Q. Please state your name, business address and present position with PacifiCorp, dba Rocky Mountain Power ("Company").

A. My name is Scott D. Thornton. My business address is 1407 W North Temple Street, Salt Lake City, Utah, 84116. My present position is Manager, Metered Data Management in the Metering Business Unit.

Q. What does that position entail?

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

Q. Please briefly describe your education and business background?

A. I have B.S. degrees in Accounting and Business Administration/ Economics from Westminster College. Additionally, I have an MBA from Brigham Young University. I have over 31 years of experience with the Company, 26 of those years associated with load research activities

Q. Have you appeared as a witness in previous regulatory proceedings?

A. Yes, I have.

Purpose of Testimony

Q. What is the purpose of your rebuttal 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 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 contribution to system peaks, contribution to distribution 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, by sampling for rate groups or by other estimation procedures.

Q. Why are load studies for some classes derived by sampling?

A. For rate groups where load profile meters are not used for billing purposes, direct measurement of customer or class loads is not available. For these customer groups, system peak and other load data is estimated through sampling and statistical analysis.

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.

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 10 and Schedule 23. 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, or by other processes that will be detailed in this testimony.

Sampling Overview

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.

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) for the variable of interest. 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. This technique is endorsed by both the Association of Edison Illuminating Companies (AEIC) Load Research Committee, as well as the Western Load Research Association (WLRA).

Load data utilized in this filing

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

A. Yes. Load estimates for this rate filing are derived from sample data collected during the base year period July 2009 through June 2010. For those schedules

where direct measurement is employed, the data represents actual measurements of load for the same base period. The estimated load data is derived from data collected via proxy sample during the same time period.

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 170 such meters installed on the residential class customers, 108 meters installed on Schedule 6 customers, 130 meters installed on Schedule 10 customers and 75 load profile meters have been installed on Schedule 23 customers.

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."

The table below summarizes these installations:

Utah				
Class/Schedule	Data Source	Design Criteria	Sample Size	Install Date
Sch 001	Stratified random sample	90/5	170	October 2008
Sch 006	Stratified random sample	90/10	108	January 2009
Sch 023	Stratified random sample	90/10	75	October 2008
Sch 010	Stratified random sample	90/10	130	May 2006
Sch 008	Direct Measurement	Census	Census	Ongoing
Sch 009	Direct Measurement	Census	Census	Ongoing
Sch 021	Direct Measurement	Census	Census	Ongoing
Sch 031	Direct Measurement	Census	Census	Ongoing
Street Lights	Estimated	Load estimated from proxy data		

Q. Would you please give an explanation of the table you've just presented?

A. Yes. The first column lists those schedules or breakout of schedules for which time differentiated load estimates are required by the cost-of-service department.

The second column, Data Source, identifies how the data is derived. Note that, depending on the schedule, these load estimates may be derived from sample data, direct measurement, or estimated using other proxy data.

The third column, Design Criteria, indicates the confidence and precision parameters that were used in the sample design. The residential class sample, for instance, was designed to achieve ±5 percent precision at the 90 percent confidence level for the variable of interest. More simply put, the sample will provide an estimate that is within ±5 percent of the actual value 9 out of 10 times. Note that schedules designated as Direct Measurement indicate a Design Criteria

of 100/0. This indicates that 100 percent of the time the loads derived from this group show 0 deviations from actual.

The fourth column, Sample Size, indicates the number of load profile meters that were installed on a given schedule to meet the specified Design Criteria. A listing of Census indicates that all customers belonging to that particular group have load profile metering installed.

The final column indicates when a given load study was installed. Those schedules from which load estimates are derived by stratified random sampling are replaced every five years. Census metering is only replaced if a given customer moves out of the specified census group. For instance, if a Schedule 8 customer was reclassified as a Schedule 6 or Schedule 23 customer, he would be removed from the Schedule 8 group. Because he was reclassified into a group whose loads are determined by sampling, he would not be added to this group except through normal random selection.

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. I do not try to force sample selection to mirror the population as this can potentially introduce bias into the process. I do expect that the sample sites will generally follow population centers. When this is not the case, I will initiate a re-sample of the target population.

Q. Can a load study sample placed in service several years ago to provide reliable load estimates today?

A. Yes. 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. 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.

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.

Q. You had previously mentioned estimating loads from proxy data. Would you explain why you would use proxy data rather than either of the methods you've already identified?

A. Yes. There are situations where installing load profile metering is cost prohibitive, or just not practical. Street lights, for instance, present a prime example. We could install load studies to estimate these loads, but it makes much more economic sense to simply divide the monthly billed energy for the group by the number of burning hours for the given month.

Adjustment of historical loads to forecast level

Q. Are any adjustments made to the data before it is submitted for use in the cost of service study?

A. Yes. Preparation of these loads includes an adjustment to ratio the historical base year loads to properly reflect forecast test year energy sales.

Q. Please describe the method used to adjust base year class load data to test year forecast energy levels.

A. The load research group prepares estimates of average per customer hourly demand for each customer rate class for every hour of the base historical year. We then calculate the base year monthly energy usage for each of these groups. This data is then extrapolated, or ratioed, so that the value of the energy associated with these base year load estimates matches the forecast energy level. The data is further adjusted by the appropriate loss factor. Finally, the class load data is extracted and summarized for those dates and times identified as the base year system peaks.

Calibration of loads

Q. Are any other adjustments applied to these data?

A. Yes, the sample data is subject to an additional calibration adjustment.

Q. Please explain and justify this adjustment.

A. One of the recommendations made to the Utah commission by the Load Research Working Group was to calibrate load data to more closely mirror reported jurisdictional load forecast estimates. The calibration process is based on the expectation that the sum of base year class loads should equal the total forecast jurisdictional load estimates. The parties in the Group agreed that there are a number of unknowns occurring in the system that will prevent an exact match, losses being the primary example, but the Group felt that these class load totals should certainly fall within ±5 percent of the total. While not all parties to the Group agreed with this process, the general consensus indicated that that the Company should implement the following calibration process in its future filings.

Q. Would you describe this calibration process?

A. Yes. The process employs a 10% - 5% - 2% look at the monthly data. First, if the sum of class loads in any given month differs from the forecast jurisdictional load estimate by more than 10 percent, that month will be subject to further investigation to determine the cause of the variance and necessary adjustments will be made. Second, if a monthly variance lies between five percent and 10 percent, the sample load data will be adjusted to a level sufficient to achieve a class load summation that does not exceed five percent. Last, if the result of the monthly 10 percent-5 percent procedure results in an annual difference greater

than two percent, the monthly calibration level will be lowered in an iterative process by 0.5 percent until the annual level of two percent is achieved.

Q. Is it possible that a specific month may exceed the 10 percent level even after calibration ?

A. Yes it is. If the Company has made all reasonable efforts to determine that cause of a variance level in excess of 10 percent, and the variance is still in excess of 10 percent, the Company will automatically adjust the data to the five percent level.

Q. In this current filing, did any months require calibration?

A. Yes. For the 2011 test year, five months exceeded allowable percentage levels and required calibration.

Q. Please detail which months exceeded allowable limits and the processes employed to adjust the loads in those five months to acceptable levels.

A. The five months were October (-13.7%), December (13.6%), March (-12.2%), April (-6.8%) and May (21.4%). April, whose required adjustment fell between five percent and 10 percent, was directly adjusted to the five percent level. The other months required a more iterative process.

Q. Please describe that process.

A. As each of these remaining months required an adjustment in excess of 10 percent, we first looked at utilizing base year loads on the respective base year system peak days but coincident with the test year peak hours.

Q. What was the result of this comparison?

A. In all cases, the percent difference between the sum of base year class loads and test year jurisdictional peak estimates decreased. October decreased from -

13.709% to -11.954%, December decreased from 13.593% to 7.173%, March decreased from -12.191% to -0.208% and May decreased from 21.471% to 20.225%. As a result of this first level adjustment, December required no further adjustment, and March fell within the guidelines for automatic adjustment.

Q. What additional steps were taken to adjust the remaining two months?

A. We reviewed the relative time of month for the base year system peak occurrences vs. the same information in the test year. For October, the base year peak occurred on October 28th while the test year peak occurred on October 29th. The May, base year peak occurred on May 6th while the corresponding test year peak occurred on May 17th.

Q. What adjustments did you make as a result of these comparisons?

A. Our last possible option for adjusting these loads is to utilize class load data from a non system peak day. The October comparison was deemed to be negligible since peaks in both years occurred at the end of the month and during the same week. Since no other obvious reason could be determined for the difference, October base year, system peak day loads coincident to the forecast system peak time were directly calibrated down to the five percent level.

Q. How were the May loads adjusted?

A. In the case of May loads, the difference of the base year system peak day to the forecast system peak day was deemed significant. The base year peak occurred on the 6th, while the test year peak occurred on the 17th. May is a transition month, which means it can include both heating and cooling load. As such, a peak occurring at the beginning of the month may be comprised of entirely

different elements than a peak that occurs later in the month. While I do believe there is an issue in utilizing non peak historical data to estimate forecast load estimates, in situations like those described above, I feel such a move is warranted. As such, I utilized the 16:00 date from May 18th, 2010 to estimate the forecast demand at 16:00 on May 17th, 2011. Both dates occur on a Tuesday.

Q. What was the result of this technique?

A. The difference between base and test years dropped to 17.138%

Q. This amount still exceeds the 10% level. Were further adjustments employed?

A. At this point in the process, I deemed that I had employed all reasonable measures to reconcile the difference. This final amount was directly adjusted to the five percent level.

Q. You discussed an additional two percent adjustment may be required. Did you find it necessary to employ this additional adjustment?

A. No. Additional adjustments are required if the annual difference between the base year class load data and the test year forecast data exceed two percent. After applying the adjustments described above, the difference between these two metrics was 0.070%.

Q. Do you believe that load estimates prepared by the load research group, and adjusted to encompass the calibration techniques previously described, 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 the most commonly used sampling methods 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 for the variable of interest, average system peak demand over the 12 month base period.
c) Samples are continuously reviewed to insure ongoing representativeness with the target population group. If samples continuously fall outside the acceptable limits, they are supplemented with additional sample points, or replaced.

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 direct testimony?

A. Yes, it does.