Q. Please state your name, business address and present position with Rocky Mountain Power (the Company), a division of PacifiCorp.

A. My name is Scott D. Thornton. My business address is 1407 W North Temple Street, Salt Lake City, Utah. My current position is Manager, Metered Data Management in the Metering Business Unit.

Q. Please briefly describe your education and business experience.

A. I have Bachelors Degrees in Accounting and Business Administration/ Economics from Westminster College. Additionally, I have a Masters Degree in Business Administration from Brigham Young University. I have over 30 years of experience with the Company, 25 of those years associated with load research activities.

Q. Please describe your present duties.

A. I am responsible for the development of all class load profile estimates utilized in cost allocation, rate design, forecasting and special studies. I direct the design, implementation, and maintenance of all load studies performed by both Rocky Mountain Power and Pacific Power Companies. I am also responsible for the development of load coincidence factors and for the determination of the distribution system peak for the Company.

Purpose of Testimony

Q. What is the purpose of your testimony?

A. My testimony is intended to give an overview of load research in general, load research processes insofar as they apply to the development of class loads, and the processes surrounding the development of load estimates used in the Company's

rate filing.

Q. What is the general purpose of load research?

A. In the utility environment, load research provides the data needed for cost allocations and the resulting cost-of-service information. Most demand related costs of production, transmission, and distribution facilities can be allocated to the classes of service based on system peaks, class peaks, or individual customer demands that are determined from load research data.

Load studies are designed to provide information on rate related activities such as demands associated with specific customer classes at specific peak periods (system peak day). These loads are derived by either direct measurement, when all customers associated with a particular rate group have load profile meters installed, or by sampling for rate groups where customers do not have load profile meters.

Q. Were load studies used to provide load estimates in this rate filing?

A. Yes. In the state of Utah, sampling is used to provide load estimates for the Residential Class, Schedule 6, Schedule 23 and the Irrigation Class. Loads reported for all other major rate groups are derived through a full census of direct measurement, where every meter within a particular class is a load profile meter.

Q. Would you provide a brief overview of load sampling?

A. There are a wide range of sampling options available for estimating load profile characteristics, from simple random to elaborate model-based sampling procedures. The two most widely accepted within the electric industry are simple random sampling and stratified random sampling.

Simple random sampling has several advantages: Each unit of the population has the same probability of being selected. Simple random sampling is the easiest sampling technique to perform and the most flexible during analysis. In load research, simple random sampling is used mainly for populations with relatively few customers or for populations where individual units have similar characteristics.

Stratified random sampling is a widely used and accepted technique used to reduce overall sample size. It divides the class of interest into sub-classes of like characteristics. The technique has the effect of reducing the overall variance of the class, thus reducing sample size. This generally results in significant reductions in the sample size required, versus simple random sampling. For example, the Utah residential class would require approximately 900 load profile meters to satisfy the requirements of a simple random sample. The current stratified random sample for this group calls for 170 load profile meters to provide similar total class load estimates. With current hardware and installation costs running about $350, the difference in cost is significant.

Q. Please detail the sampling philosophy employed by Rocky Mountain Power.

A. All samples designed and installed in the state of Utah are based on stratified random samples, and the designs meet, or exceed the standard specified in 1978 by Section 133 of the Public Utilities Regulatory Policy Act (PURPA). The specific parameters of the sample design are outlined in the Code of Federal Regulations (CFR), Title 18, Chapter 1, Subchapter K, Part 290.403, Subpart B, which states:

"**Accuracy Level.** If sample metering is required, the sampling method and procedures for collecting, processing, and analyzing the sample loads, taken together, shall be designed so as to provide reasonably accurate data consistent with available technology and equipment. An accuracy of plus or minus 10 percent at the 90 percent confidence level shall be used as a target for the measurement of group loads at the time of system and customer group peaks."

The PURPA specification has become a load research standard, particularly for samples that will be used to support rate cases or other regulatory requirements.

Q. Is stratified sampling a generally accepted practice for these types of studies?

A. Yes. Stratified sample design is an industry-accepted practice which provides for the installation of dramatically fewer sample points to achieve target precision and confidence levels. In its July 2002 Report to the Utah Public Service Commission, the Load Research Working Group, in referencing the Company's stratified sample designs, concluded that "techniques used by the Company to develop the load research sample design are appropriate. The load research protocol is designed to produce a sample that is accurate within ±10 percent on 90 percent of the observations." Membership of this group was drawn from PacifiCorp, the Division of Public Utilities, the Committee of Consumer Services and other interested parties. The Committee was assigned to chair the group.

Q. Do these samples incorporate appliance saturation into the design?

A. No. Because stratified random sampling is designed to provide statistically accurate load estimates for the total class and not for subpopulations, appliance saturation levels of load research sample customers are neither collected nor employed in the design of rate schedule or class samples, nor in the expansion of the data estimates.

Q. Was data derived from load studies utilized in this current filing?

A. Yes. Load estimates for this rate filing employ data retrieved under both former and current sample designs, which include new samples for the residential class, schedule 6 and schedule 23 which were placed into production in late 2008. The former load studies provide data through September 2008, while the newer studies were used to provide estimates of October 2008 through December 2008 loads.

Q. Please describe the data collected in these load studies.

A. For the rate groups identified, peak load data is estimated from these load samples. Sample participants have specialized load profile metering installed at their site. These meters record usage in hourly or sub-hourly increments for the duration of the load study (96 intervals/day/meter, 2,880 intervals/month/meter, 35,040 intervals/year/meter). Because these meters record and store time-differentiated usage data, we are able to determine usage for the sampled class for any identified date and time (system, jurisdictional, class peaks). This sample usage is the basis for the class load estimates utilized in cost of service studies.

Q. Which Rocky Mountain Power Schedules have load profile metering installed?

A. At the present time, there are 107 such meters installed on Schedule 6 customers, 75 meters installed on Schedule 23 customers, 130 meters installed on irrigation customers and 170 load profile meters have been installed on the Utah residential class.

In addition, all Rocky Mountain Power customers with billed demand equal to or greater than 1,000 kW have load profile metering installed. Finally, the

PacifiCorp Metering Business Policy manual, Appendix A.3 states:

"All new revenue loads that are calculated to be seven hundred and fifty kilowatts or greater shall have multifunction, interval data, solid state meters with remote communication access installed."

Q. How are load study sample customers selected?

A. Per standard sampling theory, sample customers are randomly selected. If repeated samples were drawn, you would expect that the location of the sample sites would mirror the location of the target population. For a given individual sample, this would probably not be the case. We do not try to force sample selection to mirror the population as this can potentially introduce bias into the process. We do expect that the sample sites will generally follow population centers. When this is not the case, we will initiate a re-sample of the target population.

Q. How can you expect a load study sample placed in service several years ago to provide reliable load estimates today?

A. Samples, by their very nature, are designed to provide information about something that is not otherwise readily available. Our load study samples are designed to estimate loads at the time of the monthly system peaks. This is not information that can be obtained from standard billing meters, and is not stored on a per customer basis in our billing systems.

While a sample is selected and load research meters placed into service for a particular customer class at a single point in time, the meters in the sample continue to provide continuous current load data as long as they remain in service. This is important as our customers are not static and have a tendency to change

over time. For example, swamp coolers are replaced with central air conditioners and businesses add processes, or even cease to exist. Because our load study meters are continuously in place, we capture those changes and, as such, our load estimates will reflect design and appliance changes that occur over time. When it becomes apparent that the sample is no longer providing reliable load estimates, we will supplement the number of interval meters called for in the sample design, or replace the sample.

Q How do we know these studies are performing as designed?

A. From the AIEC Load Research Manual, 2nd Edition, 2001, pages 7-26-7-27:

> Since population demands are estimated from relatively small samples drawn from the population, a valid concern is how well the samples represent the universe. Actual population demands are unknown, precluding direct comparisons with estimated demands. The representativeness of a sample must, therefore, be judged on the basis of auxiliary variables that are available for both the sample and the total population and correlate well with the variable of interest, class demands. In these respects, energy use per customer is an acceptable proxy for demand.

Energy use of the sample should correspond closely to the target population use (per customer), not only annually but also for each month of the year, after the application of any calendar month adjustments. This data validation is performed on all load study samples by Rocky Mountain Power's load research personnel. Exhibit RMP_(SDT-1) presents the complete monthly results of this comparison. A summary of the annual results is presented below:

UT RES CL	Total
Sample Kwh	2,960,507,584
Billing Kwh	2,934,329,403
Adj. Fact.	**0.9911575**

UT Sch 6	Total
Sample Kwh	3,112,768,756
Billing Kwh	2,736,387,547
Adj. Fact.	**0.8790848**

UT Sch 23	Total
Sample Kwh	646,228,032
Billing Kwh	605,265,695
Adj. Fact.	**0.9366132**

UT Irr Class	Total
Sample Kwh	101,070,222
Billing Kwh	85,497,572
Adj. Fact.	**0.8459225**

These comparisons indicate that, for the year 2008, the residential class and Schedule 23 load samples were providing load estimates that fall within the limits established in the sample design criteria, based on the comparison to the auxiliary variable kWh. The Schedule 6 comparison, falls outside these limits. Analysis of the monthly data for this schedule indicates that the prior load study was overestimating usage for the period January through September 2008. The new load study, which was used to provide estimates for the October through December 2008 time period, falls more in line with design criteria although it is not prudent to draw conclusions based on 3 months worth of data.

Q. This exhibit indicates that there is a substantial difference between the billed and sampled energy for the irrigation class. Does this indicate that the sample is not meeting accuracy specifications?

A. No. The irrigation class presents a number of challenges from a sampling viewpoint. The irrigation demand curve relies on several factors, including

weather and crop rotation. Past studies have also shown that a given customer may not irrigate every year. When employing a stratified random sampling philosophy, the loss of a single sample customer can have significant impact on the load estimates.

With this in mind, we approach irrigation samples in a different fashion. First, we over-sample the irrigation class relative to other classes. As an example, the total number of Utah residential class sample customers (170) represent .026% of the total residential class. By contrast, the total number of irrigation sample customers (130) represent 6.1 percent of the total class. In doing so, we can afford to lose one or more of the sample customers for the irrigation season without adversely affecting the load estimates.

Second, sample customers are drawn from a pool of the irrigation customers who were actively irrigating in the prior two year period. The effect of this change is that the sample estimates will always be greater than the energy derived from billing records. This is by design. Our intent is to accurately construct the load curve of those customers actively irrigating. We avoid overstating the peak demand of the irrigation class by then adjusting that load curve down to the level of the billed energy. This explains the large downward adjustment factor shown for the irrigation class in Exhibit RMP___(SDT-1).

Q. Are additional adjustments made to the data before it is submitted to the cost-of-service analysts?

A. Yes. The final step in the preparation of these loads involves making the adjustment to ratio the data from the historical test period to the forecast test year.

Ratio estimation is a technique that can take advantage of the correlation of the variable of interest y with another variable x to obtain increased precision. Class demand estimates for rate classes and other populations with "known" total energy use are adjusted by the ratio of demand *y* to energy use *x* in the sample. When x and *y* are sufficiently correlated, the relative variance of the estimated ratio is less than the relative variance of *x* or *y* alone.

The historical year data is then aligned such that Mondays in the historical year match Mondays in the forecast year, Tuesdays match Tuesdays, and so on. Once complete, we can isolate those class/schedule loads associated with various peaks of interest (system, jurisdictional).

Q. Are there any other checks that can be made to insure the data is accurate?

There is a presumption by some that an additional check on the reasonableness of the load research estimates would be to compare the sum of these estimates, plus losses, to the jurisdictional load values. The assumption is that these values should be approximately equal. This issue was addressed by the Utah Load Resource Working Group that was established by the Utah Commission in Docket No. 01-035-01.

As discussed by the working group, the hourly jurisdictional loads will rarely, if ever, be the same as the sum of the individual class loads. These two loads are derived in different fashions. The jurisdictional loads are derived through direct measurement of generation points as well as power flows into and out of the jurisdiction. Class loads represent a combination of direct measurement and sample data. The sample data provides estimates of usage at various periods

of interest. Jurisdictional loads are source loads and so are considered "at input" (with losses). Class loads are based on measurement at the customer meter and so are considered "at sales" (without losses). A loss factor is applied to the class load data to provide an estimate of loads "at input", but it is a static loss factor based on annual losses. As such, loss fluctuations based on ambient temperature are not captured.

Because of the issues defined above, as well as a general uncertainty related to the measurement of border loads, in 2002, with the knowledge and consent of the Utah PSC and various intervener groups, the practice of calibrating customer class loads to jurisdictional loads was discontinued. This decision was explained in the "Load Research Working Group Report to the Utah Public Service Commission" dated 1 July 2002.

Q. Do you believe that load estimates prepared by the load research group, accurately reflect actual population usage for the Utah customers identified previously?

A. Yes I do. These estimates are prepared and reviewed following industry and Company standard practices as defined below.

a) All Utah load data samples incorporate stratified random design principles, which are those most favored within our industry;
b) All Utah load samples are designed to meet or exceed the PURPA standard of ±10 precision at the 90 percent confidence level. This standard was later adopted by the Load Research Working Group in its 2002 submission to the Utah Public Service Commission.
c) Samples are continuously reviewed to insure ongoing representativeness with the target population group. Samples that continuously fall outside the acceptable limits are supplemented with additional sample points, or replaced.

d) Load estimates are ratioed based on their relationship to the auxiliary variable. This is a proven method for increasing the precision of the load estimates.

All of these steps contribute to the reliability of the load estimates. As such, these estimates reflect a fair and accurate representation of the affected population's usage at the various defined periods of interest.

Q. Does this complete your testimony?

A. Yes, it does.