

BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH

)	
)	
Application of Rocky)	DOCKET NO. 17-035-61
Mountain Power to)	Exhibit No. DPU 2.0 DIR PH-I
Establish Export Credits for)	
Customer Generated)	Direct Testimony of
Electricity)	Charles E. Peterson
)	
)	
)	

**THE DIVISION OF PUBLIC UTILITIES
DEPARTMENT OF COMMERCE
STATE OF UTAH**

Direct Testimony – Phase One

of

Charles E. Peterson

March 22, 2018

Contents

I.	INTRODUCTION	1
II.	SAMPLE DESIGN	2
III.	CONFIDENCE INTERVAL and SAMPLE SIZE.	4
IV.	CONCLUSIONS AND RECOMMENDATIONS	7
	DPU Exhibit 2.1 DIR-PH I, Resume of Charles E. Peterson	8

1
2
3 **Direct Testimony of Charles E. Peterson—Phase 1**
4

5 **I. INTRODUCTION**
6

7 **Q. Please state your name, business address and title.**

8 A. My name is Charles E. Peterson. My business address is 160 East 300 South, Salt Lake City,
9 Utah 84114. I am a Technical Consultant in the Utah Division of Public Utilities (Division,
10 or DPU).

11
12 **Q. On whose behalf are you testifying?**

13 A. The Division.
14

15 **Q. Would you summarize your background for the record?**

16 A. I am a Technical Consultant for the Division. I have been employed by the Division for over
17 12 years, during which time I have filed testimony and memoranda with the Public Service
18 Commission of Utah (Commission) involving a variety of economic, financial, and policy
19 topics. I have an M.S. in Economics and Master of Statistics degree, both from the University
20 of Utah. My resume is attached as DPU Exhibit 2.1 DIR PH 1.
21

22 **Q. What is the purpose of your testimony?**

23 A. I provide a review of the statistical methods used in determining the sample design,
24 confidence level and interval, and sample size of Rocky Mountain Power's (Company)
25 proposed load research study in this docket.

26

27 **II. SAMPLE DESIGN**
28

29 **Q. What is the sample design used in the Company's proposal?**

30 A. The sample design is a two stage design wherein the first stage is to stratify the target
31 population into four strata. The next stage is to perform a systematic random sample within
32 each strata in order to assure that there is coverage of the range of values within each strata.
33 This is explained in some detail in Company witness Mr. Kenneth Lee Elder Jr.'s direct
34 testimony.¹
35

36 **Q. What is the target population to be sampled?**

37 A. The target population is the approximately 25,000 rooftop solar customers that were
38 grandfathered in Docket No. 14-035-114 and are subject to electric service Schedule 135.
39 The sampled population does not include transition customers because a census of that
40 population will be included in the load research study.
41

42 **Q. Is this a recognized sample design?**

43 A. Yes. Stratified sampling is discussed in many basic texts on statistics. The combining of
44 stratified sampling with systematic sampling is briefly discussed, for example, in William
45 Cochran's classic text "Sampling Techniques."² Cochran states that this rate design "is
46 suitable if separate estimates are wanted for each stratum or if unequal sampling fractions are

¹ Direct Testimony of Kenneth Lee Elder, Jr. February 2018, pages 3-6, and 9-11.

² William G. Cochran, *Sampling Techniques, third edition* (New York, John Wiley & Sons, 1977), 226-227.

47 to be used.”³ In certain circumstances Cochran indicates that systematic sampling within
48 strata can be more precise than simple random sampling within strata.

49

50 **Q. Do you believe this sample design is appropriate?**

51 A. Yes. The Company’s data are easily sorted by size, and the strata sampling fractions are
52 unequal. So the proposed sampling design appears to be appropriate.

53

54 **Q. How were the strata selected?**

55 A. The Company proposes to use four strata with the strata boundaries selected using the
56 Dalenius-Hodges (D-H) method. The D-H method is a recognized strata boundary selection
57 method.⁴ The Company was asked by interested parties at a technical meeting on January 9,
58 2018 to test the effects of using more than four strata. The Company subsequently provided
59 data showing that there was some advantage to using six strata, which would have lowered
60 the theoretically required sample size, however the overall variance of the smaller sample
61 was noticeably higher, negating some of the benefits of additional strata.

62

63 Since the primary goal of this study is to evaluate the effects on the PacifiCorp system in
64 Utah, the Company has elected to use four strata and a larger sample size. The Division
65 generally supports the Company’s decision to use four strata with the larger sample size.

³ Ibid. page 226.

⁴ The D-H method seeks to make $\sqrt{N_h} \cdot (y_h - y_{h-1})$ for each stratum h, approximately equal. Where N_h is the population size in stratum h and $(y_h - y_{h-1})$ is the width of stratum h. See Cochran, pp. 128-130.⁵ This is technically not correct. The more precise meaning is that if you were to run the study numerous times taking a random sample of the same size with each study run, then 90 percent of your sample means would be within plus or minus 10 percent of the true population mean.

66

67 **Q. Did you verify the boundary calculations?**

68 A. Yes. Using the population data supplied by the Company I verified that the strata boundaries
69 selected were reasonable based upon the selected criteria.

70

71 **Q. What do you conclude regarding the strata selection?**

72 A. I conclude that the number of strata and the strata boundaries selected by the Company are
73 reasonable.

74

75 **III. CONFIDENCE INTERVAL and SAMPLE SIZE.**

76

77 **Q. Please summarize the sample size selection?**

78 A. Sample size is directly tied to the selected confidence interval, or precision, that is desired
79 from the study. The Company originally proposed to use a confidence level and interval of
80 90 percent plus or minus 10 percent. This is commonly understood to mean that “you are 90
81 percent sure that the sample mean is within plus or minus 10 percent of the true population
82 mean.”⁵ After receiving feedback from the parties, the Company determined to increase the
83 precision somewhat to a confidence level of 95 percent, plus or minus 10 percent. The
84 consequence of the increase in the confidence level is that the Company is increasing the

⁵ This is technically not correct. The more precise meaning is that if you were to run the study numerous times taking a random sample of the same size with each study run, then 90 percent of your sample means would be within plus or minus 10 percent of the true population mean.

85 sample size from 38 to 54 plus an over-sample in strata 1 of 16 resulting from the initial
86 study group, giving a total sample size of 70.

87

88 **Q. Does your review support that the Company's selected sample size is consistent with a**
89 **95 percent confidence level of plus or minus 10 percent?**

90 A. Yes. Given the strata selected and the estimated variance within strata, the sample design, if
91 executed properly, should give results with the desired precision.

92

93 **Q. Does it bother you that 36 of the proposed residential samples have been previously**
94 **selected in the Company's load research in Docket No. 14-035-114?**

95 A. Yes, there is some concern that all of the sample selection is not being conducted at the same
96 time and not in exactly the same way. I understand that this original sample was selected
97 based upon usage as opposed to nameplate capacity, which is the basis in this case. The
98 original 36 samples are being reallocated to strata based upon nameplate capacity. This
99 results in some anomalies when one looks at the geographic distribution the Company is
100 proposing combined with its sampling technique for selecting and allocating samples to
101 counties and strata. For example there are no strata 1 samples in Utah County, Cache County
102 has one sample in each of the four strata instead of just one, and Washington County has
103 seven samples, when it should only have, at most, two under the proportional allocation the
104 Company is using.

105

106 The Company is saving time and money by using existing sampled customers as part of this
107 new study. The Division understands that there are always time and money trade-offs in

108 doing studies such as these and that the researcher always has to balance these trade-offs. The
109 balance the Company is seeking appears reasonable.

110

111 However, the Division notes that the original 36 sample meters were selected about four
112 years ago. These 36 samples could be, on average, suffering from physical degradation, some
113 degree of technological obsolescence or other systematic differences from the new sample
114 that is to be collected. The data, when they are collected could be tested to see if there is any
115 evidence of bias between the earlier selected customers and the later sampled customers.

116

117 There are two additional concerns. The first concern is that the Company is implicitly
118 assuming that the population variance is reasonably homogeneous between regions. In
119 particular, the concern is that southern Utah may be systematically different than northern
120 Utah. If this is true, then there could be biases such that the study results do not accurately
121 reflect the PacifiCorp system. This possibility could be examined by looking for any
122 systematic differences along north versus south regions. Significant differences might require
123 additional sampling or other study of one or both regions.

124

125 Second, as discussed above, there are anomalies in the distribution across strata in the
126 geographic allocations. To the extent that there is over-sampling in one area (e.g.
127 Washington County), then the issue is not important, but would tend to increase the
128 confidence in the results coming out of that area. The potential problem is where there might
129 be under-sampling in an area that is systematically different from the rest of the system and
130 that make a material contribution to the overall system results. At this time the Division does

131 not know that there is an area of under-sampling that would have a material effect on the
132 overall results.

133

134

135 **IV. CONCLUSIONS AND RECOMMENDATIONS**

136

137 **Q. Overall, what are your conclusions and recommendations to the Commission?**

138 A. The Division believes that the Company's sample design is reasonable and, if executed
139 properly and with the caveats mentioned above, should yield the expected level of confidence
140 in the precision of the sample results.

141

142 To protect and mitigate against some of the potential problems with the study as proposed,
143 the Division recommends that the Company report to the Division and any interested parties
144 on a monthly basis the on-going results of the study so that any emerging anomalies can be
145 evaluated and (if necessary) a course of action decided upon as early in the process as
146 possible.

147

148 **Q. Does that conclude your testimony?**

149 A. Yes

DPU Exhibit 2.1 DIR-PH I, Resume of Charles E. Peterson

CHARLES E. PETERSON

EXPERIENCE Technical Consultant, Division of Public Utilities Utah Department of Commerce, May 2006 to Present.

Responsibilities: PacifiCorp and Dominion Energy Utah (formerly known as Questar Gas Company) General Rate Cases: Cost of Capital Studies; PacifiCorp avoided cost issues; Lead on PacifiCorp ECAM application; PacifiCorp 2006 General Rate Case Team leader—cost of capital, coal and natural gas contract teams; PacifiCorp 2006/2007 IRP lead; Special Contracts lead; various Economic, Financial, and Statistical Analyses.

Utility Analyst, Division of Public Utilities, Utah Department of Commerce, January 2005 to May 2006.

Responsibilities: Overall DPU Team Management of PacifiCorp Acquisition by MidAmerican Energy Holdings Company; Division Lead on a Forecasting Task Force; Principal Author of Technical Paper on “Ring-Fencing;” Economic and Statistical Analysis, Cost of Capital Studies on Questar Gas and PacifiCorp.

Manager, centrally assessed utility and transportation company valuations section, Property Tax Division, Utah State Tax Commission, September 1992 to December 2004.

Responsibilities: supervision of the annual appraisal of 100 utility, railroad, and airline companies; securities analysis, cost of capital studies, financial forecast models and other appraisal methods, settlement negotiations; expert testimony.

EDUCATION M.S., Economics. University of Utah, 1990.
Master of Statistics (M.Stat.). Graduate School of Business, University of Utah, 1980.
B.A., Mathematics. University of Utah, 1978.

PROFESSIONAL MEMBERSHIP Society of Utility and Regulatory Financial Analysts (SURFA)
Received **Certified Rate of Return Analyst (CRR)** from SURFA in 2007.

EXPERT TESTIMONY Utah Public Service Commission, Utah State Tax Commission; Federal District and Bankruptcy Courts; Utah State District Courts; Utah State Industrial Commission; Wyoming State Court

PUBLICATIONS “Accounting Challenges for Regulated Public Utilities,” The Journal Entry, April 2014. Co-author with Matthew A. Croft and J. Robert Malko.

“The Utah Test: Defining a test period to overcome controversies and inaccuracies,” Public Utilities Fortnightly, May 2010. Co-authored with Joni S. Zenger and J. Robert Malko.

“Ring Fencing in Utah,” Public Utilities Fortnightly, February 2008. Co-author with J. Robert Malko.

“Applying CAPM: Issues and Activities in Utah,” The NRRI Journal of Applied Regulation, December 2005. Co-author with Dr. Robert Malko.

ADDITIONAL EXPERIENCE Associate, (part-time), Houlihan Valuation Advisors, 1998 to 2005. Economic and financial analysis, business appraisal work.

Owner and Consultant, July 1991 to 1998. Economic Consulting and litigation support.

Utility Analyst, Utah State Tax Commission, March 1991 to September 1992.

Associate, Houlihan, Dorton, Jones, Nicolatus and Stuart, August 1989 to March 1991.

Partner, Stuart, Nicolatus and Peterson, 1989.

Associate, Frank Stuart & Associates, 1980 to 1985; 1986 to 1989.

Senior Consultant, Grant Thornton International, 1985 to 1986.

TEACHING Instructor, Unitary Valuation School held at Utah State University sponsored by the Western States Association of Tax Administrators (WSATA), 1999 to 2007, 2009, 2011, and 2014.

Education Chairman, WSATA Committee on Unitary Assessment, 2000 to 2004.

Instructor, business calculus, Salt Lake Community College, Spring 1990.

SKILLS Financial analysis, including cost of capital and financial statement analysis.
Securities analysis, financial forecasting and business appraisal.
Economic and statistical analysis.
Expert testimony.
Project management and team supervision.
Negotiation.
Research and report writing.

LICENSE Certified General Appraiser, State of Utah, License Number CG00039924 (lapsed).

HONORS Several incentive awards for work at the Division of Public Utilities and the Property Tax Division

Elected to Phi Kappa Phi (general scholastic honorary). Bachelor's degree awarded Magna cum Laude.

SERVICE Centerville City ad hoc committee member on master plan zoning matters, 1995.
Docent, Hansen Planetarium, Salt Lake City, Utah, 1992 to 1994.
President of a 200 unit condominium association, 1983 to 1984.
Various church service positions