

Rocky Mountain Power  
Docket No. 13-035-184  
Witness: Kelcey A. Brown

BEFORE THE PUBLIC SERVICE COMMISSION  
OF THE STATE OF UTAH

ROCKY MOUNTAIN POWER

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Direct Testimony of Kelcey A. Brown

Load Forecast

January 2014

1 **Q. Please state your name, business address and present position with**  
2 **PacifiCorp d/b/a Rocky Mountain Power (“the Company”).**

3 A. My name is Kelcey A. Brown. My business address is 825 NE Multnomah Street,  
4 Suite 600, Portland, Oregon 97232. My present title is Manager, Load  
5 Forecasting.

6 **Qualifications**

7 **Q. Briefly describe your education and professional experience.**

8 A. I have been employed by PacifiCorp since May 2011. I have been the Manager of  
9 Load Forecasting since June 2012. Before that time, I worked as a Senior  
10 Consultant in the Regulatory Net Power Costs Department. Before joining  
11 PacifiCorp, I worked at the Public Utility Commission of Oregon from November  
12 2007 through May 2011. During my time at the Commission, I sponsored  
13 testimony in several dockets involving net power costs, integrated resource  
14 planning, and various revenue and policy issues. From 2003 through 2007, I was  
15 the Economic Analyst with Blackfoot Telecommunications Group, where I was  
16 responsible for revenue forecasts, resource acquisition analysis, pricing, and  
17 regulatory support. I have a Bachelor of Science degree in Business Economics  
18 from the University of Wyoming, and I have completed all course work towards a  
19 Master’s degree in Economics from the University of Wyoming.

20 **Purpose of Testimony**

21 **Q. What is the purpose of your testimony in this proceeding?**

22 A. The purpose of my testimony is to explain how the Company developed the  
23 forecasts of the number of customers, kilowatt-hour (“kWh”) sales at the meter

24 (“sales”), system loads and system peak loads at the system input level (“loads”),  
25 and number of bills by rate schedule for the 12-month period ending June 30,  
26 2015. In addition, I will explain changes in the forecast, and forecast  
27 methodology, as compared to the 2012 general rate case (“GRC”) and discuss  
28 why these changes are reasonable.

29 **Overview of Testimony**

30 **Q. When did the Company prepare the sales and load forecast used in this**  
31 **filing?**

32 A. The sales and load forecast used in this filing was completed in October 2013 and  
33 is the most recent forecast of sales and loads prepared by the Company.

34 **Q. How did the Company use the October 2013 sales and load forecast in its**  
35 **preparation of this general rate case?**

36 A. The October 2013 load forecast was used to calculate net power costs, sponsored  
37 by Company witness Mr. Gregory N. Duvall. The load forecast was also used by  
38 Company witness Mr. Steven R. McDougal to calculate the inter-jurisdictional  
39 allocation factors. The sales forecast by rate schedule was used by Company  
40 witness Ms. Joelle R. Steward to allocate costs between customer classes and to  
41 design rates that correctly reflect the cost of service.

42 **Q. Please provide a summary of the forecast energy sales for July 2014 through**  
43 **June 2015 (“Test Period”).**

44 A. Table 1 provides the forecast energy sales for the 12 month period ending June  
45 30, 2015.

**Table 1 - Test Period Sales Forecast (MWh)**

<b>July 2014 to June 2015</b>		
	<b>Total Company</b>	<b>Utah</b>
Residential	15,421,549	6,401,383
Commercial	17,429,594	8,327,476
Industrial	19,770,205	8,029,187
Irrigation	1,262,520	189,890
Public Authority	274,700	274,700
Lighting	143,180	77,730
Total	54,301,748	23,300,366

46 **Q. Please provide a general overview of the Company’s sales and load forecast**  
47 **methodology.**

48 A. The Company’s methodology consists of first developing a forecast of monthly  
49 sales by customer class and monthly peak load by state. This sales forecast  
50 becomes the basis of the load forecast by adding line losses, meaning kWh sales  
51 levels are grossed-up to a generation or “input” level. The monthly loads are then  
52 spread to each hour based on the peak load forecast and typical hourly load  
53 patterns to produce the hourly load forecast.

54 **Comparisons to Prior Sales Forecasts**

55 **Q. How does the total-company sales forecast for 2014 compare to the sales**  
56 **forecast used in the 2012 GRC?**

57 A. As shown in Table 2, total-company test period forecast sales are 0.1 percent  
58 higher than 12 months ended May 2013 forecast sales used in the 2012 GRC. The  
59 difference in the forecasts is attributable to an increase in commercial, irrigation  
60 and lighting load offset by a decline in industrial and residential load. The growth  
61 in the commercial class is related to data centers. The industrial class decrease in  
62 the forecast is attributable to self-generation elections by some of the Company’s

63 large industrial customers in Utah, Wyoming, and Oregon. Forecast residential  
 64 decrease is due to decreases in average-use-per customer from increases in energy  
 65 efficiency saturation and federal lighting standard phase in through 2015.

**Table 2 - Total Company Sales Comparison (MWh)**

	<b>2012 GRC Forecast June '12 to May '13</b>	<b>2014 GRC Forecast July '14 to June '15</b>	<b>Percentage Difference</b>
Residential	15,824,583	15,421,549	-2.5%
Commercial	16,782,979	17,429,594	3.9%
Industrial	19,903,472	19,770,205	-0.7%
Irrigation	1,214,886	1,262,520	3.9%
Public Authority	405,770	274,700	-32.3%
Lighting	141,350	143,180	1.3%
Total	54,273,040	54,301,748	0.1%

66 **Q. How does the Utah sales forecast for the test period compare to the sales**  
 67 **forecast for the 2012 GRC?**

68 A. As shown in Table 3 below, the 2014 Utah sales forecast has decreased by  
 69 approximately two percent from the 12 months ended May 2013 sales forecast  
 70 used in the 2012 GRC. On a Utah basis, the commercial class increase reflects the  
 71 planned expansion of data centers in Utah. The declines in residential and  
 72 industrial load reflect growth in energy efficiency and conservation programs, and  
 73 self-generation elections by some of the Company's large industrial Utah  
 74 customers.

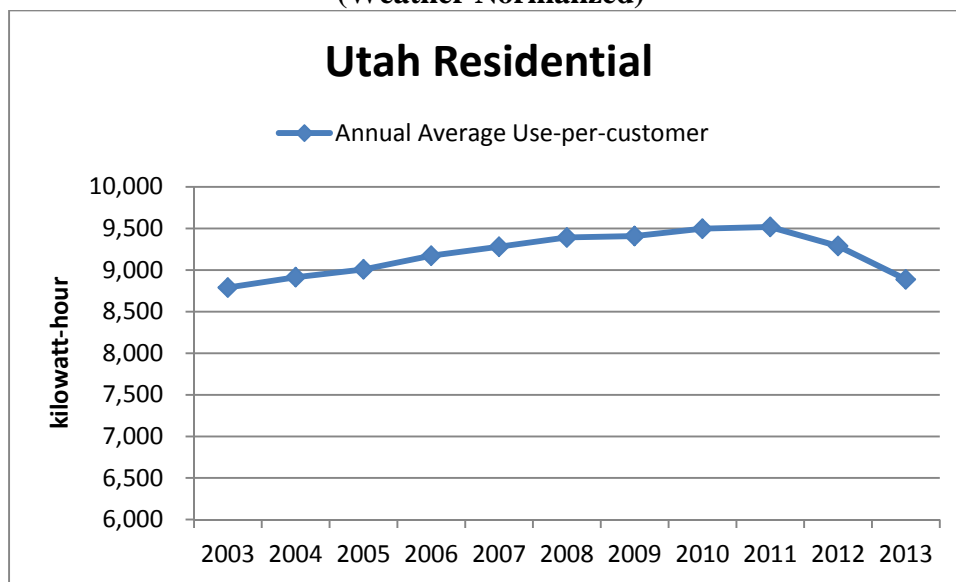
**Table 3 - Utah Sales Comparison (MWh)**

	<b>2012 GRC Forecast June '12 to May '13</b>	<b>2014 GRC Forecast July '14 to June '15</b>	<b>Percentage Difference</b>
Residential	6,634,404	6,401,383	-3.5%
Commercial	8,084,103	8,327,476	3.0%
Industrial	8,376,573	8,029,187	-4.1%
Irrigation	187,280	189,890	1.4%
Public Authority	405,770	274,700	-32.3%
Lighting	77,260	77,730	0.6%
Total	23,765,390	23,300,366	-2.0%

75 **Q. Please discuss the changes in residential sales that have occurred since the**  
76 **2012 GRC.**

77 A. Utah residential sales have shown declines in average use-per-customer since  
78 2011. The Company believes that the decrease in average use are due to increases  
79 in energy efficiency, slowing saturation of central air conditioning and behavioral  
80 changes due to increasing electricity prices over the last several years. Figure 1  
81 below illustrates the changes in Utah residential average use-per-customer on a  
82 weather normalized basis 2003 through 2013.

**Figure 1 Utah Residential Average Use-per-customer  
(Weather Normalized)**



83 **Q. What information is the Company relying on in its conclusion that changes**  
84 **in average use are due to energy efficiency changes and a slowing saturation**  
85 **of central air conditioning?**

86 A. With the observed changes in residential average use since 2011, the Company  
87 conducted a residential survey in Utah and Oregon in September 2013. Rocky  
88 Mountain Power sent approximately 243,000 surveys to its Utah residential

89 customers over a three week period and received over 32,000 responses in return.  
90 The survey responses from residential customers showed that annual average  
91 growth in cooling appliance saturation has declined from 12 percent annual  
92 growth 2001 to 2004 down to two percent annual growth from 2006 through  
93 2013. In addition, energy efficient lighting was shown to make up 51 percent of  
94 the reported number of sockets in residential homes and 40 percent of customers  
95 responded that they had invested in energy efficiency upgrades to the home.

96 **Q. Why does slowing saturation of central air conditioning cause a decline in**  
97 **residential average use-per-customer?**

98 A. Customers who have central air conditioning use 35 percent more electricity per  
99 year than customers who have no cooling unit in the home and 27 percent more  
100 electricity than customers with other types of cooling appliances. Without the  
101 addition of customers adding more significant amounts of air conditioning units,  
102 the ongoing improvements in energy efficiency of installed appliances become  
103 more dominant in reducing the average use of the class.

104 **Q. Does the Company believe that the decreases in average use per customer**  
105 **will continue in the future?**

106 A. Yes. The Company expects continued increasing saturation in energy efficient  
107 lighting due to the final phase-in of the Federal Lighting Standards through 2015.  
108 In addition, the residential survey also showed a demographic shift with Rocky  
109 Mountain Power customers moving towards condos, townhomes and apartment or  
110 multi-dwelling units versus single family homes. Multi-dwelling unit homes use  
111 approximately 40 percent less energy than a typical single family home and newer

112 homes are more energy efficient, therefore average use per customer is expected  
113 to continue to decline.

114 **Q. Has the electric industry seen changes in residential average use that are**  
115 **similar to what Rocky Mountain Power has experienced in Utah?**

116 A. Yes. ITRON, an industry leader in metering and load forecasting software,  
117 recently completed an industry benchmarking survey that showed that residential  
118 average use was declining across the industry and cited energy efficiency changes  
119 as the primary cause. Efficiency improvements have been made in residential  
120 products such as clothes washers, dryers, refrigerators, room air conditioners, and  
121 central air conditioners over the last several years and additional code and  
122 standard requirements are in place for 2014 and 2015 that will reduce appliance  
123 energy use even further.<sup>1</sup>

124 **Q. What is driving the forecast decrease in industrial usage relative to the 2012**  
125 **GRC?**

126 A. The forecast decrease in Utah industrial class use is driven by the Company's  
127 largest industrial customers. Removing five of Utah's large industrial customers  
128 from Table 3 shows that the remainder of Utah industrial class forecast is 5.3  
129 percent higher than the 2012 GRC. See Table 4 below for a comparison of the  
130 2012 GRC test period forecast compared to the 2014 GRC test period forecast  
131 with the five large customers removed from the Utah industrial class sales  
132 forecast.

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<sup>1</sup> Energy Trends Benchmarking Survey 2013, Mark Quan, ITRON, November 2013.



**Table 4 - Utah GRC Industrial Class Sales Forecast Break-down**

<b>MWh</b>	<b>2012 GRC Forecast June '12 to May '13</b>	<b>2014 GRC Forecast July '14 to June '15</b>	<b>Percentage Difference</b>
Utah Industrial Class	8,376,573	8,029,187	-4.1%
Five Large Customers	2,664,117	2,011,150	-24.5%
Industrial less Large Customers	5,712,456	6,018,037	5.3%

133 **Summary of Changes in Forecast Data, Assumptions and Methodology**

134 **Q. Please summarize major updates used to produce the 2014 forecast as**  
135 **compared to the forecast used in the 2012 GRC.**

136 A. The Company updated many of its data inputs and assumptions compared to the  
137 forecast prepared for the 2012 GRC. For each of these updates, the Company used  
138 the most recent information available.

139 1. The Company updated the historical data used to develop the monthly  
140 retail sales forecasts from the prior historical period of January 1997  
141 through July 2011 to include the most recent data available at the time of  
142 the forecast. In general, the class level forecasts for each state use the time  
143 period of January 1997 through August of 2013 – however, some class  
144 level forecasts reflect truncated periods due to data availability at the time  
145 of the forecast and customer reclassification.

146 2. Updated the historical data period used to develop the monthly peak  
147 forecast from January 1997 through December 2010 to January 1997  
148 through December 2012, however, certain monthly peak forecasts reflect  
149 truncated periods due to customer reclassification.

150 3. The Company updated the economic drivers from IHS Global Insight  
151 using the most recent information available at the time of the forecast for  
152 each of the Company’s jurisdictions.

- 153 4. The Company updated the forecast of individual industrial customer usage  
154 based on the best information available as of March 2013.
- 155 5. The time period used to define normal weather was rolled forward to the  
156 20-year time period of 1993 through 2012.
- 157 6. The Company rolled forward the line loss calculation to the five-year  
158 period ended December 2012.
- 159 7. The data used to develop temperature splines was rolled forward based on  
160 available customer class hourly data (2008 through 2012).
- 161 8. The Company used the residential use per customer per day model with  
162 appliance saturation and efficiency results released in June 2012 from  
163 ITRON.
- 164 9. The Company changed the commercial forecast methodology from a use-  
165 per-customer model to a total usage model; similar to what is used for the  
166 industrial class forecast. After analyzing the commercial load forecast the  
167 Company determined that a forecast model that utilized "average use-per  
168 customer" was less accurate than a model that utilized average use per  
169 day.
- 170 10. The Company changed the large industrial forecast methodology from a  
171 customer level forecast using customer input and probability weighting to  
172 regression analysis for the majority of all industrial customers in each  
173 state. The Company determined that the inputs provided by customers  
174 were unrealistic when compared with actual historical loads whereas  
175 regression analysis uses the historical patterns of usage and growth to

176 inform the forecast.

177 **Forecasts for Non-Industrial Customer Classes**

178 **Q. How are monthly sales forecasts developed by customer class?**

179 A. The Company develops monthly sales forecasts as a product of two separate  
180 forecasts: (1) the number of customers; and (2) sales per customer. The Company  
181 uses this methodology for the residential customer class.

182 **Q. How are the forecasts for number of customers developed?**

183 A. The Company forecasts the number of customers using IHS Global Insight's  
184 forecast of number of households and population as the demographic driver. For  
185 the commercial class, the Company forecasts the number of customers using the  
186 forecasted number of residential customers as the demographic driver. For the  
187 industrial, irrigation, and street lighting classes, the customer forecasts are fairly  
188 static and developed using time series or regression models without any economic  
189 or demographic drivers.

190 **Q. How does the Company forecast sales per customer for the residential class?**

191 A. The Company models sales per customer for the residential class through a  
192 Statistically Adjusted End-Use ("SAE") model, which combines the end-use  
193 modeling concepts with traditional regression analysis techniques. Drivers of the  
194 SAE-based residential model are heating and cooling-related variables that  
195 incorporate central air conditioning and heating appliance equipment shares,  
196 saturation levels and efficiency trends, and economic drivers such as household  
197 size, square footage, income, and energy price.

198 **Q. What methodology does the Company use to forecast the commercial class**  
199 **sales?**

200 A. For the commercial class, the Company forecasts sales using regression analysis  
201 techniques with non-manufacturing employment, population, real gross county  
202 product and number of households as the economic drivers, in addition to  
203 weather-related variables. Also, similar to how the Company forecasts its largest  
204 industrial customers, data center forecasts are based on input from the Company's  
205 customer and community managers ("CCMs"). Although the scale is much  
206 smaller, the treatment of data centers is similar to the previous methodology for  
207 large industrial customer sales, which is discussed below.

208 **Q. Please discuss why the Company changed its commercial sales forecast**  
209 **methodology since the 2012 GRC.**

210 A. The Company moved towards a total usage forecast due to analysis that showed  
211 the total usage methodology was more accurate as compared to the average use-  
212 per-customer model.

213 **Q. What analysis did the Company undertake to determine that the total usage**  
214 **model was more accurate than the use-per-customer model?**

215 A. The Company did a "backcast" analysis, which simply means re-forecasting prior  
216 periods using the same information known at the time of the forecast and  
217 comparing the forecast of each method to what actually occurred. In addition, the  
218 statistics of the forecast model, mean absolute percentage error and Rsquared, are  
219 used to understand how accurate the models are relative to the history. These  
220 regression statistics were improved in the commercial total usage model versus

221 the previous use-per-customer model.

222 **Q. What methodology does the Company use for the irrigation and lighting**  
223 **sales forecasts?**

224 A. Monthly sales for irrigation and lighting are forecast directly from historical sales  
225 volumes using regression and a simple linear trend analysis respectively.

226 **Industrial Class Forecasts**

227 **Q. How does the Company forecast sales for the industrial customer class?**

228 A. The majority of industrial customers are modeled using regression analysis with  
229 trend and economic variables. Manufacturing employment, total employment,  
230 population, real gross county/state product and personal income are used as the  
231 economic driver's in PacifiCorp's six state territories. For a small number of  
232 industrial customers, the largest on the Company's system, the Company  
233 individually forecasts these customers based on input from the customer and  
234 information provided by the CCMs.

235 **Q. Has the Company changed how it models its industrial forecast?**

236 A. Yes. Previously, the Company separated the industrial class into three categories:  
237 (1) existing customers tracked by CCMs (more than 150 customers); (2) new  
238 large customers or expansions by existing large customers; and (3) industrial  
239 customers that are not monitored by CCMs. The Company developed the forecast  
240 for the first two categories through the usage data gathered by the CCMs based on  
241 direct input from the customers, forecast load factors, and the probability of the  
242 project occurrence. The third category was forecast using regression analysis  
243 consistent with how the total industrial class is now forecast, excluding the largest

244 industrial customers.

245 **Q. What was the reason for the change in methodology of the industrial**  
246 **forecast?**

247 A. For existing large industrial customers and for new large industrial customers, the  
248 Company found that the inputs provided by customers for their existing loads and  
249 for new load tended to be overly optimistic and ultimately overstated. Therefore,  
250 the Company uses a regression analysis for the entire industrial class, excluding  
251 the largest industrial customers and taking into consideration historical patterns of  
252 industrial growth. The Company believes this is a reasonable means of forecasting  
253 existing customer load and future growth. The Company continues to monitor  
254 new load requests and planned expansions of existing customers for significant  
255 changes that would require an adjustment to the forecast.

256 **Q. Was the regression analysis that the Company is now using for its industrial**  
257 **forecast recommended by another party in a previous proceeding?**

258 A. Yes. In Docket No. 09-035-23 (“2009 general rate case”) Division of Public  
259 Utility (“DPU”) witness Mr. Jonathan Nunes recommended the Company use an  
260 econometric approach using multiple economic variables that reflect upon the  
261 components of the Company's load for the large industrial forecast. His  
262 conclusion was that the econometric approach would be less time consuming and  
263 improve the timeliness and quality of the forecasts for the large industrial  
264 customers.<sup>2</sup>

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<sup>2</sup> Docket No. 09-035-23, DPU Exhibit 9.0, Page 11, Lines 146-162.

265 **Q. How does the Company forecast its largest industrial customers in Utah,**  
266 **Wyoming, Oregon and Idaho?**

267 A. Due to self-generation and operational changes that can have large and  
268 unexpected changes on electricity usage, the Company continues to forecast its  
269 largest customers (less than 10) using inputs from the customer and CCMs. These  
270 individual customer forecasts are not included in the regression analysis and are  
271 added to the industrial class forecast at the end of the process.

272 **Q. Why does the Company forecast industrial class sales using total usage**  
273 **versus the use-per-customer methodology used for the residential customer**  
274 **class?**

275 A. The Company forecasts the industrial class using a total usage model because of  
276 the diverse makeup of the customers within the class. In the industrial class, there  
277 are no “typical” customers. Large customers have very diverse usage patterns and  
278 power requirements. In contrast, customer classes that are made up of mostly  
279 smaller, homogeneous customers are best forecasted by multiplying use-per-  
280 customer by the number of customer, such as the residential class which is  
281 composed of many smaller customers that have similar behaviors and usage  
282 patterns.

### 283 **Hourly Load Forecast**

284 **Q. Please describe how the hourly load forecast is developed.**

285 A. After the Company develops the forecasts of monthly energy sales by customer  
286 class, a forecast of hourly loads is developed in two steps.

287 First, monthly and seasonal peak forecasts are developed for each state.

288 The monthly peak model uses historical peak-producing weather for each state,  
289 and incorporates the impact of weather on peak loads through several weather  
290 variables that drive heating and cooling usage. These weather variables include 20  
291 years of average temperature on the peak day and lagged average temperatures  
292 from up to two days before the day of the forecast for each month. The peak  
293 forecast is based on the 20 year average monthly historical peak-producing  
294 temperatures for the most recent rolling 20-year period, currently 1993 through  
295 2012.

296 Second, the Company develops hourly load forecasts for each state using  
297 hourly load models that include state-specific hourly load data, daily weather  
298 variables, the 20-year average temperatures for the most recent rolling 20-year  
299 period, currently 1993 through 2012, a typical annual weather pattern, and day-  
300 type variables such as weekends and holidays as inputs to the model. The hourly  
301 loads are adjusted to match the monthly and seasonal peaks from the first step  
302 above. Also, the hourly loads are adjusted so the monthly sum of hourly loads  
303 equals monthly sales plus line losses.

304 **Q. How are monthly system coincident peaks derived?**

305 A. After the hourly load forecasts are developed for each state, hourly loads are  
306 aggregated to the total system level. The system coincident peaks can then be  
307 identified, as well as the contribution of each jurisdiction to those monthly peaks.

#### 308 **Forecasts by Rate Schedule**

309 **Q. Were any additional forecasts created for this proceeding?**

310 A. Yes. As mentioned earlier, Ms. Steward requires two additional forecasts that are



311 based on the kWh sales forecast and the number of customers forecast. Once the  
312 kWh sales forecast is complete, it must be applied to individual rate schedules to  
313 forecast kWh sales by rate schedule. In addition, the forecast of number of  
314 customers must be expressed in number of bills.

315 **Q. How are rate schedule level forecasts produced?**

316 A. The Company develops this forecast in multiple steps. First, the Company  
317 determines the proportional distribution of each schedule within the customer  
318 class. For example, Schedule 1 in the Utah residential class makes up 93 percent  
319 of the total. Second, the Company determines if the historical rate schedule sales  
320 are correlated (moving in lock step) as the class level sales. If the rate schedule  
321 historical sales move in lock step with the class level sales the rate schedule  
322 forecast is proportionally adjusted to the class level sales forecast, e.g. 93 percent  
323 of the class level sales forecast is reflected in the rate schedule forecast. If the rate  
324 schedule is uncorrelated to the class, such as Schedule 23, residential general  
325 service, the schedule is forecast separately using regression analysis or time-series  
326 analysis and then the correlated schedules are adjusted so that the total matches  
327 the customer class forecast.

328 **Q. How does the Company forecast the number of bills for each rate schedule?**

329 A. The forecast of the number of bills for each rate schedule follows the same  
330 process as the sales forecast for each rate schedule. First, the Company forecasts  
331 the number of bills by class and proportionally adjusts the forecasted number of  
332 bills by rate schedule so that the total number of bills matches the customer class  
333 forecasted number of bills.

334 **Q. Please summarize your testimony.**

335 A. The Company's load forecast has been updated with the most recent information  
336 available at the time of the forecast and includes changes in methodology that the  
337 Company believes will more accurately forecast load. The changes in  
338 methodology employed in this forecast reflect the due diligence and analysis done  
339 by the Company that will improve the accuracy of the forecast and also reflect  
340 prior recommendations from the DPU. The residential class usage patterns have  
341 changed over the last two years and, in response, the Company has conducted a  
342 customer survey and participated in industry benchmarking surveys to better  
343 understand those changes and therefore improve the forecast in the long-run.

344 **Q. Does this conclude your direct testimony?**

345 A. Yes.