysis. In 1983, the electric utilities were selected with probability proportional to size, with the number of residential accounts used as the measure of size. Similarly, the meter reading routes (MRR) within utilities were selected with probability proportional to the number of residential accounts employed as the measure of size. Individual accounts were selected from the MRR using a systematic random selection routine.

Compared with the alternatives, this method of sample selection is of relatively low cost to the sponsoring agency -- the federal government and Bonneville; the frame (all residential accounts served by electric utilities located in the Pacific Northwest) accords well with the target population (all residential dwelling units in the Pacific Northwest); and the selection process is relatively straightforward.

However, the selection method is not without costs: First, to the retail electric utilities. In both 1979 and 1983, the utilities selected into the sample were asked to select the MRR and the residential accounts using a procedure supplied by Bonneville. Obviously, this requires staff time and, in many cases, use of the utility's computational resources. Second, the design itself incurs a significant "design effect" cost,

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primarily as a result of the double clustering.¹

It is possible to reduce both of these costs by eliminating the second stage clusters -- the selection of meter reading routes within selected electric utilities. The purpose of these clusters was to reduce fieldwork costs by reducing interviewer travel between units. If the bulk of the interviewing is done via the telephone, this purpose diminishes considerably. At the same time, the sample selection can likely be done at reduced cost to the utility. The most significant impact of this change, however, is the reduction in the design effect. That is, the method of sample selection becomes substantially more similar to a simple random selection routine. As a result, the precision of the estimates for market segments are substantially increased.

A third limitation involves the information which the utilities maintain -- or don't maintain. Clearly, the utility must maintain accurate records of the location to which the electricity is supplied. In most cases, this is a street address; in some cases it involves directions based on some common system. In any case, it is nearly always possible to locate the residential unit to which the electricity is supplied, provided one is willing to place someone in the field. In both 1979 and 1983, this was the method employed: a survey research firm was hired and the firm placed trained interviewers in the field to locate the appropriate dwellings and conduct the requisite interview with an eligible member of the occupying household.

Some utilities do attempt to obtain a telephone number for the account holder. However, in some cases the holder simply refuses; in other cases, the holder provides a business telephone number; in still other cases, the account holder may reside elsewhere including out-of-state and even out-of-country. These situations (in addition to those utilities which simply don't attempt to obtain a telephone number) make it difficult -- but by no means impossible -- to conduct a survey via the telephone using utility residential account records as the sample frame.

A final point to keep in mind when considering whether to employ similar sample selection procedures is that in 1983, application

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¹ See L. Kish, 1965, esp. pages 257 ff. and W. Cochran, 1977, esp. pages 85 ff. Kish defines the "Design Effect" or "Deff" as "the ratio of the actual variance of a sample to the variance of a simple random sample of the same number of elements" (258). Subsequently, Kish notes that "In cluster samples, the ratio is typically larger than one, expressing the losses due to clustering" (259).

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was made to establish a new "System of Records" according to the applicable federal legislation and guidelines. As a result, the names and addresses of all the residential accounts which participated in the 1983 survey have been maintained. At that time, Bonneville had intended to conduct focused follow-up surveys involving selected subsamples and to empanel the survey participants, in Lazarsfeld's sense of that term (see Lazarsfeld, 1948 and Bonneville Power Administration, November 1982). In fact, one study did make use of this System of Records -- the End Use Load and Consumer Assessment Program, or ELCAP. To the best of our knowledge, the System still exists so that it would still be possible to return to at least some portion of the participants in the 1983 survey. It is not clear whether the system may be extended to include the participants in a new residential survey. We suggest that Bonneville make the appropriate inquiries through DOE Headquarters in anticipation of the next residential survey.

In summary, the sample selection procedures cannot be viewed in isolation. The procedures to be used for data collection must be considered as well as the pragmatics of existing administrative records and available staff and machine resources. Last, but certainly far from least, the impacts of the sample design on the precision of the estimates of important parameters must also be considered in the process of designing a sample selection procedure.

Survey Instrument

The primary purpose of both the 1979 and the 1983 surveys was to support the long-term forecast of residential electricity demand. The 1983 survey did include a minimal number of items designed to assist the staff of the then recently established Office of Conservation in the design and implementation of residential retrofit weatherization programs. For the most part, however, the 1983 instrument contained the same items as the instrument used in the 1979 survey except when there was a consensus that the item in the previous survey failed to obtain the appropriate data, or data of the desired precision.

Thus, for example, the questions pertaining to the fuels and equipment used for purposes of space heating were changed in 1983. Rather than inquiring about "primary" and "secondary" fuels and equipment, as was done in 1979, Bonneville asked about the fuels and equipment which the household "used most of the time to heat their home." This change in wording was induced by Bonneville analysts' realization that "primary" may mean the

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system originally installed in the dwelling as opposed to the system which is "used most of the time."

Similarly, in 1979, Bonneville asked the interviewers to inspect the ceiling/attic area to determine the amount of insulation. For a variety of reasons, this procedure failed to produce the necessary data. As a result, the procedure was changed in 1983 to a question which the respondents were expected to answer regarding the percentage of the designated area (walls, floors and ceiling/roof) which contained insulation. Unfortunately, this was not the appropriate data and, as a subsequent study clearly demonstrated, the answers were rarely accurate (see Applied Managements Sciences, Inc., July 1987).

As a general procedure, however, we recommend that the instrument used in 1983 be carefully reviewed by the interested parties and that if it is deemed desirable to obtain a given measurement, that the procedure used in 1983 be adopted unless there is compelling reason to change the procedure.

GENERAL RECOMMENDATIONS

Following is a brief list of some "green flags" -- things which we have fairly strong opinions that should be done in the next regional residential survey; and some "red flags" -- things which, in our opinion, should be avoided, if at all possible.

Green Flags

We recommend that the items in the following list be given serious consideration for inclusion in the next regional residential survey.

- * Use the same procedures that have been used in the past for the selection of the first stage public electric utilities. However, abandon the second stage procedures in favor of the use of a simple random technique to select dwelling units within each of the selected utilities.
- * Employ a multi-pronged, two-stage survey procedure such that, in the first stage, an attempt is made to contact all dwellings by telephone, with personal followups to those who are unresponsive. A highly stratified subsample of the first stage units would then be inspected in the second stage.

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- * Retain the relevant locational information regarding dwellings selected into the sample for this survey. In effect: create a panel such that the occupants may be interviewed and the dwelling inspected in the course of future surveys. The important point here is that it is the dwelling, not the household which becomes a "panel member," according to Lazarsfeld's definition (Lazarsfeld, 1948).
- * To the extent that the survey is expected to support the long-term forecast, ask the persons responsible for that forecast to provide a list of items which they desire to have measured in the survey and to review the 1983 instrument as a "starting point."
- * To the extent that the survey is expected to serve other objectives, such as the development of conservation supply curves and the evaluation of demand side programs, ask the responsible staff to provide lists of items to be measured and to review the 1983 instrument as a point of departure.
- * To the extent that the survey is expected to provide accurate estimates of dwelling thermal integrity, some portion of the sampled dwellings should be inspected by trained energy auditors.
- * In a similar manner, the records of the serving electric utility should be consulted in order to determine whether the dwelling has been audited under some utility-sponsored program and whether any conservation measures have been installed in the dwelling under any utility-sponsored program. These are intended to be data points, not criteria for selection or exclusion from the sample.
- * High priority should be placed on obtaining the participation of natural gas companies, at least to the extent of providing billing history data. This is likely to involve contacting representatives of the companies relatively early in the survey planning process and acceding to some of their data interests.
- * Although there may not be an immediate constituency within Bonneville itself for items pertaining to the "value of customer service" and "market segmentation," these may be areas which the participating retail utilities find valuable. To make participation attractive to these utilities, we recommend that a limited number of items which serve these interests be included in the survey.

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Red Flags

We recommend that the items on the following list be avoided in the course of conducting another regional residential survey of electricity demand.

- * Unless there is continuing interest in the accuracy of people's knowledge of the characteristics of their residences, we recommend that questions regarding the amount of insulation and the number of glazings be avoided.
- * Without exception, do not expect a traditional on-site interviewer to obtain measures of the dwelling thermal integrity.
- * Similarly, do not expect a traditional on-site interviewer to obtain measures of the dwelling dimensions. Those measures lack precision and, more significantly, are biased. If relatively simple estimates are desired, it appears that the occupants' estimates are at least as accurate as the results of the interviewers' attempts to measure the dwelling (see Applied Management Sciences, 1987).

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Louis Harris and Associates, "Pacific Northwest Residential Energy Consumption Survey: Interviewer Debriefing," Portland, OR: Bonneville Power Administration, October 1983

Part III

Memorandum: Planning for the Next Residential Survey (Appointment of PNWRES92 Task Team) - 8/27/90

"The new survey will focus on a variety of types of information for the households of the Pacific Northwest, including demographics, energy consumption, equipment inventories, and conservation activities. The collected data will provide a rich resource to support forecasting, resource planning, conservation assessment, and conservation program design."

U.S. DEPARTMENT OF ENERGY - BONNEVILLE POWER ADMINISTRATION

Memorandum

AUG 27 1990

FROM : John C. Holmstrom *John C. Holmstrom*
Chief, Assessment & Evaluation Branch - RPE

SUBJECT: Planning for the Next Residential Survey

TO : G. Starr - LCB
D. Auburg - RMG
R. Bennett - RMR
P. Norman - RPP
F. Brown - TB
W. Fields - WCB
J. Pyrch - RMC
N. Clark - RMI
G. Moorman - RPC
R. Lamb - RPS
T. Hannon - UCB

Planning is under way for Bonneville's next regional residential energy use survey. Data collection is expected to start late in 1991, with the results expected in 1992. By this memo we are seeking to identify those having a stake in the survey so we can provide for their needs.

The last two such surveys were conducted in 1979 and 1983. The new survey will focus on a variety of types of information for the households of the Pacific Northwest, including demographics, energy consumption, equipment inventories, and conservation activities. The collected data will provide a rich resource to support forecasting, resource planning, conservation assessment, and conservation program design.

Although the End-Use Research Section (RPEE) is providing the focus for this activity, participants in the initial planning process come from many sections in the Office of Energy Resources. The participants already involved and their constituencies are:

Roger Moore, Overall Survey Design, RPEE, x4264;
Ruth Ann James, Supply Curves, RPED, x5462;
David Mills, Forecasting, RPCD, x3662;
Fev Pratt, Residential Programs, RMRC, x5994;
Jean Sullens, Evaluation, RPEB, x5861; and
Megan Taylor, End-Use Research, RPEE, x5458.

Beginning in mid-September, this group will be meeting regularly to accomplish the planning and the survey effort. We will report progress on the survey through RP's weekly activity reports.

If you have or know of other interests that can benefit from and contribute to this effort, please call Roger Moore, x4264.

JHolmstrom:csj:5463:8/27/90 (VS5-RPE-2425b/1)

cc:
S. Hickey/G. Fuqua - R
J. Elizalde - RM
C. Meyer - RP
Official File - RPE (RP-28)

Part IV

The Goal of the 1992 Pacific Northwest Residential Energy Survey (PNWRES92) Process and Its Two Principle Objectives

The Goal of the 1992 Pacific Northwest Residential Energy Survey (PNWRES92) Process ...

**... is to develop and implement
an accurate, comprehensive residential energy-use survey
that will meet the continuing, diverse needs and applications
of Bonneville and of the Region.**

The First Principle Objective of the PNWRES92 Process:

To develop a precise and timely regional residential consumer data base designed to:

- a) support long-range forecasts of electricity demand within the Pacific Northwest Region;**
- b) support fuel- and equipment-choice analyses, including HVAC, water heating, and appliance portfolios;**
- c) determine the saturations of various conservation technologies and support analyses of factors affecting the differential diffusion of conservation measures and technologies; and**
- d) support analyses of annual energy consumption across the various fuel and equipment types at both regional and climate-zone levels.**

The Second Principle Objective of the PNWRES92 Process:

To develop an expanded frame of the Region's residences from which a variety of sub-samples may be selected for the purpose of conducting focused, cost-effective surveys that support future-but necessarily-yet-undefined analyses.

Objective #1 delineates those data and analytical needs that have been identified to date and are to be addressed with the completion of PNWRES92.

Objective #2 is longer-term in focus and is not driven explicitly by any particular short-range requirements. This objective provides an expanded frame from which smaller, cost-effective, and focused survey sampling frames could be extracted over the next 3 to 5 years. The design and utilization of this expanded data frame are key components of the "process" identified in the PNWRES92 Goals Statement.

Part V

Statement of Work for Task Team Planning Support - 5/1/91

"The major purpose ... is to obtain specialized consulting services for the preliminary design stages of a third survey of Pacific Northwest residential energy users.... [T]his project is designed to provide the basis for the development of a highly reliable data base which is usable by a variety of interests, adaptable to many uses, and appropriate for the geographic areas of interest. A great deal of confidence must be placed in the survey results since many parties are expected to be interested in its outcome."

STATEMENT OF WORK
1992 Pacific Northwest Residential Energy Survey
(PNWRES92)

Part 1: General

1.0 Goal of this Contract

Bonneville Power Administration (BPA) seeks the services of a contractor to assist in the development and implementation of an accurate, comprehensive residential energy-use survey that will meet the continuing, diverse needs and applications of BPA and the region.

1.1 Background and Purpose

BPA, a power marketing agency within the U.S. Department of Energy (DOE), sells electric power at wholesale to 129 publicly-owned and eight investor-owned utilities within the Pacific Northwest. These utilities, BPA, and the Pacific Northwest Electric Power and Conservation Planning Council (Council) cooperate through the Pacific Northwest Utilities Conference Committee (PNUCC) to develop appropriate data phases for the support of load forecasting and conservation planning.

One key element in long-range planning is the ability to explicitly incorporate energy end-uses and the effects of conservation programs. Until 1979, there was a lack of statistically reliable historical data for the Pacific Northwest Region as a whole on the ways in which consumers use energy and on the associated economic and demographic factors which affect energy consumption. A step toward overcoming this deficiency was taken in 1979. At that time, a regional survey of the residential sector was initiated. The survey was sponsored jointly by the PNUCC, through its subcommittee on End-Use Data, and by BPA. The survey produced over 4,000 interviews with adult members of households residing in separately metered dwelling units. In addition, all participating utilities and suppliers cooperated in providing billing records for each of the major fuels used by each household over the year prior to the conduct of the interview.

In 1983, an additional survey (also involving some 4,000 interviews) was conducted to improve upon and update the data from the 1979 survey. The data from both surveys have been used extensively by BPA staff in the development of long-term forecasts of energy demand in the Pacific Northwest. The results have also been used by outside firms under contract to BPA for purposes of enhancing, refining, and updating forecasting models; by the PNUCC and the Council in developing their forecasts of energy demand; and by several of the utilities in the region for their own purposes.

Apart from the surveys supported by BPA, there are several completed or ongoing data collection efforts directed at the residential sector. At the national level, the DOE has a long-range program to gather end-use energy consumption data, while locally the Oregon Department of Energy, and many individual electric utilities have been involved in data collection efforts. None of these efforts, however, are able to provide consistent, statistically reliable data for the Pacific Northwest Region as a whole.

In the interval since the 1983 survey was conducted, consumer behavior and, thus, important energy-related characteristics of residential units, including fuels and equipment, have changed in response to increased prices and to BPA and/or utility-sponsored conservation programs, as well as to other forces.

In order to maintain the defensibility, flexibility, and authority of BPA and other regional energy operating plans, it is necessary to update the data base from which the model inputs are derived. Furthermore, to improve the accuracy of the forecasts and the cost-effectiveness of BPA's conservation programs, it is necessary to collect more precise and detailed information concerning the usage of energy in the Pacific Northwest residential sector. As a result, BPA wishes to conduct a third regional residential survey. The survey is targeted to begin in the summer of 1991 with a telephone survey of approximately 20,000 households.

A Task Team, composed of BPA staff members and designed to represent a variety of constituencies within the agency, is assigned the responsibility for the development and implementation of the survey. The team's deliberations and resulting processes are collectively identified by the acronym PNWRES92. The Contractor for the work described herein will interact in most major decisions with the team through the Contracting Officer's Technical Representative (COTR).

The major purpose of this purchase order is to obtain specialized consulting services for the preliminary design stages of a third survey of Pacific Northwest residential energy users. The survey will lead to the further development of a detailed data base concerning the ways in which households use energy in the Pacific Northwest. This data base will be valuable for use by BPA and other interested parties in the conduct of a wide variety of energy analyses and forecasting efforts.

The Contractor awarded this contract shall be precluded from subsequent contracting activities in regard to PNWRES92 in order to prevent a possible conflict of interest. The only exceptions to this will be if the COTR issues a modification or amendment to the contract awarded as a result of this Statement of Work.

In summary, this project is designed to provide the basis for the development of a highly reliable data base which is usable by a variety of interests, adaptable to many uses, and appropriate for the geographic areas of interest. A great deal of confidence must be placed in the survey results since many parties are expected to be interested in its outcome.

Part 2: Technical Approach and Tasks

2.0 General Tasks

The PNWRES92 Task Team has developed a draft set of survey items. The team has also determined that the population of interest (the target population) is the set of residential housing units in the BPA service territory. This includes all types of domiciles (such as single-family, duplexes, apartments, and manufactured) which may use any types of energy sources (such as electricity, natural gas, and oil). However, the difficulty of obtaining a frame (a list) for the target population leads to the recognition that the sampled population is the set of households that have residential telephone service.

The Contractor will refine and restructure the draft set of survey items. Following that, the Contractor shall select a frame for the sampled population of units and construct a plan for sampling the units. The plan will involve the stratification of the units according to criteria given in Task B. The Contractor shall be responsible for reviewing the final sample to ensure that it complies with the original instructions from BPA and for producing the sample lists in both paper-based copy and consistent SAS-readable format in preparation for the conduct of the fielder. A pretest of the survey instrument will be conducted at this point. The survey process will be initiated by BPA after the negotiation of a final contract for the conduct of the fieldwork. The Contractor shall maintain close contact with the COTR and will submit the product to the COTR for review and approval prior to initiation of subsequent tasks, unless otherwise instructed by the COTR.

2.1 Specific Tasks

Task A - Survey Instrument Development: The Contractor shall meet with the Task Team to discuss the approaches to be taken and to receive direct information from team members. The Task Team has compiled a set of survey questions that correspond to and refine the survey questions used in the 1983 survey. The Contractor also shall be present at a meeting BPA will schedule with regional residential energy entities to discuss the survey process and instrument. Following this meeting, the Contractor shall review the survey instrument and provide suggestions for improvement of the instrument design and content. The Contractor shall then finalize the survey instrument, providing appropriate skip and loop patterns, as well as a coding system.

As part of this task, the Contractor shall prepare a set of comprehensive written instructions for telephone interviewers and a similar set for the central office coders for the performance of a pretest of the survey instrument. Each set of instructions will be bound separately and will be submitted to the COTR for review and approval. Once they have been approved, the Contractor will prepare camera-ready copies of each of these manuals and submit them to BPA, who will be responsible for printing sufficient copies for use in the training of fieldwork and central office personnel.

The instruction manuals should contain item-by-item comments and instructions for the administration, editing, and coding of each item on the telephone interview instrument. In addition, the interviewer instruction manual should contain descriptions of general interviewing principles and techniques and of the scope and objectives of this survey project. The instruction manuals for editors and coders should contain descriptions of basic editing and coding principles as well as general rules governing the coding scheme used for this project.

The Contractor shall also provide BPA with electronic copies of the word processing files in Word for Windows format, or in an alternate format negotiated with the COTR, which contains the survey instrument and all associated instructions and instruction manuals. BPA will adapt and use these files as necessary in the conduct of future survey activities.

Task B - Populations and Frame Selection: The target population shall consist of residential housing units in the BPA service territory (i.e., all of Washington, Oregon, and Idaho; that portion of Montana which is west of the Continental Divide; and several small sections of California, Nevada, Utah, and Wyoming). The Contractor will propose an appropriate sample population that is concordant with both the target population and the intention to conduct a telephone survey. The frame will be specified according to the final choice of the sample population.

Task C - Sample Selection: The Contractor will propose a stratification of the frame specified in Task B such that the survey's results will reflect acceptable survey practice. Units in all geographic portions of the BPA service territory will be candidates for inclusion in the sample. The Contractor shall propose and then draw (with the COTR's concurrence) a sample to obtain approximately 20,000 fully completed interviews from the frame.

Task D - Pretest: The Contractor shall conduct a pretest of the survey instrument, the methodology of which will be decided in the initial meeting with the Task Team. The purposes of the pretest are to refine the instrument's content and structure and to determine if there are items to be added, revised, or deleted. Units from the sample will be used for the pretest. Analysis of the results from the pretest will be presented to the Task Team. The Contractor and the COTR will then determine whether and what types of refinements are needed.

Task E - Recommendations: The Contractor shall provide BPA with recommendations on two specific issues: (1) "renewing" the sample periodically if it proves desirable to empanel the sample respondents, and (2) procedures for choosing households for a possible on-site inspection to be conducted at a later date as part of a still-to-be-specified survey activity.

Task F - SAS Files: Once the sample has been reviewed and the COTR determines that the list complies with the original instructions, the Contractor will place the list in a SAS formatted file. This file will be used to prepare a printed copy of the sample, sorted by strata first and then by ten-digit telephone number. As a minimum, each record will include fields for: (1) the stratum from which the unit was selected, (2) the ten-digit telephone number, (3) the name of the telephone subscriber, (4) street, (5) city, (6) two-character state code, and (7) zipcode.

Task G - Documentation: The Contractor shall provide a written (usually one or two pages) report upon completion of each of tasks A through F. These reports shall be comprehensive and will detail the methodology used in developing the product, as well as problems, solutions, and final determinations/results of the task. Upon completion of tasks A through F, the Contractor shall compile a Final Report which details and integrates the overall process and which includes an executive summary (no more than five pages) and chapters on: (1) the Overall Project Workplan; (2) Survey Instrument Development; (3) Populations and Frame Selection; (4) Sample Selection; (5) Pretest; (6) Recommendations; (7) SAS Files (including a data dictionary and codebook for each file, the details of which may appear in an appendix, rather than a chapter in the text); and (8) Summary/Findings.

2.2 Deliverables

Following an initial meeting with the Task Team to discuss the scope of work, a detailed workplan for accomplishing the specified tasks shall be provided by the Contractor. The COTR shall review the workplan with the Contractor and, at that time, adjustments may be made.

2.3 Timelines

1. Workplan: The Contractor shall provide a detailed workplan describing the methodology to be used and a project plan with dated milestones. After making delivery, the Contractor will meet with the Task Team to discuss and refine the plans. The Contractor shall then have 1 week to incorporate changes in the plans.

(Draft plans due 2 weeks after contract award;
meet with Task Team during the 3rd week; complete
plans due before end of 4th week)

2. (Task A) Survey Instrument and Interviewer Training Documentation:

2.a. The Contractor shall refine and restructure a set of survey questions prepared by BPA, suggesting improvement in the design and content, as well as providing a coding scheme for each response. BPA will be presented with pertinent word processing files as described in Task A before this task is considered complete.

(Due 5 weeks after contract award)

2.b. Upon completion of the Pretest, the Contractor shall provide BPA with comprehensive written instructions for telephone interviewers and central office coders.

(Due 18 weeks after contract award)

3. (Task B) Frame: The Contractor shall propose for BPA's consideration a set of alternative frames, each of which is designed to represent the target population; the final decision will be made after consultation with the COTR and the Task Team.

(Due 6 weeks after contract award)

4. (Task C) Sample Selection: The Contractor shall draw a random sample to obtain approximately 20,000 fully completed interviews from the frame in Deliverable 3. The Contractor's 1- to 2-page report on the sample selection work shall constitute the deliverable for this task.

(Due 9 weeks after contract award)

5. (Task D) Pretest: The Contractor shall perform the pretest. The Contractor's 1- to 2-page report on the pretest work shall constitute the deliverable for this task.

(Due 12 weeks after contract award)

6. (Task E) Recommendations: The Contractor shall provide a 1- to 2-page report of recommendations.

(Due 18 weeks after contract award)

7. (Task F) SAS Files: Both printed and SAS files must be delivered.

(Due 18 weeks after contract award)

8. (Task G) Documentation: The Contractor shall provide draft reports to signal the completions of tasks A through F, as specified in Task G. These draft reports should be prepared in such a fashion that they have similar formats and styles, so that they form the basis for the chapters (sections, parts) of the Final Report. Following completion of all tasks and the associated draft reports, the Contractor shall submit a draft Final Report of the overall survey process as described in Task G. BPA will be allowed 3 weeks to review the Task G draft Final Report, before the end of which interval the COTR will provide comments to the Contractor.

The Contractor shall incorporate the COTR's comments into the final report.

(Draft Final Report due 18 weeks after contract award;
Final Report due 24 weeks after contract award)

All work on this contract shall be completed within 6 months of contract award.

2.4 Payment Schedule for Deliverables

Payments will be made using the following schedule upon receipt of draft reports (Task G) and properly documented invoices.

<u>Deliverable</u>	<u>%</u>
Workplan	25
Sample Design	50
Final Report	25

Part VI

Statement of Work for Implementation of the Telephone Survey for the 1992 Pacific Northwest Residential Energy Survey (PNWRES92 - Phase I, Part 2) - 7/5/92

"In order to maintain the defensibility, flexibility, and authority of Bonneville and other regional energy operating plans, it is necessary to update the data base from which the model inputs are derived. Furthermore, to improve the accuracy of these forecasts and the cost-effectiveness of Bonneville's conservation programs, it is necessary to collect more precise and detailed information than ever before concerning the use of energy in the Pacific Northwest residential sector....

"This third survey and the process leading to it are collectively termed **the 1992 Pacific Northwest Residential Energy Survey**, designated, both in this Statement of Work and in other Bonneville documents, by the acronym **PNWRES92**. Planning, oversight, and review of PNWRES92 reside in a Task Team of several senior Bonneville staff members.

"PNWRES92 is designed so that, if need be, it can be conducted in several phases.

Phase I is a designed telephone survey of as many Pacific Northwest housing units as needed to obtain 20,000 completed interviews. The data collected in Phase I, in addition to having their own intrinsic values for forecasting and conservation programs, will provide a frame from which additional phases can be carried out. Thus, the results from Phase I can be thought of as providing a surrogate population to the entire set of Pacific Northwest residences.

"The major purpose of this contract is to obtain specialized telephone surveying services for Phase I, Part 2: the implementation of the telephone survey. The survey is expected to lead to the further development of a detailed data base concerning the ways in which households use energy in the Pacific Northwest. This data base will be valuable for use by Bonneville and other interested parties in the conduct of a wide variety of energy analyses and forecasting efforts."

STATEMENT OF WORK

**Implementation of the Telephone Survey for
the 1992 Pacific Northwest Residential Energy Survey**

PNWRES92 - Phase I, Part 2

STATEMENT OF WORK
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the 1992 Pacific Northwest Residential Energy Survey
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Implementation of the Telephone Survey for
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PNWRES92 - Phase I, Part 2

Part 1: General

1.0 Goal of this Contract

Bonneville Power Administration (Bonneville) seeks the services of a contractor to implement an accurate, comprehensive residential energy-use telephone survey that will meet the continuing, diverse needs and applications of Bonneville and the region.

1.1 Background and Purpose

Bonneville, an agency in the U.S. Department of Energy (DOE), markets wholesale electric power to public and investor-owned utilities within the Pacific Northwest. These utilities, Bonneville, and the Northwest Power Planning Council (the Council) cooperate through the Pacific Northwest Utilities Conference Committee (PNUCC) to develop appropriate data-collection phases for the support of load forecasting and conservation planning.

One key element in Bonneville's long-range planning is the ability to explicitly incorporate quantifications of energy end-uses and effects of conservation programs. Until 1979, there was a lack of statistically reliable historical data for the Region as a whole on the ways in which consumers use energy in the Pacific Northwest and on the associated economic and demographic factors which affect energy consumption.

Data from residential energy-use surveys conducted in 1979 and 1983 have since been used extensively by Bonneville staff in the development of long-term forecasts of energy demand in the Pacific Northwest. These data also have been used by outside firms under contract to Bonneville for purposes of enhancing, refining, and updating forecasting models; by the PNUCC and the Council in developing their forecasts of conservation supply and energy demand; and by several of the utilities in the Region for their own purposes.

Apart from the surveys supported by Bonneville, there are several completed or ongoing data collection efforts directed at the residential sector. At the national level, DOE has a long-range program to gather end-use energy consumption data; at the sub-Regional level, the Oregon Department of Energy and many individual electric utilities have been involved in data collection efforts. None of these efforts, however, is able

to provide consistent, statistically reliable data for the Pacific Northwest Region as a whole.

In the interval since the 1983 survey was conducted, both consumer behavior and energy-related characteristics of residential units (such as fuels and equipment) have changed. These changes are brought about by a variety of forces, including increased fuel prices and Bonneville- and utility-sponsored conservation programs.

In order to maintain the defensibility, flexibility, and authority of Bonneville and other regional energy operating plans, it is necessary to update the data base from which the model inputs are derived. Furthermore, to improve the accuracy of these forecasts and the cost-effectiveness of Bonneville's conservation programs, it is necessary to collect more precise and detailed information than ever before concerning the use of energy in the Pacific Northwest residential sector. As a result, Bonneville intends to conduct its third regional residential survey.

This third survey and the process leading to it are collectively termed the 1992 Pacific Northwest Residential Energy Survey, designated, both in this Statement of Work and in other Bonneville documents, by the acronym PNWRES92. Planning, oversight, and review of PNWRES92 reside in a Task Team of several senior Bonneville staff members. The contractor for the work described herein will interact with the Task Team through the Contracting Officer's Technical Representative (COTR).

PNWRES92 is designed so that, if need be, it can be conducted in several phases. Phase I is a designed telephone survey of as many Pacific Northwest housing units as needed to obtain 20,000 completed interviews. The data collected in Phase I, in addition to having their own intrinsic values for forecasting and conservation programs, will provide a frame from which additional phases can be carried out. Thus, the results from Phase I can be thought of as providing a surrogate population to the entire set of Pacific Northwest residences. Detailed work on Phase I began in the Spring of 1991 with Part 1, which involved the development of a survey instrument, the sample design, a codebook, and an instruction manual, and included a pretest of the survey instrument and the selection of a sampling list to be employed in Part 2.

The major purpose of this contract is to obtain specialized telephone surveying services for Phase I, Part 2: the implementation of the telephone survey. The survey is expected to lead to the further development of a detailed data base concerning the ways in which households use energy in the Pacific Northwest. This data base will be valuable for use by Bonneville and other interested parties in the conduct of a wide variety of energy analyses and forecasting efforts.

In summary, Phase I of PNWRES92 is designed to develop a highly reliable residential data base for Bonneville which is usable by a variety of interests, adaptable to many uses, and appropriate for the geographic areas of interest. A great deal of confidence must be placed in the survey results since many parties are expected to be interested in

its outcome and will rely on its data to support decisions in a number of issues connected with the Region's energy use.

Part 2: Technical Approach and Tasks

The sampling objectives for Phase I of PNWRES92 are as follows:

- The *target population* (Cochran¹, p. 5) is all housing units² in the Pacific Northwest (also called "the Region"³).
- The *sampled population* (Cochran, p. 5) is all housing units in the Pacific Northwest with telephone service.
- The *sampling unit* is a ten-digit number believed to be a residential telephone number.
- The *measurement unit* is the housing unit and the household associated with the sampled telephone number.
- The *sampling domains* (Cochran, p. 34) are combinations of
three utility types
    U-1 - publicly-owned generating
    U-2 - publicly-owned nongenerating
    U-3 - investor-owned
and six geographic areas
    G-1 - Western Montana⁴
    G-2 - Idaho

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¹ Cochran, W.G. 1977. *Sampling Techniques*. 3rd edition New York: Wiley & Sons.

² As defined by the U.S. Bureau of the Census for the 1980 Census of Housing: "a house, an apartment, a group of rooms, or a single room, occupied as a separate living quarters or, if vacant, intended for occupancy as a separate living quarters. Separate living quarters are those in which the occupants live and eat separately from any other persons in the building and which have direct access from the outside or through a common hall."

³ According to Public Law 96-501, 96th Congress, the *Pacific Northwest Electric Power Planning and Conservation Act*:

"3.(14) 'Pacific Northwest', 'region', or 'regional' means -

"3.(14)(A) the area consisting of the States of Oregon, Washington, and Idaho, the portion of the State of Montana west of the Continental Divide, and such portions of the States of Nevada, Utah, and Wyoming as are within the Columbia River drainage basin; and

"3.(14)(B) any contiguous areas, not in excess of seventy-five air miles from the area referred to in subparagraph (A), which are part of the service area of a rural electric cooperative customer served by .... [the Bonneville Power Administration] on the effective date of this Act which has a distribution system from which it serves both within and without such region."

As interpreted for this Statement of Work: all of Idaho, Oregon, and Washington; the portion of Montana served by Montana Light and Power Co., Pacific Power and Light, Northern Lights, Inc., Lincoln Electric Cooperative, Flathead Electric Cooperative, BIA Flathead Irrigation Project, Missoula Electric Cooperative, Ravalli County Electric Cooperative, Vigilante Electric Cooperative; the portion of Montana west of the Continental Divide served by Montana Power Co.; the portion of California served by Surprise Valley Electric Corporation; the portion of Nevada served by Harney Electric Cooperative, Wells Rural Electric Co., and Raft River Rural Electric Cooperative; the portion of Utah served by Raft River Rural Electric Cooperative; the portion of Wyoming served by Lower Valley Power and Light, Inc.

⁴ Essentially, the portion of Montana that lies west of the Continental Divide.

- G-3 - Eastern Washington⁵
- G-4 - Western Washington⁶
- G-5 - Eastern Oregon⁷
- G-6 - Western Oregon⁸.

Note: Three of the 18 sampling domains defined in this manner are empty: no public generating utilities operate in Western Montana (G-1), Idaho (G-2), or Eastern Oregon (G-5). Therefore, PNWRES92 concentrates on 15 nonempty domains.

- The portions of California and Nevada that are in the target population and are served by Surprise Valley Electric Corp. and by Harney Electric Cooperative, respectively, are treated as if they were part of Eastern Oregon (G-5). The portions of Nevada, Utah, and Wyoming served by Wells Rural Electric Co., Raft River Rural Electric Cooperative, and Lower Valley Power and Light inc. are treated as if they were part of Idaho (G-2).
- Each of the 15 nonempty domains is treated as separate stratum; i.e., a separate sample is selected for each (Cochran, p. 140). There is no further stratification, i.e., each domain will not be divided into subpopulations, with a separate sample selected for each defined subpopulation. However, the Phase I sample for each domain includes as many counties and individual utilities as is practical. This is accomplished through "impact stratification" (e.g., sorting sampling units by county and utility prior to selection).
- The criterion variable is a hypothetical binomial parameter, say θ , whose prior estimate is approximately 0.5.
- The precision requirement is to estimate θ in each domain with as small a sampling error as possible, given BPA's fixed data-collection budget. The sampling error in each of the six public-utility domains is one-half the sampling error in each of the nine investor-owned utility domains.⁹

The process developed in Part 1 for the telephone survey requires the use of computer-assisted telephone interviewing (CATI). Thus, it will be necessary for the contractor to employ a CATI system, one virtue of which is the direct transfer of data to electronic data records. The survey will employ the survey instrument, sampling list, instruction manuals, and sample design that were developed during Part 1. Bonneville will provide the contractor with paper and electronic copies of the survey instrument,

⁵The 20 Washington counties that lie east of the Cascade ridge.

⁶The 19 Washington counties that lie west of the Cascade ridge.

⁷The 17 Oregon counties that lie east of the Cascade ridge.

⁸The 19 Oregon counties that lie west of the Cascade ridge. They all are in BPA's Lower Columbia Area, except for a small strip along the eastern edge of Hood River County.

⁹For example, if the sample will allow the criterion variable to be estimated within 2 percent with 95 percent confidence in each of the six investor-owned utility domains, it will allow the criterion variable to be estimated within 1 percent with 95 percent confidence in each of the nine public-utility domains.

sampling list, and instruction manuals for telephone interviewers and supervisors, as well as with the results of a pretest conducted during Part 1.

During the conduct of Task 1 (Advance Planning), Bonneville will look to the contractor for suggestions of nonmonetary incentives to encourage respondent participation.

Note: With respect to computer-based activities called out in this contract, the contractor shall use only software and hardware that have been agreed upon by the contractor and the COTR. The purpose here is to assure that communications and records will be maintained as electronic files and that those files are interchangeable between Bonneville and the contractor. This includes, but is not limited to, word-processing, spreadsheet, data-analytic, and project-planning/tracking packages. The contractor shall maintain electronic versions of all PNWRES92 Phase I, Part 2 paper-based materials in a COTR-approved system. These materials will form the basis for documenting telephone survey activities and will form part of the permanent record of achievement.

BPA-87 is the control number assigned to this work under the Paperwork Reduction policies of the Federal government. All references to the collection will be made using this number.

2.0 General Tasks

This Statement of Work is arranged as a set of seven Tasks:

<u>Task Number</u>	<u>Task Title</u>
1	Advance Planning
2	Preparing for Data Collection
3	Conducting Pretest
4	Conducting Fieldwork
5	Reducing Data
6	Calculating Sample Statistics
7	Reporting

Each of the seven tasks has several subtasks.

Task 1: Advance Planning

Subtask 1.1 - Scoping Meeting

Before performing any substantive work under this contract, the contractor shall arrange with the COTR to meet with the Task Team to discuss the scope of the work and to explore and determine feasible approaches to the entire Part 2 effort that are within the scope of work as presented in the Statement of Work. This meeting will occur within two weeks of the effective date of the contract.

Subtask 1.2 - Detailed Workplan

Within two weeks following the scoping meeting specified in Subtask 1.1, the contractor shall provide a detailed draft workplan describing the methodology to be used and a project plan with dated milestones. After this draft workplan is delivered, the contractor will again meet with the Task Team to discuss and refine the plan. The contractor will then have up to two weeks following this second meeting to incorporate and gain approval of any requested changes in the plan and to produce the final project plan. It is specifically expected and anticipated that the project plan may be changed, for appropriate reasons, as conditions change¹⁰. These must be negotiated between the contractor and the COTR.

Subtask 1.3 - "Dummy" Documentation System

During the scoping meeting specified in Subtask 1.1, the contractor shall present a design for and examples of a "dummy" documentation system (consisting of reports, other documents, and electronic files) for review and approval by the Task Team. The final version of the system will be presented when the final detailed project plan, specified in Subtask 1.2, is presented.

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¹⁰ "It is a bad plan that admits of no modification." - Publilius Syrus.

- c. Comprehensive training on CATI procedures as they apply to PNWRES92 (contractor staff).
- d. Technical training on energy equipment and implications of equipment used in combination (Bonneville senior staff).

Task 3: Conducting Pretest

The contractor shall conduct a pretest in the contractor's own surveying environment of the survey instrument displayed in Attachment A. This "straight text" display was rendered from a Ci2¹¹ version that Bonneville staff used in its preliminary deliberations about survey content and length. Two Ci2 files, LOGIC.UNF and FRAMES.UNF, are available to the contractor.

Subtask 3.1 - Training Pretest Interviewer

The contractor shall train one interviewer in pretesting techniques, using Bonneville's survey instrument.

Subtask 3.2 - Conduct Pretest

The contractor shall conduct a pretest of the survey instrument as applied by the interviewer trained in Subtask 3.1. The pretest shall be conducted in several waves (although the total number of pretest interviews is expected to range between 30-50, the actual number of pretest waves/interviews will be determined in consultation between the contractor and the COTR).

Subtask 3.3 - Analysis of Pretest Results

The contractor shall analyze the results of the pretest after each wave is completed. The contractor shall then suggest items which need to be deleted, added, reworded, or reordered. Changes will be made to the survey instrument following the COTR's approval of such changes.

Subtask 3.4 - Documentation of Pretest Results

The contractor shall document the methodology, analysis, and subsequent changes to the survey instrument in a report to be approved by the COTR.

Task 4: Conducting Fieldwork

The fieldwork for this project may not commence until Tasks 1, 2, and 3 are complete and approved by the COTR. Five types of files are to be created and maintained as a method of record-keeping during the field work:

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¹¹ Ci2 is a questionnaire assistance software system produced by Sawtooth Software, 1007 Church Street, Suite 102, Evanston IL 60201 (or 208 Spruce North, P.O. Box 3429, Ketchum, ID 83340).

1. the Telephone Call Disposition File,
2. the Telephone Respondent Information File,
3. the Telephone Data File,
4. the Telephone Successful Completions File, and
5. the Flagged Successful Completions File.

The intended purpose and contents of each of the five types are discussed in the following paragraphs:

1. The Telephone Call Disposition File (TCDF) will contain the outcome of every call made to each sample telephone number, including callbacks. The contractor shall maintain complete and accurate records of such events as busy signals, no-answers, telephone-answering systems, telephone numbers not connected to residences, telephone-number-changes¹², and immediate refusals to participate at the onset of the interview. Each record in the TCDF will include at least the following fields:

- a. the 10-digit telephone number,
- b. the domain of study,
- c. the outcome of each attempt to make contact, along with the date and time and the caller's identification of the attempt
- d. the final disposition of regarding the telephone number,
- e. the reason, if known, for failure to participate in the survey, and
- f. comments by the interviewer.

2. The Telephone Respondent Information File (TRIF) will contain information regarding the respondents who are willing to begin the survey; i.e., those who do not immediately refuse to participate. The contractor shall maintain accurate records of the survey process in such a fashion that each record in the TRIF will include at least the following fields:

- a. the 10-digit telephone number that was called by the caller/surveyor,
- b. the confirmed (or modified) telephone number of the respondent,
- c. the domain of study represented by the telephone number,
- d. a unique site identifier to serve as a key field in all files related to and/or derived from the telephone survey data,
- e. the caller/surveyor's identification,
- f. street address,
- g. city,
- h. state,
- i. Zip-code (allow for 9-digit format),
- j. the disposition of the interview (partial, complete, why -- if known, etc.)
- k. the date of the contact

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¹²A changed telephone number will terminate the call-back process.

3. The Telephone Data File (the TDF) will contain all the information recorded by the surveyor/caller during each interview that was started, regardless of its being successfully completed. The TDF will contain, at least:

- a. the unique site identifier used in the TRIF and
- b. a field for each item on the survey, along with encoding/decoding schema.

4. The Telephone Successful Completions File (the TSCF) will contain only records from the TDF that are successfully completed. The information in the TSCF will be "as-collected"; i.e., the contents will not be edited or otherwise modified following the caller/interviewer's completion.

5. The Flagged Successful Completions File (the FSCF) will contain links and connecting information to the those records in the TSCF that, for whatever reason, are questioned during quality review by the survey's supervisor(s). Records which pass the contractor's quality reviews will not be included in the FSCF.

Subtask 4.1 - Telephone Call Disposition File

All calls to a given telephone number will be recorded in the Telephone Call Disposition File. The contractor will be prepared to provide evidence to Bonneville of a good-faith effort to implement the prescribed callback schedule. In some instances, when valid information cannot be obtained for a specific field in the survey instrument, the field will be recorded as *Missing* according to the system prepared by the contractor and approved by the COTR.

Subtask 4.2 - Telephone Respondent Information File

Each telephone interview is intended to be conducted with a householder (i.e., one of the persons in whose name the housing unit is owned, rented, or occupied under some other arrangement) who is willing to be interviewed and who is qualified according to the survey instrument. Information will be recorded in the Telephone Respondent Information File for all respondents who *do not* refuse to participate at the onset of the interview. In some instances, when a respondent is unwilling or unable to provide requested data for a specific item, the item will be recorded as *Missing* according to the system prepared by the contractor and approved by the COTR.

Subtask 4.3 - Telephone Data File

Survey results will be recorded in the Telephone Data File for all respondents who do not refuse to participate at the onset of the interview, whether or not the interview is considered to be "successfully concluded." In some instances, when a respondent is unwilling or unable to provide requested data for a specific item, the item will be recorded as *Missing* according to the system prepared by the contractor and approved by the COTR.

Subtask 4.4 - Telephone Successful Completions File

The Telephone Successful Completions File is a subset of the Telephone Data File. It will consist of survey results obtained for those respondents for whom a

complete survey was obtained; i.e., those who were qualified and for whom the process reached a normal conclusion.

Subtask 4.5 - Flagged Successful Completions File

The contractor will propose and carry out quality review processes to flag those records in the TSCF for which some question has been raised regarding their quality. The Flagged Successful Completions File will record the findings of this process. It is not the purpose of this file to contain "corrected" data; its purpose is to provide Bonneville with indicators of anomalous findings and to "flag" them for further investigation.

Examples: (1) A 750-square-foot house is inconsistent with its having six bedrooms. Such a unit will be included in the FSCF, along with the reason(s) for its being flagged.
(2) The respondent does not appear to the interviewer to be fully cognizant of the survey process (e.g., age, hearing difficulty, substance-induced impairment). Entry in the FSCF will include the interviewer's interpretation.

Bonneville's senior staff will provide additional examples during the interviewer/supervisor training specified in Subtask 2.2.

Subtask 4.6 - Letters of Appreciation

Within two weeks of the successful completion of the Telephone Survey with a household, the contractor will mail a personalized letter, printed on Bonneville letterhead stationery and signed by an appropriate Bonneville official, to the household thanking the occupants for their participation in the survey. Bonneville will provide the text of this letter to the contractor together with a supply of Bonneville letterhead stationery and franked envelopes. The contractor will be responsible for all printing and mailing.

Subtask 4.7 - Fieldwork Report

A draft report of the contractor's experiences in conducting the fieldwork will be submitted within four weeks of the completion of the fieldwork. The final version of this report will be included as a part of the final report for this contract.

Task 5: Reducing Data

Because the coded data will be entered directly into electronic records using a CATI system, "reducing data" is defined here to include all those procedures necessary and sufficient to the detection and correction of errors and inconsistencies (which are to be recorded in the Flagged Successful Completions File as described in Subtask 4.5) and to the accurate transfer of the data to SAS datasets. Bonneville expects to use SAS as the primary tool for analyzing the data produced by this project. The contractor is responsible for insuring that the data files satisfy all SAS requirements and for the production of SAS data definition control files. All SAS formats used in this work will be compatible with SAS Version 6.06 (or later).

Subtask 5.1 - Quality Review

As the interviewing process goes on, the contractor's supervisors will conduct a quality review of the five type of files designated in Task 4. A draft agenda for the quality review will be prepared. It is expected that at least the following will be included: (1) a timely review of the records for completeness and reasonableness and (2) a systematic routine which will assure interviewer quality control and the proper disposition of respondents and non-respondents. Anomalous findings will be placed in the Flagged Successful Completions File. Once the final agenda is approved, these quality reviews will include checking for out-of-range codes and for logical inconsistencies across items and across files. All changes to the data files which involve the exercise of the contractor's judgement will be appropriately flagged. Complete descriptions of the editing procedures and implementation experience will be included in the agenda. Where necessary, the supervisor(s) will consult with the responsible interviewer in order to complete the interview schedule and resolve any observed inconsistencies.

Subtask 5.2 - Transfer of Data Files

The contractor shall be prepared to provide "state of the project" copies of these files and printed summaries of them to Bonneville upon request, any time following the initiation of the fieldwork. Clean and fully verified¹³ copies of the five types of files designated in Task 4 will be delivered to Bonneville within one month following the completion of the interview portion of this project and abiding by a schedule established between the contractor and the COTR. The contract will not be considered complete until after the COTR has performed independent quality control checks on the data and certified the files as clean, complete, and usable.

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¹³"Clean and fully verified" means that the contractor will develop and execute programs designed to identify out-of-range codes and to test for the internal consistency of the data. More specifically, for each identified "error" in the Telephone Successful Completions File, the contractor will flag the result and place an appropriate record in the Flagged Successful Completions File. If necessary, the contractor will contact the responsible interviewer or sample household to verify the record.

Subtask 5.3 - Training Bonneville staff

Once the data are delivered to and accepted by Bonneville, the contractor will schedule and conduct an 8-hour training course for Bonneville staff members who will be accessing the files.

Subtask 5.4 - Data-Reduction Documentation

The contractor will prepare complete documentation for all manual and computerized data-reduction activities performed under this contract. This documentation will include full descriptions of task inputs, outputs, quality reviews, and decision rules. The documentation for computer programs will also include complete user operating instructions, with copies of program listings and actual runs. Consistent with Subtask 1.3, dummy versions of all documentation items will be agreed to with the COTR before any work begins on the project. Summary descriptions of processing activities will be included in the final project report.

Task 6: Producing Sample Statistics

Completion of elements in this task are dependent on the successful completion and acceptance by Bonneville of the five files described in Task 4.

Subtask 6.1 - Estimates/Variances of Special Interest

Based on the survey design and the Telephone Successfully Completed File, the contractor will calculate estimates of, along with their estimated variances, the following essential quantities that are of special interest in this survey:

- (1) the proportion of housing units for which electricity is used most of the time for purposes of space heating;
- (2) the proportion of housing units which use electricity for (a) space heating, (b) water heating, and (c) cooking;
- (3) the proportion of single-family housing units among all housing units; and
- (4) the proportion of manufactured homes among all housing units.

The estimates will be made for the Region, for each domain, for each state, for each type of utility, and for each of Bonneville's area offices.

Subtask 6.2 - Response Rates

Using the data contained in the Telephone Sample Accounts Completions File, the contractor will conduct an analysis of response rates for the telephone survey. The analysis will include, but is not necessarily limited to, the following:

- a. Overall response rates for the sample as a whole.
- b. Response rates by the number of calls, by the type of housing unit, by account location (e.g., urban-rural), by interview date.
- c. Non-response rates by reason for non-response.
- d. Proportion of sampled accounts which are non-residential and, therefore, outside the scope of any residential survey.

Subtask 6.3 - Report on Methodology

A report of the methodology used (including algebraic formulations, example computations, and open-literature references) and the results of the analyses conducted for Subtasks 6.1 and 6.2 will be submitted for review and approval by the COTR. Following approval, this report will be included as a part of the final project report. The report will include suggestions of techniques which might be used in future surveys in an effort to increase the response rate.

Task 7: Reporting

Subtask 7.1 - Weekly Summaries

The contractor shall submit weekly written summaries of the survey's status, including, but not limited to, the number of calls attempted and completed, categorized by domain, primary space heating fuel, and housing type.

Subtask 7.2 - Monthly Progress Reports/Briefings

Throughout the effective period of this contract, the contractor shall submit monthly technical progress reports and briefings. Each month's report/briefing will include the weeks that end during the calendar month. The set of such reports/briefings will form the permanent record of progress and activity in the survey and, as such, will be factual and concise and cover the following:

- a. A description of the project's overall progress plus a separate description for each task or other logical segment of work on which effort was expended during the month. Gantt and PERT charts and other project-management graphics will be used. The descriptions will include overviews of the expected layout of tables, codebooks, preliminary crosstabulations, and the subject-matter reports.
- b. A description of the problems that may impede proper performance of the survey. The description should be accompanied by proposed corrective actions, even if only in a preliminary formulative stage.
- c. A description of work to be performed during the next month.

Subtask 7.3 - Subject-Matter Reports

The contractor will prepare a series of written subject-matter reports, designed to support the Executive Summary and linked by the Project Concordance called out in Subtask 7.5, which shall be delivered in both camera-ready form and word-processing files and shall include the following volumes:

- a. Technical Appendix - sampling plan, survey instrument, exhibits, methodologies, interviewer instructions, and description and evaluation of sampling error.
- b. Item-by-Item results - responses to each survey item for each of the 15 domains of study; in addition, each survey item's data will be shown in at least three forms:

- (1) "as observed" in each of the 15 domains,
  - (2) summed across the 15 domains to produce "raw" survey results for the PNW Region, and
  - (3) "weighted up to" the PNW Region to produce unbiased regional estimates and their estimated variances.
- c. Pacific Northwest Region Crosstabulations - crosstabulations of some 20-to-30 selected survey items, "weighted up to" the PNW Region, by such key categories as (1) type of residence, (2) ownership type, (3) year of construction, (4) size (in square feet), (5) type of space-heating fuel, (6) type of water-heating fuel, (7) household income, and (8) utility type.
  - d. Area Office Crosstabulations - similar to the Pacific Northwest Region Crosstabulations but with estimates "weighted up to" the Puget Sound, Upper Columbia, Lower Columbia, and Snake River Area Offices.
  - e. Domain Crosstabulations - similar to the Pacific Northwest Region Crosstabulations but with estimates "weighted up to" the 15 domain totals.
  - f. Washington Crosstabulations - similar to the Pacific Northwest Region Crosstabulations but with estimates "weighted up to" the East/West split in Washington.
  - g. Oregon Crosstabulations - similar to the Pacific Northwest Region Crosstabulations but with estimates "weighted up to" the East/West split in Oregon.
  - h. Idaho Crosstabulations - similar to the Pacific Northwest Region Crosstabulations but with estimates "weighted up to" state-level in Idaho.
  - i. Montana Crosstabulations - similar to the Pacific Northwest Region Crosstabulations but with estimates "weighted up to" Western-portion of Montana.
  - j. Utility Type Crosstabulations - similar to the Pacific Northwest Region Crosstabulations but with estimates "weighted up to" each of the three utility types (investor-owned, public generating, and public nongenerating).

In addition to containing linking narrative and displaying tabular results, each of these subject-matter reports will contain graphics and charts to display pertinent comparisons and contrasts in the data. These reports shall be submitted for Bonneville review, in draft form, consistent with the Documentation System developed as Subtask 1.3.

Following discussion and incorporation of comments provided to the contractor by the COTR, final versions of the reports shall be submitted to Bonneville.

The contractor also will prepare an electronic-spreadsheet-based system of tabulations for use on personal computers, designed to support the Executive Summary and linked by the Project Concordance called out in Subtask 7.5. This electronic-spreadsheet-based system shall be delivered in both Microsoft Excel 3.0 (operating under Windows 3.0 or later) and Lotus 1-2-3 2.2 (operating under MS-DOS 3.3 or later) formulations unless a more efficient and less costly alternative is agreed upon. The system of tabulations described in this paragraph will be menu-driven. In addition

to displaying tabular results, these subject-matter reports will contain menu-accessible graphics and charts to display the comparisons and contrasts in the data. The system shall be submitted for Bonneville review, in draft form, consistent with the Documentation System developed as Subtask 1.3. Installation and operating and maintenance procedures for Bonneville equipment shall be included. Following discussion and incorporation of comments provided to the contractor by the COTR, final versions of the system shall be submitted to Bonneville.

Subtask 7.4 - Executive Summary and Project Concordance

In consultation with the Task Team and the COTR, the contractor will develop a "stand-alone" Executive Summary of the findings, the fieldwork, and the data-reduction portions of the work conducted under this contract. The length and amount of detail of the Executive Summary will be determined by the COTR after discussion with the contractor. Appended to the report, but bound separately, will be the Project Concordance and the Project Report Concordance, which together are designed to provide guidance to and connectivity with all the reports, documents, and data files that support the Executive Summary.

Subtask 7.5 - Final Data Files and Software

This contract will not be considered complete until the contractor has submitted, and Bonneville has accepted, electronic copies of each of the following data files and their supporting computer software, as well as complete instructions, data dictionaries, and codebooks for each of:

1. the Telephone Call Disposition File,
2. the Telephone Respondent Information File,
3. the Telephone Data File,
4. the Telephone Successful Completions File, and
5. the Flagged Successful Completions File.

Each of these files will be provided to the COTR on electronic files in a form agreed upon between the contractor and Bonneville. Each of the files will be fully verified, clean, and consistent within accepted levels of tolerance specified by Bonneville.

Table of Deliverables

No.	Deliverable	Week Due Following Contract Award
Task 1 - Advance Planning		
1.1.1	Scoping meeting	2
1.2.1	Draft workplan	3
1.2.2	Meet with Task Team	4
1.2.3	Final workplan	6
1.3.1	Draft "dummy" documentation system	3
1.3.2	Final "dummy" documentation system	6
Task 2 - Preparing for Data Collection		
2.1.1	Draft agenda for interviewer training	4
2.1.2	Final agenda for interviewer training	6
2.1.3	Select interviewers	7
2.2.1	Training sessions	8
2.3.1	Draft report on training	9
2.3.2	Final report on training	10
Task 3 - Conducting Pretest		
3.1.1	Training pretest interviewers	7
3.2.1	Conduct pretest	8
3.3.1	Analysis of pretest results	9
3.4.1	Draft report on pretest	9
3.4.2	Final report on pretest	10
Task 4 - Conducting Fieldwork		
4.1.1	Telephone Calls Disposition File (TCDF)	25
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4.3.1	Telephone Data File (TDF)	25
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4.6.1	Letters of appreciation	27
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Task 5 - Reducing Data		
5.1.1	Draft agenda for quality review	6
5.1.2	Final agenda for quality review	8
5.1.3	Conduct quality review	27
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5.3.1	Training Bonneville staff	29
5.4.1	Draft report on data-reduction activities	28
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Task 6 - Calculating Sample Statistics		
6.1.1	Draft report of estimates/variances	31
6.1.2	Final report of estimates/variances	33
6.2.1	Draft report on response rates	31
6.2.2	Final report on response rates	33
6.3.1	Draft report on methodology	35
6.3.2	Final report on methodology	37

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No.	Deliverable	Week Due Following Contract Award
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7.2.1	Monthly progress reports/briefings	Monthly
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7.3.b	Item-by-item Results	34
7.3.c	Pacific Northwest Region Crosstabulations	35
7.3.d	Area Office Crosstabulations	35
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7.5.2	Telephone Respondent Information File	37
7.5.3	Telephone Data File	37
7.5.4	Telephone Successful Completions File	37
7.5.5	Flagged Successful Completions File.	37

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Part VII

Contractor-Prepared Documents

Overview

Concordance

Report of Methodology

Introduction

- 1. Background And Purpose**
- 2. Design Of The Survey**

Overall Project Management And Quality Control

- 1. Advance Planning**
- 2. Preparing For Data Collection**
- 3. Conducting Pretest**
- 4. Conducting Fieldwork**
- 5. Reducing Data**
- 6. Producing Sample Statistics**
- 7. Reporting**

Technical Appendices

Final Work Plan

Survey Instrument

Training Materials

Training Report

Interviewer's Manual

Supervisor's Manual

Pretest Report

Power Plus User's Guide

OVERVIEW OF 1992 PACIFIC NORTHWEST RESIDENTIAL ENERGY SURVEY

Phase I of the 1992 Pacific Northwest Residential Energy Survey (PNWRES92-I) was the third comprehensive survey of the region to provide data on energy usage, conservation awareness/behaviors and associated consumer characteristics for use in forecasting and planning by the Bonneville Power Administration.

Energy-use data from residential surveys conducted in 1979 and 1983 have been used extensively by Bonneville, the Pacific Northwest Utilities Conference Committee, the Northwest Power Planning Council, and by several of the utilities in the region. Since 1983, both increased fuel prices and conservation programs have impacted consumer behavior and have made it necessary to update the data base used for forecasting. In order to improve the accuracy of these forecasts, more detailed information was required concerning the use of residential energy in the Pacific Northwest. Thus, Bonneville contracted its third regional residential survey, PNWRES92-I.

A team of staff members, representing several constituencies within Bonneville's Office of Energy Resources, designed the data collection as a telephone survey. The Applied Management & Planning Group (AMPG), Los Angeles, California, was selected to carry out the survey, to summarize the data, and to prepare the initial documentation. Interviewing Services of America (ISA), Van Nuys, California, was subcontracted by AMPG to conduct the telephone interviews.

PNWRES92-I used random digit dialing (RDD) and computer-assisted telephone interviewing (CATI). The sample was stratified into 15 sampling domains defined by geographic area and utility type. A total of 20,170 interviews were completed from September 3, 1992, to December 9, 1992.

The survey's full documentation is divided among 33 volumes, which are displayed in the Project Concordance in the next section. All volumes are available both in printed form and on personal computers using **Bonneville Power Plus**. Volumes A and B provide detailed documentation. Volume C shows all survey items for each sampling domain, for the entire region. Each of the data tables in Volumes C through AF show both the sample counts and the weighted population counts, as well as a chart for the population counts.

Volume B contains the Report of Methodology and the Technical Appendices.

For additional information, comments, or data requests, contact David Mills: (503)230-7505. To obtain copies of the reports, contact Kim Andersen, End-Use Research Section (RPEE), Bonneville Power Administration, P.O. Box 3621, Portland, OR 97208-3621; (503)230-5712.

REPORT OF METHODOLOGY

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INTRODUCTION

The Pacific Northwest Residential Energy Survey 1992, Phase I (PNWRES92-I) was the third comprehensive survey of the region to provide data on energy usage, conservation awareness/behaviors and associated consumer characteristics for use in future planning.

This Report of Methodology provides the technical description of the study, including the sample design, techniques of fieldwork, response rates, variance estimates, and project reporting.

Background and Purpose

Bonneville Power Administration (BPA), an agency in the U.S. Department of Energy, markets wholesale electric power to public and investor-owned utilities in the Pacific Northwest. A necessary element in Bonneville's forecasting and conservation planning is information about consumers' energy use and factors affecting energy consumption. Energy-use data from residential surveys conducted in 1979 and 1983 have been used extensively by Bonneville, the Pacific Northwest Utilities Conference Committee, the Northwest Power Planning Council, and by several of the utilities in the region.

Since 1983, both increased fuel prices and conservation programs have affected consumer behavior and have made it necessary to update the database used for forecasting. In order to improve the accuracy of these forecasts, more detailed information was required concerning the use of residential energy in the Pacific Northwest. Thus, Bonneville contracted its third regional residential survey, PNWRES92-I.

Design of the Survey

PNWRES92-I was a telephone survey, using random digit dialing (RDD) and computer-assisted telephone interviewing (CATI). The sample was stratified into fifteen sampling domains defined by the type of utility and geographic area.

The data collection for the survey followed a number of planning activities, beginning at BPA in September, 1990, with the formation of the PNWRES92 Team. The team members interviewed staff who had worked on the the 1979 and 1983 surveys, consulted with several survey professionals, and developed strategies for the conduct of the new survey. Much of this work was concentrated in May to October, 1991, during which the following were accomplished:

- **Developing the survey instrument.** BR Associates, a consulting firm located in Seattle, Washington, was contracted by the Bonneville Power Administration to develop the survey instrument. The instrument was derived in large part from many of the questions which had been included in PNWRES83, BPA's last comprehensive survey of energy use in the Pacific Northwest.
- **Pretesting the survey instrument.** Once BR Associates completed the draft instrument, a pretest was conducted to determine the length of time involved in conducting a survey and to assess the "answerability" of the questions on the instrument. Approximately 60 residences in the Seattle and Portland metropolitan areas participated in the pretest. Once the pretest was completed and modifications were made to the survey, the instrument was finalized.
- **Designing and selecting the survey sample.** BPA developed the following sampling design:
  1. The targeted population included all housing units in the Pacific Northwest;
  2. The sampled population included all housing units in the Pacific Northwest with telephone service;
  3. The sampling unit was an RDD telephone number, which was screened for residential status;
  4. The stratification was 15 sampling domains, designed as a combination of three utility types:
    - Investor-owned,
    - Public generating, and
    - Public non-generating;and six geographic areas:
    - Western Oregon (19 counties west of the Cascade ridge),
    - Eastern Oregon (17 counties east of the Cascade ridge),
    - Western Washington (19 counties west of the Cascade ridge),
    - Eastern Washington (20 counties east of the Cascade ridge),
    - Idaho, and
    - Western Montana.

OF

Since there were no public generating utilities in the western Montana, eastern Oregon, and Idaho geographic areas, three of the utility/geographic cells were empty and the sampling design contained a total of 15 domains.

5. Target sample sizes were set at 1905 completed surveys for each of the nine sampling domains with publicly-owned utilities and 476 completed surveys for each of the six sampling domains with investor-owned utilities. This yielded a total sample size of 20,001.
6. It was estimated that as many as ten different randomly generated numbers would be needed for each completed survey.

Once the study was designed, the PNWRES92 Team issued a Statement of Work in order to select a contractor to implement the study. The Applied Management & Planning Group (AMPG) in Los Angeles, California, was selected in April, 1992. Their subcontractor, Interviewing Services of America (ISA) in Van Nuys, California, performed the telephone interviewing. Planning sessions with the PNWRES92 Team began immediately, leading to interviewing from September to December, 1992. A study of non-respondents was conducted during May and June, 1993.

OVERALL PROJECT MANAGEMENT AND QUALITY CONTROL

PNWRES92-I was organized into seven major activities:

- Advance planning;
- Preparation for data collection;
- Conducting the pretest;
- Conducting fieldwork;
- Reducing data;
- Calculating sample statistics; and
- Reporting.

Figure 1 indicates the relationship between project tasks and reports. Each of these activities and their related tasks is discussed below.

Figure 1
**1992 Pacific Northwest Residential Energy Survey
 Activity and Reports Chart**

Task 1: Advance Planning

Subtask 1.1 - Scoping Meeting

AMPG staff conducted a preliminary scoping meeting with Roger Moore, the Contract Officer's Technical Representative (COTR) and the Task Team (David Mills, Ottie Nabors, Jean Oates, Lou Miranda, Wendy Lin-Kelly, and Ruth Ann James) to discuss and refine the work scope and schedule provided in the proposal. The meeting provided additional detail to the workplan where necessary and revised and refined specific tasks. Other issues which were discussed include:

- Project timeline, milestones, and deliverables;
- AMPG's and ISA's staffing and responsibilities;
- Electronic file management systems/software;
- Documentation;
- Budget monitoring and cost control;
- Project status reporting mechanisms;
- Client review;
- Problem identification and methods of resolution;
- Examples of a "dummy documentation system" (including reports and graphic presentations, tracking systems, interviewer selection criteria, handling/coding incomplete survey items, among others).

One of the key outcomes which emerged as a result of this meeting was Bonneville's decision to not use incentives to encourage respondents to complete the survey. Instead, Bonneville's toll free number was provided for public inquiries regarding the survey. This phone number was given to all respondents who completed the survey and was added as a part of the final question of the survey.

It was also decided that letters of appreciation would not be used in this study. It was agreed upon by AMPG staff and the BPA Task Team that letters of appreciation were both cost and labor intensive with relatively little benefit.

Subtask 1.2 - Detailed Workplan

Following the meeting with the COTR and Task Team, AMPG revised the Final Workplan to reflect the input of the Scoping Meeting outlined in Subtask 1.1. The Final Workplan is contained in the Technical Appendices.

Task 2: Preparing for Data Collection

Subtask 2.1 - Selection of Interviewers

As a standard practice, Interviewing Service of America (ISA) maintains an employment base of at least 150 pre-trained interviewers. All ISA staff used in this project were experienced in CATI surveying techniques. The staffing pattern for the purpose of this study was as follows:

- **Floor Manager** who monitored the staff and project productivity;
- **Team Captains** who supervised teams of interviewers and resolved problems as they arose;
- **Editors** who reviewed each questionnaire upon completion;
- **Monitors** who "listened in" on interviews to ensure compliance with procedures concerning probing, verbatim recording, skip patterns, etc.; and
- **Interviewers** who conducted the survey questionnaire.

Subtask 2.2 - Training Sessions

AMPG drafted an agenda for Interviewer Training and submitted it to the COTR for review. Although the agenda was drafted by AMPG, the training was conducted by AMPG, BPA, and ISA staff. Having Bonneville, AMPG and ISA staff collaboratively direct the interviewer training assured that each interviewer was familiar with all aspects of the study, and that the interviewers would be capable of knowledgeably answering questions from the respondents.

The training session involved hands-on experience conducting PNWRES92-I. Actual role playing were used with BPA, ISA and AMPG staff serving as "residents" in training sessions. Immediately following the training session, ISA interviewers began fieldwork and were monitored for their interviewing techniques, reporting accuracy, and documentation.

Materials provided by Bonneville served as the core training materials: a Supervisor's Training Manual and an Interviewer's Training Manual. These materials were revised by AMPG staff as changes in the survey instrument emerged and were submitted for approval to BPA.

Figure 2 indicates the areas of training included in the training session.

Following Subtasks 2.1 and 2.2, AMPG drafted and submitted to the BPA a final report on interviewer training and supervision. A copy of the approved report is contained in the Technical Appendices.

FIGURE 2 Interviewer Training for 1992 Pacific Northwest Residential Energy Survey			
TRAINING AREA	AGENCY PROVIDING TRAINING		
	BPA	AMPG	ISA
The background, objectives, and scope of the 1992 Residential Energy Survey			
Survey parameters (evenings/weekends, hours, numbers of residential households, sampling domains, etc.)			
Technical training on energy equipment; implications of equipment used in combination			
Review of standard interviewing principles and techniques			
Introduction of the survey instrument, quality requirements and potential technical issues			
Documentation of all telephone surveys (including procedures and forms)			
Techniques for increasing response rates			
Review of CATI procedures and internal pretesting of survey on CATI equipment			
Monitoring of internal pretesting (Random "listening in" or spot checking)			
Summary feedback to interviewers based on monitoring of internal pretesting and review of survey records/documentation			
Additional issues of concern			

Task 3: Conducting the Pretest

The pretest was conducted prior to the actual training of all interviewers. This approach ensured that interviewers were trained on the final procedures as well as the final survey instrument in a single session, as opposed to conducting training before the pretest and then retraining to accommodate any changes required as a result of the pretest.

The pretest was undertaken for the following four reasons:

- To test each step of the procedures (including CATI operations, survey documentation, and reporting) and reveal possible flaws or problems that could be corrected or dealt with prior to the full survey;
- To test all survey questions to reveal possible problems that could be examined and reworked prior to the full survey;
- To yield preliminary estimates of response rates for each step in the survey;
- To provide an opportunity for preliminary survey outcomes to be reviewed by AMPG, ISA and Bonneville staff.

Subtask 3.1 - Training Pretest Interviewers

To conduct the pretest, four interviewers were trained on August 21, 1992, on the pretest instrument. Using four interviewers for the formal pretest allowed for a range of potential problems or concerns to surface quickly and be addressed in a comprehensive manner.

Subtask 3.2 - Pretest

The pretest was conducted on August 21 and 22, 1992, at the Interviewing Services of America. The pretest involved a complete run through of all survey procedures. Following training, the pretest was conducted, with monitoring on every call.

The pretest employed actual fieldwork procedures, including full-use of CATI operations and comprehensive documentation of every call. Immediately following the pretest, interviewers met with ISA, BPA, and AMPG staff to discuss their

feedback on the survey instrument and to receive clarification on questions which emerged during the interviewing.

Outcomes of the pretest resulted in slight changes to the survey instrument and in the training of interviewers. Another result of the pretest was the development of the "special" screen for interviewers. This screen allowed interviewers to obtain answers to commonly asked questions by typing in "special" at any point in the survey.

Subtask 3.3 - Analysis of Pretest Results

The results of the pretest were analyzed by ISA and AMPG staff in consultation with the COTR. Some minimal changes in wording were implemented.

One outcome of the pretest was that response rates seemed low. The sample contained 50 percent more "bad" numbers (e.g. disconnected and business numbers) than the usual industry norm. It was determined that the age of the sample, estimated at 1 to 1.5 years, contributed to the large percentage of bad numbers. As a result of these discoveries, BPA decided to obtain a new sample (via ISA) from GENSYS.

Subtask 3.4 - Documentation of Pretest Results

Upon completion of the pretest, AMPG submitted to the COTR and Task Team a report of the pretest methodology, analyses, changes, and outcomes. In addition, AMPG also produced a complete set of frequencies. This yielded preliminary outcomes both in terms of survey outcomes and response rates.

For a complete report of the outcomes of pretest field work, please refer to the Pretest report contained in the Technical Appendices.

Task 4: Conducting Fieldwork

Fieldwork for PNWRES92-I began on Thursday, September 3, 1992, and was completed on Wednesday, December 9, 1992. Over the course of fieldwork 20,170 interviews were completed.

During the first two weeks of interviewing, both AMPG and ISA staff members monitored fieldwork daily. This provided instant feedback of potential problems with the interview or with the interviewer training. Subsequently, interviewers were monitored weekly during remote "spot-checks" by AMPG and BPA staff. The monitoring was accessible by calling ISA from remote sites. Neither the respondent nor the interviewer was aware of the monitoring as it took place.

AMPG and ISA developed a standardized system of daily reporting of all telephone activity. The reporting included a comparison of the desired sample to the actual completions, classified into the fifteen sampling domains; the number of refusals and incompletes by sampling domain; a detailed explanation of failed or incomplete contacts which includes the number of attempts; any summary statistics requested; and a narrative discussion of any problems or special issues.

AMPG and ISA transmitted to the Bonneville team these daily reports and served as the primary point of contact with the study team. In addition, there was daily telephone communication between BPA, ISA and AMPG. Outcomes of the fieldwork were also reported to the COTR and Task Team in weekly and monthly reports.

Every dialing was classified into at least one of five categories:

- Telephone Call Disposition;
- Telephone Respondent Information;
- Telephone Data File;
- Telephone Successful Completions; or
- Flagged Successful Completions.

The relationship among these categories is presented in **Figure 3** and a detailed explanation is contained in the subsequent tasks in this section.

Subtask 4.1 - Telephone Call Dispositions

The outcome of every call during the study was contained in the Telephone Call Dispositions. This included numbers which were busy, no answer after six rings, disconnected, FAX machines, telephone answering machines, non-residential numbers, immediate refusals, refusals during screening, appointments made, language barrier, wrong zipcode, call limit reached, and began survey. Each of these responses was documented and tallied at the end of every survey day.

Interviewers made five attempts to reach each number. For unsuccessful contacts for which there was an answering machine, no pick up, busy signal, or no individual over the age of 18 at home during the call, four follow-up attempts were made on separate days of the week. After five unsuccessful attempts, the number was coded as "unable to contact".

The disposition of all calls were reviewed by an editor to assure the validity of the data. Each day, AMPG and ISA staff reviewed the number of entries in the Telephone Call Dispositions and examined the relationship to the Telephone Successful Completions (see Subtask 4.4).

At the end of fieldwork there were 70,727 call dispositions.

Figure 3
Five Types of Data Files
1992 Pacific Northwest Residential Energy Survey

Subtask 4.2 - Telephone Respondent Information

Data from residents who accepted a call and indicated a willingness to participate in the study were contained in the Telephone Respondent Information. The data were reviewed by an editor to assure validity. At the close of every survey day, AMPG and ISA staff reviewed these entries to determine possible means of increasing completions.

The information collected included:

- Interviewer's identification number;
- Date of call;
- Time of call;
- 10-digit telephone number (including confirmation or modification of the number);
- Identification of sampling domain;
- Unique site identifier (serving as a key field in all files);
- Resident's name, street address, city, state, zip code (if provided);
- Disposition of the telephone number (including rationale for resident's partial completion); and
- Interviewer's comments (as needed).

At the end of the fieldwork there were data on 30,752 residences.

Subtask 4.3 - Telephone Data File

The Telephone Data File was designed to contain the information recorded by the interviewers during each interview, regardless of its successful completion. This would include the information in the Telephone Respondent Information (including the unique site identifier) and, additionally, a field for each survey item. Unfortunately, these data were deleted from the system and are not available for analysis.

Subtask 4.4 - Telephone Successful Completions

All completed interviews were contained in the Telephone Successful Completions, a subset of the Telephone Data File. A completed interview was defined as one where the respondent reaches Q. 200, regardless of whether the name, address, or family income was provided.

At the close of fieldwork, there were 20,170 completed surveys across all 15 sampling domains. This dataset was used to generate all of the tables for the study and was delivered to BPA on May 5, 1993, along with a SAS program.

Subtask 4.5 - Flagged Successful Completions File

As is the case in any large survey, some data were eliminated because it did not pass quality control. This occurred most often in incidents of conflicting or illogical responses or inability of the respondent to understand the purpose or content of the questionnaire.

During fieldwork AMPG and ISA staff carefully monitored the Flagged Successful Completions File to determine if additional question clarification was needed or data requests were in any way misleading. The final count for this file, identifiable by the variable FLAG in the final completions dataset, is 246.

Subtask 4.6 - Fieldwork Reporting

AMPG provided weekly summaries of the call dispositions during the interviewing. The final results of the fieldwork and response rates are reported below in **Subtask 6.2**.

Task 5: Reducing Data

The CATI system provides direct data entry during the interview, as each interviewer works at a computer terminal. Several checks were programmed to be verified during the interview. For example, if a respondent reported that the housing unit had several kitchens, a programmed trigger would request verification of the number. Likewise, if the count of residents across age groups did not match the reported total of residents, the respondent would be asked to clarify. The data reduction activity after the interviewing provided additional quality checks, preparation of the datasets for analysis, and programming SAS control cards to read the data.

Subtask 5.1 - Quality Review

ISA used standardized control mechanisms to detect out-of-range codes and internal inconsistencies. These included the editor review as well as the frequencies that identify miscoding or keyboard errors. All data in each of the files were carefully examined to insure accuracy and cleanliness. Surveys containing questionable data were flagged and added to the Flagged Successful Completions File. When necessary, these cases were investigated through follow-up with the interviewer.

Subtask 5.2 - Transfer of Data Files

Summaries of the 5 Telephone Data files were provided during fieldwork. ISA generated survey data at three critical junctures: immediately following the pretest and the first week of calls, at mid-point, and at the culmination of the project.

Following data cleaning, all of the files except the Telephone Data File were delivered to AMPG, and subsequently to Bonneville.

Subtask 5.3 - Technical Assistance to the Bonneville Staff

In September, 1993, AMPG staff provided a presentation of the menu-driven tables and reports and conducted a workshop in the computer access of the reports and data files for interested Bonneville staff members.

Subtask 5.4 - Data-Reduction Documentation

ISA provided SURVHARD documentation of the data collection instrument. This provided documentation of criteria used in skip patterns and in the triggers for respondent verification of out-of-range data. Upon receiving the dataset from ISA, AMPG developed a SAS program to access and manipulate the dataset. This program provided data formats, labels of the data items, and labels of the data values in the dataset. Both the dataset and the SAS program were provided to Bonneville on hard disks in compressed format.

Task 6: Producing Sample Statistics

AMPG was responsible for manipulating all SAS datasets and developing all data output, including frequencies, ranges, breakdowns, crosstabulations, and other statistics and computer runs for the final report. It was determined by BPA that AMPG would provide both raw and weighted data tables for the final report volumes.

After the household was interviewed, updated information was available for the zip codes and the utility companies. Some of the households were actually in another domain than their originally assigned sampling domain. For both weighting and reporting purposes, the actual, updated domain was used. The BPA Task Team determined that the utility company was the best indicator for domain. If the utility was unavailable (7.3% of the respondents), the next best indicator was the zip code. All domains could be assigned using either the utility or the zip code. Table 1 shows the counts of changes from the original domain to the actual domain.

TABLE 1
Changes from Original Sampling Domain to Actual Domain

Original Sampling Domain	Total N (original assignment)	No change	Utility type change only	Geographic change only	Both utility and geographic change
13 PG-EWA	1,938	1,895	34	2	7
14 PG-WWA	1,904	1,724	170	2	8
16 PG-WOR	1,921	1,803	116	0	2
21 PN-WMT	2,003	1,830	162	11	0
22 PN-ID	1,939	1,442	488	7	2
23 PN-EWA	1,946	1,735	184	23	4
24 PN-WWA	1,989	1,752	219	17	8
25 PN-EOR	1,967	1,866	64	24	13
26 PN-WOR	2,055	1,375	622	52	6
31 IO-WMT	397	345	51	0	1
32 IO-ID	457	429	20	1	7
33 IO-EWA	454	408	40	0	6
34 IO-WWA	410	401	7	0	2
35 IO-EOR	474	412	57	0	5
36 IO-WOR	316	305	10	0	1
TOTAL	20,170 (100.0%)	17,722 (87.9%)	2,244 (11.1%)	132 (0.7%)	72 (0.3%)

Subtask 6.1 - Estimates and Variances of Interest

This section discusses both weighting and variance estimation.

Weighting

AMPG and Bonneville originally discussed using 1992 intercensus data for weighting in the PNWRES92-Phase I Study. State population centers in each of the eight states within Bonneville's jurisdiction were contacted regarding the existence of county household data. However, this information was not uniformly available across all eight states. To eliminate potential confusion between 1992 intercensus and 1990 census data, AMPG used 1990 census data for the weights.

Bonneville provided AMPG with the occupied housing counts for the residences within the 15 sampling domains. The data were derived from Bonneville's Financial and Operations (F&O) database for all utilities and adjusted by using state and sub-state vacancy rates as measured by the 1990 census.

The weights for estimating population totals for the 15 sampling domains were calculated as

$$\text{weight}_i = \frac{\# \text{ estimated occupied HU's for domain } i}{\# \text{ responding households in domain } i}$$

Thus, there were fifteen unique weights, one for each sampling domain. The estimated count of housing units, the vacancy rate, the estimated count of occupied housing units, the number of responding households, and the resulting weights are presented in Table 2. The variable name in the SAS dataset for these domain weights is EXPAN1.

A similar methodology was used to develop the weights for the area offices, provided in Table 3. The variable name for these area weights is EXPAN2.

TABLE 2
Calculation of Population Weights
for the 15 Sampling Domains

Domain	Estimated HU's for 1991 F&O Domain	Vacancy Rate (%)	Estimated Occupied HU's	Completed interviews (updated domains)	Domain Weights
13 PG-EWA	63,062	6.65	58,882	1,957	30.0879
14 PG-WWA	638,986	5.48	603,972	1,815	332.7669
16 PG-WOR	60,614	8.76	55,304	1,857	29.7814
21 PN-WMT	32,269	10.85	28,769	1,892	15.2056
22 PN-ID	89,922	9.80	81,110	1,491	54.3997
23 PN-EWA	136,862	6.63	127,791	1,826	69.9841
24 PN-WWA	280,355	5.48	264,992	1,868	141.8587
25 PN-EOR	76,808	8.76	70,079	1,930	36.3104
26 PN-WOR	171,159	5.10	162,425	1,499	108.3556
31 IO-WMT	83,005	10.85	74,002	511	144.8180
32 IO-ID	338,119	9.80	304,985	920	331.5054
33 IO-EWA	250,048	6.63	233,474	562	415.4342
34 IO-WWA	673,882	5.48	636,955	661	963.6233
35 IO-EOR	94,595	8.76	86,308	478	180.5607
36 IO-WOR	800,615	5.10	759,761	903	841.3743
OVERALL	3,790,301	6.37	3,548,810	20,170	---

TABLE 3
Calculation of Weights
for Utility Types within Areas

Utility Type	Total Housing Units	Total Occupied Housing Units	Completed Interviews	Area Weights
LOWER COLUMBIA AREA OFFICE				
Investor Owned	889,442	850,930	907	936.6494
Generating	94,695	90,595	2,028	44.5976
Nongenerating	274,246	262,371	2,215	118.2546
Total	1,258,383	1,203,895	5,150	--
PUGET SOUND AREA OFFICE				
Investor Owned	673,882	635,808	666	953.0751
Generating	604,906	570,729	1,660	343.2398
Nongenerating	177,268	167,252	1,150	145.1939
Total	1,456,056	1,373,789	3,476	--
SNAKE RIVER AREA OFFICE				
Investor Owned	363,498	332,528	1,455	228.1608
Generating	N/A	N/A	N/A	N/A
Nongenerating	203,183	185,872	4,464	41.5685
Total	566,681	518,399	5,919	--
UPPER COLUMBIA AREA OFFICE				
Investor Owned	313,442	282,317	1,007	279.8868
Generating	63,062	56,800	1,941	29.2143
Nongenerating	132,678	119,503	2,677	44.5663
Total	509,182	458,620	5,625	--

Variances for proportions within domains

Because of the stratified design, sampling variances are reported within sampling domains. Table 4 shows the standard errors (the square root of the variance) for several proportions for each domain. They were calculated as

$$SE_i = \sqrt{p_i (1 - p_i) / n_i}$$

where p_i and n_i are, respectively, the proportion and sample size for domain i .

To use Table 4 in order to calculate a 95% confidence interval for a proportion, the proportion p_i should be derived from one of the domain tables in the report volumes or from the computerized tables. This would be the count divided by the total number. The standard error tabled for the proportion in Table 4 which is closest to the calculated proportion should be retrieved for that domain. Then the 95% confidence interval is 1.96 times the tabled value.

As an illustration of the use of Table 4 versus direct calculation, the sample size (n_i) for the domain defined as public generating utility type in Eastern Washington (PG-EWA) is 1957. From Table C-1 of Volume C, we can read that an estimated 42123 of 58882 residences for this domain were single family dwellings. This yields a proportion of 42123/58882, or $p_i = 0.715$. The direct calculation of the standard error is:

$$SE = \sqrt{0.715 (1-0.715)/1957} = \sqrt{0.2038/1957} = 0.0102.$$

To use Table 4 instead of this calculation, we find the most appropriate column of the table, which is the one marked 0.70 and read the standard error of 0.010 for this domain (PG-EWA).

Approximate 95% confidence bounds can be calculated as the standard error times 1.96. In the example, this would be 0.010 times 1.96, or 0.020. Thus, our 95% confidence level for the proportion of residences which are single family dwellings in the Eastern Washington public generating domain is 0.715, plus or minus 0.020, or somewhere between 0.695 and 0.735.

TABLE 4
Sampling Errors for Proportions by Sampling Domain

Sampling Domain	Proportion								
	0.10 or 0.90	0.15 or 0.85	0.20 or 0.80	0.25 or 0.75	0.30 or 0.70	0.35 or 0.65	0.40 or 0.60	0.45 or 0.55	0.50
13 PG-EWA	0.0068	0.0081	0.0090	0.0098	0.0104	0.0108	0.0111	0.0112	0.0113
14 PG-WWA	0.0070	0.0084	0.0094	0.0102	0.0108	0.0112	0.0115	0.0117	0.0117
16 PG-WOR	0.0070	0.0083	0.0093	0.0100	0.0106	0.0111	0.0114	0.0115	0.0116
21 PN-WMT	0.0069	0.0082	0.0092	0.0100	0.0105	0.0110	0.0113	0.0114	0.0115
22 PN-ID	0.0078	0.0092	0.0104	0.0112	0.0119	0.0124	0.0127	0.0129	0.0129
23 PN-EWA	0.0070	0.0084	0.0094	0.0101	0.0107	0.0112	0.0115	0.0116	0.0117
24 PN-WWA	0.0069	0.0083	0.0093	0.0100	0.0106	0.0110	0.0113	0.0115	0.0116
25 PN-EOR	0.0068	0.0081	0.0091	0.0099	0.0104	0.0109	0.0112	0.0113	0.0114
26 PN-WOR	0.0077	0.0092	0.0103	0.0112	0.0118	0.0123	0.0127	0.0128	0.0129
31 IO-WMT	0.0133	0.0158	0.0177	0.0192	0.0203	0.0211	0.0217	0.0220	0.0221
32 IO-ID	0.0099	0.0118	0.0132	0.0143	0.0151	0.0157	0.0162	0.0164	0.0165
33 IO-EWA	0.0127	0.0151	0.0169	0.0183	0.0193	0.0201	0.0207	0.0210	0.0211
34 IO-WWA	0.0117	0.0139	0.0156	0.0168	0.0178	0.0186	0.0191	0.0194	0.0194
35 IO-EOR	0.0137	0.0163	0.0183	0.0198	0.0210	0.0218	0.0224	0.0228	0.0229
36 IO-WOR	0.0100	0.0119	0.0133	0.0144	0.0152	0.0159	0.0163	0.0166	0.0166

Statistics of special interest

This section discusses the methodology of estimation of particular proportions and their variances. These statistics were:

- proportion of housing units which use electricity for space heating most of the time;
- proportion of housing units which use electricity for water heating;
- proportion of housing units which use electricity for both space heating and water heating;
- proportion of housing units which are single family dwellings; and
- proportion of housing units which are manufactured homes.

These statistics were estimated for several subgroups:

- the entire region;
- each of the 15 sampling domains;
- each of the 4 area offices (Puget Sound, Lower Columbia, Upper Columbia, and Snake River);
- each of the 4 states (Washington, Oregon, Idaho, and Montana); and
- each the 3 utility types (public generating, public non-generating, and investor-owned).

The proportions were estimated for the region, the domains, the states, and the utility types by using the set of weights found in Table 2. For area offices the set of weights found in Table 3 was used.

The variances of the proportions were estimated by using a formula that takes advantage of the stratification of the survey¹. For the proportions calculated with the first set of weights, variances were calculated by using the updated sampling

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¹See page 108 of Sampling Techniques, third edition, by William G. Cochran (Wiley, 1977).

domains as the strata, estimating the within-stratum variances, and summing a function of them across strata. This formula is:

$$v(p) = (1/\sum N_h)^2 \sum [N_h^2 (p_h)(1 - p_h)/n_h]$$

where p_h is the estimated proportion for stratum h , n_h is the stratum sample size, N_h is the population total of occupied housing units for stratum h , and the summation is over the relevant sampling domains for the area of interest. For example, the variance for the state of Washington was summed over the six sampling domains located in the state of Washington.

For the proportions calculated for the area offices, using the weights in Table 3, the strata were redefined. These strata were the utility types within the area office, as seen in Table 3. Otherwise the same formula for the variances was used.

These statistics of special interest are displayed in Table 5. Due to the extremely small values for the variances, Table 5 displays the standard errors, instead, which are the square roots of the calculated variances. Approximate 95% confidence bounds can be estimated by multiplying the standard errors from Table 5 by the factor 1.96.

TABLE 5
Statistics of Special Interest and Their Standard Errors

Geographic Area or Utility Type	Proportion Using Electricity for Space Heating		Proportion Using Electricity for Water Heating		Proportion Using Electricity for both Space Heating and Water Heating		Proportion Single Family Dwellings		Proportion Manufactured Homes	
	Estimated Proportion	Standard Error	Estimated Proportion	Standard Error	Estimated Proportion	Standard Error	Estimated Proportion	Standard Error	Estimated Proportion	Standard Error
Region	0.4592	0.0058	0.7644	0.0052	0.4291	0.0057	0.7194	0.0053	0.1241	0.0037
Domains:										
13 PG-EWA	0.8513	0.0080	0.9463	0.0051	0.8212	0.0087	0.7154	0.0102	0.1809	0.0087
14 PG-WWA	0.4931	0.0117	0.7311	0.0104	0.4479	0.0117	0.7025	0.0107	0.0612	0.0056
16 PG-WOR	0.6974	0.0107	0.8282	0.0088	0.6408	0.0111	0.7124	0.0105	0.0565	0.0054
21 PN-WMT	0.3103	0.0106	0.8266	0.0087	0.2933	0.0105	0.7452	0.0100	0.1871	0.0090
22 PN-ID	0.5091	0.0129	0.7995	0.0104	0.4829	0.0129	0.7653	0.0110	0.1174	0.0083
23 PN-EWA	0.7037	0.0107	0.9211	0.0063	0.6785	0.0109	0.6911	0.0108	0.1583	0.0085
24 PN-WWA	0.6183	0.0112	0.9031	0.0068	0.5996	0.0113	0.7361	0.0102	0.1585	0.0084
25 PN-EOR	0.3466	0.0108	0.8394	0.0084	0.3280	0.0107	0.6938	0.0105	0.2342	0.0096
26 PN-WOR	0.5804	0.0127	0.8973	0.0078	0.5617	0.0128	0.6878	0.0120	0.1915	0.0102
31 IO-WMT	0.1624	0.0163	0.5636	0.0219	0.1350	0.0151	0.7534	0.0191	0.1644	0.0164
32 IO-ID	0.3511	0.0157	0.7337	0.0146	0.3348	0.0156	0.7837	0.0136	0.1511	0.0118
33 IO-EWA	0.3986	0.0207	0.8132	0.0164	0.3790	0.0205	0.7206	0.0189	0.1423	0.0147
34 IO-WWA	0.4297	0.0193	0.6974	0.0179	0.3949	0.0190	0.7141	0.0176	0.1135	0.0123
35 IO-EOR	0.3410	0.0217	0.8264	0.0173	0.3326	0.0215	0.7490	0.0198	0.1883	0.0179
36 IO-WOR	0.4020	0.0163	0.7220	0.0149	0.3688	0.0161	0.7076	0.0151	0.1118	0.0105

TABLE 5
Statistics of Special Interest and Their Standard Errors

Geographic Area or Utility Type	Proportion Using Electricity for Space Heating		Proportion Using Electricity for Water Heating		Proportion Using Electricity for both Space Heating and Water Heating		Proportion Single Family Dwellings		Proportion Manufactured Homes	
	Estimated Proportion	Standard Error	Estimated Proportion	Standard Error	Estimated Proportion	Standard Error	Estimated Proportion	Standard Error	Estimated Proportion	Standard Error
Area Offices:										
Puget Sound	0.4582	0.0104	0.7274	0.0095	0.4202	0.0103	0.7090	0.0095	0.0981	0.0063
Lower Columbia	0.4756	0.0118	0.7720	0.0106	0.4442	0.0116	0.7038	0.0110	0.1242	0.0077
Upper Columbia	0.3637	0.0089	0.7573	0.0092	0.3433	0.0087	0.7295	0.0090	0.1700	0.0075
Snake River	0.4160	0.0085	0.7983	0.0073	0.3969	0.0084	0.7554	0.0074	0.1610	0.0064
States:										
Washington	0.5028	0.0080	0.7728	0.0071	0.4696	0.0079	0.7128	0.0073	0.1118	0.0050
Oregon	0.4339	0.0112	0.7675	0.0102	0.4044	0.0111	0.7073	0.0104	0.1339	0.0073
Idaho	0.3843	0.0127	0.7475	0.0117	0.3659	0.0126	0.7798	0.0110	0.1440	0.0095
Montana	0.2038	0.0121	0.6372	0.0160	0.1793	0.0113	0.7511	0.0140	0.1708	0.0121
Utility Types:										
Public Generating	0.5382	0.0099	0.7562	0.0088	0.4934	0.0099	0.7043	0.0091	0.0707	0.0048
Public Non-Generating	0.5748	0.0056	0.8845	0.0035	0.5542	0.0056	0.7172	0.0052	0.1696	0.0043
Investor Owned	0.3917	0.0090	0.7251	0.0082	0.3632	0.0089	0.7254	0.0083	0.1264	0.0059

Subtask 6.2 - Response Rates

Following fieldwork the final call dispositions of all numbers were presented to BPA. These dispositions have been collapsed and tabled in Table 6, which provides the final response rates overall and by the original (unrecoded) sampling domain. The definition of the several columns in Table 6 are:

- "Domain" indicates the original sampling domain;
- "Return Rate" is the percentage of telephone numbers that were completed interviews versus all the telephone numbers that were attempted for the domain ("Complete" as a percentage of "Count of numbers");
- "Response Rate" is the percentage of telephone numbers that were completed interviews versus the sum of the completed interviews and those who were not complete ("Complete" as a percentage of "Complete" plus "Not Complete");
- "Count of numbers" is the count of telephone numbers which were attempted in the domain;
- "Complete" is the count of completions;
- "Not Complete" is the count of telephone numbers that were known to be eligible households for the study but who did not respond due to refusals, break-offs, or unkept appointment calls;
- "Not Eligible" is the count of households that were ineligible for the study, such as wrong zip codes;
- "Not an HU" is the count of non-residential numbers, such as businesses, FAX machines, and modems;
- "Disconnect" is the count of disconnected telephone numbers;
- "Unknown Status" is the count of telephone numbers that could not be contacted, such as always busy or no answers.

TABLE 6
Response Rates for Sampling Domains

Domain	Return Rate	Response Rate	Count of Numbers	Complete	Not Complete	Not Eligible	Not an HU	Disconnect	Unknown Status
13 PG-EWA	27.3	63.7	7,106	1,938	1,106	223	436	1,368	2,035
14 PG-WWA	26.1	51.5	7,286	1,904	1,793	234	601	1,415	1,339
16 PG-WOR	26.7	60.0	7,198	1,921	1,280	84	646	1,025	2,242
21 PN-WMT	28.3	69.8	7,068	2,003	865	135	402	2,237	1,426
22 PN-ID	27.4	65.4	7,066	1,939	1,025	230	453	1,268	2,151
23 PN-EWA	27.6	65.7	7,050	1,946	1,016	149	467	2,191	1,281
24 PN-WWA	27.5	60.6	7,247	1,989	1,295	143	483	1,169	2,168
25 PN-EOR	27.1	67.4	7,268	1,967	952	103	388	2,279	1,579
26 PN-WOR	28.2	59.7	7,298	2,055	1,386	175	441	1,481	1,760
31 IO-WMT	22.6	66.0	1,754	397	205	20	75	310	747
32 IO-ID	26.5	61.0	1,724	457	292	72	111	268	524
33 IO-EWA	25.2	60.1	1,804	454	302	28	109	380	531
34 IO-WWA	22.5	55.0	1,826	410	336	68	160	307	545
35 IO-EOR	26.5	64.1	1,786	474	266	41	138	368	499
36 IO-WOR	17.9	57.3	1,764	316	236	98	91	258	765
TOTAL	26.8	62.0	75,245	20,170	12,355	1,803	5,001	16,324	19,592

Subtask 6.3 - Report on Methodology

Combined with the Technical Appendices, also in Volume B, this Report on Methodology was prepared to provide detailed documentation of the procedures used in the study.

Task 7: Reporting

In addition to the frequent telephone communication between AMPG and the COTR/Task Team, AMPG submitted formal written reports throughout the project on a weekly and quad-weekly basis detailing the project activities and outcomes.

Subtask 7.1 - Weekly Reports

Weekly reports, organized by task, were submitted to Bonneville by AMPG. These reports included both the current week's activities and the proposed activities for the following week for each task. Among those items reviewed in the weekly reports were the status of:

- Project timeline, milestones, staffing and deliverables;
- Project documentation, including status of calls and number of total calls and number of successful completions during fieldwork;
- Specific problem identification and resolution; and
- Any additional issues impacting the project.

Weekly reports were transmitted via facsimile to Bonneville in draft form. Once these drafts were approved, AMPG sent final copies.

Subtask 7.2 - Quad Weekly Reports

AMPG also submitted reports to Bonneville every four weeks. Each report included all activities of the previous four weeks, and project activities to be undertaken and completed in the coming month. These reports were concise and focused on progress toward project objectives and interim findings. Issues outlined under Subtask 7.1 were included in the reports. In addition, the following were included in the quad-weeklies:

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- Project progress, including project management graphics (derived from Microsoft Project 1.0);
- Proposed content and design of tables, manuals, training sessions, and other types of forms and documentation;
- Preliminary data and accompanying narrative;
- Adjustments to the Detailed Workplan based on concerns/problems arising during the month (or anticipated during the coming month);
- Additional issues requiring client review.

Subtask 7.3 - Subject-Matter Reports

AMPG produced the Pretest Report, the Training Report, and reports related to weighting the data. Subject-matter reports included tables, charts, graphs, and narrative. When entire reports were not necessary for specific items, AMPG wrote detailed memoranda to BPA staff outlining issues, problems, and procedures.

In addition to the subject matter reports, a final report included each of the following items:

Executive Summary, Project Concordance, Glossary, and Report of Methodology to summarize and document the study.

Technical Appendices with all information related to the study's work plan, survey instrument, interviewer training and supervision, pretest, SAS program, and manual for "Bonneville Power Plus".

Survey Results (Item-by-Item) for Each of the 15 Sampling Domains were presented, weighted for the region. Item-by-item results were also tabled for the Region by Area Office and by state.

Pacific Northwest Region Crosstabulations included selected survey items weighted for the PNW Region. Crosstabulations examined nine variables: type of dwelling; ownership type; year of construction; size (in square feet); type of space-heating fuel; type of water-heating fuel; household income; utility type; and type of space-heating equipment.

Area Office/ Geographic Crosstabulations were similar to the Pacific Northwest Region's Crosstabulations, weighted for each specific geographic region. The crosstabulations and areas were:

Sampling Domains;

Area Office (Puget Sound, Upper Columbia, Lower Columbia, and Snake River Area Offices);

Washington;

Oregon;

Idaho; and

Montana.

Utility Type Crosstabulations were similar to the PNW Region's crosstabulations for the three types of utilities--public generating, public non-generating, and investor-owned.

Subtask 7.4 - Executive Summary and Project Concordance

The Executive Summary provides an overview the study, with basic information about geographic areas, utility types, demographic variables, and other survey items. It also briefly outlines the project's background and objectives, methodology, and fieldwork.

The Project Concordance provides an index to the various tables and reports of the study.

Subtask 7.5 - Final Data Files and Software

PNWRES92-Phase I volumes include 33 separate reports, labeled **Volume A** through **Volume AG**.

Volume A and **Volume B** contain reports which document the project.

Volume A: **Executive Summary**
Project Concordance (connects all reports)
Glossary (definition of terminology)

Volume B: **Report of Methodology**
Technical Appendices (Work plan, survey instrument, interviewer training materials, interviewer and supervisor instructions, pretest report, and Bonneville Power Plus manual)

Volumes C through Volume AF provide tables and charts. Each has:

- Title page;
- One-page overview of Bonneville's PNWRES92-Phase I Study;
- Listing of Tables;
- Tables (for the region or specific domain, area office, state, or utility type); and
- Listing of survey questions for the tables.

Volume C: Item-by-Item Results -- Region and Domains

The tables for this volume include the total and domain responses for all survey questions. Specifically, the volume includes:

Table 1:	Dwelling Type by Domain (Q16)
Table 2:	Ownership Type by Domain (Q18)
Table 3:	Year of Construction by Domain (Q20)
Table 4:	Year of Occupancy by Domain (Q22)
Table 5:	Dwelling Size in Square Feet by Domain (Q24)
Table 6:	Type of Foundation by Domain (Q26)
Table 7:	Cathedral or Vaulted Ceilings by Domain (Q30)
Table 8:	Number of Living Rooms by Domain (Q32A)
Table 9:	Number of Kitchens by Domain (Q32B)
Table 10:	Number of Kitchens with Eating Areas by Domain (Q32C)
Table 11:	Number of Dining Rooms by Domain (Q32D)
Table 12:	Number of Bedrooms by Domain (Q32E)
Table 13:	Number of Bathrooms by Domain (Q32F)
Table 14:	Number of Dens, Studies, Libraries, or Sewing Rooms by Domain (Q38A)
Table 15:	Number of Family or Recreation Rooms by Domain (Q38B)
Table 16:	Number of Utility or Work Rooms by Domain (Q38C)
Table 17:	Number of Other Small Rooms by Domain (Q38D)
Table 18:	Number of Other Large Rooms by Domain (Q38E)
Table 19:	Primary Multi-Unit Heating System Type by Domain (Q44)
Table 20:	Primary Space-Heating Fuel Type by Domain (Q46)
Table 21:	Primary Space-Heating Equipment Type by Domain (Q48)
Table 22:	Primary Electric Space-Heating Equipment Type by Domain (Q50)
Table 23:	Primary Wood Space-Heating Equipment Type by Domain (Q52)
Table 24:	Fireplace Equipment by Domain (Q54)
Table 25:	Presence of Secondary Space-Heating Fuel by Domain (Q56)
Table 26:	Secondary Space-Heating Fuel Type by Domain (Q68)
Table 27:	Secondary Space-Heating Equipment Type by Domain (Q69)
Table 28:	Secondary Electric Space-Heating Equipment Type by Domain (Q70)

Table 29:	Secondary Wood Space-Heating Equipment Type by Domain (Q72)
Table 30:	Secondary Fireplace Equipment by Domain (Q74)
Table 31:	Changed Fuel Type in Past Year by Domain (Q76)
Table 32:	Primary Fuel Type Prior to Change by Domain (Q88)
Table 33:	Daytime Heating by Domain (Q89)
Table 34:	Natural Gas Available in Neighborhood by Domain (Q90)
Table 35:	Presence of Air Conditioning by Domain (Q92)
Table 36:	Multi-Unit Air Conditioning System by Domain (Q94)
Table 37:	Most-Used Air Conditioning Equipment System Type by Domain (Q96)
Table 38:	Number of Window or Wall Air Conditioning Units by Domain (Q98)
Table 39:	Multi-Unit Water-Heating System by Domain (Q100)
Table 40:	Primary Water-Heating Fuel Type by Domain (Q102)
Table 41:	Stove-Top Fuel Type by Domain (Q116)
Table 42:	Number of Cooking Ovens by Domain (Q118)
Table 43:	Cooking Oven Fuel Type by Domain (Q120)
Table 44:	Presence of Microwave Ovens by Domain (Q122)
Table 45:	Number of Refrigerators by Domain (Q124A)
Table 46:	Number of Televisions by Domain (Q124B)
Table 47:	Number of Personal Computers by Domain (Q124C)
Table 48:	Number of Freezers, Separate from Refrigerators by Domain (Q124D)
Table 49:	Number of Dishwashers by Domain (Q124E)
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Each table is followed by a chart showing weighted data.

Volume D and **Volume E** present frequencies for the Area Offices and States. These tables are comparable to those in **Volume C**:

Volume D: Item-by-Item Results -- Area Offices

For listing of tables, see Volume C.

Volume E: Item-by-Item Results -- States

For listing of tables, see Volume C.

Volume F through **Volume AF** provide crosstabulations for region, domain, area office, state, and type of utility:

Volume F:	Region
Volumes G through U:	Domains
Volumes V, W, X, and Y:	Area Offices
Volumes Z, AA, AB, and AC:	States
Volume AD, AE, and AF:	Utility Types.

Specific volumes are:

Volume F: Pacific Northwest Region Crosstabulations
Volume G: Eastern Washington (Public Generating) Crosstabulations
Volume H: Western Washington (Public Generating) Crosstabulations
Volume I: Western Oregon (Public Generating) Crosstabulations
Volume J: Western Montana (Public Nongenerating) Crosstabulations
Volume K: Idaho (Public Nongenerating) Crosstabulations
Volume L: Eastern Washington (Public Nongenerating) Crosstabulations
Volume M: Western Washington (Public Nongenerating) Crosstabulations
Volume N: Eastern Oregon (Public Nongenerating) Crosstabulations
Volume O: Western Oregon (Public Nongenerating) Crosstabulations
Volume P: Western Montana (Investor Owned) Crosstabulations
Volume Q: Idaho (Investor Owned) Crosstabulations
Volume R: Eastern Washington (Investor Owned) Crosstabulations
Volume S: Western Washington (Investor Owned) Crosstabulations
Volume T: Eastern Oregon (Investor Owned) Crosstabulations
Volume U: Western Oregon (Investor Owned) Crosstabulations
Volume V: Puget Sound Area Office Crosstabulations
Volume W: Lower Columbia Area Office Crosstabulations
Volume X: Upper Columbia Area Office Crosstabulations
Volume Y: Snake River Area Office Crosstabulations
Volume Z: Washington Crosstabulations
Volume AA: Oregon Crosstabulations
Volume AB: Idaho Crosstabulations
Volume AC: Montana Crosstabulations
Volume AD: Public Generating Utilities Crosstabulations
Volume AE: Public Nongenerating Utilities Crosstabulations
Volume AF: Investor-Owned Utilities Crosstabulations

Specific tables for these volumes are crosstabulations of nine survey items: type of dwelling, ownership type, year of construction, size (in square feet), type of space-heating fuel, type of water-heating fuel, household income, utility type, and type of space-heating equipment:

Table 1: Ownership Type (Q18) by Dwelling Type (Q16)
 Table 2: Year of Construction (Q20) by Dwelling Type (Q16)
 Table 3: Dwelling Size in Square Feet (Q24) by Dwelling Type (Q16)
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 Table 5: Primary Water-Heating Fuel Type (Q102) by Dwelling Type (Q16)
 Table 6: Household Income (Q186, Q188, Q189) by Dwelling Type (Q16)
 Table 7: Utility Type by Dwelling Type (Q16)

Table 8:	Space-Heating Fuels: Systems and Equipment (HEAT_EQP ²) by Dwelling Type (Q16)
Table 9:	Year of Construction (Q20) by Ownership Type (Q18)
Table 10:	Dwelling Size in Square Feet (Q24) by Ownership Type (Q18)
Table 11:	Primary Space-Heating Fuel Type (Q46) by Ownership Type (Q18)
Table 12:	Primary Water-Heating Fuel Type (Q102) by Ownership Type (Q18)
Table 13:	Household Income (Q186, Q188, Q189) by Ownership Type (Q18)
Table 14:	Utility Type by Ownership Type (Q18)
Table 15:	Space-Heating Fuels: Systems and Equipment (HEAT_EQP) by Ownership Type (Q18)
Table 16:	Dwelling Size in Square Feet (Q24) by Year of Construction (Q20)
Table 17:	Primary Space-Heating Fuel Type (Q46) by Year of Construction (Q20)
Table 18:	Primary Water-Heating Fuel Type (Q102) by Year of Construction (Q20)
Table 19:	Household Income (Q186, Q188, Q189) by Year of Construction (Q20)
Table 20:	Utility Type by Year of Construction (Q20)
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Table 28:	Household Income (Q186, Q188, Q189) by Primary Space-Heating Fuel Type (Q46)
Table 29:	Utility Type by Primary Space-Heating Fuel Type (Q46)
Table 30:	Space-Heating Fuels: Systems and Equipment (HEAT_EQP) by Primary Space-Heating Fuel Type (Q46)
Table 31:	Household Income (Q186, Q188, Q189) by Primary Water-Heating Fuel Type (Q102)
Table 32:	Utility Type by Primary Water-Heating Fuel Type (Q102)
Table 33:	Space-Heating Fuels: Systems and Equipment (HEAT_EQP) by Primary Water-Heating Fuel Type (Q102)
Table 34:	Utility Type by Household Income (Q186, Q188, Q189)

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²HEAT_EQP was a composite of several questions including dwelling type, multi-unit primary heat system, space-heat fuel, and equipment used with the various fuels.

- Table 35: Space-Heating Fuels: Systems and Equipment (HEAT_EQP) by Household Income (Q186, Q188, Q189)
- Table 36: Space-Heating Fuels: Systems and Equipment (HEAT_EQP) by Utility Type

Volume AG

In addition, a separate volume presents the findings of a follow-up study of non-respondents. This volume examines the responses of individuals who were called during the initial study but did not participate and/or complete the interview. Their nonparticipation was due to no contact, refused or was not reached after the initial contact, and began survey but did not complete.

This volume contains a report which documents the design of the non-respondent study, provides estimation of selected statistics, and compares the sample of nonrespondents and the regional sample of 20,170 on selected variables. The volume also contains three sets of tables:

1. Item-by-item responses for the original sampling domains;
2. Item-by-item responses for the non-respondent groups; and
3. Selected crosstabulations such as those outlined for **Volume F**.

Bonneville Power Plus

AMPG developed a personal computer system of the PNWRES92-I reports, called "Bonneville Power Plus". This system operates under Windows using Microsoft Excel and Word for Windows programs. The files consist of a spreadsheet-based system of tabulations easily accessed through a menu-driven format. In addition to the data tables, "Bonneville Power Plus" provides menu-accessible charts of weighted data.

Documentation for Bonneville Power Plus is contained in the Technical Appendices.

TECHNICAL APPENDICES

EXHIBITS

Final Work Plan . . . . . Appendix A

Survey Instrument . . . . . Appendix B

Training Materials

Training Report . . . . . Appendix C

Interviewer's Manual . . . . . Appendix D

Supervisor's Manual . . . . . Appendix E

Pretest Report . . . . . Appendix F

Power Plus Users Guide . . . . . Appendix G

APPENDIX A

FINAL WORK PLAN

The Final Workplan outlines all tasks, activities and deliverables associated with the Pacific Northwest Residential Energy Study 1992- Phase I.

Final Workplan

1992 Pacific Northwest Residential Energy Survey Phase I

September 1992

**Submitted to:
Bonneville Power Administration
Portland, Oregon**

**Submitted by:
Applied Management & Planning Group
Los Angeles**

**Work performed under Contract Number DE-AC79-92BP25174
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Applied Management & Planning Group

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WORKPLAN

This report presents a detailed discussion of AMPG's revised workplan for the 1992 Pacific Northwest Residential Energy Survey -- Phase I. This revised workplan incorporates Bonneville Power Administration staff input to AMPG subsequent to the initial proposal. AMPG staff will work closely with the Contracting Officer's Technical Representative (COTR) and the Task Team should additional modifications be needed as the study progresses.

Overall Project Management and Quality Control

Figure 1 presents the "1992 Pacific Northwest Residential Energy Survey Activity and Reports/Deliverables Chart". This figure indicates AMPG's understanding of the relationship between project tasks and outcomes (i.e. reports and deliverables). AMPG concurs that the workplan outlined by Bonneville can be completed within the proposed timeline. (A timeline of all project activities, **Figure 6**, is presented at the end of the Workplan.)

AMPG and ISA have developed comprehensive quality control procedures which insure that all project work is verified and validated. These measures are outlined in **Figure 2**. As is evident in the chart, both firms will provide quality control checks on all major activities prior to final approval by the client. Having utilized the dual quality control process in prior projects, AMPG is confident of its ability to deliver valid and comprehensive reports according to the project's timeline.

Task 1: Advance Planning

Subtask 1.1 - Scoping Meeting

AMPG met with the COTR and Task Team to discuss and refine the workplan and timeline of the project. The intent of this meeting was to provide additional detail to the workplan where necessary and also to revise and refine specific tasks. Revisions were also made to the timeline to accommodate specific concerns and issues of Bonneville. Additional topics of concern to Bonneville and AMPG were addressed during the meeting. This document reflects changes to the original proposal.

Figure 1
1992 Pacific Northwest Residential Energy Survey
Activity and Reports/Deliverables Chart

FIGURE 2
1992 Pacific Northwest Residential Energy Survey
Quality Control Chart

ISA Quality Control	AMPG Quality Control	Bonneville
TASK 1: ADVANCE PLANNING		
Verify Draft and Final Workplan	Review of Draft and Final Workplan	Final Approval
Review "Dummy Documentation"	Verify "Dummy Documentation"	Final Approval
TASK 2: PREPARING FOR DATA COLLECTION		
Confirm draft and final Agenda for Training	Review Draft and Final Agenda for Training	Final Approval
Validate experience of interviewers	Confirm selection of interviewers	
Monitor training	Monitor training	
Verify training CATI training and interviewing outcomes	Evaluate CATI training and interviewing outcomes	
Verify draft and final report of training	Review draft and final report of training	Final Approval
TASK 3: CONDUCTING PRETEST		
Evaluate pretest interviewers	Monitor training	
Monitor pretest	Monitor pretest	
Verify pretest results	Examine pretest results	
Verify draft and final report on pretest	Review draft and final report on pretest	Final Approval
TASK 4: CONDUCTING FIELDWORK		
Monitor interviewers	Monitor interviewers	
Verify disposition of calls	Review disposition of calls	
Verify draft and final report on fieldwork	Review draft and final report on fieldwork	Final Approval
TASK 5: REDUCING DATA		
Review Quality Control Agenda	Examine and confirm Quality Control Agenda	Final Approval
Verify contents of five data files	Review contents of five data files	
Audit data file transfer methods and outcomes	Examine data transfer methods and outcomes	
Review Bonneville training agenda	Evaluate Bonneville training agenda	Final Approval
Verify draft and final report on data-reduction activities	Review draft and final report on data-reduction activities	Final Approval
TASK 6: CALCULATING SAMPLE STATISTICS		
Verify estimates/variances of special interest	Audit estimates/variances of special interest	
Verify response rates	Audit response rates	
Review report on estimates/variances of special interest	Review draft and final report on estimates/variances of special interest	Final Approval
Review report on response rates	Review draft and final report on response rates	Final Approval
Review report on methodology	Review draft and final report on methodology	Final Approval
TASK 7: REPORTING		
Verify weekly, monthly and subject-matter reports, and technical appendices	Audit weekly, monthly and subject-matter reports, and technical appendices	Final Approval
Verify electronic spreadsheet-based system	Audit electronic spreadsheet-base system	Final Approval
Review of Executive Summary and Project Concordance	Review of Executive Summary and Project Concordance	Final Approval
Verify transfer of data files and software	Audit transfer of data files and software	Final Approval

AMPG discussed with the COTR and Task Team:

- Project timeline, milestones, and deliverables;
- AMPG's and ISA's staffing and responsibilities;
- Electronic file management systems/software;
- Project documentation
- Budget monitoring and cost control;
- Project status reporting mechanisms;
- Client approval process;
- Problem identification and methods of resolution;
- Examples of a "dummy documentation system" (including reports and graphic presentations, tracking systems, electronic file management, interviewer selection criteria, handling/coding incomplete survey items, Spanish-language survey, among others);
- Specific issues or concerns (e.g., training sessions for supervisory staff; use or non-use of non-monetary incentives; use or non-use of Letter of Appreciation; sampling error rates, etc.)
- Other project monitoring activities; and
- Any addition issues impacting the project.

AMPG discussed the use of incentives for survey participants in this initial meeting. Agreement was reached that no incentives would be used in the study for the following reasons:

- Incentives work in increasing response rates under limited circumstances. (These circumstances include mail surveys, where the incentive accompanies the survey prior to the respondent's participation. In fact, when incentives were sent after participation, they have discernible net effect on the response rate.)
- Many members of the general public do not support the concept of incentives for participation in surveys sponsored by public agencies or those who provided public goods and services.
- Incentives (monetary or non-monetary) also means that the interviewer faces two challenges:
  - Encouraging/convincing the respondent to participate in the study; and
  - Convincing the resident that he/she will actually receive an incentive for doing so.
- Incentives tend to positively bias respondents' answers to survey questions.

Increasing Response Rates

AMPG recommends another tested approach for increasing survey response rates. This is an approach that we have used with other large surveys cutting across wide geographic areas and population centers. Under this approach AMPG would work closely with Bonneville and with the public information departments of the utility agencies whose populations will be surveyed to publicize the survey and its purpose. **We recommend that Bonneville obtain a toll-free number (1-800-XXX-XXXX) for public inquiries regarding the survey.** Earlier surveys has shown us that interviewers provided the toll-free number to individuals who were reluctant to participate in the survey, or those who indicated that they were going to not complete the telephone survey. Having received the telephone number, residents did call and were assured that the survey was a legitimate effort.

This strategy addresses the two questions most common to any potential respondent: "Is the survey legitimate?" and "Will some good result from my participation?"

AMPG believes that a public outreach effort via a toll-free telephone number will greater increase survey response rates.

Subtask 1.2 - Detailed Workplan

Following the meeting with the COTR and Task Team, AMPG will revise the Workplan to reflect the input of the Scoping Meeting outlined in Subtask 1.1. (This document reflects the revisions discussed with BPA during the Scoping Meeting.) This will include revisions in the project plan, milestones, deliverables, electronic file systems/software, etc.

Once the Workplan has been revised and submitted to BPA, AMPG staff will again meet with the COTR and Task Team to review the revisions. Once these are approved, AMPG will submit the final detailed workplan to the COTR in both hard-copy and disk format.

Subtask 1.3 - "Dummy" Documentation System

AMPG staff will develop a documentation system for the project. This "dummy" system. We are well aware of the need for consistency and standardization across the various components of such a system.

Among the other "dummy" documentation that AMPG will review with BPA will be the "Monthly Progress Reports and Technical Memoranda". AMPG will submit monthly progress reports which will include:

- Technical Memoranda, which document the methods and decisions made regarding the survey methods or procedures;
- A statement of project progress and schedule;
- A statement of problems encountered and their resolution; and

ISA has developed a standardized system of daily reporting of all data collection and telephone activity on a large-scale surveys. The reporting includes a comparison of the desired sample to the actual recruitments and completions, by cell of the sampling frame.

Also finalized at this stage of the project will be the plan for maintaining electronic files. This is outlined in **Figure 3**. These systems/software were selected because they are the leader in their specialization. As such, they are found in both large and small organizations.

FIGURE 3 Electronic File Management Systems/Software 1992 Pacific Northwest Residential Energy Survey	
Data Type/Function	System/Software
Word Processing	WordPerfect 5.1
Graphics (charts, figures, overheads, presentations)	Harvard Graphics (Version 3.0), CorelDraw (Version 2.01), and/or Excel (Version 3.1 operating under Windows 3.1)
Spreadsheets	Excel (Version 3.0 operating under Windows 3.1)
CATI software	Survent Software and Mentor Software both by Computers for Marketing Corp.
Project Planning/Tracking (including Gantt and PERT charts)	Microsoft Project
Data Analyses	SAS (Version 6.06)

Task 2: Preparing for Data Collection

AMPG recognizes that the survey interviewers must receive the same careful scrutiny that was given the survey instrument under Phase 1, Part 1. AMPG and ISA's experience undertaking large-scale data collection for a wide range of public agencies allows us to draw upon a large team of skilled, experienced interviewers and supervisory personnel. In addition, the large and diverse population to be surveyed requires interviewers with experience in obtaining high response rates.

Subtask 2.1 - Selection of Interviewers

Interviewing Service of America maintains an employment base of at least 250 interviewers. As a standard practice, AMPG and ISA collaborate on all selection and training for large-scale surveying. All interviewers and supervisors utilized in this project will be experienced in CATI surveying techniques. AMPG will work with ISA to select and train interviewers on the procedures of the study and will conduct an on-screen briefing of the survey instrument.

Quality control is an essential element of any survey undertaking and commences with the interviewers and their supervisors. Interviewers will be carefully supervised and each will be spot-checked by a supervisor during actual interviews. Our procedure is based on a four-tiered supervisory structure that features:

- **Field Supervisor** who monitors staff and project productivity;
- **Project Supervisor** who supervise teams of interviewers and resolve problems as they arise;
- **Editors** who review each questionnaire upon completion; and
- **Monitors** who "listen in" on interviews to ensure compliance with procedures concerning probing, verbatim, and skip patterns.

In addition to interviewers, the monitors, editors, project supervisors, and field supervisor will be selected from among ISA's experienced professionals. Each individual participating as either an interviewer or supervisor will be available and willing to work evenings and weekends.

Subtask 2.2 - Training Sessions

AMPG and ISA will conduct the pretest prior to the training sessions so that the outcomes of the pretest might be incorporated into the formal training. This will insure that all interviewers are trained on final interview procedures as well as the final survey instrument.

The Agenda for the pretest training will be submitted to Bonneville for approval prior to the actual training. Following the pretest, a revised training agenda will be developed for both interviewers and supervisory staff. AMPG will draft the "Agenda for Interviewer Training" and submit it to the COTR for review. In addition, an "Agenda for Supervisor Training" will also be developed and submitted to BPA. Following this, AMPG will finalize the two agendas and send the revised version to the COTR. AMPG, ISA and Bonneville staff will participate in both pretest and interviewer/supervisor training.

Figure 4 indicates the areas of training to be included in the two-day training session and whether the material will be presented by Bonneville, AMPG or ISA staff. All interviewers and supervisors will attend the two-day training session. In addition, subsequent training will be provided for supervisors.

AMPG and ISA will audiotape all training of interviewers and supervisory staff. Should additional interviewers be needed or retraining required, all training information would be documented and available for review.

Having Bonneville, AMPG and ISA staff jointly direct the interviewer training assures that each interviewer is familiar with all aspects of the work he or she will be performing and will be capable of answering respondent's questions knowledgeably. ISA also has the capability to monitor interviews visually and verbally both on-site and remotely using telephone lines. In addition to ISA supervisors, AMPG will monitor interviews during the first evening of each phase of the study and will monitor periodically during the entire project.

As a part of the internal pretest training, supervisors will complete survey records. These will also be checked for accuracy in the response coding. Any problems encountered will be corrected immediately either by retraining or by terminating an interviewer who does not perform to our standards.

FIGURE 4 Interviewer Training for 1992 Pacific Northwest Residential Energy Survey -- Phase I			
TRAINING AREA	AGENCY PROVIDING TRAINING		
	Bonneville	AMPG	ISA
The background, objectives, and scope of the 1992 Residential Energy Survey			
Survey parameters (evenings/weekends, hours, numbers of residential households, sampling domains, etc.)			
Technical training on energy equipment; implications of equipment used in combination			
Review of standard interviewing principles and techniques			
Introduction of the survey instrument, quality requirements and potential technical issues			
Documentation of all telephone surveys (including procedures and forms)			
Techniques for increasing response rates			
Review of CATI procedures and internal pretesting of survey on CATI equipment			
Monitoring of internal pretesting (Random "listening in" or spot checking)			
Summary feedback to interviewers based on monitoring of internal pretesting and review of survey records/documentation			
Additional issues of concern			

All interviewers will participate in internal training in which each pretests the survey on ISA and/or AMPG staff. This will allow each to become familiar with the instrument and the range of responses that might be given. Interviewers will all have had experience in CATI surveying, but CATI procedures will be reviewed in relation to completion of this particular survey instrument.

Supervisory personnel (field supervisors, project supervisors, editors, and monitors) will also participate in the interviewing training.

Following Subtask 2.1 and 2.2, AMPG will draft and submit to the BPA a final report on interviewer training and supervision. Following input and revisions, the final report will be submitted.

Task 3: Conducting Pretest

A large-scale survey requires a complete walk-through of the entire survey process, including data entry and analysis.

Again, AMPG and ISA will conduct the pretest prior to the actual training of all interviewers. This approach will ensure that interviewers are trained on the final procedures as well as the final survey instrument in a single session, as opposed to conducting training before the pretest and then retraining to accommodate any changes required as a result of the pretest.

The pretest will be conducted in Sampling Domains 23, 13, and 33. ISA will begin calling numbers at the end of the file. BPA anticipates that these domains will have the greatest number of potential problems; thus, they will be used in the pretest.

The pretest will serve at least four purposes. A comprehensive pretest will:

- Test each step of the procedures (including CATI operations, survey documentation, and maintenance of five data file types, among others) and reveal possible flaws or problems that can be corrected or dealt with prior to the full survey;
- Test all survey questions to reveal possible problems that can be examined and reworked prior to the full survey;
- Yield preliminary estimates of response rates for each step in the survey (and estimates of the five file types discussed in Task 4); and
- Provide an opportunity for preliminary survey outcomes to be reviewed by AMPG, ISA and Bonneville staff.

Subtask 3.1 - Training Pretest Interviewers

AMPG recommends that the formal external pretest extend beyond the one interviewer recommended in the RFP. Rather, AMPG recommends that three interviewers be

trained in pretesting techniques and each participate in the formal pretest. Utilizing three interviewers will allow a greater number of potential problems or concerns to surface quickly and be addressed in a comprehensive manner.

Subtask 3.2 - Conduct Pretest

The pretest will involve a complete run through of all survey procedures. The three pretest interviewers will successfully complete 50 surveys over two days. The pretest will be conducted in waves to assure that a broad range of interviewing conditions are experienced. The first day will involve 20 completed surveys, followed by a debriefing with Bonneville, ISA and AMPG staff. All pretesting will involve full-use of CATI operations.

The pretesting will employ actual fieldwork procedures. This includes comprehensive documentation of every call. During the pretest, the five types of files outlined in Task 4 will be documented and tracked. In addition, multiple calls to numbers and other good-faith efforts will be made to produce a high response rate.

Results of the interviews will be reviewed at this time to determine if there are any problems in the instruments or in the training of interviewers that are apparent from the completed responses. For the pretest, ISA and AMPG will also do a 100 percent logic check of the data to determine any potential errors.

Subtask 3.3 - Analysis of Pretest Results

The results of the pretesting undertaken in Subtask 3.2 will be analyzed by ISA and AMPG staff in consultation with the Task Team and COTR. Recommendations for changes in procedures, survey questions, etc. will be made following each pretest wave. After approval, these changes will be implemented.

The pretest will include the creation of the five types of computer files outlined in Task 4. At each day of the pretest, these computer files will be monitored to assure both that the interviewers are correctly coding the call and the files themselves are tracking all pretest results. At the end of the pretest the five types of files will be produced in SAS format on floppy disk and be submitted to the COTR and Task Team to guarantee that there are no problems in reading the data.

Subtask 3.4 - Documentation on Pretest Results

Upon completion of the pretest, AMPG will submit to the COTR and Task team a report of the pretest methodology, analyses, changes and outcomes. In addition, AMPG will also produce a complete set of frequencies for the data, together with the appropriate statistics. This will yield preliminary outcomes both in terms of survey outcomes and response rates.

AMPG anticipates that it will include in this report a projected schedule of the number of calls per day/week needed to complete 20,000 residential interviews during the anticipated 14 weeks of fieldwork.

Task 4: Conducting Fieldwork

Based on the completion of the pretest and approval from the COTR, AMPG and ISA will conduct the fieldwork over a 14-week period. The supervisory staff will monitor -- unbeknownst to the interviewer -- calls at random. During the first weeks of interviewing, both AMPG and ISA staff members will monitor the fieldwork. Any problems related to individual interviewers will be addressed and corrected. If correcting the problem is not possible, the interviewer will be terminated.

In addition, AMPG and ISA staff will hold post-surveying briefings during the first weeks to provide feedback of a general nature to interviewers. This will also allow interviewers to raise questions related to technical issues or successful techniques in increasing response rates.

ISA anticipates that on any given day of fieldwork, 24 interviewers will be surveying at CATI stations.

During this time period, AMPG and ISA will develop daily progress reports on each of the five data files:

- Telephone Call Disposition File (TCDF)
- Telephone Respondent Information File (TRIF)
- Telephone Data File (TDF)
- Telephone Successful Completions File (TSCF)
- Flagged Successful Completion File (FSCF)

The relationship of these files is presented in **Figure 5**. Outcomes of the field work will be reported to the COTR and Task Team in weekly and monthly reports (see Task 7: Reporting).

Figure 5
Five Types of Data Files
1992 Pacific Northwest Residential Energy Survey

Subtask 4.1 - Telephone Calls Disposition File (TCDF)

The outcome of every call during the entire duration of the study will be contained in the Telephone Calls Disposition File (TCDF). This will include numbers which are busy, disconnected, FAX machines, telephone answering machines, non-residential numbers, immediate refusals, no pick up, etc. Each will be documented and the results of each will be tallied at the end of every survey day.

Interviewers will make four attempts to reach each number. For unsuccessful contacts for which there is: an answering machine; no pick up; busy signal; or no individual over the age of 18 at home during the call. Three follow-up attempts will be made on separate days of the week. After four unsuccessful attempts, the number will be coded as "unable to contact". AMPG and ISA will provide documentation of all "good faith" efforts to reach numbers. (This includes times, dates and outcomes of every effort.) AMPG proposes that four rings constitutes a no-answer call.

Documentation in the TCDF will contain the:

- Interviewer's identification number;
- Date of first (second, third, and fourth) call;
- Time of first (second, third, and fourth) call;
- Scheduled call back time (if applicable) for interview;
- 10-digit telephone number;
- Identification of sampling domain;
- Outcome of the attempt to contact (including first, second, third and fourth calls);
- Final disposition of the telephone number (including rationale for resident's non-participation); and
- Interviewer's comments (as needed).

As stated earlier, all calls will be reviewed by an editor to assure the validity of the data. At the close of every survey day, AMPG and ISA staff will review the number of entries in the TCDF. The relationship between this file and the Telephone Successful Completion File (TSCF, see Subtask 4.4) will be examined. AMPG will adjust the number of interviewers and/or calls per day to assure that all work is successfully completed within the project's timeframe.

Subtask 4.2 - Telephone Respondent Information File (TRIF)

Data from those willing to begin the survey will be contained in the Telephone Respondent Information File (TRIF). This file will contain data on residents who accept

a call and indicate a willingness to participate in the study. The information collected will include, at a minimum:

- Interviewer's identification number;
- Date of call;
- Time of call;
- 10-digit telephone number (including confirmation or modification of the number);
- Identification of sampling domain;
- Unique site identifier (serving as a key field in all files);
- Final disposition of the telephone number (including rationale for resident's partial completion); and
- Interviewer's comments (as needed)

As will be the case in all calls, the interview will be reviewed by an editor to assure validity of the data. At the close of every survey, AMPG and ISA staff will review the entries in the TRIF. Possible means of increasing the completion of surveys will be examined. AMPG will give specific attention to residents' rationales for non-completion. Any issues that can or should be clarified will be addressed with the interviewers.

Subtask 4.3 - Telephone Data File (TDF)

All the information recorded by the interviewers during each interview, regardless of its being successfully completed, will be contained in the Telephone Data File (TDF). At a minimum it will contain all the information recorded in the TRIF (including the unique site identifier) and a field for each survey item completed. In addition, encoding and decoding procedures will be outlined.

AMPG anticipates that some residents will not complete the entire survey. Some will decide to discontinue several minutes into the survey. Other survey items will be refused, missing, or incomplete. Again, AMPG will work with the COTR and Task Team to determine the appropriate handling of incomplete or "missing" responses.

Subtask 4.4 - Telephone Successful Completions File (TSCF)

All completed survey data will be contained in the Telephone Successful Completions File (TSCF). This file will be a subset of the TDF. At the close of the 14 weeks of fieldwork, the TSCF will contain a minimum of 20,000 completed surveys across all 15 sampling domains.

Subtask 4.5 - Flagged Successful Completions File (FSCF)

As is the case in any large survey, some data is eliminated because it does not pass quality control. This could include incidents of conflicting or illogical responses or respondent's inability to understand the purpose or content of the questionnaire.

AMPG and ISA staff will carefully monitor the FSCF to determine if additional question clarification is needed or data requests are in any way misleading. Findings of these reviews will be shared with the COTR and Task Team. When appropriate, methods will be taken to alleviate the problems.

All telephone fieldwork will be completed by the second week in December.

Subtask 4.6 - Fieldwork Report

AMPG will report to the COTR and Task Team the outcomes of the fieldwork. This will include charts and graphs of weekly calls, completed surveys, etc. In addition, qualitative data related to the fieldwork procedures will be outlined in the report.

Task 5: Reducing Data

ISA utilizes the most commonly used research marketing software in the United States: Survent Software and Mentor Software, both developed by the Computers for Marketing Corporation. Survent is the CATI software; Mentor is utilized for data processing and analyses. The programs are fully interactive. In addition, they can easily be transferred into ASCII files and read by numerous programs, including SAS. The SAS dataset will be analyzed by AMPG and both the dataset and analyses provided for Bonneville.

Subtask 5.1 - Quality Review

Following the survey pretest, AMPG will prepare an "Agenda for Quality Review of the Five Data Files". This draft will be reviewed by the COTR and Task Team prior to finalization. AMPG anticipates that the agenda include such items as:

- Review schedule of files for completeness, correctness and accuracy;
- Appropriate disposition of each call, including respondents and non-respondents;

- Handling miscoding and incorrect keypunching, including out-of-range codes;
- Cataloging/coding of interviewers' comments;
- Handling of Flagged Successful Completions File surveys; and
- Items which must be referred to the COTR or Bonneville staff.

The agenda developed under Subtask 5.1 will serve as the basis for a comprehensive and documented quality control. AMPG will work with the COTR in developing and refining the agenda items to be included. In addition, AMPG staff will provide instructions of the editing procedures and implementation process for both supervisors and interviewers.

As stated earlier, both AMPG and ISA supervisory staff will monitor the interviews during both the pretest and the first weeks of the study. Issues related to quality control will be fully reviewed at daily debriefing sessions. All results and outcomes will be shared with the COTR. ISA will continue to monitor interviewers throughout the course of the study.

ISA utilizes control mechanisms that detect out-of-range codes and internal inconsistencies. This includes the editor review as well as the frequencies that identify miscoding or keyboard errors. All data in each of the files will be examined to insure that it is clean. Any survey with questionable data will be flagged and added to the FSCF. If needed, interviewers will be contacted to verify the data.

Subtask 5.2 - Transfer of Data Files

Through its Survent and Mentor Survey, ISA has the capability to generate any or all of the survey data files at any point during the course of the project. Upon request from Bonneville, we will generate copies of these data files in an automated and hard copy format, along with any summary statistics identified.

At the conclusion of fieldwork, AMPG staff will clean and verify all five files. In the course of this process, all data will be reviewed for out-of-range codes and internal inconsistencies. Any errors or abnormalities in the data identified through this process will be documented through appropriate updates to the Flagged Successful Completion Files. Any such cases will also be investigated through follow-up with the interviewer as appropriate.

Following this cycle of data cleaning, clean, complete and useable copies of all five files will be delivered to Bonneville.

Subtask 5.3 - Training Bonneville Staff

AMFG and ISA staff will provide a one-day training session for Bonneville staff at a location of BPA's choice. This training will walk Bonneville staff through the data collection, file management, coding, and analyses. The training will be limited to SAS datasets and analyses. AMPG will provide "user friendly" code books and outprint to assist BPA staff in accessing and utilizing the files.

AMPG will be available for technical assistance to BPA staff throughout the project. We anticipate that utilizing SAS datasets may necessitate additional technical assistance beyond the one-day training session. As such, AMPG staff members will be available to assist BPA personnel following the formal training.

Subtask 5.4 - Data-Reduction Documentation

AMPG will document all survey procedures and data manipulations in a thorough and comprehensive manner. It will be particularly important to document manual and computerized data-reduction activities so that they might be fully utilized by BPA subsequent to the study.

AMPG will develop a complete **"User Operating Manual for PNWRES92 Datasets"**. This will include a complete description of and output of program listings and actual runs. The documentation will specify the disk characteristics and the layout of files on the disks, together with the formats of the files.

Among the materials provided by AMPG will be: quality review assurances and documentation; decision rules adopted by the study after review with BPA; descriptions of task input and outputs, etc. AMPG will work closely with the COTR and Task Team to determine that all appropriate subject areas are included.

The data/reduction report will include a summary of the procedures and decisions outlined above. AMPG will submit the draft report of the study. Following input and revisions, the final report will be submitted to BPA.

Task 6: Producing Sample Statistics

AMPG will be responsible for manipulating all SAS datasets and developing all data output, including frequencies, ranges, breakdowns, crosstabulations, and other statistics and computer runs. Following all data collection, cleaning and verification, AMPG staff and the COTR will review the data analysis plan. This plan will serve as the "road map" in undertaking all analysis. AMPG anticipates that the data analysis plan will be revised throughout the course of the project.

Again, AMPG will provide documentation on the formats of all files and updated versions of the codebook, if necessary, embodying any changes that may have been made in codes in processing and cleaning data.

Subtask 6.1 - Estimates/Variations of Special Interest

AMPG recognizes that there are issues of special interest to Bonneville. These issues will receive high priority in terms of data analysis. Among those interests identified by Bonneville are calculations related to:

- Percent of homes using electricity as its primary source of space heating;
- Percent of housing units using electricity for: space heating; water heating; cooking; etc.
- Single-family housing units as a percent of all housing units, and
- Manufactured homes as a percent of all housing units.

AMPG will also conduct analyses by:

- BPA Service Area Boundaries--specifically the six Sample Design Subregions in relation to the four Area Office Subregions;
- The entire Region and the six subregions;
- Each of the 15 non-empty sampling domains;
- Each of the three types of utilities; and
- Each of Bonneville's four Area Offices.

The intent of these analyses is to determine estimates and variances among the groups. AMPG also recognizes that over the course of the study additional special interests may surface among BPA staff members. An analysis plan for these issues will be presented in a separate document that will be delivered in draft form for COTR approval during the first week of November 1992.

AMPG has had extensive experience conducting large-scale data analyses for samples as large as the one outlined by Bonneville. In doing so, AMPG staff have

learned to conduct exhaustive data analyses but to parsimoniously present narrative that focuses on the prime concerns of the client. The advantage of the design of this research is AMPG's involvement in data collection, management and analysis as well as BPA's subsequent access to the same SAS datasets. Any special interests that surface after the completion of the study will be handled by AMPG/ISA-trained Bonneville staff.

AMPG will prepare both draft and final revisions of the estimates and variances. The draft report will be submitted to the COTR for input. The final report will incorporate recommendations from the COTR and Task Team.

Subtask 6.2 - Response Rates

AMPG will conduct the analyses approved by the COTR and Task Team. Following the data estimates and variances outlined in Subtask 6.1, AMPG staff will conduct an analysis of response rates for the survey. Among those analyses and comparisons to be conducted are:

- Response rates for the entire sample;
- Response rates for specific groups or circumstances:
  - Type of housing unit
  - Geographic region
  - Demographics variables (age, income, etc.)
  - Date
  - Time of day
  - Utility type
  - And other as needed;
- Proportion of calls in each of the five data files; and
- Proportion of calls falling outside the scope of the study (i.e., non-residential)

AMPG will submit the draft report on response rates. Following input and revisions, the final report will be submitted.

Subtask 6.3 - Report on Methodology

As is the case at the end of each major task, AMPG will prepare draft and final reports of the methodology and outcomes of all activities under Task 6. These interim reports will be summarized for inclusion in the final report.

Specifically at the close of Task 6, AMPG will provide Bonneville with all documentation on data management, coding, transferring, manipulations, analyses, etc. Included will be algebraic formulations (as needed) and relevant literature references.

The draft report on survey methodology and sample statistics will be written by AMPG senior staff and submitted to Bonneville. Following input and revisions, the final report will be submitted to BPA.

Task 7: Reporting

In addition to the frequently communication between AMPG and the COTR/Task Team, AMPG will submit formal written reports throughout the project on a weekly and monthly basis detailing the project activities and outcomes.

Subtask 7.1 - Weekly Summaries

Weekly reports will be submitted directly to the COTR. These reports will include both the current week's activities and the proposed activities for the following week. Among those items reviewed in the weekly report will be the status of:

- Project timeline, milestones, staffing and deliverables;
- Project documentation, including status of calls and number of total calls and number of successful completions
- Electronic file management systems/software;
- Specific problem identification and resolution;
- Any addition issues impacting the project.

During the weeks of fieldwork, AMPG will provide weekly summaries to BPA that include calls categorized by sampling domains and type of file. As stated earlier,

AMPG anticipates that the areas of special interest will increase during the study. These special interests will be incorporated into the weekly reports.

Subtask 7.2 - Quad-Weekly Progress Reports/Briefings

AMPG will submit to the COTR quad-weekly progress reports and briefings. Each report/briefing will include all activities of the previous four weeks. Reports will be concise and focus on progress toward project objectives and interim findings. All issues outlined under Subtask 7.1 will be included in the reports. In addition, the following will be a part of every quad-weekly report:

- Project progress, including project management graphics (Gantt and PERT charts);
- Any changes regarding the content and design of tables, manuals, training sessions, codebooks, etc.;
- Preliminary data runs, including frequencies, breakdowns, crosstabulations, etc., and accompanying narrative;
- Preliminary subject matter reports;
- Any proposed adjustments to the Detailed Workplan based on concerns/problems arising during the month (or anticipated during the coming month);
- Additional issues requiring client approval;
- Detailed description of the next month's work, outlined by week and by responsible staff member.

Every quad-weekly report will discuss those issues identified during the previous report for which action was pending. The results of the decisions/actions will be discussed in the current report.

Subtask 7.3 - Subject-Matter Reports

AMPG will prepare a series of subject-matter reports which include tables, charts, graphs, and narrative in camera-ready format. These subject-matter reports will contain the outcomes of Tasks 1 to 6 as outlined above.

AMPG has extensive experience in turning "raw data" into useful, readable documents for targeted or general audiences. AMPG staff will produce reports that are both easy-to-read and helpful. They will contain the degree of detail specified during earlier discussions with the COTR and Task Team.

Each report will contain the graphics and charts necessary to highlight the significant findings and draw appropriate conclusions. Reports will also be developed in a manner such that comparisons may be drawn. When appropriate, and in consultation with the COTR and Task Team, AMPG will draw relevant comparisons and contrasts based on the data.

AMPG will produce, at a minimum, the subject-matter reports outlined in the RFP. Many of these reports will involve "weighting" the data, a statistical procedure employed by AMPG staff on a routine basis in the analysis of survey data. The appropriate methodological issues will be taken into consideration in weighting any data collected for in the study.

The project reports produced by AMPG will include, at a minimum, those listed below.

Technical Appendix with all information related to the study's methodology, quality control procedures, sampling plan, survey instrument, interviewer training and monitoring, discussion and evaluation of the sampling error, among others.

Survey Results (Item-by-Item) for Each of the 15 Sampling Domains will be presented, at a minimum: "as observed" in each domain; across domains (or Regionally), and "weighted up to" the Region. This former process results in unbiased regional estimates and variances.

Pacific Northwest Region Crosstabulations will include selected survey items weighted up to the PNW Region. These crosstabulations will examine such variables as: type of residency; ownership; year of construction; residency size; type of space-heating fuel; household income; and utility type. The final selection of crosstabulations will be included in the "Data Analysis Plan" and approved by the COTR.

Area Office/Geographic Crosstabulations will be similar to the Pacific Northwest Region's Crosstabulations, being weighted up to specific geographic regions. These crosstabulations and areas to which their estimates will be "weighted up" are:

Area Office (weighted up to Puget Sound, Upper Columbia, Lower Columbia and Snake River Area Offices);

Sampling Domains (weighted up to the 15 sampling domain totals);

Washington (weighted up to the East/West split in Washington);

Oregon (weighted up to East/West split in Oregon);

Idaho (weighted up to state-level in Idaho);

Montana (weighted up to the Western portion of Montana);

Oregon (weighted up to East/West split in Oregon);

Utility Type Crosstabulations will be similar to the PNW Region's crosstabulations but with estimated weighted up to each of the three types of utilities--investor-owned, public generating, and public non-generating.

Spreadsheet-type System for Personal Computers

In addition to the subject-matter reports, AMPG will prepare an electronic system of tabulations for use on personal computers. AMPG will utilize Microsoft Excel in preparing the files. The files will be a spreadsheet-based system of tabulations that will be indexed by the Project Concordance (See Subtask 7.5). All files will be menu-driven.

In addition to the data tabulations, the spreadsheet-type system will contain menu-accessible graphics and charts to indicate project outcomes. AMPG will submit graphics and charts in Microsoft Excel, since this program provides higher quality graphics both on screen and in hard copy.

AMPG will complete the electronic spreadsheet and deliver it to Bonneville. AMPG will be responsible for the installation, operations, and maintenance procedures of the system. The system must meet the approval of the COTR.

Subtask 7.4 - Executive Summary and Project Concordance

All subject-matter reports will be summarized in an Executive Summary linked or indexed in Project Concordance. The Executive Summary will provide an overview of all major findings of the study, cutting across a wide range of geographic areas, utility types, demographic variables, and survey items. The Executive Summary will also briefly outline the project's background and objectives, methodology, and fieldwork. The specific content of the Executive Summary will be reviewed with the COTR.

AMPG will provide an executive summary that is concise and highlight the major findings of the study. In addition, it will be written in language that is understood by a wide audience.

A draft of both the Executive Summary and Project Concordance will be submitted to the COTR. After review by the COTR and Task Team, the revised materials will be sent to Bonneville.

Subtask 7.5 - Final Data Files and Software

Bonneville will receive from AMPG electronic copies of each of the five data files as well as their supporting software. AMPG will also provide a manual containing comprehensive instructions, data dictionaries, and codebooks. As outlined in the quality control procedures (See Figure 2), all files will be verified and cleaned. All manuals and instructions will meet pre-established standards and formats.

AMPG will submit the final data files, software and documentation directly to the COTR.

TIMELINE

The timeline presented in **Figure 6** presents AMPG's plan for completing all project activity within the allotted time of the contract.

APPENDIX B

SURVEY INSTRUMENT

This appendix contains the survey instrument used in the study.

Q# 1

Hello, this is _____, from AMPG.
We are conducting a survey
for the Bonneville Power Administration
to collect information about energy use in Pacific Northwest homes.

[PRESS ANY KEY TO GO ON]

=====

Q# 2

For this survey I need to speak with the person
who is over 18 who is the most knowledgeable person
about energy use in your home.
Would that be you?

[A13.2] 01 YES
02 NO

[IF RESPONDENT ANSWERS "DON'T KNOW," PROBE WITH:
Are you over 18?
Would you be comfortable answering questions about energy use
in your home, or do you think I should talk with somebody else?]

IF = 1, GO TO Q# 8

=====

Q# 4

May I speak with the person over 18 who is most knowledgeable?

[A15.2] 01 YES
02 NO, NOT CURRENTLY AVAILABLE (ARRANGE CALLBACK)
03 NO ONE WILLING TO CONDUCT INTERVIEW

IF = 2, GO TO Q# 6

=====

Q# 5

Hello, this is _____, from AMPG.
We are conducting a survey
for the Bonneville Power Administration
to collect information about energy use in Pacific Northwest homes.

[PRESS ANY KEY TO GO ON]

GO TO Q# 8

=====

Q# 6

When would be a good time to call back?

[RECORD NAME, DATE, AND TIME ON CALL-BACK SCHEDULE,
THEN TERMINATE. IF RESPONDENT ANSWERS "NEVER,"
CONSIDER IT A REFUSAL. IF NO DATE OR TIME IS GIVEN,
PROBE FOR AN APPROXIMATE DATE/TIME.]

[PRESS (CTRL) (END)]

TERMINATE

Q# 8

I want to emphasize that I am not selling anything,
and all of your answers will be kept strictly confidential.
Is this a good time to talk with you?

[A17.2]	01	WILLING TO CONTINUE
	02	DO NOT WISH TO CONTINUE NOW (ARRANGE CALLBACK)
	03	UNWILLING TO CONDUCT INTERVIEW

[PRESS ANY KEY]

=====

Q# 10

First, let me make sure I have your telephone number right.

Is this

** INPUT TELEPHONE NUMBER **

[A19.2]   01 YES
              02 NO
              03 DON'T KNOW

IF > 1, GO TO TERMINATE

=====

Q# 12

Your telephone number was selected at random to represent
homes throughout the Pacific Northwest.

Is this a home or a business?

[A21.2]   01 HOME
              02 BUSINESS
              03 OTHER

[IF RESPONDENT ANSWERS "DON'T KNOW"
OR THERE IS A PAUSE, PROBE WITH:
Does anybody live at this telephone number?]

[IF RESPONDENT ANSWERS "BUSINESS" OR "OTHER," CONFIRM BY ASKING:
So nobody lives at this telephone number?]

IF > 1, GO TO TERMINATE

=====

Q# 14

What is your home ZIP Code?

[A25.5] Zip code

[A11.2] Domain generated from Zip code

IF [A25.5=99999], GO TO TERMINATE

IF [A01.2] <> [A11.2] , CHECK LIST OF ZIP CODES IN INPUT DOMAIN

IF [A11.2] NOT ON LIST, GO TO TERMINATE

Q# 16

Now I would like to ask you some questions about your home.
Which of the following best describes your dwelling? Is it a ...

[READ LIST]

[A30.2]

- 01 Manufactured home [MOBILE HOME]
- 02 Single family house
- 03 Duplex [BUILDING WITH 2 UNITS]
- 04 Triplex [BUILDING WITH 3 UNITS]
- 05 Fourplex [BUILDING WITH 4 UNITS]
- 06 Building with 5 or more units [APARTMENT OR FIVE+ PLEX]
- 07 Other [DESCRIBE]
- 98 DON'T KNOW
- 99 REFUSAL

IF > 7, GO TO TERMINATE

=====

Q# 18

Do you own your home, rent it, or occupy it under some other arrangement?

- [A32.2]
01	OWN [OR BUYING/SOMEBODY ELSE IN HOUSEHOLD OWNS/BUYING]
02	RENT
03	OCCUPIED WITHOUT PAYMENT OR RENT
98	DON'T KNOW
99	REFUSAL

=====

Q# 20

In what year was your home constructed?

[PAUSE, READ LIST IF NECESSARY]

- [A34.2]
01	Before 1950
02	1950-59
03	1960-69
04	1970-78
05	1979-85
06	1986-88
07	1989-92
98	DON'T KNOW [PROBE]
99	REFUSAL

=====

Q# 22

In what year did you move into your home?

[PAUSE, READ LIST IF NECESSARY]

[A36.2]	01	Before 1950
	02	1950-59
	03	1960-69
	04	1970-78
	05	1979-85
	06	1986-88
	07	1989-92
	98	DON'T KNOW [PROBE]
	99	REFUSAL

IF Q22 > Q20 THEN RECHECK Q20 AND Q22

=====

Q# 24

What is the square footage of your home?

[PAUSE, READ LIST IF NECESSARY]

[A38.2]	01	Less than 750 square feet
	02	750 - 1,000 square feet
	03	1,000 - 1,250 square feet
	04	1,250 - 1,500 square feet
	05	1,500 - 1,750 square feet
	06	1,750 - 2,000 square feet
	07	2,000 - 2,500 square feet
	08	2,500 - 3,000 square feet
	09	3,000 or more square feet
	98	DON'T KNOW [PROBE]
	99	REFUSAL

IF Q# 16 > 2, GO TO Q# 30

=====

Q# 26

Does your home have a ....

[READ LIST; ENTER THE NUMBER NEXT TO THE FOUNDATION TYPE THE
RESPONDENT HAS]

PROMPT: What is the foundation type under the largest portion of your \Q16\

- [A40.2] 01 Basement
02 Crawl space
03 Concrete slab
04 Other [DESCRIBE]
98 DON'T KNOW [PROBE]
99 REFUSAL

=====

Q# 30

Do you have any cathedral or vaulted ceilings in your home?

- [A42.2] 01 YES
02 NO
98 DON'T KNOW [PROBE]
99 REFUSAL

[IF RESPONDENT ANSWERS "DON'T KNOW"
OR THERE IS A PAUSE, PROBE WITH:
These are also called vaulted ceilings.
Cathedral ceilings are usually higher than regular ceilings
and are slanted at the same angle as the roof.]

=====

Q# 32

Please tell me how many of each of the following
types of rooms you have in your home.

98 FOR DON'T KNOW, 99 FOR REFUSAL

Living rooms: [A44.2]
Kitchens with eating area: [A48.2]
Dining rooms: [A50.2]
Bedrooms: [A52.2]
Bathrooms: [A54.2]

Q# 38

Please tell me how many of each of the following
types of rooms you have in your home.

98 FOR DON'T KNOW, 99 FOR REFUSAL

Den, study, library or sewing rooms: [A56.2]
Family room or recreation rooms: [A58.2]
Utility or work rooms: [A60.2]
Other small rooms (80 square feet or less): [A62.2]
Other large rooms (More than 80 square feet): [A64.2]

IF Q# 16 < 3, GO TO Q# 46

=====

Q# 44

Now I would like to ask you a few questions about how you heat your home.
When you heat your home, do you primarily rely on ...

[READ LIST]

- [A66.2]
- 01 A central system that heats all of the units in your building, or
  - 02 A heating equipment that only heats your unit
  - 03 A heating system that only heats your unit
  - 04 HOME NOT HEATED
  - 98 DON'T KNOW [PROBE]
  - 99 REFUSAL
-

IF NOT = 03, GO TO Q# 92

=====

Q# 46

What fuel do you use most to heat your home?

[PAUSE, READ LIST IF NECESSARY]

- [A68.2]
- 01 Electricity (skip to Q50)
  - 02 Natural gas
  - 03 Fuel oil
  - 04 Wood or presto logs (skip to Q52)
  - 05 Propane or bottled gas
  - 06 Kerosene
  - 07 Coal
  - 08 Solar (skip to Q56)
  - 09 Geothermal (skip to Q56)
  - 10 Other [DESCRIBE] (skip to Q56)
  - 11 NO HEAT (skip to Q92)
  - 98 DON'T KNOW [PROBE] (skip to Q76)
  - 99 REFUSAL (skip to Q76)

=====

Q# 48

Which of the following types of
** Q# 46 **
heating equipment do you use most to heat your home?

[READ LIST]

[A70.2]

- 01 Steam or hot water system with radiators or pipes
- 02 Units that are permanently installed in the wall, floor, or ceiling
- 03 Portable units
- 04 Central furnace [FORCED AIR]
- 05 Other [DESCRIBE]
- 98 DON'T KNOW [PROBE]
- 99 REFUSAL

GO TO Q# 56

(See survhard for check fuels here - Q46 reverified for any "illegitimate" responses)

=====

Q# 50

Which of the following types of electric heating equipment
do you use most to heat your home?

[READ LIST]

[A72.2]

- 01 Heat pump
- 02 Portable room heaters
- 03 Radiant panels imbedded in the floor, ceiling, or wall
- 04 Steam or hot water system with radiators or pipes
- 05 Central furnace [FORCED AIR]
- 06 Baseboard or wall units
- 07 Other [DESCRIBE]
- 98 DON'T KNOW [PROBE]
- 99 REFUSAL

GO TO Q# 56

=====

Q# 52

Which of the following types of wood heating equipment
do you use most to heat your home?

[READ LIST]

- [A74.2]
- 01 Free-standing wood stove
  - 02 Free-standing pellet burning stove
  - 03 Central wood furnace with ducts to individual rooms
  - 04 Fireplace with an insert
  - 05 Fireplace without an insert
  - 98 DON'T KNOW [PROBE]
  - 99 REFUSAL

IF NOT = 5, GO TO Q# 56

=====

Q# 54

Does your fireplace have ...

[READ LIST]

- [A76.2]
- 01 Recirculating fan [HEATOLATOR]
  - 02 Glass doors on front
  - 03 None
  - 98 DON'T KNOW
  - 99 REFUSAL

=====

Q# 56

Do you use any other fuel besides
** Q# 46 **
to heat your home?

[B09.2]   01 YES
              02 NO
              98 DON'T KNOW
              99 REFUSAL

IF NOT = 1, GO TO Q# 76

=====

Q# 68

Other than
** Q# 46 **
what fuel do you use most to heat your home?

[PAUSE, READ LIST IF NECESSARY]

[B11.2]   01 Electricity
              02 Natural gas
              03 Fuel oil
              04 Wood or presto logs
              05 Propane or bottled gas
              06 Kerosene
              07 Coal
              08 Solar
              09 Geothermal
              10 Other [DESCRIBE]
              98 DON'T KNOW [PROBE]
              99 REFUSAL

IF = 1 GO TO Q# 70
IF = 4 GO TO Q# 72
IF > 7 GO TO Q# 76

=====

Q# 69

Which of the following types of
** Q# 68 **
heating equipment do you use most to heat your home?

[READ LIST]

- [B13.2]
- 01 Steam or hot water system with radiators or pipes
  - 02 Units that are permanently installed in the wall, floor, or ceiling
  - 03 Portable units
  - 04 Central Furnace [FORCED AIR]
  - 05 Other [DESCRIBE]
  - 98 DON'T KNOW [PROBE]
  - 99 REFUSAL
-

GO TO Q# 76

(See survhard for check fuels here - Q68 reverified for any "illegitimate" responses.
Same as for question Q48)

=====

Q# 70

Which of the following types of electric heating equipment
do you use most to heat your home?

[READ LIST]

- [B15.2]
- 01 Heat pump
  - 02 Portable room heaters
  - 03 Radiant panels imbedded in the floor, ceiling, or wall
  - 04 Steam or hot water system with radiators or pipes
  - 05 Central furnace [FORCED AIR]
  - 06 Baseboard or wall units
  - 07 Other [DESCRIBE]
  - 98 DON'T KNOW [PROBE]
  - 99 REFUSAL
-

GO TO Q# 76

=====

Q# 72

Which of the following types of wood heating equipment
do you use most to heat your home?

[READ LIST]

[B17.2]

- 01 Free-standing wood stove
- 02 Free-standing pellet burning stove
- 03 Central wood furnace with ducts to individual rooms
- 04 Fireplace with an insert
- 05 Fireplace without an insert
- 98 DON'T KNOW [PROBE]
- 99 REFUSAL

IF NOT = 5, GO TO Q# 76

=====

Q# 74

Does your fireplace have ...

[READ LIST]

[B19.2]

- 01 Recirculating fan [HEATOLATOR]
- 02 Glass doors on front
- 03 None
- 98 DON'T KNOW
- 99 REFUSAL

=====

Q# 76

In the past year, have you changed the fuel type you
use most to heat your home?

- [B21.2]
- 01 YES
  - 02 NO
  - 98 DON'T KNOW
  - 99 REFUSAL
-

IF NOT = 1, GO TO Q# 89

Q# 88

What fuel was used most to heat your home before you switched?

[PAUSE, READ LIST IF NECESSARY]

- [B23.2]
- 01 Electricity
  - 02 Natural gas
  - 03 Fuel oil
  - 04 Wood or presto logs
  - 05 Propane or bottled gas
  - 06 Kerosene
  - 07 Coal
  - 08 Solar
  - 09 Geothermal
  - 10 Other [DESCRIBE]
  - 98 DON'T KNOW [PROBE]
  - 99 REFUSAL

=====

Q# 89

During the winter, do you heat your home
more than half of the time between 9 am and 5 pm weekdays?

- [B25.2]   01 YES
              02 NO
              98 DON'T KNOW [PROBE]
              99 REFUSAL

IF Q# 46 = 2 OR Q# 68 = 2 OR Q# 78 = 2, GO TO Q# 92

=====

Q# 90

Is natural gas available in your neighborhood?

- [B27.2]   01 YES
              02 NO
              98 DON'T KNOW
              99 REFUSAL

=====

Q# 92

Next I would like to ask you some questions about air conditioning.
Do you have air conditioning in your home?

- [B29.2]
- 01 YES
  - 02 NO
  - 98 DON'T KNOW [PROBE]
  - 99 REFUSAL
-

IF NOT = 1 GO TO Q# 100
IF Q# 16 < 3, GO TO Q# 96

Q# 94

When you cool your home, do you primarily rely on ...

[READ LIST]

- [B31.2]
- 01 A central air conditioning system that cools all of the units in your building, or
  - 02 An air conditioning system that cools several units in your building, but not all
  - 03 An air conditioning unit that only cools your unit
  - 98 DON'T KNOW [PROBE]
  - 99 REFUSAL
-

IF NOT = 3, GO TO Q# 100

=====

Q# 96

What type of air conditioning system do you use most?

[READ LIST]

- [B33.2]
01	Central electric system
02	Central gas system
03	Evaporative swamp cooler
04	Heat pump
05	Individual window or wall units
98	DON'T KNOW [PROBE]
99	REFUSAL

IF NOT = 5, GO TO Q# 100

=====

Q# 98

How many window or wall air conditioning units do you have in your home?

[B35.2]   98 FOR DON'T KNOW, 99 FOR REFUSAL

IF Q# 16 < 3, GO TO Q# 102

=====

Q# 100

Now I would like to ask you some questions about how your water is heated.
Is most of the hot water you use heated by ...

[READ LIST]

[B37.2]

- 01 A central hot water system that heats water for all of the units in your building, or
- 02 A water heater that heats several units in your building, but not all
- 03 A hot water heater that only heats water for your unit
- 04 NO HOT WATER IN HOME
- 98 DON'T KNOW [PROBE]
- 99 REFUSAL

IF NOT = 3, GO TO Q# 116

=====

Q# 102

What fuel do you use most for heating water in your home?

[PAUSE, READ LIST IF NECESSARY]

[B39.2]

- 01 Electricity
- 02 Natural gas
- 03 Fuel oil
- 04 Wood
- 05 Propane or bottled gas
- 06 Kerosene
- 07 Solar
- 08 Other [DESCRIBE]
- 09 NO HOT WATER IN HOME
- 98 DON'T KNOW [PROBE]
- 99 REFUSAL

=====

Q# 116

Now I would like to ask you some questions about the appliances
you use for cooking in your home.
What fuel does your stove top use?

[PAUSE, READ LIST IF NECESSARY; IF MORE THAN ONE, PROBE FOR THE FUEL OF
OF THE BURNERS USED MOST]

- [B41.2]
- 01 Electricity
  - 02 Natural gas
  - 03 Propane or bottled gas
  - 04 Kerosene
  - 05 Wood
  - 06 Other [DESCRIBE]
  - 07 No stove top burners
  - 98 DON'T KNOW [PROBE]
  - 99 REFUSAL

=====

Q# 118

How many ovens, not including microwave ovens or toaster ovens,
do you use for cooking?

[A DOUBLE-OVEN UNIT COUNTS AS TWO OVENS.]

[B43.2] 98 FOR DON'T KNOW, 99 FOR REFUSAL

IF = 0 OR > 97, GO TO Q# 122

=====

Q# 120

What fuel does your oven use?

[PAUSE, READ LIST IF NECESSARY; IF MORE THAN ONE, PROBE FOR THE FUEL OF
THE OVEN USED MOST]

[B45.2] 01 Electricity
02 Natural gas
03 Other [DESCRIBE]
98 DON'T KNOW [PROBE]
99 REFUSAL

=====

Q# 122

Do you have a microwave oven in your home
that you use at least occasionally?

[B47.2] 01 YES
02 NO
98 DON'T KNOW
99 REFUSAL

=====

Q# 124

Now I'm going to read you a list of other household appliances.
For each appliance, please tell me how many you have
in your home that you use, at least occasionally.

98 FOR DON'T KNOW, 99 FOR REFUSAL

Refrigerator: [B49.2]
Television: [B51.2]
Personal Computer: [B53.2]
Freezer, separate from refrigerator: [B55.2]
Dishwasher: [B57.2]
Clothes washing machine: [B59.2]
Clothes dryer: [B61.2]

=====

Q# 124A

Is your clothes dryer ...

If [B61.2]>0

[B63.2]	01 Electric
	02 Gas
	03 Other
	98 Don't Know
	99 Refused

=====

Q# 132

Do you have your own ...

[READ LIST; MARK ALL THAT APPLY]

[B65.2],[B67.2],[B69.2]

- 01 Swimming pool (ONLY VALID Q16=1,2)
- 02 Hot tub
- 03 Whirlpool bath [JACUZZI]
- 04 NONE
- 98 DON'T KNOW
- 99 REFUSAL

[A "HOT TUB" IS GENERALLY OUTDOOR, HEATED BY AN INDEPENDENT SYSTEM
A "WHIRLPOOL BATH/JACUZZI IS GENERALLY INDOOR, HEATED BY
CENTRAL SYSTEM (HOME WATER HEATER)]

IF > 3, GO TO Q# 144

IF NOT = 1, GO TO Q# 142

=====

Q# 140

What fuel do you use most to heat your swimming pool?

[PAUSE, READ LIST IF NECESSARY]

- [B71.2]
01	Electricity
02	Natural gas
03	Fuel oil
04	Propane or bottled gas
05	Solar [COLLECTORS OR PANELS]
06	Other [DESCRIBE]
07	NOT HEATED
98	DON'T KNOW [PROBE]
99	REFUSAL

[A "HEATED" POOL IS ONE WHICH USES SOME SORT OF MECHANICAL HEATING EQUIPMENT.

PASSIVE SOLAR, INCLUDING "SOLAR BLANKET" DOES NOT COUNT AS A "HEATED" POOL.]

IF Q# 132 NOT = 2, GO TO Q# 144

=====

Q# 142

What fuel do you use most heat your hot tub?

[PAUSE, READ LIST IF NECESSARY]

- [B73.2]
01	Electricity
02	Natural gas
03	Fuel oil
04	Propane or bottled gas
05	Solar [COLLECTORS OR PANELS]
06	Other [DESCRIBE]
07	NOT HEATED
98	DON'T KNOW [PROBE]
99	REFUSAL

[A "HEATED" HOT TUB IS ONE WHICH USES SOME SORT OF MECHANICAL HEATING EQUIPMENT.

PASSIVE SOLAR, INCLUDING "SOLAR BLANKET" DOES NOT COUNT AS A "HEATED" HOT TUB.]

=====

Q# 144

How many shower heads do you have in your home?

[B75.2]   98 FOR DON'T KNOW, 99 FOR REFUSAL

=====

Q# 146

Next, I'd like to ask a few questions about energy conservation.
Since you moved into your home, has any energy
professional inspected your home and advised you on
ways to make your home more energy efficient?

[B77.2]   01 YES [BOTH INSPECTED AND ADVISED]
              02 NO
              98 DON'T KNOW
              99 REFUSAL

IF = 1, GO TO Q# 150

=====

Q# 148

If contacted by your utility, would you be willing to have
an energy professional visit your home, at no cost to you,
and advise you on ways to make your home more energy efficient?

[C09.2]   01 YES
              02 NO
              98 DON'T KNOW
              99 REFUSAL

=====

Q# 150

Since you moved into your home,
has the state or your electric utility weatherized your home?

[C11.2]   01 YES
              02 NO
              98 DON'T KNOW
              99 REFUSAL

=====

Q# 151

Have you heard or read anything about any of the following programs?

Low interest weatherization loans

[C13.2]   01   YES
              02   NO
              98   DON'T KNOW
              99   REFUSAL

=====

Q# 152

Have you heard or read anything about:

Other utility or state weatherization programs

[C15.2]   01   YES
              02   NO
              98   DON'T KNOW
              99   REFUSAL

=====

Q# 153

Have you heard or read anything about:

Efficient appliance programs

[C17.2]   01   YES
              02   NO
              98   DON'T KNOW
              99   REFUSAL

=====

Q# 158

We'd like to know how you feel about the energy efficiency of your home.

I'm going to read you five statements.
Please tell me which one best describes how you feel
about the energy efficiency of your home.

[READ LIST WITH ANSWER NUMBERS]

- [C19.2]
- 01 My home is about as energy efficient as it can be
  - 02 A little improvement can be made
  - 03 A moderate improvement can be made
  - 04 A lot of improvement can be made
  - 05 A great deal of improvement can be made
  - 98 DON'T KNOW
  - 99 REFUSAL

=====

Q# 160

I am going to read you a list of five issues. As I read each issue
Please tell me how serious you consider the issue to be today in your state.

Use a scale of 1 to 5, where 1 means "Not serious at all"
and 5 means "Extremely serious." You may use any number between 1 and 5.

Not at all				Extremely	REFUSAL	DK
01	02	03	04	05	99	98

Environmental pollution: [C21.2]
The cost of energy: [C23.2]
Unemployment: [C25.2]
The scarcity of energy: [C27.2]
Crime: [C29.2]

=====

Q# 163

Do you receive a bill from your electric utility?

- [C47.2]   01 YES
              02 NO
              98 DON'T KNOW
              99 REFUSAL

IF NOT = 1, GO TO Q# 165

=====

Q# 164

What is the name of your electric utility?

- [C49.3]   998 FOR DON'T KNOW, 999 FOR REFUSAL, 997 IF NOT ON LIST
[A09.2]   Domain from electric utility

(See lists from Bonneville for Utility numbers)

=====

Q# 165

Finally, I'd like to ask you some questions about
the people who live in your home.

Your answers will be used for classification purposes only.
Is your home occupied on a year-round basis or on a seasonal basis?

- [C31.2]   01 YEAR-ROUND
              02 SEASONAL
              98 DON'T KNOW
              99 REFUSAL

=====

Q# 172

How many people, including yourself, normally live in your home?

[C33.2]   98 FOR DON'T KNOW, 99 FOR REFUSAL

IF > 97, GO TO Q# 179

IF > 1, GO TO Q# 174

IF > 9, RECONFIRM NUMBER OF PEOPLE IN HOUSEHOLD

=====

Q# 173

Are you ...

[C35.2]   01   Between 18 and 64 years old
              02   or 65 and over
              98   DON'T KNOW
              99   REFUSAL

GO TO Q# 179

=====

Q# 174

How many of the people that live in your home are:

98 FOR DON'T KNOW, 99 FOR REFUSAL

5 years old or less: [C37.2]

Between 6 and 17 years old: [C39.2]

Between 18 and 64 years old: [C41.2]

65 and over: [C43.2]

SHOULD TOTAL TO: ** Q# 172 **

IF Q172 <> Q174 RECONFIRM Q172 AND Q174

=====

Q# 179

What is the highest level of education that you have completed?

[PAUSE/READ]

[C45.2]	06	Trade/technical school
	05	At least one college degree
	04	Some college
	03	High school graduate
	02	Some high school [GRADES 7 - 11]
	01	Grade school [GRADES K - 6]
	98	DON'T KNOW
	99	REFUSAL

=====

Q# 186

Was your total household income before taxes for 1990
above or below \$25,000?

- [C52.2]
- 01 BELOW \$25,000
  - 02 ABOVE \$25,000
  - 98 DON'T KNOW
  - 99 REFUSAL

[IF RESPONDENT ANSWERS "25,000," TYPE 02]

IF > 2, GO TO Q# 190
IF = 2, GO TO Q# 189

=====

Q# 188

Would that be ...

[READ LIST]

- [C54.2]
- 01 Less than 5,000 dollars
  - 02 Between 5,000 and 10,000
  - 03 Between 10,000 and 15,000
  - 04 Between 15,000 and 20,000
  - 05 Between 20,000 and 25,000
  - 98 DON'T KNOW
  - 99 REFUSAL
-

GO TO Q# 190

=====

Q# 189

Would that be ...

[READ LIST]

- [C56.2]
- 01 Between 25,000 and 30,000 dollars
  - 02 Between 30,000 and 40,000
  - 03 Between 40,000 and 50,000
  - 04 Between 50,000 and 60,000
  - 05 Between 60,000 and 80,000
  - 06 Between 80,000 and 100,000
  - 07 100,000 or more
  - 98 DON'T KNOW
  - 99 REFUSAL

=====

Q# 192

In addition to the types of fuel you use, we are interested in the
amounts of electricity and natural gas you use.

Would you be willing to authorize your electric utility
and natural gas company
to provide this information to us?

- [C58.2]
- 01 YES
  - 02 NO
  - 98 DON'T KNOW
  - 99 REFUSAL

IF NOT = 1, GO TO Q# 200

3 OF 3

=====

Q# 195

In that case can I get your name and address?

ENTER FIRST NAME, THEN LAST NAME: [D09.30]

Q# 196 - 197

What is your address?

ENTER STREET ADDRESS ON FIRST LINE: [D39.30], [E09.30]

ENTER CITY: [E39.30]

ENTER STATE: [E69.2]

=====

Q# 200

In about one year, Bonneville Power Administration
will be conducting in-person interviews with some of the people
we are talking with now.
Can we re-contact you at that time?

[C60.2]   01 YES
              02 PROBABLY
              03 PROBABLY NOT
              04 NO
              98 DON'T KNOW
              99 REFUSAL

IF Q# 192 = 1, GO TO END
IF > 2, GO TO END

=====

Q# 202

In that case can I get your name and address?

ENTER FIRST NAME, THEN LAST NAME: [D09.30]

=====

Q# 204 - 205

What is your address?

ENTER STREET ADDRESS ON FIRST LINE: [D39.30], [E09.30]
ENTER CITY: [E39.30]
ENTER STATE: [E69.2]

=====

Respondent gender:

[C77]   1 Male
             2 Female

=====

Q# 400

This concludes our survey. Thank you very much for your time
and the useful information you have provided us.

[PRESS ANY KEY]

TERMINATE

=====

APPENDIX C

TRAINING REPORT

Appendix C contains the training report, a summary of all activities relating to the training of interviewers and supervisors.

The 1992 Pacific Northwest Residential Energy Survey-- Phase I (PNWRES92-I)

TRAINING REPORT

September 1992

**Prepared for:
Bonneville Power Administration
Portland, Oregon**

**Prepared by:
Applied Management & Planning Group
Los Angeles**

**Work Performed under Contract No.: DE-AC79-92BP25174
OMB Control Number 1910-1200**

On Thursday September 3, 1992 interviewer and supervisor training was conducted for the 1992 Pacific Northwest Residential Energy Survey-- Phase I (PNWRES92-I). Training sessions were held from 3:00-5:00 p.m. and from 5:00-7:00 p.m. Nineteen interviewers and three supervisory personnel participated in these sessions.

The training was provided by David Mills and Wendy Lin-Kelly of the Bonneville Power Administration (BPA), Mary Kay Stout and Lande Ajose of the Applied Management & Planning Group (AMPG) and Alan Tarko of Interviewing Service of America (ISA).

The agenda for the day was as follows:

Welcome/Introduction of Project Team	AMPG/ISA
The Background, Objectives and Scope of PNWRES92-I	BPA
Survey Parameters (evenings/weekends, hours, numbers of residential households, sampling domains, etc.)	ISA
Introduction of the survey instrument, quality requirements and potential technical issues)	BPA
Documentation of all telephone surveys/Case ID and verification (including procedures and forms)	ISA
Monitoring of internal pretesting (Random "listening in" or spot checking)	AMPG
Additional issues of concern/Interviewer and supervisor questions	AMPG/ISA/ BPA

The sections below describe what took place under each of the agenda items.

Welcome/Introduction of Project Team

Mary Kay Stout of AMPG welcomed the interviewers to the training. AMPG, BPA and ISA project staff introduced themselves and described their areas of responsibility. The field staff introduced themselves and identified themselves as either an interviewer or a supervisor.

Background, Objectives and Scope

Wendy Lin-Kelly described the history and goals of PNWRES92-I to the interviewers and supervisors. She explained that two other residential energy surveys had been conducted by BPA to date, one in 1979 and the second in 1983. The surveys were on-site visits where interviewers actually went to customer homes to obtain data. Because of the nature of the survey only 4,000 homes were surveyed. PNWRES92-I differs significantly from previous surveys in that the survey is a telephone survey using a CATI system. This will allow BPA to survey 20,000 households in eight states.

The purpose of PNWRES92-I is to project energy use in the Pacific Northwest given the tremendous rate of growth and the increasing scarcity of energy sources. The information collected will provide baseline data for forecasting energy consumption and help BPA to further develop energy conservation programs. In addition, a sample of residences will be drawn from the respondents in this study to participate in Phase II of the study: on-site visits.

Because baseline data will be generated from this survey, BPA emphasized the necessity of quality data. BPA also acknowledged interviewers as "experts" in data collection because of their ability to probe for more specific responses and keep respondents on the line for the entirety of the survey, among other skills.

Survey Parameters

Alan Tarko of ISA explained the survey parameters to the field staff. Among these were:

- Dialling will occur on both weekdays and weekends.
- The states being telephoned are in the mountain time zone as well as the pacific time zone. On weekends dialing will be from 9:00 a.m. until 5:00 p.m.
- On weekdays phone calling will begin at 4:00 p.m. and end at 8:30 p.m. for residences in mountain time. For residences in the pacific time zone, dialing will begin at 5:00 p.m. and terminate at 9:30 p.m.
- The region to be surveyed is composed of 15 calling domains. Interviewing will begin in five domains on September 3 and will expand to all 15 domains by September 10.

- Two teams will be calling every night. Weekday shifts will be comprised of 24 interviewers a day. We are anticipating 220 complete surveys per day.
- On Labor Day, Thanksgiving Day and the day before Thanksgiving Day there will be no dialing. All dialing will be completed prior to the second week of December.

The Survey Instrument, Quality Requirements and Potential Technical Issues

---

David Mills provided background on BPA. He described BPA as "wholesalers" of energy in the Pacific Northwest. BPA is not a utility through which customers purchase their energy, but a generating source which sells power to utilities, who in turn pass it on to their customers. As a generating source, BPA is particularly concerned with the conservation of energy because it is aware of how limited resources will become in the future. The need to fully understand the conservation issues facing the Northwest prompted BPA to undertake this study.

At this point during the training interviewers and supervisors went through the survey instrument on the CATI system. Prior to the training, interviewers were given training manuals which explained various questions in the survey. Supervisors were also given manuals explaining the methodology. As we went through the survey, interviewers had the opportunity to ask additional questions about specific survey questions. David Mills was able to elaborate on potentially difficult issues which the interviewer might encounter. Among the issues which arose were:

- The definition of a crawl space
- How to account for partial rooms (i.e. 1 1/2 bathrooms)
- The distinction between fireplaces with inserts vs. those without.
- Wood burning pellets
- The availability of natural gas in the Pacific Northwest
- The role of ranking questions
- The importance of accuracy in recording customer name and billing address
- The purpose of the confirmation screen.

David Mills also emphasized that there are some regional issues in the Pacific Northwest that respondents might bring up during the survey. These included the depleted salmon in the Columbia River and nuclear power. In the event that respondents use this survey as a platform to discuss or ask questions about these issues, interviewers should use the "special" screen. At any point during the survey interviewers can type "special," and a number of statements will appear on the screen instructing the interviewer how to handle specific situations. For example, if respondents are hesitant about the legitimacy of the survey and would like to confirm its authenticity, they can be referred to the Bonneville 800 number.

Documentation

Interviewers were instructed to follow normal ISA operating procedures for completing Case ID sheets. They were also informed that phone calls would be verified, and that they were to give the respondent their name and say that they were calling from AMPG Research.

It was also noted that all surveys completed on the mainframe would also be backed up on tape. ISAs quality control team will also be editing all completed surveys.

Monitoring

Mary Kay Stout informed the field staff that AMPG, BPA and ISA staff would be monitoring phone calls throughout the course of the study, with particular emphasis on the first few weeks. At the end of the first night of calling, each team reconvened with the project staff to discuss how the calling went and to receive and give feedback.

Additional Issues of Concern/Questions

Interviewers and supervisors were given an opportunity at the end of each training session to ask questions. The field staff was told that the project staff wanted to remain accessible. If any questions arose through the course of the survey, they should be directed to Alan Tarku who will direct it to the appropriate project staff person.

APPENDIX D

INTERVIEWER'S MANUAL

The Interviewer's Manual was distributed to all interviewers who conducted PNWRESM92-I.

1992 Pacific Northwest Residential Energy Survey

Interviewer's Manual

September 1992

**Contract Number DE-AC79-92BP25174
OMB Control Number 1910-1200**

1992 Pacific Northwest Residential Energy Survey Interviewer's Manual

This document comprises the Interviewer's Manual for the 1992 Pacific Northwest Residential Energy Survey (PNWRES92), a telephone survey of Pacific Northwest (PNW) residences. The Manual is organized in four sections:

1. Survey Background
2. Description of the Sample
3. General Interviewing Instructions
4. Question-by-Question Instructions.

1. SURVEY BACKGROUND

PNWRES92 is sponsored by the Bonneville Power Administration (BPA). The purpose of PNWRES92 is to collect basic information about the energy-related characteristics of residences in the Pacific Northwest. The characteristics of interest include:

- Characteristics of the housing structure, such as square footage and type of foundation
- Characteristics of energy-using equipment, such as the fuels used for space heating and water heating
- Characteristics of the occupants, such as the number of occupants and annual household income
- Attitudes toward energy-related issues.

The data collected in PNWRES92 Phase I will be used to:

- Improve forecasts of PNW residential energy consumption
- Plan PNW residential energy conservation programs.

In addition, BPA is considering conducting an on-site (i.e., in-person) survey of residences in 1993. The data collected in PNWRES92 would be used to provide the list of residences from which a sample for the on-site survey would be selected.

2. DESCRIPTION OF THE SAMPLE

The sample consists of 200,010 randomly generated 10-digit numbers that are believed to be the telephone numbers of PNW residences. From these 200,010 numbers, 20,001 interviews will be completed. For the purpose of this survey, the Pacific Northwest is defined as the states of Idaho, Oregon, and Washington, western Montana, and small parts of California, Nevada, Utah, and Wyoming.

3. GENERAL INTERVIEWING INSTRUCTIONS

Each interviewer working on this survey should have already completed general training in interviewing techniques and use of the Computer Aided Telephone Interview (CATI) system to be employed in the survey. During this training, you should have become familiar and comfortable with the following topics:

1. Types of questions
  - a. open-ended versus closed response questions
  - b. single choice versus multiple choice questions
  - c. use of rating scales
2. Reading questions
  - a. following wording exactly
  - b. reading entire question before accepting answer
  - c. following question sequence exactly
  - d. not "directing" the respondent towards a particular answer
3. Use of clarification
  - a. clarifying a question only when the respondent requests more information
  - b. types of clarifications
4. Probing for answers
  - a. types of probes
  - b. probing techniques
  - c. importance of neutral probing
  - d. probing a "don't know" answer at least once
  - e. use of neutral prefaces
5.
  - a. giving feedback for good performance, not good content
  - b. giving feedback for acceptable performance 30 - 50 percent of the time
6. Record-keeping

If you are not familiar or comfortable with any of these issues, you should ask your supervisor for assistance.

There are several features of this survey that may be different from other surveys on which you have worked. These features include:

1. Words printed on the screen in ALL UPPER-CASE (i.e., "ALL CAPS") are instructions to you, the interviewer, and should not be read to the respondent.
2. Many of the questions are fairly technical (e.g., Question 24 asks about the square footage of the residence, and Question 50 asks about the type of electric space heating equipment that the household uses). If the respondent is not sure of the answer to a technical question, do the following.
  - a. Prompt all "don't knows" at least once.

- b. If the question is numeric (e.g., square footage), ask the respondent which category he or she thinks is the closest; as a last resort, ask the respondent to make a "best" or "educated guess."
- c. If the question is categorical (e.g., heating equipment type), ask the respondent to describe the component. If you can determine the correct category from the description, state the category to the respondent. If he or she does not disagree, enter that category. If the respondent disagrees with the category you determined, or if you cannot determine the correct category from the description, enter the response "Other" and type in the respondent's description.

4. QUESTION-BY-QUESTION INSTRUCTIONS

Many of the questions on this survey are fairly technical. It is important to collect responses to these questions that are as accurate as possible. It is therefore critical that you fully understand the definitions of the various technical concepts provided below, so that you are able to clarify and interpret responses.

4.1 Pre-Dialing

Prior to dialing the telephone (or instructing the computer to dial), a screen will appear indicating the telephone number to be called and other information about the respondent. When this screen appears, the first thing you should do is identify the "Sampling Domain" of the telephone number. This will be a two-digit number between 11 and 36, and will be printed on the last line of the screen.

Recognizing the Sampling Domain will be important during Question 14 when the respondent is asked for his/her home zip code. If the zip code corresponds with the Sampling Domain, the interview will continue. If the zip code is out of the study area, the interview will terminate. If the zip code is not in the Sampling Domain but is within the study area, the interview will continue and the call will be reassigned to the new Sampling Domain.

4.2 Screening Questions (Questions 2 - 14)

Questions 2 - 8

Because the survey is fairly technical, we only want to interview respondents who are 1) over 18 years old and 2) are knowledgeable about energy use in their home. If possible, we would like to interview the person most knowledgeable about energy use. Questions 2 - 8 are used to identify this person and, if he or she is not able to answer questions at the time you call, to schedule a call back.

Question 12

This is a survey of residences, which are defined as "a house, an apartment, a group of rooms, or a single room, occupied as a separate living quarters or, if vacant, intended for occupancy as a separate living quarters. Separate living quarters are those in which the occupants *live and eat separately from any other persons* in the building and which have *direct access from the outside or through a common hall.*" Question 12 is used to screen non-residences from the survey.

Question 14

Question 14 asks for the respondent's home ZIP code. Be sure to get the ZIP code at the respondent's home or billing address, and not a separate mailing address.

If the respondent's zip code corresponds with the Sampling Domain, the interview will continue. If the zip code is out of the study area, the interview will terminate. If the zip code is not in the Sampling Domain but is within the study area, the interview will continue and the call will be reassigned to the new Sampling Domain.

4.3 Housing Structure (Questions 16 - 38)

Question 16

Question 16 is both the last screening question and the first "substantive" question. It serves as a screening question, because if the respondent does not know the answer to the question, the interview will terminate. Therefore, make sure you prompt "Don't Knows" thoroughly. Read the responses immediately, as part of the question.

The question serves as a substantive question because this is the most important way to clarify residences. It is therefore critical that the question be answered accurately. A *Manufactured home* is a residence that was completely assembled elsewhere (including trailers and mobile homes) and then moved onto the site. It may be permanently fixed at the site now. A *Single family house* is a structure not physically connected to attached through common walls to any other housing units. Any home that is connected to another home through common walls falls in categories 3 - 6, depending on the number of housing units that are physically connected in the structure.

Questions 20 - 24

On these numerical questions, probe "Don't Know" responses with "which category do you think is closest." If the respondent is still unsure, but knows it is one of two categories, ask him or her to guess one of the categories -- it is more important on these questions to get an answer that is close than to not get an answer at all.

Question 26

Question 26 concerns the type of foundation the residence has. We are asking for a single response to this question; while residents may have more than one type of foundation, we asked that they respond with the foundation under the **largest portion** of the dwelling.

A *concrete slab* foundation is one in which the house sits directly on a "slab" of concrete, which sits directly on the ground; there is no air between either the house and the slab or the slab and the ground.

A *crawl space* is a foundation with air between the house and the ground. A crawl space must be enclosed (i.e., can only be entered through a door); if the foundation is not enclosed, enter "Other" and then type "Open."

A *basement* 1) has at least two complete walls below ground level, 2) is tall enough to stand up in, and 3) has a concrete (or other non-dirt) floor. Only enter "1" (Basement) if all three of these conditions are satisfied. Many houses have an area that the occupants consider to be a "basement,"

that do not satisfy all three of these conditions, and thus should not be counted as a basement in this survey. Three specific examples of such areas, and how you should handle them:

- If the area the occupant considers a basement is not tall enough to stand up in, but has at least two complete walls below ground level and a non-dirt floor, then the foundation is a crawl space, not a basement.
- If the area the occupant considers a basement has a dirt floor, but is tall enough to stand up in and has at least two complete walls below ground level, then the foundation is a crawl space, not a basement.
- If the area the occupant considers a basement has only one wall completely below ground, but has a non-dirt floor and is tall enough to stand up in, then the foundation is a concrete slab, not a basement. These areas are often referred to as "daylight basements" or "half basements"; they are actually not basements at all.

Many mobile homes have a "skirt" underneath them. If the skirt is enclosed, consider it a *crawl space*; if it is not enclosed, enter "Other" and then type "Open." Other manufactured homes sit on the ground; if there is a sheet of concrete between the manufactured home and the ground, consider it a *concrete slab*; if there is nothing between the ground and the manufactured home, enter "Other" and then type "None."

Question 30

Question 30 concerns the type of ceilings the home has. As indicated in the text of the question, *cathedral ceilings*, which are also called *vaulted ceilings*, are slanted at the same angle as the roof. Another characteristic of a vaulted ceiling is that there is no space between the roof and the ceiling. Most respondents who have cathedral ceilings will know what they are.

Questions 32 and 38

Questions 32 and 38 concern the number of rooms in the house of each type. Read each room type and wait for the respondent to provide a number. If any questions arise about whether or not to count a room, use the following rule: **only count a room that is heated**. For example, do not count unheated garages or unfinished, unheated basements that are used only for storage. If a respondent cannot decide whether to call a multi-purpose room a *Bedroom*, a *Den*, *study*, *library*, or *sewing room*, or an *Other small room*, have him or her pick the one he or she likes the best -- getting the number of rooms in particular size categories is more important than trying to get the precise use of each of these rooms and instead not getting anything at all. In these cases, make sure the room does not get counted twice.

If the respondent answers that they have a portion of a room, then round off. For example, if the respondent says that he/she has 2 1/2 bathrooms, type in "3" bathrooms. If on the other hand they say they have 2 1/4 bathrooms, type in "2".

If the respondent says that they have an unusual number of rooms (such as 5 kitchens), a screen will appear asking the interviewer to confirm the number of rooms. The interviewer should double check that the number of rooms he/she entered was correct.

4.4 Space Heating (Questions 44 - 90)

Question 44

Question 44 is asked only of respondents living in multi-family housing (e.g., duplexes, apartments). If their primary heating source is a central heating system for the whole building, we will not ask them any additional heating-related questions. If the respondent is not sure of the answer, ask if there are baseboard units on any of the walls, or a small furnace in a closet; if so, enter 3 (heating equipment that only heats your unit.)

Question 46

Many people use more than one fuel to heat their home. It is important in Question 46 to get the fuel that the household uses the *most* for space heating. If necessary, clarify that you want to know the fuel being using most *now* (or during the last heating season, if no heat is being used at the time of the interview).

Natural gas is a gas (non-liquid) delivered via underground pipes to a residence. *Fuel oil* is a liquid fuel, usually delivered in a truck and stored at the residence in a large tank. Kerosene is a liquid fuel, typically purchased at a store in a can. Propane or bottled gas is a gas that can be purchased at a store or delivered to a home by truck, to be stored at the residence in a pressurized container.

Question 48

This question is only asked of respondents who use a fossil fuel (natural gas, fuel oil, propane or bottled gas, kerosene, or coal) as their primary heating fuel. Some people may use more than one type of equipment to burn a particular fuel. Again, it is important in this question to get the *type* of equipment they use most.

A *central furnace*, also called a forced air or warm air or hot air system, burns the fuel to create hot air, which is then blown by a fan (or fans) through ducts that run throughout the house. The warm air enters rooms in the house through grates or registers.

With a *steam or hot water system*, the fuel is burned in a boiler to heat water. The hot water (or steam) then circulates through the house in pipes to radiators located in each room.

Units that are *permanently installed in the wall, floor or ceiling* differ from a central furnace in that there is no ductwork -- the equipment burns the fuel in the same room that receives the heat. The equipment may have a vent to allow exhaust gases to get outside. These units are *not portable*.

Portable units also have no ductwork, and heat the room where they are located. However, they are portable, meaning they are not affixed to the walls, floor or ceiling, and can easily be moved from one room to another.

If the respondent describes a system not listed in the above options, enter "Other," and then type the respondent's description of the system.

Question 50

Question 50 is only asked of respondents who use electricity as their primary heating fuel. Again, some people may use more than one type of electric equipment to heat their home; the purpose of this question is to identify the one type of equipment they use most.

A *heat pump* can be used to heat or cool the house. Heat pumps are usually located where they have access to outside air (often one part is inside of the house and one part is outside the house). A heat pump takes advantage of temperature differences between the inside and outside air to heat inside air, which is then blown through ductwork into rooms in the house. If a respondent says he or she has a central hot air system, but doesn't know if it is a heat pump or a furnace, ask if it can be used to cool the house in the summer. If the answer is "yes", it is a heat pump; if the answer is "no", it is a forced air furnace.

A *central furnace*, also called a forced air or warm air or hot air system, uses electricity (in the same manner as an oven) to heat air, which is then blown by a fan (or fans) through ducts that run throughout the house. The warm air enters rooms in the house through grates or registers.

Baseboard or wall heaters are electric heaters that are permanently attached to the wall. Baseboard heaters tend to be long (4 to 8 feet) and low. They generally do not have fans attached, though they might. Wall heaters tend to be more upright. Again, they may or may not have fans. These heaters differ from a central furnace in that there is no ductwork -- the equipment heats the room where it is located.

Portable units also have no ductwork, and heat the room where they are located. However, they are portable, meaning they are not affixed to the walls, floor or ceiling, and can easily be moved from one room to another.

With *radiant panels*, electricity is used to heat a fluid, which is distributed throughout the house in coils that are imbedded in the ceiling, floor, or walls of the home. The warm or hot water running through the coils warm the ceiling, floor, or walls; the heat in these materials is then transferred to the air in the room.

With a *steam or hot water system*, electricity is used to heat water. The hot water (or steam) then circulates through the house in pipes to radiators located in each room.

Question 52

Question 52 is asked only of respondents who use wood as their primary heating fuel. Again, some people may use more than one type of wood-burning equipment to heat their home; it is important in this question to get the type of equipment they use most.

A *free-standing wood stove* is not connected to a fireplace, and burns ordinary wood (i.e., logs) or presto-logs. It does not have ducts to other rooms.

A *free-standing pellet burning stove* is also not connected to a fireplace, and does not have ducts to other rooms. Unlike free-standing wood stove, a free-standing pellet burning stove burns small (i.e., pea-size) pellets that are made specifically for the stove.

Some wood stoves are connected to ducts, which distribute the heat created by the stove throughout the house. These stoves are called *central wood furnaces*.

A *fireplace insert* is a wood stove that fits into the fireplace and is used for heating. It generally fills the entire opening between the fireplace and the room. A "standard" fireplace without special heating equipment is called a *fireplace without an insert*.

Question 54

This question is only asked of respondents who use a fireplace without insert as their primary heating system. These "standard" fireplaces may have *glass doors* that cover the entire fireplace opening, they may have a *recirculating fan*, which is also called a Heatolator, or they may have neither.

Questions 56 - 74

Question 56 asks whether another fuel, in addition to the one identified in Question 46, is used to heat the home. If the answer to Question 56 is yes, follow-up questions identical to question 48 - 54 are asked about the fuel and equipment that are *used second most*. In cases where the respondent uses three or more fuels for space heating, remember to focus on the fuel and associated equipment that is used second most.

For clarification on Question 68, see the discussion of Question 46 above. Notice that the answer to Question 46 (i.e., the main fuel used for space heating) does not appear as a possible answer in Question 68.

For clarification on Question 69, see the discussion of Question 48 above.

For clarification on Question 70, see the discussion of Question 50 above.

For clarification on Question 72, see the discussion of Question 52 above.

For clarification on Question 74, see the discussion of Question 54 above.

Questions 76 and 88

Question 76 asks whether the household has changed the fuel they use most for space heating during the past year. This is a very important question. If the respondent knows that he or she switched recently, but cannot remember if the switch occurred during the past twelve months, probe with "Was the new equipment installed during the winter or summer?" and "Was this winter the first one that you used the new heating equipment?" or similar questions. If the respondent still cannot remember when the switch occurred, enter 3 ("Don't Know").

For clarification on question 88, see the discussion of Question 46 above. Question 88 is only asked if the answer to Question 76 is "Yes". Notice that the answer to Question 46 (i.e., the main fuel used for space heating) does not appear as a possible answer in Question 88.

Question 90

This question will be asked of all respondents who have not already indicated that they use natural gas for heating. If the respondent isn't sure, or doesn't know, ask him or her to consider the following:

- do any of their neighbors use natural gas for space heating, water heating, or cooking?
- do they ever see Natural Gas service trucks in their neighborhood?

If the respondent answers "Yes" to either of the above questions, gas is available in their neighborhood.

4.5 Air Conditioning (Questions 92-98)

Question 92

Question 92 asks if the residence has air conditioning. If the respondent is not sure of the answer to this question, ask if there is any way to make the house cooler during the hottest part of the summer. If the response is "opening the windows," turning on the fan," or "None," enter 2 ("No"). If the response sounds like one of the systems described under Question 96 below, enter 1 ("Yes"). If you or the respondent is still unsure, enter 3 ("Don't Know").

Question 94

Question 94 is asked only of respondents who 1) have air conditioning and 2) live in multi-family housing (e.g., duplexes, apartments). If their primary air conditioning source is a central air conditioning system for the whole building, we will not ask them any additional air conditioning-related questions. If the respondent is not sure of the answer, ask if there are any cooling units in any windows, or hanging on any walls; or if there is a small air conditioner in a closet. If the answer to any of these follow-up question is "Yes," enter 2 (air conditioning that only cools your unit).

Question 96

Question 96 is only asked of respondents who have air conditioning. If the respondent lives in multi-family housing, the air conditioning source must be for his or her unit only. A *central electric air conditioner* uses electricity (in the same manner as a refrigerator) to cool air, which it then blows through ducts to rooms in the house. A *central gas air conditioning system* works in the same way, except that natural gas is used to run the refrigerator-like motor instead of electricity.

A *heat pump* can be used to heat or cool the house. A heat pump takes advantage of temperature differences between the inside and outside air to cool inside air, which is then blown through ductwork into rooms in the house. If a respondent says he or she has a central air conditioning system, but doesn't know if it is a heat pump or a standard central electric system, ask if the same equipment can also be used to heat the house during the winter. If the answer is "yes" it is a heat pump; if the answer is "no", it is a central electric system. If the respondent told you he or she uses a heat pump for heating, expect that "heat pump" will also be the answer to this question, as well.

An *evaporative swamp cooler* uses electricity to power a fan, which blows air across or over a container of water into a room. The water container is connected to a pipe, which keeps it full of

water. The blown air collects moisture as it is blown across the water, which cools the occupants of the rooms into which it is blown.

Individual window or wall units cool air in the same way as a central electric air conditioning system. A fan in each unit blows the cool air into the room in which it is located. The units are not connected to any ductwork. They are mounted either in the window or wall, and so have contact with both outside and inside air.

4.6 Water Heating (Questions 100 - 102)

Questions 100

Question 100 is asked only of respondents living in multi-family housing (e.g., duplexes, apartments). If their primary water heating source is a central system for the whole building, we will not ask them any additional questions related to water heating. If the respondent is not sure of the answer, ask if there is a small water heater in a closet or under the kitchen or bathroom sink. If so, enter 2 (heating equipment that only heats your unit).

Question 102

Most people only use one fuel to heat water, however, if the respondent says more than one water heat fuel is used, it is important that you get the respondent to tell you which one fuel is used *most* (i.e. most often) for water heat. We want to know the fuel being using most *now* (not two years ago). For descriptions of the fuels, see the discussion of Question 46 above.

4.7 Cooking and Other Appliances (Questions 116 - 144)

Question 116

This question concerns the fuel used for the stove top which are also called stove top; burners, or just stove. The stove top is different from the oven, which is the subject of Questions 118 - 122; the stove top is the horizontal surface on which one would place a pan of water in order to boil the water. For descriptions of the fuels, see the discussion of Question 46 above. If the respondent says that more than one fuel is used for stove top burners (e.g., he or she has two stoves, one electric and one gas), determine the fuel of the burners that are used most.

Question 118

Make sure microwave ovens, toaster ovens (i.e., small portable ovens), and toasters are not included in the answer the respondent provides to this question. If the respondent says he or she has a combined microwave/convection oven, determine whether it is used most as a microwave or a convection oven. If the respondent says microwave, do not count it here (do include it in Question 122); if he or she says convection, count it here, and do not include it in Question 122. Make sure double ovens (i.e., one oven on top of another) are counted as two ovens. Finally, only count ovens that are used, not any that are sitting unplugged in the garage.

Question 120

Stress that we want the fuel of the oven used *most*. Microwaves and toaster ovens still do not count here.

Question 122

Make sure you include combined microwave/convection ovens that were determined in Question 118 to be used primarily as a microwave oven. Do not include microwave ovens that are not used, e.g., still sitting in the box.

Question 124

Again, we are interested in appliances that are used at least occasionally, not appliances that are in storage in the garage. Ask the respondent separately about each appliance, entering how many of that appliance the respondent has (0 if none). Be sure to note clearly that we are asking about freezers that are *completely separate* (i.e. a completely different appliance) from the refrigerator, and to distinguish clearly between the *gas* dryer and the *electric* dryer. Once again, if the respondent gives an answer which appears to be an unusually high number, a confirmation screen will appear.

Question 132

A *hot tub* is a stand alone unit that is usually outside of the house, while a *whirlpool bath* (also called Jacuzzi) is basically a bathtub with jets, usually located in a bathroom (sometimes in a bedroom). Mark all that apply. By "your own" we mean "serving your home only." A pool or hot tub serving a condo complex does not count because it does not serve the individual unit only. However, a whirlpool in that unit's bathroom *would* count.

Questions 140 - 142

Here we want to know what fuel is used to heat the swimming pool (Question 140) and hot tub (Question 142). If more than one fuel is used, determine the fuel that is used *most*. Note the interviewer instructions regarding the definition of heated: passive solar heating (i.e., "letting the sun heat the pool," even if a solar blanket is used) *does not* count as heated. Active solar (solar hot water panels on the roof, for example) *does* count as heat. Note that "not heated" is a possible response.

Question 144

We are only interested in the number of shower heads that are at least occasionally used.

4.8 Conservation (Questions 146 - 160)

Question 146

The inspection referred to in the question is also called a *home energy audit*. These inspections are typically performed by electric utility or natural gas company staff, or contractors working for the local electric utility or natural gas company; however, there are independent companies that perform these inspections as well. Typically, an occupant has to request such an inspection. Even if the occupant does not request the inspection, he or she would have to approve it; an inspection cannot be

performed without the occupant's consent. The occupant may or may not have paid for the inspection.

Question 148

Again, we are referring here to an *energy audit*. This is a hypothetical question; if the respondent would like further information, type special and instructions will appear advising respondent how to pursue this option.

Question 150

Weatherized means *installation of storm windows or doors; wall, ceiling, or floor insulation; or caulking or weatherstripping*. Note that we are not interested in whether the respondent has taken any of these actions on his or her own; only if the state or electric utility has installed one or more of these measures at the respondent's home.

Questions 151 - 153

Other than repeating the question, do not clarify these questions at all. We are looking for recognition.

Question 158

Read the question slowly and clearly, pausing very briefly at the end of each possible response. Again, other than repeating the question, do not clarify these questions at all.

Question 160

Read the question slowly and clearly. Address each issue separately, getting a rating for each before you move onto the next. If the respondent appears not to understand, you may remind him or her that any number between 1 and 5 is permitted, with "1" indicating "Not serious at all" and "5" indicating "Extremely serious." Do not provide any other clarification. Do not explain what the rating 2, 3, or 4 represent -- just say "whatever it means to you."

4.9   Occupant Characteristics (Questions 165 - 189)

If the respondent appears reluctant to answer any of these questions make sure he or she understands that all of the information collected in the survey will be kept strictly confidential. We are only asking these questions for classification purposes.

Question 163

If the respondent is unsure, ask who pays for the electricity the household uses -- the household itself or somebody else, such as the landlord.

Question 164

If the respondent is not sure of the exact name, read through the list of possible utilities on the screen. If the respondent does not know, ask who he or she receives an electric bill from. If the respondent still does not know, type in "Don't Know." Otherwise, select the utility listed on the screen.

Question 165

Question 165 asks if the home is occupied year-round or seasonally. If the respondent asks for clarification, ask "during the past year, (other than moving from one residence to another) did you live at least half of every three-month season in this house?"

Question 172

We are interested here in the number of persons who live in the home at least half of the year. If there is confusion, ask the respondent to consider the past year (i.e. from a year before the interview to the day of the interview), and count all occupants that lived in the home more than half (50 percent) of the time. A student home from college for two months in the summer would not count. Be sure the respondent remembers to count him- or herself.

Questions 173 - 174

Question 173 is only asked if there is just one occupant.

Question 174 is asked if there is more than one occupant. The total number of occupants across all the age categories should add up to the total number of occupants listed at the bottom of the screen. If this is not the case, a screen will appear asking you to query the respondent again. Gently work with the respondent to determine the problem and to fix it. Be sure the respondent remembers to count him- or herself.

Question 179

Pause prior to prompting to allow the respondent to answer. If he or she does not answer, begin reading the list of possible responses. Stop reading the list as soon as the respondent indicates the correct category. College graduates and those who attended graduate school are in the "at least one college degree" category. Note the different categories for those who have not completed high school.

Questions 186 - 189

Question 188 is asked if the answer to Question 186 was "Below \$25,000"; Question 189 is asked if the answer to Question 186 was "Above \$25,000". Begin reading the list of possible responses immediately. Stop reading the list as soon as the respondent indicates the correct category.

4.10 Final Questions (Questions 190 - 204)

The purpose of Questions 190 - 206 is to obtain the respondent's permission for 1) the respondent's electric utility and (if relevant) natural gas company to provide copies of the respondent's past electricity and natural gas bills to BPA; and 2) BPA to re-contact the respondent in one year for an in-person interview. If permission is obtained, we will also ask for the respondent's name and address.

These are very important activities, and you should do everything you can to encourage the respondent to give permission. If concerns arise, you should emphasize that these are very important activities that will help BPA better plan for our future electric requirements, and re-emphasize that this information will be kept strictly confidential.

Questions 192

One of these two questions will be asked of every respondent who receives a bill from his or her natural gas or electric utility. BPA will use past electric and natural gas bills to determine how much energy households with particular characteristics use, which will help it determine the need for additional power plants and conservation programs in the Pacific Northwest.

If the respondent does not respond immediately, emphasize that no effort will be required of the respondent; BPA will simply send a list of names and addresses of respondents who have given us permission to each utility and natural gas company, requesting the utilities/companies to send copies of the respondents' past bills, which the utilities/companies keep on file, to BPA.

Questions 195 - 196

These questions will be asked only if the respondent answered "yes" to Question 190 or 192. In Question 195, type in the first name, then the last name, of the person to whom the bill is sent. Check the spelling if you are not sure, and after typing the complete name, read it back to the respondent. In Question 196, type the city of the billing address. In Question 197 enter the state in which the billing address is located and in Question 198 type in the mailing address (e.g., 1234 Elm Street). Again, check the spelling if you are not sure, and after typing the complete address, read it back to the respondent. Make sure the entire address is typed correctly before hitting "Enter".

Question 200

If the respondent does not respond immediately, there are several things you may want to emphasize. First, we are asking for permission to re-contact the respondent in a year, not to actually conduct the on-site interview. If the respondent is unsure, he or she can give permission now, and decide next year whether to participate or not. Second, the on-site interview will provide extremely valuable information to BPA about insulation levels and specific types of appliances, which will help it improve the conservation programs it provides to Northwest residences. Respondents will be performing a true public service by granting their permission for us to re-contact them.

Questions 202 - 206

These questions will only be asked if the respondent answers "Yes" to Question 200, and he or she did not already provide this information in Questions 195 and 196. In Question 202, type in the first name, then the last name, of the respondent. Check the spelling if you are not sure, and after typing the complete name, read it back to the respondent. In Question 203, type the city. In Question 204 enter the state and in Question 205 type the mailing address (e.g., 1234 Elm Street) on the first line, and the city, state, and ZIP code on the second. Again, check the spelling if you are not sure, and after typing the complete address, read it back to the respondent. Make sure the entire address is typed correctly before hitting "Enter" on the second line.

After this information has been entered, a screen will appear (Question 206.1) asking the respondent if the name given is the name of the respondent. If it is not, another screen will appear for the interviewer to document the name of the respondent.

APPENDIX E

SUPERVISOR'S MANUAL

The Supervisor's Manual was used in the training sessions for all supervisors for this study.

1992 Pacific Northwest Residential Energy Survey Supervisor's Manual

September, 1992

1992 Pacific Northwest Residential Energy Survey Supervisor's Manual

This document comprises the Supervisor's Manual for the 1992 Pacific Northwest Residential Energy Survey (PNWRES92), a telephone survey of Pacific Northwest (PNW) residences. The Manual is organized in four sections:

1. Survey Background
2. Sample Selection and Management
3. Training
4. Quality Assurance

This Manual is not intended to be a stand-alone document. Many of the details about the PNWRES92 survey instrument that the supervisor will need to know are discussed in detail in the accompanying PNWRES92 Interviewer's Manual.

1. SURVEY BACKGROUND

PNWRES92 is sponsored by the Bonneville Power Administration (BPA). The purpose of PNWRES92 is to collect basic information about the energy-related characteristics of residences in the Pacific Northwest. A "residence" is defined as "a house, an apartment, a group of rooms, or a single room, occupied as separate living quarters or, if vacant, intended for occupancy as separate living quarters. Separate living quarters are those in which the occupants *live and eat separately from any other persons* in the building and which have direct access from the outside or through a common hall." "Pacific Northwest" is defined as the states of Idaho, Oregon, and Washington, western Montana, and portions of California, Nevada, Utah, and Wyoming.

The characteristics of interest include:

- Characteristics of the housing structure, such as square footage and type of foundation
- Characteristics of energy-using equipment, such as the fuels used for space heating and water heating
- Characteristics of the occupants, such as the number of occupants and annual household income
- Attitudes toward energy-related issues.

The data collected in PNWRES92 Phase I will be used to:

- Improve forecasts of PNW residential energy consumption
- Plan PNW residential energy conservation programs.

In addition, BPA is considering conducting an on-site (i.e., in-person) survey of residences in 1993. The data collected in PNWRES92 would be used to provide the list of residences from which a sample for the on-site survey would be selected.

2. SAMPLE DESIGN AND MANAGEMENT

2.1 Sample Design

The final sample design for the 1992 PNWRES is provided in Attachment A. Basically, the sample consists of 200,010 randomly generated ten-digit numbers, from which 20,001 interviews will be completed. The sample is divided into 15 Sampling Domains. The definitions of these Sampling Domains, and the sample size and required number of completed interviews for each, are listed in Table 1.

Table 1
PNWRES92 Sampling Domain Definitions,
Sample Sizes, and Required Numbers of Completed Interviews

Sampling Domain Number	Sampling Domain Description	#10 Digit Numbers in Sample	Required # Completed Interviews
13	Eastern Washington Generating Public Utility	19,050	1,905
14	Western Washington Generating Public Utility	19,050	1,905
16	Western Oregon Generating Public Utility	19,050	1,905
21	Montana Nongenerating Public Utility	19,050	1,905
22	Idaho Nongenerating Public Utility	19,050	1,905
23	Eastern Washington Nongenerating Public Utility	19,050	1,905
24	Western Washington Nongenerating Public Utility	19,050	1,905
25	Eastern Oregon Nongenerating Public Utility	19,050	1,905
26	Western Oregon Nongenerating Public Utility	19,050	1,905
31	Montana Investor-Owned Utility	4,760	476
32	Idaho Investor-Owned Utility	4,760	476
33	Eastern Washington Investor-Owned Utility	4,760	476
34	Western Washington Investor-Owned Utility	4,760	476
35	Eastern Oregon Investor-Owned Utility	4,760	476
36	Western Oregon Investor-Owned Utility	4,760	476
Total		200,010	20,001

In implementing the survey, the three most critical elements of the sample design are:

- The number of interviews to be completed for each Sampling Domain, listed in column d of Table 1, serves as a quota for the Sampling Domain; for example, 1,905 interviews of respondents living in ZIP code areas assigned to Sampling Domain 13 must be completed
- An interview is not considered "complete" unless it reaches Question 200, i.e., the respondent provides an answer to Question 200.

- Some of the ten-digit numbers in the sample for each Sampling Domain will be telephone numbers of residences located in ZIP code areas assigned to a different Sampling Domain. Question 14 of the survey will be used to identify such residences. Interviews should not continue past Question 14 for these residences.

2.2. Sample Management

The sample for the survey will be provided to you as a flat, ASCII file. The 200,010 records will be sorted by Sampling Domain; within each Sampling Domain, the records will be sorted randomly, in the order in which they were randomly generated. For each record, the following information will be provided:

- a 10-digit number (believed to be the telephone number of a residence located in a ZIP code area assigned to the Sampling Domain)
- the ZIP code area in which the residence is believed to be located
- the Sampling Domain.

When loading the sample on your computer system, it is important to **not sort the 10-digit numbers assigned to each Sampling Domain in any way**. Moreover, the 10-digit numbers assigned to each Sampling Domain should be called in the order that they appear in the file that is provided to you. Any deviations from these instructions will corrupt the statistical properties of the sample, and will tarnish the survey results.

When you install the survey instrument on your computer system, you will have to add a set of commands to read these three fields. You will also have to add commands to display all three fields on the interviewer's screen prior to Question 1 of the survey. The interviewer will use this information, following the instructions provided in Sections 4.1 and 4.2 of the Interviewer's Manual, to determine if the residence is in a ZIP code area assigned to the Sampling Domain. (If it is not, the interview will terminate.)

Each call will result in one of the following "events".

1. The number was a working telephone number, but has been changed (i.e., the interviewer hears the recording, "The number you have reached, xxx-xxx, has been changed. The new number is yyy-yyyy.")
2. The number is not a working telephone number (i.e., the interviewer hears the recording, "The number you have reached, xxx-xxxx, is not in service;" fax machine, etc.)
3. A connection is not made (i.e., nobody is home, or the line is busy)
4. An answering machine is reached
5. A connection is made, no qualified person (i.e., over 18 years old, knowledgeable about energy use in the home) is available, and a call-back cannot be scheduled
6. A connection is made, no qualified person is available, and a call-back is scheduled
7. A connection is made, a qualified person is reached, but the "residence" is not qualified (e.g., not in a ZIP code area assigned to the Sampling Domain)

8. A connection is made, a qualified person is reached, but the respondent terminates the interview prior to completion
9. An interview is completed.

Following events, 1, 2, 7, 8, and 9, the computer should be programmed to remove the telephone number from the list of telephone numbers that can still be called (i.e., the "queue"). Following events 3, 4, and 5, the computer should remove the telephone number from the queue if the number has been called five times; otherwise, it will place the number back in the queue, to be called later. The computer should schedule the second through fifth calls for different days-of-the-week and times-of-the-day than previous calls to the number, in order to maximize the likelihood that a qualified respondent will be available. Following event 6, the computer should schedule a call-back for the specified date and time. If the schedule call-back results in event 3, 4 or 5, the computer should place the number back in the queue (unless it has been called five times); if the call results in event 6 (again), the computer should schedule a call-back for the re-specified date and time.

3. TRAINING

Each interviewer working on this survey should have already completed general training in interviewing techniques and use of the Computer Aided Telephone Interview (CATI) system to be employed in the survey. During this training, interviewers would have become familiar and comfortable with the following topics:

1. Types of questions on survey
  - a. closed response questions
  - b. multiple choice questions
  - c. use of rating scales
2. Reading questions
  - a. following wording exactly
  - b. reading entire question before accepting answer
  - c. following question sequence exactly
  - d. not "directing" the respondent towards a particular answer
3. Use of clarification
  - a. types of probes
  - b. probing techniques
  - c. importance of neutral probing
  - d. probing a "don't know" answer at least once
  - e. use of neutral prefaces
4. Probing for answers
  - a. types of probes
  - b. probing techniques
  - c. importance of neutral probing
  - d. probing a "don't know" answer at least once
  - e. use of neutral prefaces

5. Feedback
  - a. giving feedback for good performance, not good content
  - b. giving feedback for acceptable performance 30 - 50 percent of the time
6. Record-keeping

This session should also cover the following topics:

- Survey sponsor and purpose
- Overview of sample design
- Description of qualified respondents
- Question-by-question instructions
  - Purpose
  - How to read the question
  - Allowable prompts and clarification
  - Definitions of concepts (i.e., technologies)
- Record keeping.

These topics are covered in detail in either this Manual or the Interviewer's Manual. Before conducting the training session, the supervisor should be very comfortable with all of these areas.

In addition, the training session should contain a period during which interviewers administer the survey to one another. To the extent possible, interviewers should rotate so that each interviewer is allowed to interview every other interviewer at least once. Finally, the supervisor should meet with the interviewers to discuss any questions or concerns that rise during the practice session.

4. QUALITY ASSURANCE

The following quality control measures should be used during the survey:

1. All interviewing should be conducted by trained and regularly employed data collection staff under a supervisor's direction and control.
2. The maximum ratio of interviewers to supervisors should be 8 to 1.
3. An on-line telephone monitoring system, in which the supervisor listens to the conversation and observes the interviewer's computer key strokes without the interviewer's knowledge, should be used.
4. The supervisor should use the on-line telephone monitoring system to monitor a) the first five interviews conducted by each interviewer and b) at least one interview conducted by each interviewer each day. Necessary corrective actions should be taken immediately.
5. The supervisor should review the call record sheets submitted daily, as well as a marginal analysis of the data collected during the day, to insure that sample specifications are being met and data quality is maintained.

6. The electronic copy of all completed interviews should be reviewed by the supervisor at the end of each week to insure completeness and accuracy.
7. If major questions or problems arise, the supervisor should hold a meeting with the interviewers as soon as possible to resolve the issue.
8. The supervisor should conduct a meeting with the interviewers at the end of each week to review questions, problems, and concerns that have arisen during the week, and to conduct supplemental (or refresher) training.

1992 Pacific Northwest Residential Energy Survey Supervisor's Manual

Attachment A Final Sample Design

Final Sample Design

BPA staff currently plans PNWRES92 to be a "multi-phase" survey. Phase I of PNWRES92, which will be conducted during the spring of 1992, will comprise a telephone survey of approximately 20,000 Pacific Northwest households. Phase II, which will be conducted during the spring of 1993, will comprise an on-site survey of a sample of Phase I respondents. The sample size for Phase II has not yet been determined. Additional phases may also be conducted, involving telephone, mail, or on-site surveys of a sample of Phase I respondents; at this time, however, the exact nature of these additional phases has not been specified.

The final sampling objectives for PNWRES92 Phase I are specified in Section 1. The final sample design for Phase I is described in Phase II.

1. SAMPLING OBJECTIVES FOR PHASE I OF PNWRES92

The sampling objectives for Phase I of PNWRES92 are as follows:

- The *target population* (Cochran ¹, p. 5) is all housing units ² in the Pacific Northwest ³
- The *sampled population* (Cochran, p. 5) is all housing units in the Pacific Northwest with telephone service.
- The *sampling unit* is a ten-digit number believed to be the telephone number for a housing unit.
- The *measurement unit* is the housing unit and household associated with the sampled telephone number.
- The *sampling domains* (Cochran, p. 34) are combinations of:
  - a. three utility types (investor-owned utility, public generating utility, and public nongenerating utility)

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¹ Cochran, W.G. 1977. Sampling Techniques. 3rd Edition New York: Wiley & Sons.

² As defined by the U.S. Bureau of the Census for the 1980 Census of Housing: "a house, an apartment, a group of rooms, or a single room, occupied as a separate living quarters or, if vacant, intended for occupancy as a separate living quarters. Separate living quarters are those in which the occupants live and eat separately from any other persons in the building and which have direct access from the outside or through a common hall."

³ According to the interpretation the BPA PNWRES92 Task Team of BPA's definition: all of Idaho, Oregon, and Washington; the portion of Montana served by Montana Light and Power Co., Pacific Power and Light, Northern Lights, Inc., Lincoln Electric Cooperative, Glacier Electric Cooperative, Flathead Electric Cooperative, BIA Flathead Irrigation Project, Missoula Electric Cooperative, Ravalli County Electric Cooperative, Vigilante Electric Cooperative; the portion of Montana west of the Continental Divide served by Montana Power Co.; the portion of California served by Surprise Valley Electric Corporation; the portion of Nevada served by Harney Electric Cooperative, Wells Rural Electric Co., and Raft River Rural Electric Cooperative; the portion of Utah served by Raft River Rural Electric Cooperative; the portion of Wyoming served by Lower Valley Power and Light, Inc.

- b. six geographic areas (Idaho; Western Montana; the 19 Oregon counties west of the Cascade ridge⁴; the 17 Oregon counties east of the Cascade ridge; the 19 Washington counties west of the Cascade ridge⁵; the 20 Washington counties east of the Cascade ridge)⁶

Three of the possible domains are empty, i.e., there are no public generating utilities in Eastern Oregon, Idaho, or Montana. Therefore, there are 15 sampling domains.

- The 15 domains are treated as separate strata (i.e., a separate sample was selected for each; *Cochran*, p. 140)
- The criterion variable is a hypothetical parameter $\emptyset$, whose prior estimate is approximately .5.
- The *precision requirement* is to estimate $\emptyset$ in each domain with as small a sampling error as possible, given BPA's fixed data collection budget. The sampling error in each of the nine public-utility domains is one-half the sampling error in each of the six IOU domains⁷

2. SAMPLE DESIGN FOR PHASE I OF PNWRES92

The sample for Phase I is a *simple random sample* of housing units with telephone service. Conceptually, in each of the nine public utility domains, a simple random sample of 1,905 housing electricity and natural gas bills to BPA; and 2) BPA to re-contact the respondent in one year for an in-person interview. If permission is obtained, we will also ask for the respondent's name and address.

These are very important activities, and you should do everything you can to encourage the respondent to give permission. If concerns arise, you should emphasize that these are very important activities that will help BPA better plan for our future electric requirements, and re-emphasize that this information will be kept strictly confidential.

Questions 192

One of these two questions will be asked of every respondent who receives a bill from his or her natural gas or electric utility. BPA will use past electric and natural gas bills to determine how much

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⁴ Basically, the counties in BPA's Lower Columbia Area, including all of Hood River County.

⁵ Basically, the counties in BPA's Puget Sound and Lower Columbia Areas.

⁶ The portion of California in the target population and the portion of Nevada served by Harney Electric Cooperative will be treated as if they were in Eastern Oregon; and the portion of Nevada served by Raft River Rural Electric Cooperative, and the portion of Wyoming served by Lower Valley Power and Light, Inc. will be assigned to Idaho. The boundaries of the six geographic regions are displayed on the attached map.

⁷ For example, if the sample will allow the criterion variable to be estimated within 2 percent with 95 percent confidence in each of the six IOU domains, it will allow the criterion variable to be estimated within 1 percent with 95 confidence in each of the nine public-utility domains.

energy households with particular characteristics use, which will help it determine the need for additional power plants and conservation programs in the Pacific Northwest.

If the respondent does not respond immediately, emphasize that no effort will be required of the respondent; BPA will simply send a list of names and addresses of respondents who have given us permission to each utility and natural gas company, requesting the utilities/companies to send copies of the respondents' past bills, which the utilities/companies keep on file, to BPA.

Questions 195 - 196

These questions will be asked only if the respondent answered "yes" to Question 190 or 192. In Question 195, type in the first name, then the last name, of the person to whom the bill is sent. Check the spelling if you are not sure, and after typing the complete name, read it back to the respondent. In Question 196, type the city of the billing address. In Question 197 enter the state in which the billing address is located and in Question 198 type in the mailing address (e.g., 1234 Elm Street). Again, check the spelling if you are not sure, and after typing the complete address, read it back to the respondent. Make sure the entire address is typed correctly before hitting "Enter".

Question 200

If the respondent does not respond immediately, there are several things you may want to emphasize. First, we are asking for permission to re-contact the respondent in a year, not to actually conduct the on-site interview. If the respondent is unsure, he or she can give permission now, and decide next year whether to participate or not. Second, the on-site interview will provide extremely valuable information to BPA about insulation levels and specific types of appliances, which will help it improve the conservation programs it provides to Northwest residences. Respondents will be performing a true public service by granting their permission for us to re-contact them.

Questions 202 - 206

These questions will only be asked if the respondent answers "Yes" to Question 200, and he or she did not already provide this information in Questions 195 and 196. In Question 202, type in the first name, then the last name, of the respondent. Check the spelling if you are not sure, and after typing the complete name, read it back to the respondent. In Question 203, type the city. In Question 204 enter the state and in Question 205 type the mailing address (e.g., 1234 Elm Street) on the first line, and the city, state, and ZIP code on the second. Again, check the spelling if you are not sure, and after typing the complete address, read it back to the respondent. Make sure the entire address is typed correctly before hitting "Enter" on the second line.

After this information has been entered, a screen will appear (Question 206.1) asking the respondent if the name given is the name of the respondent. If it is not, another screen will appear for the interviewer to document the name of the respondent.

APPENDIX F

PRETEST REPORT

The document presented on the following pages is the report of the pretest conducted on August 20-21, 1992.

The 1992 Pacific Northwest Residential Energy Survey--Phase I (PNWRES92-I)

PRETEST REPORT

September 1992

**Prepared for:
Bonneville Power Administration
Portland, Oregon**

**Prepared by:
Applied Management & Planning Group
Los Angeles**

**Work Performed under Contract No.: DE-AC79-92BP25174
OMB Control Number 1910-1200**

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The 1992 Pacific Northwest Residential Energy Survey--Phase I (PNWRES92-I)

PRETEST REPORT

Introduction

A pretest for the 1992 Pacific Northwest Residential Energy Survey -- Phase I (PNWRES92-I) was held August 20 and 21, 1992 at the Interviewing Service of America (ISA). Individuals from Bonneville Power Administration (BPA), Applied Management & Planning Group (AMPG), and Interviewing Service of America participated in the pretest. The two-day session consisted of three primary activities: training; pretest; and review of pretest findings.

Prior to the pretest the CATI programming was completed and tested by both ISA and AMPG staff. Errors in programming were detected and corrected. Numerous attempts were made to try to identify programming "bugs" prior to the pretest. Several initial calls were made on the evening prior to the pretest to insure that the sampling domains were accurate and the programming operational.

Training

The interviewer and supervisor training for the 1992 Pacific Northwest Residential Energy Survey -- Phase I was held August 20. Four interviewers and three supervisory personnel participated in the training, which was conducted by Roger Moore, Wendy Lin-Kelly, Lou Miranda (BPA), Mary Kay Stout and Lande Ajose (AMPG) and Alan Tarko (ISA).

The training consisted of the following agenda items:

Welcome/Introduction of Project Team	AMPG/ISA
The background, objectives, and scope of study	Bonneville
Survey parameters (evenings/weekends, hours, residential households, sampling domains, etc.)	ISA

Introduction of the survey instrument, quality requirements and potential technical issues	Bonneville
Documentation of all telephone surveys/ Case ID and verification (including procedures and forms)	ISA
Monitoring of pretesting (Random "listening in" or spot checking)	AMPG
Additional issues of concern/ Interviewer and supervisor questions	AMPG/ISA/BPA

Those participating in the training received either an Interviewer's Manual and/or a Supervisor's Manual. These were also being "pretested" for use in the final training.

Pretest

The pretest was undertaken in two "waves", across two evenings. Slight refinements to the survey instrument were made following the first day. In addition, specific questions were identified as a result of the pretest. These questions were given to Bonneville representatives so that they might be discussed with the full BPA team. (These questions related to such issues handling responses of 4.5 when asked to respond on a 1 to 5 scale, listing number of bathroom as 2.75, handling questions related to the purpose of the study, etc.)

Bonneville, AMPG, and ISA representatives monitored calls on both August 21 and 22. All monitoring was undertaken unbeknownst to both the interviewer and the respondent. Interviewers were found to be following the survey questionnaire. In addition, they were found to be enthusiastic and successful in developing a good rapport with the respondent. One issue of concern was the speed at which questions were asked. Interviewers were asked to speak more slowly on specific words so that respondents might better comprehend.

Pretest Findings

The following are the findings of the pretest. These include discussion of the sampling domains; five disposition files; survey findings; and issues related to the sample.

Sampling Domains

The three sampling domains utilized in the study were all in Eastern Washington: 13 (public generating), 23 (public non-generating), and 33 (investor owned). These domains were selected because of the zipcodes of these domains could belong to more than one utility.

The pretest indicated that the numbers were, in fact, within the geographic area specified. Only one of the 355 calls made was disconnected, and 7.6 percent were non-residential. These compute to 39.2 percent "bad" numbers, numbers that must be dialed but then must be excluded from the sample.

The pretest resulted in 141 calls falling in the Telephone Respondent Information File (TRIF). This includes those calls where an actual contact was made. This includes: appointments (made Thursday for Friday -- 22); refusals (28); non-residential numbers (27); wrong zipcode (1); refused at Question #4 (6); refused at Question #8 (2); and those beginning the survey (55).

Those willing to begin the survey are included in the Telephone Data File (TDF). During the pretest, 55 residents were willing to begin the survey. All surveys where the interviewer completed the survey are included in the Telephone Successful Completions File (TSCF). Only five individuals began but did not complete the telephone survey. Thus, the pretest yielded 50 completed interviews.

The fifth data file, Flagged Successful Completion File (FSCF), was created to handle all completed surveys where responses were questionable. AMPG and ISA developed a series of logic checks to flag as many as possible of these questionable responses during the actual interview. (Interviewers are given a series of prompts asking for a confirmation of the respondent's answer. The reason the "bad" numbers exceed the industry norm is that the sample was based on algorithms not accepted by other large sampling houses. These other firms provide samples that do not exceed 25 percent "bad" numbers.

AMPG and ISA subsequently recommended and Bonneville agreed that the sample be replaced. It was agreed among the three firms that ISA would obtain a new sample through GENSYS, one of the two highly respected sampling houses whose algorithms meet industry norms. Replacing the sample places Bonneville on firmer ground where the methods and/or findings of the study ever challenged in court.

Final Survey

Bonneville sent to AMPG clarifications for specific questions which arose during the pretest. These were incorporated into the CATI programming. In addition, BPA gave input regarding the interviewer and supervisor manuals. These changes were also incorporated into the materials to be used in the final training. The final training will take place September 3 and 4. The interviewing will begin immediately following

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APPENDIX G

POWER PLUS USERS GUIDE

Bonneville Power Administration

Bonneville Power Plus

Version 1.0

By Applied Management & Planning Group

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Overview

Introduction

What is *Bonneville Power Plus*?

Bonneville Power Plus is a small but powerful custom Windows application developed for Bonneville Power Administration by AMPG (Applied Management & Planning Group) to make navigating PNWRES92-I (The Pacific Northwest Residential Energy Survey 1992 - Phase I) information fast and easy. A simple, hierarchical menu system allows you to find specific information with just a few mouse clicks or keystrokes. Browse Buttons let you move between documents with a single click of the mouse, or pop up a chart detailing the data you're viewing, then close the chart when you're done. *Bonneville Power Plus* (hereafter referred to simply as *Power Plus*) is your own personal assistant that will make accessing PNWRES92-I information fast and easy.

Why do I need *Power Plus*?

Power Plus will allow you to make the most effective use of your time when analyzing PNWRES92-I information. It will allow you to think in terms of "What data do I want to see?" instead of "Where's the file and what is it called?" It can save you hundreds, if not thousands, of keystrokes and mouse clicks every single day.

Guided Tour

This section will give you a quick overview of *Power Plus*' main components to familiarize you with their appearance and the terminology we will be using to refer to them. For each of the main components we will have a picture of the component and a brief description of its function. Detailed information is available in the Operation section.

Volume Selection Window

The Volume Selection Window is the first, and most general, navigation tool available in *Power Plus*. You select which Volume of PNWRES92-I information you wish to access by clicking a button or pressing a hot-key (the Alt key with the underlined letter in the button caption).

When you make a selection, a more specific group of Volume Options will replace the main Volume Options. This approach allows you to "zoom in" on your data rather than offering an overwhelming number of options all at once.

Browse Buttons

The Browse Buttons allow you to step, sequentially, from one file to the next so you can browse related data. If you reach the beginning or end of the Volume you are viewing, *Power Plus* will automatically move to the next or previous Volume.

The Chart Button will open the chart associated with the current data (Table), at which time the picture and caption of the button will change (see below). Pressing the button again will close the chart and reveal the data (Table) again.

It is also possible to open and close Charts manually in Excel. If you open a Chart manually then you should also close it manually. If you use the Chart Button to open the Chart then you should also use the Chart Button to close the Chart otherwise Power Plus will be out of sync with Excel and the Chart Button will not operate as expected.

To Open a Chart manually in Excel

1. While you are viewing a table, locate the Chart in the current table by scrolling through the table until you find the chart. In Volumes C and D the Chart will be found below and to the right of the weighted data. In all other Volumes the Chart will be located directly below the weighted data.
2. Double-click on the Chart to open it.

To Close a Chart manually in Excel

1. Select the Chart Window by Single-Clicking anywhere within the window.
2. Double-click on the System Menu of the Chart window

OR

From the System Menu of the Chart window select Close.

Topic Menu

The Topic Menu, which sits at the top of the screen, allows you to jump to any topic in the current Volume simply by selecting it. The Topic Menu allows you to move quickly between unrelated topics. The choices available to you are context sensitive, which means that they will change automatically to reflect the options available in the current Volume.

NOTE: *If the Topic Menu does not appear as it does here then you may need to use a different video driver with your Windows configuration. With certain video drivers the last menu option (Demographic) may not be displayed properly. If this occurs try switching to the VGA driver that came with Windows.*

Moving between *Power Plus* Windows

You can click on any *Power Plus* window at any time with the mouse or you can move from window to window by pressing Ctrl+F6. When a window becomes active, you will see its title bar change color just like any other Windows application with the exception being the Topic Menu. The Topic Menu has no title bar so it cannot possibly change its color. You simply need to be aware that if neither the Volume Selection Window or the Browse Button Window is active, then the Topic Menu is active.

Installation

System Requirements

In order to run *Power Plus* your computer system needs to meet certain minimum requirements. While *Power Plus* should run successfully on any system capable of running Microsoft Windows 3.1 we recommend that you use it on systems which meet the configuration requirements listed below to insure that its performance is adequate.

Note: *While Power Plus may operate adequately on systems that do not meet the recommended minimum requirements we cannot guarantee its performance on such systems.*

Hardware Requirements

- IBM or 100% compatible computer capable of running Windows 3.1 in Standard Mode or Enhanced Mode. Consult your Windows documentation for detailed information.
- Hard Disk with at least 1 megabyte of free space available* (*does not include space for PNWRES92-1 data files)

Hardware Recommendations

- 386 or 486 processor
- 4 or more megabytes of RAM
- VGA or SVGA video system
- Microsoft Mouse or compatible pointing device

Software Requirements

- MS DOS 3.3 or later
- Microsoft Windows 3.1 or later
- Microsoft Word for Windows 2.0
- Microsoft Excel 4.0

Other Requirements

Fonts installed on system: Arial, Arial Narrow, MS Sans Serif, Times New Roman

In some instances *Power Plus* may substitute another font if the designated font is not available on the system. While *Power Plus* will still operate, the documents and applications may not appear as intended.

Installing *Power Plus*

Installing the *Power Plus* Application

We have provided a complete setup utility that will allow you to install *Power Plus* quickly and easily.

To install Power Plus

1. Start Windows if it isn't already running.
2. Put the Installation disk in drive A.
3. Open the Windows Program Manager
4. From the File Menu select Run
5. Type A:\SETUP.EXE
6. Press the OK button or hit ENTER
7. Follow the on-screen instructions.

NOTE: *Substitute Drive B for Drive A if the Power Plus installation disk fits Drive B instead.*

NOTE: *When you first start Power Plus after the initial installation you will be prompted for configuration information. The menu option allows you to change the information at a later time in case your system configuration changes.*

See Also: Configuring *Power Plus* for the first time on page 7.

Installing PNWRES92-I data files

When you receive *Power Plus*, all the PNWRES92-I data files are contained on floppy diskettes. You may opt to install some, or all, of the data files on your hard disk to improve performance. *Power Plus* will first look for the necessary file(s) on your hard disk and, if they are not found, it will attempt to find them on the floppy diskette.

In order for *Power Plus* to locate the PNWRES92-I data files on your hard disk, they need to be installed in specific directories. We have provided a utility to make this process as easy as possible. In order to use this utility, *Power Plus* should already be installed on your system.

To install PNWRES92-I files on your hard disk

1. Start Windows if it isn't already running.
2. Locate the *Power Plus* Program Group in Windows Program Manager.
3. Run the File installation utility by either
  - Double-clicking on the **Install PNWRES92-I Files** iconOR
  - Selecting the **Install PNWRES92-I Files** icon and pressing **ENTER**.
4. Follow the on-screen instructions.

If you want to find out how much disk space is available on the drive where you're installing the PNWRES92-I data files you can do so with the Windows File Manager. Simply select the drive letter of the drive where the data files are to be installed and select any directory on that drive. The amount of available disk space for that drive will be displayed in the Status Bar of the Windows File Manager.

Configuring Power Plus for the first time

When you start *Power Plus* for the first time you should take a few minutes to configure it for use with your particular system. We have made every effort to insure that *Power Plus* will operate on most systems with only minimal configuration information: where Excel and Word are located on your system and which floppy drive to use if the PNWRES92-I files are not installed on your hard disk. We also give you the option of tailoring certain aspects of *Power Plus*' performance to suit your personal taste. For example, you may choose to install specific PNWRES92-I data files on your hard disk to speed up file access.

To Locate Word and Excel on your System

1. From the **Options** Menu on the Volume Selection window select **Setup...**
(You will then be presented with the Setup dialog box)
2. In the Applications frame, select the Word for Windows option button.
  - Type the full path specification (including file name) to Word for Windows in the Filename text box.OR
  - Press the **Browse** button and locate the file name using the dialog box which opens. When you press the OK button in the Browse dialog box the selected file, including path, will be placed in the Filename text box for you.
3. Select the Excel Option button (In the Applications frame)
  - Type the full path specification (including file name) to Excel in the Filename text box.OR

- Press the **Browse** button and locate the file using the dialog box which opens. When you press the OK button in the Browse dialog box the selected file, including path, will be placed in the Filename text box for you.

The **Reset Defaults** button (under the Filename text box) will set file specifications for Word and Excel to WINWORD.EXE and EXCEL.EXE with no path specification. These options will work if Word and Excel are located in directories listed in the Path statement in your AUTOEXEC.BAT file. If you get a message from *Power Plus* that says it is unable to locate Word or Excel then you will need to specify the full path in the Filename text box.

To Select a Floppy Drive

Note: <i>If you have not closed the Setup dialog box you do not need to reopen it at this time.</i>

1. From the **Options** Menu on the Volume Selection window select **Setup...**
(You will then be presented with the Setup Dialog Box)
2. Select the option button (A: or B: in the Floppy Drive frame) that correctly identifies the floppy drive where the PNWRES92-I data files can be located if not installed on the hard disk.

Operation

Using Power Plus

Starting Power Plus

Power Plus is launched exactly like all other Windows applications. We'll outline the necessary steps here for completeness. If you are familiar with the Windows environment then just launch *Power Plus* as you would any other Windows application.

To Start Power Plus

1. Open the Windows Program Manager
2. Open the Program Group that contains the *Power Plus* icon
3. Double-click on the *Power Plus* icon

OR

Single-Click on the *Power Plus* icon to select it and then press the ENTER key

When you start *Power Plus* the first thing you'll see is an animated opening screen containing general information relating to *Power Plus*. From this screen you may either continue executing the application or you may exit at this time.

To Continue from the Opening Screen

- Press ENTER or any alphanumeric key on your keyboard

OR

- Click the left mouse button while the mouse is over the opening screen

Note: <i>The Opening Screen provides a Press Any Key prompt as a reminder.</i>

To Exit the Program from the Opening Screen

- Press the ESCAPE key on your keyboard

Selecting a Volume

The Volume Selection Window (see page 2) allows you to select which Volume you want to access simply by pressing the **command button** associated with that Volume. When you first start *Power Plus*, the Volume Selection Window will have the main choices listed for you.

- Exec. Summary, Methods, Appendices
- Item-by-Item Results
- Crosstabulations Region/Domains
- Crosstabulations Area Offices
- Crosstabulations States
- Crosstabulations Utility Types
- Non-Respondents
- Quit

When you press one of these buttons (with the exception of **Non-Respondents** and **Quit**) the current choices will be replaced by a new set of choices based on your selection. For example, if you choose **Item-by-Item Results** the new set of choices will be:

- Region/Domains
- Area Offices
- States
- Main Menu

The last choice, **Main Menu**, will reset the choices to those available when *Power Plus* is first started. With one exception, this is the format of the Volume Selection Window.

The exception is the menu for **Crosstabulations Region/Domains**. The choices here are numerous so a modified selection method was called for. The command buttons operate just as they do on every other window, but there are some extra **option buttons** (*pictured below*) which change the specific Volumes available from the command buttons based on the Utility Type selected.

Utility Type
☒ Public <u>G</u> enerating
☐ Public <u>N</u> on-Generating
☐ Investor <u>O</u> wned

When you select a Utility Type option button you will notice that the captions on the command buttons change to reflect the available Volumes. You will also notice that some of the command buttons become disabled when a certain Utility Type is selected. This is the correct behavior which occurs if a Volume is not available for the Utility Type selected.

To Select a Volume

- Click the desired command button.

OR

- Press the **hot-key** associated with the desired command button.

OR

- Press the TAB key until the desired command button has the focus, then press the ENTER key.

Using the Browse Buttons

The functionality and operation of the Browse Buttons should be fairly obvious so we will cover those aspects which may not be readily apparent.

When you press the **Next** browse button *Power Plus* will automatically close the current document and open the next document for viewing. When you reach the last document in a Volume, *Power Plus* will move to the next available Volume and open the first document of that Volume. The **Previous** browse button operates in the same manner.

The **Chart** browse button will open and close the chart that is associated with the data in the current Excel table. The picture and caption on the **Chart** button will reflect what operation it will perform. If the picture of a chart is displayed and the caption reads "Chart" then pressing the button will *open* the chart. If the picture of a worksheet (table) is displayed and the caption reads "Table" then the chart will be closed and the current table will become visible once again.

Note: *If you open the chart for viewing with the Chart button you must also close it with the Chart button in order for Power Plus to remain properly "in sync" with Excel. Conversely, if you open the chart manually then you should close the chart manually as well.*

Shutting Down

Power Plus offers three ways to exit the application for maximum flexibility.

- Press the **Quit** button on the Volume Selection Window when the main choices are displayed.
- From the **Options** Menu on the Volume Selection window select **Exit**.
- Select **Close** from the system Menu of any *Power Plus* window or double-click on the control box of any window.

Note: *Power Plus will not close Word or Excel when it exits, you must close them manually. If Power Plus closed Word or Excel it would run the risk of losing any unsaved data in open documents.*

Options and Configuration

Display

The following menu choices are available on the **Options Menu** in the **Volume Selection Window**.

Stay on Top

This selection allows the *Power Plus* windows to "float" on top of other windows that may be open. Turning this option on will prevent other windows from obscuring the *Power Plus* Menu and Browse Buttons.

Topic Menu

This selection allows the Topic Menu that sits at the top of the screen to be toggled on and off.

Browse Buttons

This selection allows the Browse Buttons to be toggled on and off.

Options and File Access

Locating Excel and Word on your System

To Locate Word and Excel on your System

1. From the **Options Menu** on the **Volume Selection** window select **Setup...**
(You will then be presented with the **Setup** dialog box)
2. Select the **Word for Windows** option button (in the **Applications** frame)

- Type the full path specification (including file name) to Word for Windows in the Filename text box.

OR

- Press the Browse button and locate the file using the dialog box which opens. When you press the OK button in the Browse dialog box the selected file, including path, will be placed in the Filename text box for you.
3. Press the Excel Option button (In the Applications frame) and repeat steps 1 and 2.

See Also: Configuring *Power Plus* for the first time on page 7.

File Access

Installing PNWRES92-I data files on your hard disk

When you receive *Power Plus*, all the PNWRES92-I data files are contained on floppy diskettes. You may opt to install some, or all, of the data files on your hard disk to improve performance. *Power Plus* will first look for the necessary file(s) on your hard disk and, if they are not found, it will attempt to find them on the floppy diskette.

In order for *Power Plus* to locate the PNWRES92-I data files on your hard disk they need to be installed in specific directories. We have provided a utility to make this process as easy as possible. In order to use this utility, *Power Plus* should already be installed on your system. You may also install the data files with the Windows File Manager.

To install PNWRES92-I files on your hard disk using the supplied utility program

1. Start Windows if it isn't already running.
2. Locate the *Power Plus* Program Group in Windows Program Manager.
3. Run the File installation utility by either
  - Double-clicking on the **Install PNWRES92-I Files** icon

OR

  - Selecting the **Install PNWRES92-I Files** icon and pressing ENTER.
4. Follow the on-screen instructions.

To install PNWRES92-I files on your hard disk using the Windows File Manager

1. Start Windows if it isn't already running.
2. Start Windows File Manager.
3. In an open File Manager window, select the floppy drive where the data files you wish to install are located.

4. Select the *directory* name of the Volume you wish to install by single clicking on it.
(The directory name will be one of the yellow folders in the left hand column of the File Manager window.)
5. Press the F8 key or choose Copy from the File Menu..
(At this point a dialog box will open asking you for the name of the directory you wish to copy the Volume *to*.)
6. Type the name of the destination directory in the box labeled **To**.
(The name you type will normally be the name of the directory where *Power Plus* is installed.)
7. Press ENTER or click the OK button.

Note: *Do Not change the name of the Volume directory when you copy it or Power Plus will not be able to locate the data files properly.*

Selecting a Floppy Drive

If you choose not to install the PNWRES92-I data files on your hard disk, you may access them from the floppy diskette they were delivered on. In order for *Power Plus* to locate them, you need to tell it which floppy drive you wish to use.

Note: *Power Plus will always look for the files on the hard disk before attempting to locate them on a floppy diskette.*

To Select a Floppy Drive

1. From the **Options** Menu on the Volume Selection window select **Setup...**
(You will then be presented with the Setup Dialog Box)
2. Select the option button (A: or B: in the Floppy Drive frame) that correctly identifies the floppy drive where the PNWRES92-I data files can be located if not installed on the hard disk.

Removing Write Protection from PNWRES92-I data Files

To Disable Write-Protection on a file

1. From the **Excel File** Menu select **Save As...**
2. Type the Filename in the dialog box.
3. Press the OK button on the dialog box.

NOTE: *You must save the file under a new name. Power Plus will not allow you to overwrite its original PNWRES92-I files.*

What does Save As... mean?

This operation saves a new document, or a new version of an existing document, in the file format and with the filename you specify. It is also used to save a file to a different drive or directory and to export files in another format.

Because the PNWRES92-I files are write protected you can't alter them in any way. Should you wish to make changes to a file you will first have to use the **Save As** command to save the file under a new name and then change that new file instead of the original. This method ensures that the PNWRES92-I files will always contain the correct information because they can't be altered.

Troubleshooting

Installation

The Setup Program won't run

- Make sure your system meets the minimum hardware and software requirements to run *Power Plus*.
- Make sure Windows is running in Standard or Enhanced Mode.
- Exit and restart Windows, then try running the Setup program again.
- ♦ If you cannot successfully install *Power Plus* on your system after taking these steps then contact technical support for assistance.

I can't install the PNWRES92-I data files on my hard disk

- Make sure you have enough room on your hard disk to install the desired files.
- Make sure the File Installation utility is installed on your system. If the File Installation utility has been removed from the system, or becomes corrupt, you may either reinstall it or manually install (see File Manager installation instructions on page 13) the PNWRES92-I data files on your hard disk.

I can't find Excel or Word on my system

- If your system is on a LAN, certain applications may be installed on a server rather than locally on your machine. You may need to look for Excel and Word on Networked drives.
- If you are not on a LAN then you may have to install Word and Excel on your system. *Power Plus* will not operate without Word and Excel.

Operation, File Access, and Configuration

Power Plus won't start

- Make sure *Power Plus* has not been removed from the system.
- If you receive error messages when you start *Power Plus* and then the application exits, make note of the error messages and contact technical support.

Power Plus can't start Excel or Word

- Make sure your configuration information is correct.
See: Options and Configuration
- Make sure the application is installed on your system or available on the network you are using.

Power Plus is looking for the PNWRES92-I files on the wrong Floppy Drive

- Make sure your configuration information is correct.
See: Options and Configuration

Power Plus can't locate the PNWRES92-I files on my hard disk

- Make sure the PNWRES92-I data files are located in the proper directory on your hard disk.
- Run a disk utility program to determine if the file(s) or your hard disk have become damaged in any way.

Power Plus can't find a PNWRES92-I file on the floppy disk, but it is looking at the proper disk drive

- Make sure you have the correct floppy disk, for the volume you wish to view, in the floppy drive.
- Make note of the name of the file(s) which can't be found and try to locate the file on the floppy disk using Windows File Manager. If the file does not exist it may have been deleted in which case you need to use the back-up diskettes to restore the file to the diskette.
- If the file exists on the diskette run a disk utility program to determine if the file(s) or diskette have become damaged in any way.

Lots of "flashing" occurs on the screen when Power Plus opens a new file.

Depending on the speed of your system and the amount of installed memory, there may be some delay as files are opened. When a new file is opened *Power Plus* sends

commands to Word and Excel much as if you had typed them at the keyboard. What this means to you is that you may be able to watch Word and Excel operate as they carry out these commands. You may see files opening and closing, menus being accessed, and dialog boxes appearing and disappearing. On a fast system these operations may just be perceived as flickers on the screen or not seen at all. This is normal behavior and is nothing to be concerned about.

Excel or Word are behaving incorrectly when they receive commands from *Power Plus*

- Make sure you are giving Excel or Word enough time to process the commands from *Power Plus* completely before attempting to browse the table or document manually. If you are trying to perform other activities on the system while *Power Plus* is issuing commands, they may be delivered to the wrong application.
- Make sure you have the correct versions of Word and Excel on your system. The required versions are listed in the System Requirements section.

The Volume Selection Window disappears behind Word or Excel.

This is normal behavior for the Volume selection window. Due to the orientation and size of the Volume Selection Window it automatically moves behind the main application window so as not to obscure your view.

- Simply click on the title bar of the Browse Buttons window and the Volume Selection Window will appear again.

The Chart button is out of sync with Excel.

You will need to synchronize *Power Plus* and Excel by manually opening or closing the chart *once*.

Word and Excel are left running after *Power Plus* has exited.

This is normal behavior. *Power Plus* was designed so that it would not close Word and Excel automatically. You may be using Word and Excel to work on other documents while using *Power Plus*. If we arbitrarily shut down these applications we would discard any unsaved documents you may have been working on, effectively losing your work. *Power Plus* has been designed to be as cooperative as possible with the way you work. This also allows you to use *Power Plus* to locate a particular piece of PNWRES92-I information and then shut it down so you can continue to work in Excel or Word even after *Power Plus* has been shut down.

Addendum/Notes

Tips on using *Power Plus*

Bringing the Volume Selection Window to the top

While *Power Plus* has a Stay On Top option to make sure the Topic Menu and Browse Buttons are always visible, the Volume Selection Window will drop behind the Word and Excel windows because of its size. We felt it was important to keep the screen as free from clutter as possible so the PNWRES92-I data would not be obscured.

When you want to see the Volume Selection Window again you can click anywhere on the Browse Buttons window or the Topic Menu. The **Title Bar** of the Browse Buttons window is a good choice as clicking there won't trigger any unwanted events.

Operational Characteristics

"Flashing" may occur on the screen when *Power Plus* opens a new file.

Depending on the speed of your system and the amount of installed memory, there may be some delay as files are opened. When a new file is opened, *Power Plus* sends commands to Word and Excel much as if you had typed them at the keyboard. What this means to you is that you may be able to watch Word and Excel operate as they carry out these commands. You may see files opening and closing, menus being accessed, and dialog boxes appearing and disappearing. On a fast system these operations may just be perceived as flickers on the screen or not seen at all. This is normal behavior and is nothing to be concerned about.

Hourglass cursor stays on

There is a known aberration that may cause the Hourglass cursor to remain on even after all necessary processing has been completed. This is most likely to occur when a file or chart is opened or closed. *Power Plus* is not altering the cursor itself so it is not possible to fix the problem at this time.

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Glossary of Terms

386 or 486 processor

The 80386 and 80486 processors are manufactured by Intel and are the current industry standard 32 bit chips used in IBM and compatible computers.

Browse Buttons

The Browse Buttons allow you to step, sequentially, from one file to the next so you can browse related data. If you reach the beginning or end of the Volume you are viewing Power Plus will automatically move to the next or previous Volume for you.

command button

A button which initiates an activity. These are standard buttons which appear in many Windows applications. Examples would be the OK and Cancel buttons used in many dialog boxes. A command button that is followed by an ellipsis (e.g. Browse...) causes another dialog box to appear.

Control box

The Icon that opens the System Menu for the window. It is always at the left of the title bar.

Crosstabulation

A report that groups data from a database into categories and tallies, analyzes or compares the data in ways specified by the programmer.

Enhanced Mode

A mode in which Windows runs to access the virtual-memory capabilities of the 80386 processor. In this mode, Windows appears to use more memory than is physically available and provides multitasking for non-Windows applications.

Hard Disk

A disk that is permanently mounted in its drive. Also known as a fixed disk.

hot-key

A combination keystroke used to access menus and other components quickly by pressing the Alt, Shift, or Ctrl keys along with the character in the caption that is underlined.

megabyte of RAM

RAM is Random Access Memory that can be used by applications to perform necessary tasks while the computer is on.

A megabyte is approximately one million bytes.

option buttons

A small, round button that appears in a dialog box. Within a group of related option buttons, you can select only one.

PNWRES92-I

Pacific Northwest Residential Energy Survey 1992, Phase I.

Standard Mode

A Windows operating mode that can be used with 80286, 80386, and 80486 computers. This mode provides access to extended memory and also enables you to switch between non-Windows applications, but it does not provide virtual memory or enable non-Windows applications to run in the background or in a window.

System Menu

A Menu that contains commands you can use to manipulate the window. Application icons and some dialog boxes also have a System Menu. To open the System Menu, you use the Control Box at the left of the title bar in a window, or you select an application icon. See also Control Box.

Title Bar

The horizontal bar that runs across the top of a window. It generally contains the name of the window (e.g. Power Plus). On many windows, the title bar also contains the Control box and Maximize and Minimize buttons.

Topic Menu

The Topic Menu, which sits at the top of the screen, allows you to jump to any topic in the current Volume simply by selecting it. The Topic Menu allows you to move quickly between unrelated topics

VGA

Video Graphics Array - A video standard that provides a resolution of 640x480 pixels. SVGA (Super-VGA) can provide 800x600 pixel or 1024x768 resolution with anywhere from 16 to 16.7 million colors depending on the hardware being used.

Volume

For the PNWRES92-I study, a Volume is a collection of reports or crosstabulations for a specific geographic area or area office.

Volume Selection Window

The *Power Plus* window used to select which Volume of PNWRES92-I data you wish to view.

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Part VIII

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2. Memorandum: Household Counts for PNWRES92 Survey - 1/25/93
3. Notes on PNWRES92, Phase I (with Special Reference to Weighting the Data for both Domain and Area Estimates) - 3/5/93
4. The "Complex Question" Simplified ... - March 1993
5. The PNWRES92 Seminars - 9/21/93
6. PNWRES92-I Archives

MODIFICATION TO
STATEMENT OF WORK

**Implementation of the Telephone Survey for
the 1992 Pacific Northwest Residential Energy Survey
(PNWRES92 - Phase I, Part 2)**

Part 2: Technical Approach and Tasks

Task 8: The Non-response Study

A non-respondent in PNWRES92-I.2 falls into one of three distinct strata:

- S1:** Those with whom telephone contact was never made.
- S2:** Those who answered the telephone and then declined to be interviewed *before* any substantive questions were asked.
- S3:** Those who answered the telephone, started the interview, and then chose to break off the interview before it was completed.

During the conduct of Task 8, Bonneville will look to the contractor for suggestions of non-monetary incentives to encourage respondent participation.

Sub-task 8.1: Conduct of the Non-response Study -- The contractor will assign its most competent interviewers to attempt to secure completed interviews with a total of 900 non-respondents, 300 from each of the 3 strata (S1, S2, and S3). The interview instrument will be almost identical to that used in Tasks 1-7; the one change being the addition of an item whose intent is to determine the respondent's reason for not starting/completing the survey in the first round. Exact placement and wording of this additional item will be negotiated with the COTR.

Within each stratum, to the extent possible and with COTR's concurrence, 20 completed interviews will be secured for each of the 15 domains defined in the Statement of Work. The structure and processes of the database used to collect the results will be identical to that developed in Tasks 1-7.

Results will be accumulated to Region-level, using the same weighting-up procedures employed in Tasks 1-7. The recording and reporting system shall be the same as that used in Tasks 1-7.

With particular respect to Task 8's written reports, each report will include, at least, a title page, a summary page, a table of contents, a body/discussion, and an index. If feasible, the reports themselves will be linked by means of a special Project Report Concordance whose elements are the entries in the individual reports' indices.

As with the workplan in Sub-task 1.2, it is specifically expected that the system and procedures outlined here will change as conditions change. The treatment of these changes will be negotiated between the contractor and the COTR.

The fieldwork for this project may not commence until the contractor's written plan is complete and approved by the COTR. Five types of files are to be created and maintained as a method of record-keeping during the field work:

1. the T-8 Telephone Call Disposition File,
2. the T-8 Telephone Respondent Information File,
3. the T-8 Telephone Data File,
4. the T-8 Telephone Successful Completions File, and
5. the T-8 Flagged Successful Completions File.

The intended purpose and contents of each of the five types are the same as those agreed to for Tasks 1-7.

The contractor will conduct Task 8, The Non-response Study, with the same thoroughness, record-keeping, and data-reduction skills and materials used in Tasks 1-7. This includes the quality review, the transfer of data files, written reports, and the productions of basic statistical estimates and their variances for the following:

- (1) the proportion of housing units for which electricity is used most of the time for purposes of space heating;
- (2) the proportion of housing units which use electricity for (a) space heating and (b) water heating;
- (3) the proportion of single-family housing units among all housing units; and
- (4) the proportion of manufactured homes among all housing units.

The estimates will be made for the Region.

Sub-task 8.2: Report of Findings -- The contractor will prepare a written report, designed to support the Executive Summary and linked (if possible) by the Project Concordance called out in Sub-task 7.5, which shall be delivered in both camera-ready form and word-processing files and shall include the following:

- a. Item-by-Item results - responses to each survey item for each of the 3 strata.

- b. Pacific Northwest Region Cross tabulations - cross tabulations for each of the 3 strata of these key categories: (1) type of residence, (2) ownership type, (3) year of construction, (4) size (in square feet), (5) type of space-heating fuel, (6) type of water-heating fuel, (7) household income, (8) utility type, and (9) space-heating system.
- c. Comparisons of Task 8 results with the results obtained from Tasks 1-7, pointing out differences and similarities for age distributions, income distributions, education levels, and numbers of occupants.

In addition to containing linking narrative and displaying tabular results, this report will contain graphics and charts to display pertinent comparisons and contrasts in the data and with respondents' data. The report shall be submitted in draft form, at least two weeks before its due date, for Bonneville review, consistent with the Documentation System developed as Sub-task 1.3. Following discussion and incorporation of comments provided to the contractor by the COTR, the final version of the report shall be submitted to Bonneville.

Sub-task 8.3: 5 Types of Data Files -- Task 8 will not be considered complete until the contractor has submitted, and Bonneville has accepted, electronic copies of each of the following data files derived during Task 8 and their supporting computer software, as well as complete instructions, data dictionaries, and code books for each of:

- 1. the T-8 Telephone Call Disposition File,
- 2. the T-8 Telephone Respondent Information File,
- 3. the T-8 Telephone Data File,
- 4. the T-8 Telephone Successful Completions File, and
- 5. the T-8 Flagged Successful Completions File.

Each of these files will be provided to the COTR on electronic files in a form agreed upon between the contractor and Bonneville. Each of the files will be fully verified, clean, and consistent within accepted levels of tolerance specified by Bonneville.

Table of Deliverables
Task 8: The Non-response Study

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Memorandum

DATE : January 25, 1993

FROM : Ottie Nabors -- RPCB

SUBJECT: Household Counts for PNWRES92 Survey.

TO : David Mills -- RPEE

Problem: Analysis of zip code level census data indicates that zip code level assignments are not accurate enough to provide housing stock numbers for each of the survey domains to be used to construct the weights that will be used to make housing estimates for the survey reports.

Background:

Data collection for the PNWRES92 Survey was completed in December 92. The next task for the contractor is to prepare data reports utilizing the survey responses. One aspect of the data reports will be to develop estimates of the total occupied households that the responses represent. In order to prepare weights for estimating the occupied housing stock that the survey represents the number of occupied households for each of the survey domains must be known. Domains were developed by utilizing geographic location (MT, ID, E.WA, W.WA, E.OR, W.OR) and utility type (GPU, NSGPU, IOU).

The originally plan was to use occupied housing stock from the 1992 Census for each domain. Zip code level census data seemed to make sense because the random telephone numbers used for collecting the survey data were generated by assignment of telephone exchanges to zip codes and domain assignments to zip codes based on assigned utilities and geographic location of the zip code. Utilities were assigned to zip codes based on which utility had the majority of residential customers in that zip code.

Analysis:

BR Associates provided the telephone numbers and utility to zip code, to domain assignments. CACI provided the data set of zip code level 1990 Census information. RPCB linked the utility to zip code to domain assignments to the CACI data set and calculated the size of the housing stock for each domain in a manner that would be comparable with the utility customer accounts collected by RPEE. These F&O customer account figures were aggregated to the domains and a comparison of the Census and F&O estimates were made to determine how well the census data fits with known residential customers. The results are contained in Table 1.

From the comparisons in Table 1 it has been determined that given the domain assignments, the census data does not match the customer data very well. In the case of the IOU customers in

Montana, the Census household count is 62,625 units higher than the F&O data. This over-count is due in large part to inclusion of IOU customers in zip codes located east to the Continental Divide. When these zip codes are removed from the count, approximately two-thirds of the error is removed (43,980 units). About the time the PNWRES92 project went to the data collection stage it was noted that the sample design excluded three eastern Montana counties which are served by the BPA public customers (Madison, Jefferson, and Broadwater) and technically constituted BPA service territory. When this was checked out it was learned that these three counties were excluded because it appeared that MPC was the dominant utility in all 19 zip codes serving these counties. With 19 zip codes located in these counties there is a total of 8,366 households. If, for example, each zip code had only 49 percent service by a public utility, a 49 percent minority of Public customers is 4,099 households in these counties. Although the selection criteria is logical, it appears that bias can creep in due to the selection criteria. If this bias was known at the time of the sample selection process (which was not the case because BPA lacked zip code level census data to check the assignments against the customer data) it would have been reasonable to select, or reassign, zip codes in those cases where the results of the sample design diverge from reality. A lesson learned for future surveys.

In both ID and MT the public utilities appear to be under-counted while the IOU's are over-counted, in OR and WA the situation is reversed. Analysis of eastern Washington showed that Washington Water Power (IOU) had more customers by the census count than in the F&O data. At the same time the non-generating publics seemed to be seriously under counted. The analysis showed that one public utility (Modern Electric with 5,680 customers) was not represented in the sample and counties (other than Spokane County) that had service shared between Washington Water Power and Inland Power & Light (PUB) showed no zip assignments to Inland Power & Light.

In Western Washington the IOU's were under represented in the census housing counts while the generating publics (Seattle City Light specifically) were over represented. Analysis of MetroScan data for King county revealed that in three zip codes assigned to Seattle City Light the utilities of Parkland (3,013 customers), Lakeview (6,059 customers) and Puget Sound Power and Light. Reassignment of these three zip codes from SCL to the three respective utilities would reduce the over count of generating publics in Western Washington from +51,776 to +14,817.

Analysis of Oregon's utility customers was hampered by lack of data on PP&L's customer splits between eastern and western Oregon. PP&L did provide approximate 1992 customer counts (telephone conversation 1/8/93) between western (334,000) and eastern (99,000) Oregon. These numbers were used to generate splits for the 1990 customer accounts used in the analysis. Generally, the IOU's are under counted in both eastern and western Oregon. Lew Miranda checked the zip code assignments for the Portland Tri-county area and found that utility assignments track MetroScan information on utility properties. Oregon MetroScan data does not have as detailed information on utility easements as the Washington MetroScan data. Lew's analysis indicates that PP&L and PGE have shared service territories in three major populated zip code areas which does nothing to correct the under representation of IOU's versus the Publics. There is currently no evidence suggesting that zip codes assignments for Oregon's utilities can or should be adjusted to correct the imbalance. However the conclusion that a significant level of bias has crept in during the sample design for the Oregon domains cannot be dismissed.

The last point that substantiates the presence of some bias in the zip code assignments is the results of the actual survey. Table 1 contains a comparison of the completed surveys by domain as originally assigned to the telephone number called and secondly by domain assignment according to the utility named as the serving utility by the respondent. The increase in the score by IOU's in Idaho, western Washington and western Oregon tend to suggest that there is a greater level of error in assignment of the zip codes than we expected going into the survey.

Conclusion: Comparison of the zip code level household data with F&O residential customer account data indicates that significant error exists at the domain level in the estimated number of occupied households for each domain. If we utilize the census data as currently proportioned among the utilities serious error in the numbers on customers by utility type and geographic location (area) will creep into the descriptive statistics that will be contained in the data reports being prepared by AMPG. It can be concluded that another scheme should be used to develop the household counts.

Recommendations:

I recommend that an estimated occupied household count be utilized for developing domain level weights. The methodology I propose is to take the F&O customer accounts and adjust them downward to take into account vacancy rates for each of the six geographic areas used to build the domains. The vacancy rate in this case is the difference between occupied households in the census data and the adjusted housing units used for comparison with the F&O customer counts. Adjusted housing units is the sum of occupied housing units plus vacancies for sale plus vacancies for rent plus vacancies--seasonal occupancy. When the BPA service territory is accurately described, removing eastern MT counties served by IOU's, the zip code level census data count of adjusted housing units is within four-tenths of one percent of the F&O customer accounts (13,692 units out of 3,698,670 customer accounts). Table 2 shows the vacancy rates at the geographical level that would be applied and the resulting estimated occupied housing units.

Table 2 also contains the proposed estimated occupied housing counts for 1990 using the proposed methodology. Note that as a result of this method the estimated occupied housing count for 1990 is 3,462,682. The occupied housing count using the 1992 Census data for the identical BPA service territory is 3,477,564 units. This places the estimated occupied housing units within four-tenths of one percent of the Census count, which is basically noise given the size to the region. The only geographical areas with sizable errors in this estimate are Montana and eastern Oregon; approximately 7 percent for each. This is probably due to effects of the fringe counties in California, Nevada and eastern Montana compounded by differing vacancy rates between the rural verses urbanized areas of these geographic divisions. However, this error is distributed proportionally between utility type so that the relative size of IOU's when compared with the Generating Publics or the NSGPU's is identical to the relative sizes contained in the F&O data. This will make across utility type comparisons within each geographic area (or area office) more accurate. The absolute size of the error 8,178 units short in Montana and 11,455 units over in eastern Oregon are probably not large enough to cause serious problem when making across area comparisons. Further, if in the documentation we emphasize the fact that these are estimates it will improve to likelihood that analysts (people who know what they are doing) will use these numbers as approximations of reality not "truth".

Finally, it should be noted that in adopting this methodology we will not be limited to using 1990 F&O customer accounts. We could utilize the 1992 counts which will correspond to the survey date (all the analysis presented in this memo utilized 1990 customer counts). This would not preclude us from reworking the weights at a later date to correspond to the 1990 Census when we decide how to reassign zip codes to correspond more closely to the customer counts.

ONabors:ofn:4002 (6897-B:\PNWRES1.DOC)

CC: Roger Moore
Chuck Forman
Lew Miranda

Notes on PNWRES92, Phase I
(with Special Reference to Weighting the Data
for both Domain and Area Estimates)
RHM - BPA/RPEE

Planning the Survey

The *target population* for this survey was all housing units in the Pacific Northwest (also called "the Region"). The *sampled population* was all housing units with telephone service. The *sampling unit* was a ten-digit number believed to be a telephone number. The *measurement unit* was the housing unit and the household associated with the sampled telephone number. Telephone numbers were selected at random from exchanges believed to be associated with each of the 15 non-empty domains (defined by six geographic subregions and three utility types). This association was derived through a mapping of the Region's Post Office ZIP codes to the utilities which provide electric service in the region.

The planning of the survey called for a total sample size of $n = 20,000$ completed surveys from an estimated $N = 3.5$ million households. Let N_d and n_d , $d = 1, 2, \dots, 15$, respectively, be the total number of occupied households and the designed sample size for the d^{th} domain. For specificity, the domains and their designed sample sizes are listed in Table 1.

Table 1	
Domain (Code)¹	Designed Sample Size (n_d)
PG-EWA (13)	1,905
PG-WWA (14)	1,905
PG-WOR (16)	1,905
PN-WMT (21)	1,905
PN-ID (22)	1,905
PN-EWA (23)	1,905
PN-WWA (24)	1,905
PN-EOR (25)	1,905
PN-WOR (26)	1,905
IO-WMT (31)	476
IO-ID (32)	476
IO-EWA (33)	476
IO-WWA (34)	476
IO-EOR (35)	476
IO-WOR (36)	476

¹PG = Public Generators; PN = Public Non-Generators; IO = Investor-Owned. WMT = Western Montana; ID = Idaho; EWA = Eastern Washington; WWA = Western Washington; EOR = Eastern Oregon; WOR = Western Oregon.

The values of N and N_d were to be determined from 1990 Census-based information that was not available during the survey's planning stages.

Conducting the Survey

Sampling within each domain was continued until n_d completed surveys were obtained for the d^{th} domain. Let i be the index on the completed surveys. Then $i = 1, 2, \dots, n_d$ for the d^{th} domain.

Weighting the Responses

There were Q questions in the survey. The q^{th} question had $a = 2, 3, \dots, A_q$ category responses.

Let X_{dqia} = the "answer" for the a^{th} category of the q^{th} question given by the i^{th} respondent in the d^{th} domain. That is,

$$X_{dqia} = 1, \text{ if the } a^{\text{th}} \text{ response were picked and} \\ = 0, \text{ otherwise.}$$

Let $Y_{dq.a} = \sum X_{dqia}$ be the frequency over i of the a^{th} category of the q^{th} question given by all respondents in the d^{th} domain.

Let $AV_{dq.a} = Y_{dq.a} / n_d$ be the average over i of the a^{th} category of the q^{th} question given by all respondents in the d^{th} domain.

Then the estimated total for the a^{th} category of the q^{th} question in the d^{th} domain is given by

$$\begin{aligned} T_{dq.a} &= N_d \times AV_{dq.a} \\ &= N_d \times Y_{dq.a} / n_d \\ &= \sum (N_d / n_d) \times X_{dqia} \end{aligned}$$

Thus, X_{dqia} was assigned a "weight" $W_{dqia} = (N_d / n_d)$.

As for combining 2 or more domains (e.g., the Eastern and Western Oregon publicly-owned nongenerating utilities), consider the following:

Let a particular set of domains be designated by $D^* = \{d \mid d^*_1, d^*_2, \dots\}$. Then the estimated total for the a^{th} category of the q^{th} question in the d^{th} domain is given by

$$T_{D^*.q.a} = \sum T_{dq.a} \text{ where } d \text{ belongs to the set } D^*.$$

Determining N_d for the 15 Sampling Domains

The original plan for determining the domain sizes, i.e., the values of N_d , called for the straightforward summing of ZIP-level occupied housing counts (based on the 1990 Census) into their respective domains. This scheme turned out to be flawed for a number of reasons, among them:

- Not every ZIP in the region was accounted for in the original mapping.
- Not every utility was included in the original mapping.
- Numerous respondents reported being served by a utility different from that indicated in the original mapping; in some cases, this meant that they were in the wrong domain.

To examine the consequences of these flaws, the ZIP/Census-based adjusted occupied household counts² for 1990 were compared with the 1990 utility-based residential customer counts contained in Bonneville's Financial & Operations (F&O) database. Table 2 displays the by-domain differences between these two methods of enumeration.

Domain (Code)	ZIP/Census-based Adjusted Household Counts	1990 Customer Counts from F&O Database	Differences	Relative Differences	Estimated Occupied Housing Units³
PG-EWA (13)	56,090	61,327	-5,237	-9.34%	58,882
PG-WWA (14)	675,603	623,827	51,776	7.66%	603,972
PG-WOR (16)	61,636	59,184	2,452	3.98%	55,304
PN-WMT (21)	23,481	31,687	-8,206	-34.95%	28,769
PN-ID (22)	78,912	86,653	-7,741	-9.81%	81,110
PN-EWA (23)	105,843	136,175	-30,332	-28.66%	127,791
PN-WWA (24)	264,667	272,338	-7,671	-2.90%	264,992
PN-EOR (25)	62,023	74,651	-12,628	-20.36%	70,079
PN-WOR (26)	208,945	168,141	40,804	19.53%	162,425
IO-WMT (31)	144,678	82,053	62,625	43.29%	74,002
IO-ID (32)	346,838	331,191	15,647	4.51%	304,985
IO-EWA (33)	272,816	246,976	25,840	9.47%	233,474
IO-WWA (34)	608,454	651,060	-42,606	-7.00%	636,955
IO-EOR (35)	104,743	98,322	6,421	6.13%	86,308
IO-WOR (36)	742,257	775,094	-32,837	-4.42%	759,751
Region	3,756,986	3,698,679	58,307	1.55%	3,548,809

²According to a draft memorandum from Ottie Nabors to David Mills, January 25, 1993, the ZIP/Census-based adjusted occupied household counts were obtained as [occupied housing units] + [vacancies for sale] + [vacancies for rent] + [vacancies--seasonal occupancy]. These four Census categories can be expected to receive electrical service in contrast to, say, units under construction.

³Estimated from procedures described in the Nabors-to-Mills memorandum.

Although the region-level totals are fairly closely aligned, the individual domains are not. This ZIP-based process simply is inadequate to the survey's reporting needs. A different methodology⁴ was developed, this one based on adjusting the BPA's 1991 F&O customer counts and adjusting them to account for Census-based vacancy rates for the six geographic subregions. These counts are shown in the right-most column of Table 2.

Determining N_a for the 12 "Area" Domains

In order to obtain estimates for each of BPA's four Area Offices (AOs), the data were post-stratified into 12 different "area domains," with N_a , $a = 1, 2, \dots, 12$, occupied housing units in the a^{th} area domain. In setting up this post-stratification, the three utility types were maintained and the four geographic AO areas replaced the six sub-state areas used in the design. Because these AO-based geographic entities were not accommodated in the design of the survey, they were created by assigning the utilities to the AOs. Splits between geographic AOs were decided on the basis of county lines. BPA's PNWRES92 Team decided to adopt a strategy of post-stratifying by assigning county-level information to create the area offices' estimates (in particular, Hood River county was assigned "in full" to Lower Columbia in the initial survey design).

The specific values of N_a derived by this process are given in Table 3.

Table 3				
Area Office:	Utility Type:			Totals
	Investor-Owned	Public Generating	Public Non-Generating	
Lower Columbia	849,541	90,444	261,934	1,201,919
Puget Sound	634,748	559,778	166,973	1,371,499
Snake River	331,974	Not Applicable ⁵	185,562	517,536
Upper Columbia	281,846	56,705	119,304	457,855
Totals	2,098,109	716,927	733,773	3,548,809

Reassigning Respondents to Other Sampling Domains (i.e., modifying n_d)

As the survey progressed, many respondents indicated that they received their electric service from utilities other than the one assigned according to the respondent's ZIP code. Two steps were taken to deal with these misallocations:

First, each respondent was assigned to the utility they named. Of the 20,170 respondents, 18,582 named their utility.

⁴Discussed in detail in the Nabors-to-Mills memorandum.

⁵There are no publicly-owned generating utilities in the Snake River Area.

Second, the 1,588 respondents who did not name a utility remained linked to their originally-assigned utility.

The effects of these allocations are shown in Table 4, in which the effective sample sizes appear in the last column..

Table 4				
Domain (Code)⁶	Designed Sample Size (n_d)	Number of Surveys Completed	Self-assigned Sample Size	Effective Sample Size
PG-EWA (13)	1,905	1,911	1,828	1,967
PG-WWA (14)	1,905	1,912	1,652	1,816
PG-WOR (16)	1,905	1,908	1,775	1,857
PN-WMT (21)	1,905	1,913	1,726	1,892
PN-ID (22)	1,905	1,918	1,325	1,490
PN-EWA (23)	1,905	1,917	1,644	1,822
PN-WWA (24)	1,905	1,909	1,718	1,868
PN-EOR (25)	1,905	1,952	1,657	1,924
PN-WOR (26)	1,905	1,914	1,359	1,499
IO-WMT (31)	476	487	487	511
IO-ID (32)	476	477	908	920
IO-EWA (33)	476	500	534	562
IO-WWA (34)	476	492	641	661
IO-EOR (35)	476	476	444	478
IO-WOR (36)	476	484	884	903
				20,170

⁶PG = Public Generators; PN = Public Non-Generators; IO = Investor-Owned. WMT = Western Montana; ID = Idaho; EWA = Eastern Washington; WWA = Western Washington; EOR = Eastern Oregon; WOR = Western Oregon.

Reassigning Respondents to Other "Area" Domains (i.e., modifying n_d)

A similar process was followed to determine the effective sample size for the Area-Office-based statistics. The counts in Table 5 were prepared by AMPG from the survey records; consultation with BPA staff was required to resolve only a dozen or so anomalous records.

Table 5				
Utility Type:				
Area Office:	Investor-Owned	Public Generating	Public Non- Generating	Totals
Lower Columbia	907	2,028	2,215	5,150
Puget Sound	666	1,660	1,150	3,476
Snake River	1,455	Not Applicable ⁷	4,464	5,919
Upper Columbia	1,007	1,941	2,677	5,625
Totals	4,035	5,629	10,506	20,170

⁷There are no publicly-owned generating utilities in the Snake River Area.

Notes on the "Complex Question"

Or: Be Especially Alert about Combining Results from Q-16, Q-44, and Q-46

The Excel-based spreadsheet on the next page is designed to alert analysts to and to describe a problem¹ that arises when you are dealing with PNWRES-I responses to heating-system and space-heat-fuel-type questions. The basic problem arises because *not all households were asked the same questions about systems and fuels*.

To illustrate: Those who responded to Q-16 (regarding dwelling type) with "manufactured home" or "single-family house" were *not* asked Q-44 (regarding multi-unit primary heat system).

Similarly: a DK (Don't Know) response to Q-44 (regarding multi-unit primary heat system) resulted in an immediate DK response to Q-46 (regarding space-heat fuel).

Note that the spreadsheet is based upon the total of 20,170 interviews. If your analysis is affected by any of these matters, you should trace similar layouts at the domain levels at which you are working.

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¹ That became known as the "Complex Question" because it entangles three of the survey items in an unfortunate way. Such consequences surely are to be mitigated in any subsequent survey.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	The "Complex Question" Simplified ... or: Oh, Golly! Let's NOT Make This Mistake Again!																									
2																			AMPG's Exhibit A (FAX 3/8/93 -16:13)							
3	Q-16: Dwelling type				Q-44: Multi-unit primary heat system				Q-48: Space-heat fuel				"Value"				AMPG says:				AUF*					
4													Multi-Unit Systems:				1	44-01 Central heat/All Units				354				
5	16-03 2	728			44-01: Central - All	354											2	44-02 Central Heat/Several Units				54				
6	16-04 3	113			44-02: Central - Several	54											3	44-03 App'l Not Heated				11	419	0		
7	16-05 4	330			44-04: Not Heated	11	419						Fossil Fuel Systems:				4	48-01 FF Steam/Radiator				249				
8	16-06 5+	1,392											46-XX Not Asked	419			5	48-02 FF Wall/Floor/Ceiling Units				352				
9	16-07: Other	79	2,642		44-99: DK	30	30						46-YY: DK	30			6	48-03 FF Portable Units				42				
10													46-02 NG	3,053			7	48-04 FF Central Furnace				4,105				
11					44-03: Own unit only	2,193	2,193						46-03 FO	1,426			8	48-05 FF Other				112	4,860	51		
12													46-05 Prop	379			Electric Systems:				9	50-01 EI Heat Pump				1,160
13					44-XX: Not Asked	17,528	17,528	19,721					46-06 Keros	18			10	50-02 EI Portable Room				210				
14	16-01: Manuf'd	2,992						20,170					46-07 Coal	35	4,911		11	50-03 EI Radiant Panels				1,722				
15	16-02: SFH	14,536	17,528														12	50-04 EI Steam Radiator				66				
16													46-01 Elec	10,621			13	50-05 EI Central Furnace				3,505				
17	16-98: DK	0															14	50-06 EI Baseboard/Wall				3,853				
18	16-99: Refused	0	0										46-04 Wood	4,093			15	50-07 EI Other				37	10,553	68		
19			20,170														Wood Systems:				16	52-01 Wood Stove				3,048
20													46-08 Solar	16			17	52-02 Wood Pellet Stove				264				
21													46-09 Geotherm	8			18	52-03 Wood Central				187				
22													46-10 Other	50			19	52-04 Wood Fireplace/Insert				497				
23													46-11 No Heat	4	78		20	52-05 Wood Fireplace/No Insert				84	4,080	13		
24																	Other Systems:				21	Solar				16
25													46-98 DK	17			22	Geothermal				8				
26													46-99 Refused	1	18	19,721	23	Other				50				
27														20,170			24	No Heat				4	78	0		
28																	DK:				25	DK				177
29																	Refused:				26	Refused				3
30																										
31																										
32																										
33																										
34																										
35	* AUF: Answers Unaccounted For																									
36																										

These DK+Refused counts should match the AUF* total... and they do!

The 1992 Pacific Northwest Residential Energy Survey Seminars

Seminar I -

Introduction to PNWRES92's Data and Findings

10 am to 11 am, Tuesday,
September 21, 1993

Room 365, Oregon State Office
Building, 800 N.E. Oregon Street,
Portland

- Welcome and Introduction
- Background (including use of survey respondents as surrogate for the residential sector for future surveys)
- Survey process
- PNWRES92 documentation system and how to use it
- Demonstrate **Bonneville Power Plus**--a Windows-, Word-, and Excel-based system for using PNWRES92 data on personal computers
- Report on special-interest estimates
- Alert to need for special care about the two kinds of weights (Domain and Area Office) and the *critical* need to distinguish between *Raw* and *Weighted* results
- Q&A
- What's next on the PNWRES92 TooDoo list

Seminar II -

Exploring and Using PNWRES92's Public-Use Files

1 pm to 3 pm, Tuesday,
September 21, 1993

Room 225, 827 Building,
827 N.E. Oregon Street,
Portland

- Welcome and Introduction
- Short recap of Session I -- including the special-interest estimates and the use of **Bonneville Power Plus** as a way of getting quick-look answers on personal computers
- Nature of public-use SAS dataset (data dictionary, etc.)
- Nature of public-use *.dbf* file for use with PC-based database managers (e.g., Paradox, Access, dBase)
- How to use the two kinds of weights--and why
- Example problems -- how to think about them, how to set up SAS code, how to use output, how to modify for specifically different queries:
- Details about special-interest estimates
- Sub-domain estimates; e.g., what is the ESTIMATED average dwelling square footage (with standard error) for houses in Malheur, Harney, Lake, and Klamath counties?
- Inter-domain estimates; e.g., what is the ESTIMATED difference (with standard error) in per-household income for Washington and Oregon counties facing each other across the Columbia River?
- *Ad hoc* queries
- Q&A

PNWRES92-I Archives

From May 1989 through September-October 1993, chronological written records were kept on the planning, conduct, and closure of the active data-collection portion of PNWRES92-I. These include personal notes, Task Force meeting minutes, draft and final statements of work, exchanges with contractors, the data collected during the survey, and experimental data presentations.

In order to preserve these records for the next few years, they were collected into BPA's basic long-term storage units and, during the last quarter of 1993, were placed in archival storage. They may be examined by contacting the Assessment and Evaluation Branch (RPE).

PNWRES92-I Primary Documentation Series

- Book 1: Volumes A and B.** The Executive Summary, the Concordance, and the Glossary (A) and the Report on Methodology and the Technical Appendix (B).
- Book 2: Volume C.** Item-by-item crosstabulations for the Pacific Northwest Region.
- Book 3: Volume D.** Item-by-item crosstabulations for the four Bonneville Area Offices (Puget Sound, Lower Columbia, Upper Columbia, and Snake River).
- Book 4: Volume E.** Item-by-item crosstabulations for the four Pacific Northwest states served by Bonneville (Western Montana, Idaho, Washington, and Oregon).
- Book 5: Volume F.** Selected crosstabulations for the Pacific Northwest Region.
- Book 6: Volumes G, H, and I.** Selected crosstabulations for the three publicly-owned *generating* utility domains: Eastern Washington (G), Western Washington (H), and Western Oregon (I).
- Book 7: Volumes J, K, L, M, N, and O.** Selected crosstabulations for the six publicly-owned *non-generating* utility domains: Western Montana (J), Idaho (K), Eastern Washington (L), Western Washington (M), Eastern Oregon (N), and Western Oregon (O).
- Book 8: Volumes P, Q, R, S, T, and U.** Selected crosstabulations for the six investor-owned utility domains: Western Montana (P), Idaho (Q), Eastern Washington (R), Western Washington (S), Eastern Oregon (T), and Western Oregon (U).
- Book 9: Volumes V, W, X and Y.** Selected crosstabulations for Bonneville's four Area Offices: Puget Sound (V), Lower Columbia (W), Upper Columbia (X), and Snake River (Y).
- Book 10: Volumes Z, AA, AB, and AC.** Selected crosstabulations for the four states served by Bonneville: Washington (Z), Oregon (AA), Idaho (AB), and Western Montana (AC).
- Book 11: Volumes AD, AE, and AF.** Selected crosstabulations for the three categories of utilities in the Pacific Northwest: Public Generating (AD), Public Non-Generating (AE), and Investor-Owned (AF).
- Book 12: Volume AG.** A report of a post-survey of PNWRES92-I non-respondents (conducted in late Spring 1993) and their reason(s) for not completing the original survey.

END

DATE

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3/3/94