

BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH

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<b>In the Matter of the Review of</b>	)	<b>Docket No. 14-035-140</b>
<b>Electric Service Schedule No. 38,</b>	)	
<b>Qualifying Facilities Procedures,</b>	)	<b>Rebuttal Testimony of</b>
<b>and Other Related Procedural</b>	)	<b>Philip Hayet</b>
<b>Issues</b>	)	<b>On Behalf of the</b>
	)	<b>Utah Office of</b>
	)	<b>Consumer Services</b>

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REDACTED

May 28, 2015

**I. INTRODUCTION**

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**Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

A. My name is Philip Hayet. My business address is 570 Colonial Park Drive, Suite 305, Roswell, Georgia, 30075.

**Q. PLEASE STATE YOUR OCCUPATION, EMPLOYMENT, AND ON WHOSE BEHALF YOU ARE TESTIFYING.**

A. I am a utility regulatory consultant and Vice President of J. Kennedy and Associates, Inc. (Kennedy and Associates). I am appearing on behalf of the Office of Consumer Services (“Office”).

**Q. WHAT CONSULTING SERVICES ARE PROVIDED BY KENNEDY AND ASSOCIATES?**

A. Kennedy and Associates provides consulting services related to electric utility system planning, energy cost recovery, revenue requirements, regulatory policy, and other regulatory matters.

**Q. PLEASE SUMMARIZE YOUR QUALIFICATIONS AND APPEARANCES.**

A. My qualifications and appearances are provided in Exhibit OCS\_(PH-1). I have participated in numerous PacifiCorp and Rocky Mountain Power (or the “Company”) cases involving power costs, acquisitions, and avoided costs over the past 15 years. I also had a significant role in the initial development of the avoided cost methodology adopted by this Commission and currently used by PacifiCorp.

**Q. WHAT IS THE PURPOSE OF THIS PROCEEDING?**

A. The Public Service Commission of Utah’s (“Commission”) August 16, 2013 Order on Phase II Issues in Docket No. 12-035-100 (“Avoided Cost Order”) required PacifiCorp to

25 file a capacity contribution study for wind and solar resources deriving results that would  
26 be used in the calculation of avoided capacity and energy costs using the Proxy/PDDRR  
27 method. The Commission's Avoided Cost Order permitted PacifiCorp to develop capacity  
28 contribution values using an approximation method known as the Capacity Factor  
29 Allocation Method ("CF Method") considering Loss of Load Probability ("LOLP").  
30 PacifiCorp made a compliance filing on October 9, 2014 containing its 2014 Wind and  
31 Solar Capacity Contribution Study that it developed using the CF Method.

32 **Q. IN ADDITION TO THE COMPANY, WHAT OTHER PARTIES HAVE FILED**  
33 **TESTIMONY IN THIS PROCEEDING AND WHAT WERE THEIR POSITIONS?**

34 A. Mr. Charles Peterson and Mr. Ken Dragoon filed Direct Testimony on April 28, 2015, on  
35 behalf of the Division of Public Utilities ("Division") and Utah Clean Energy ("UCE"),  
36 respectively. Mr. Peterson presents the Division's analysis of the Company's capacity  
37 contribution calculations, and concludes that the Company "has provided estimates using  
38 the best information available to it and that it has used an appropriate and accepted method  
39 to calculate those estimates."<sup>1</sup>

40 Mr. Dragoon states he has "two major issues with PacifiCorp's inputs and  
41 assumptions, which significantly affect their calculated capacity values for wind and solar  
42 resources."<sup>2</sup> First, Mr. Dragoon objects to PacifiCorp's capacity contribution methodology  
43 being performed as a System Analysis; instead, he believes that for purposes of calculating  
44 Utah capacity contribution values, only the East side of the System should be considered.  
45 Second, he objects to the planned maintenance schedule assumptions that PacifiCorp  
46 developed for use in this study, which he stated "are overly aggressive for April and place

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<sup>1</sup> Direct Testimony, Charles Peterson, Division, Docket No. 14-035-140, April 28, 2015, page 12, line 209.

<sup>2</sup> Direct Testimony, Ken Dragoon, UCE, Docket 14-035-140, April 28, 2015, page 4, line 45.

47 too much emphasis on renewable resource performance in that month, further diluting their  
48 effective capacity contribution values.”<sup>3</sup>

49 **Q. WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?**

50 A. The purpose of my testimony is to respond to the direct testimonies of Mr. Peterson and  
51 Mr. Dragoon.

52 **Q. WHAT IS YOUR RESPONSE TO MR. PETERSON?**

53 A. I agree with Mr. Peterson’s conclusion regarding the Company’s calculation of its capacity  
54 contribution values. Similar to the analysis Mr. Peterson performed, I also reviewed the  
55 Company’s calculations received in discovery, and I determined that the Company  
56 accurately developed its capacity contribution estimates using the CF Method consistent  
57 with the method described in the National Renewable Energy Laboratory (“NREL”) report,  
58 “Comparison of Capacity Value Methods for Photovoltaics in the Western United States.”<sup>4</sup>  
59 In Docket 12-035-100, the Commission found that the CF method, as discussed in the  
60 NREL report, was a reasonable method to derive capacity values for wind and solar  
61 resources.

62 **Q. WHAT IS YOUR RESPONSE TO MR. DRAGOON?**

63 A. As I will explain further below, I strongly disagree with Mr. Dragoon’s recommendation  
64 that the PacifiCorp System should not be treated as a single system, that is, should not be  
65 treated as an integrated whole. Second, with regard to maintenance scheduling, while I  
66 understand the importance of utilizing reasonable maintenance schedules for modeling

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<sup>3</sup> Ibid at page 5, line 69.

<sup>4</sup> Sayed Madaeni, Ramteen Sioshansi, and Paul Denholm, National Renewable Energy Laboratory, July 2012. Exhibit RTL-2 to PacifiCorp witness Rick Link’s testimony, Docket 12-035-100, October 9, 2014.

67 analyses, I do not believe that Mr. Dragoon has presented any evidence nor provided  
68 adequate support proving that the Company's maintenance schedule is unreasonable.

69 **Q. WHAT ARE YOUR OVERALL CONCLUSIONS ON THE COMPANY'S**  
70 **CAPACITY CONTRIBUTION STUDY?**

71 A. I am satisfied that PacifiCorp has calculated reasonable capacity contribution values  
72 (14.5% for wind, 34.1% for fixed tilt solar, and 39.1% for single-axis tracking solar) at this  
73 time, and I recommend that the Commission should use these in place of the interim  
74 capacity contribution values that were set in Docket No. 12-035-100.

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76 **II. BACKGROUND**

77 **Q. PLEASE EXPLAIN HOW THE COMPANY'S CF METHOD DEVELOPS**  
78 **CAPACITY CONTRIBUTION VALUES?**

79 A. Given the intermittent nature of variable energy renewable resources, the capacity value of  
80 those resources from a reliability perspective would not be the same as the capacity value that  
81 would be provided by an equivalent amount of conventional resource capacity. The  
82 Company's capacity contribution values, developed using the CF Method, requires hourly  
83 Loss of Load Probability ("LOLP"), and hourly wind and solar capacity factors to be input  
84 to the calculation. Hourly weighted LOLP values are multiplied by the corresponding  
85 hourly solar or wind capacity factors, and the resulting values are then summed to derive  
86 the capacity contribution values.

87 **Q. WHAT CONDITIONS WOULD LEAD TO INTERMITTENT RENEWABLE**  
88 **RESOURCES PROVIDING GREATER LEVELS OF CAPACITY**  
89 **CONTRIBUTION?**

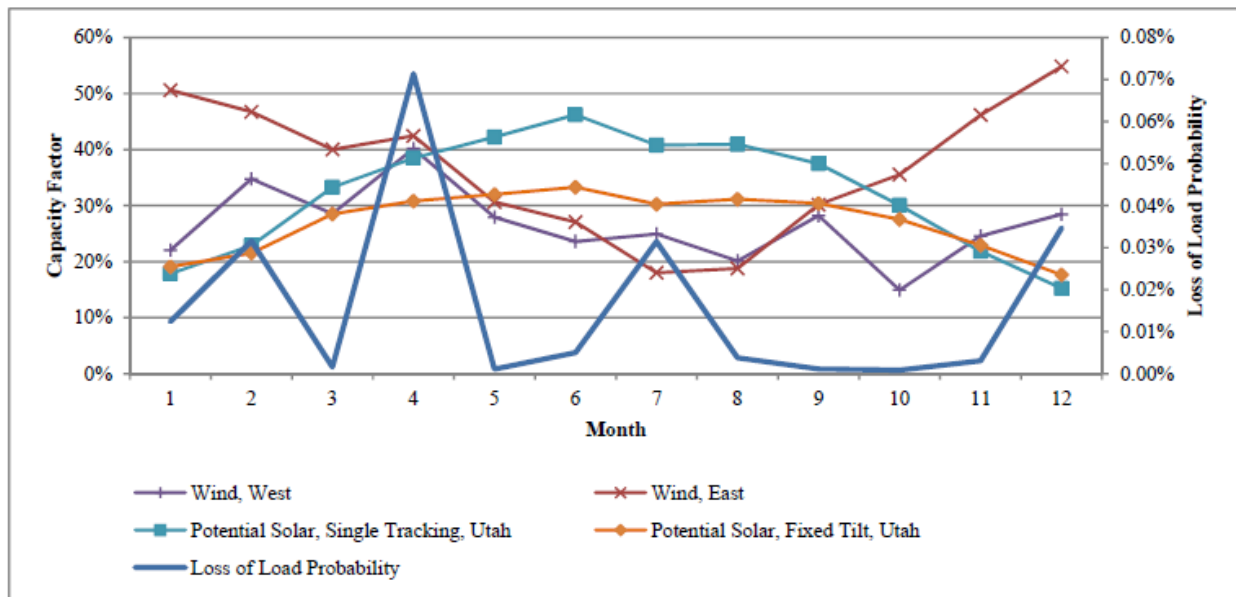
**REDACTED**

90 A. Relatively high capacity contribution values can occur if the System encounters high levels  
 91 of LOLP concentrated in just a few months, and those months are when the intermittent  
 92 renewable resources achieve high capacity factors. However, if LOLP is spread out and  
 93 occurs in months when intermittent renewable resources achieve lower capacity factors,  
 94 then relatively lower capacity contribution values would result.

95 **Q. HOW DO THE PACIFICORP SYSTEM LOLP VALUES COMPARE TO THE**  
 96 **WIND AND SOLAR CAPACITY FACTOR PROFILES?**

97 A. PacifiCorp evaluated this and provided the following graph, which was included as Figure  
 98 2 in Exhibit RTL-1 to Rick Link’s testimony.<sup>5</sup> It compared monthly solar and wind  
 99 resource capacity factors to PacifiCorp System LOLP.

100 **Figure 1**  
 101 **Comparison of Renewable Resource Capacity Factors vs LOLP**  
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<sup>5</sup> PacifiCorp Direct Testimony, Docket No. 12-035-100, October 9, 2014, Exhibit RMP\_(RTL-1), 2014 Wind and Solar Capacity Contribution Study, page 4.

104 Wind profiles were developed based on actual projects located on the east side of the  
105 system, and single axis tracking and fixed tilt solar profiles were developed in a study  
106 performed by Black and Veatch, with potential projects located in Milford, Utah.  
107 PacifiCorp developed LOLP results by performing a 500-iteration hourly Monte Carlo  
108 simulation using its Planning and Risk (“PaR”) model for the sample year of 2017. The  
109 500 iterations were generated using random combinations of different load, hydro and unit  
110 outage assumptions.

111 Figure 1 shows that LOLP primarily occurs in the winter months of Dec, Jan and Feb,  
112 the spring month of April, and the summer months of June, July and August.<sup>6</sup> It also shows  
113 that Utah solar capacity factors range from about 17% to 47% and wind ranges from about  
114 18% to 55% over the different months of the year. In the case of Utah solar, the capacity  
115 factors are generally greatest during the summer months. Therefore, from Figure 1, it is  
116 reasonable to expect that the capacity contribution value of the solar resources should be  
117 relatively lower on a system like PacifiCorp’s, in which much of the LOLP occurs outside  
118 the summer months when the capacity factors of the solar resources are lower.

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### **III. MR. DRAGOON’S FIRST CONCERN – SYSTEM OPERATION**

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**Q. PLEASE EXPLAIN MR. DRAGOON’S FIRST CONCERN THAT PACIFICORP’S  
123 CALCULATION SHOULD HAVE ONLY CONSIDERED THE EAST SIDE OF  
124 THE SYSTEM?**

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<sup>6</sup> As Mr. Peterson also noted at page 9, line 155 of his Direct Testimony, while the LOLP results appear reasonable, none of the interveners were able to conduct a thorough review of the LOLP analysis because the PaR model was only available to PacifiCorp.

125 A. Mr. Dragoon explains, “The first issue has to do with applying the Capacity Factor  
126 methodology to the PacifiCorp system *as a whole* instead of focusing on the capacity  
127 contribution of East side resources to meeting East side loads.”<sup>7</sup> Given that there are some  
128 limits to the amount of power that can be transferred across its system during peak demand  
129 periods, Mr. Dragoon believes that the benefit of incremental resources on the East side  
130 should be evaluated without giving any consideration to the West-side.

131 Mr. Dragoon states, “...the practical effect of limited transfer capability going from  
132 east to west in the winter means that not all of those East-side resources are able to  
133 contribute to meeting West-side load.” Mr. Dragoon’s conclusion is that wintertime LOLP  
134 should be eliminated from the capacity contribution calculation, which makes the impact  
135 of the summertime LOLP more prominent. Because solar resources have the greatest  
136 capacity factors in the summertime, this results in greater solar capacity contribution  
137 values. Mr. Dragoon, in fact, performed an analysis in which he simply eliminated all  
138 wintertime LOLP events, and the result was that solar capacity contribution values were  
139 increased.

140 **Q. DO YOU AGREE WITH MR. DRAGOON’S ANALYSIS?**

141 A. No, for two reasons. First, in this study Mr. Dragoon does not believe that the two sides  
142 of the system operate as an integrated whole, which I strongly disagree with. For nearly  
143 the past 30 years since the East and West sides of the System have merged to form the  
144 PacifiCorp System, the System has operated as an integrated whole. This means that  
145 resources are acquired to serve system loads, and units are committed and dispatched to  
146 serve system loads, subject to various constraints such as reliability constraints, all with

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<sup>7</sup> Ken Dragoon, Direct, page 4, line 52.



147 the objective of minimizing system costs. Second, even if one were to accept that separate  
148 East and West-side analyses should be performed, Mr. Dragoon has provided no evidence  
149 to support his assertion that transmission limits would be binding at precisely the same  
150 time that LOLP events were encountered on the West side.

151 **Q. ARE THERE ANY OTHER REASONS YOU DISAGREE WITH MR. DRAGOON**  
152 **ON HIS RECOMMENDATION NOT TO TREAT THE PACIFICORP SYSTEM AS**  
153 **AN INTEGRATED WHOLE?**

154 A. Yes. Mr. Dragoon is convinced that all wintertime loss of load events would have to occur  
155 on the West Side of the System, and that is ultimately why he wanted to separate the System  
156 into its parts. By not treating the entire PacifiCorp System as an integrated whole, and  
157 focusing strictly on the East Side, Mr. Dragoon was convinced that this separation would  
158 eliminate any wintertime loss of load events from the analysis. The fact is that wintertime  
159 loss of load events occurred on both the West and East sides of the System, and in fact,  
160 more loss of load events occur on the East side than the West side.

161 **Q. WHAT ANALYSIS DID YOU PERFORM TO CONFIRM THAT MORE LOSS OF**  
162 **LOAD EVENTS OCCURRED ON THE EAST SIDE?**

163 A. I examined the Company's response to discovery request OCS 3.10, which contained  
164 unserved energy results by area as determined by the PaR model. The data from OCS 3.10  
165 show that a significant amount of loss of load events occurred in Colorado and Wyoming.  
166 Mr. Dragoon is familiar with this discovery response as he discussed it in his testimony;  
167 however, he was skeptical of the results because he did not believe that Colorado could be  
168 responsible for any loss of load, nor could Wyoming be responsible for a large number of  
169 wintertime loss of load events.

**REDACTED**

170 **Q. WHAT ARE YOUR FINDINGS CONCERNING THE COLORADO LOSS OF**  
171 **LOAD EVENTS AND THE WINTER LOSS OF LOAD EVENTS THAT WERE OF**  
172 **CONCERN TO MR. DRAGOON?**

173 A. In response to discovery request OCS 4.2, the Company explained why the Colorado  
174 generation area encountered such a large number of loss of load events. First, the Company  
175 noted that since Colorado is only a generation area (containing the Craig and Hayden units),  
176 and does not include any PacifiCorp load, the LOLP results produced by the model for this  
177 area were ignored in PacifiCorp's capacity contribution study. The large number of LOLP  
178 events relates to the Company modeling an exchange contract in that area, and the inability  
179 to serve the exchange contract when there were outages of the Craig and Hayden plants. I  
180 agree with PacifiCorp that this is not an issue for the Company's capacity contribution study  
181 because no retail load is modeled in that area.

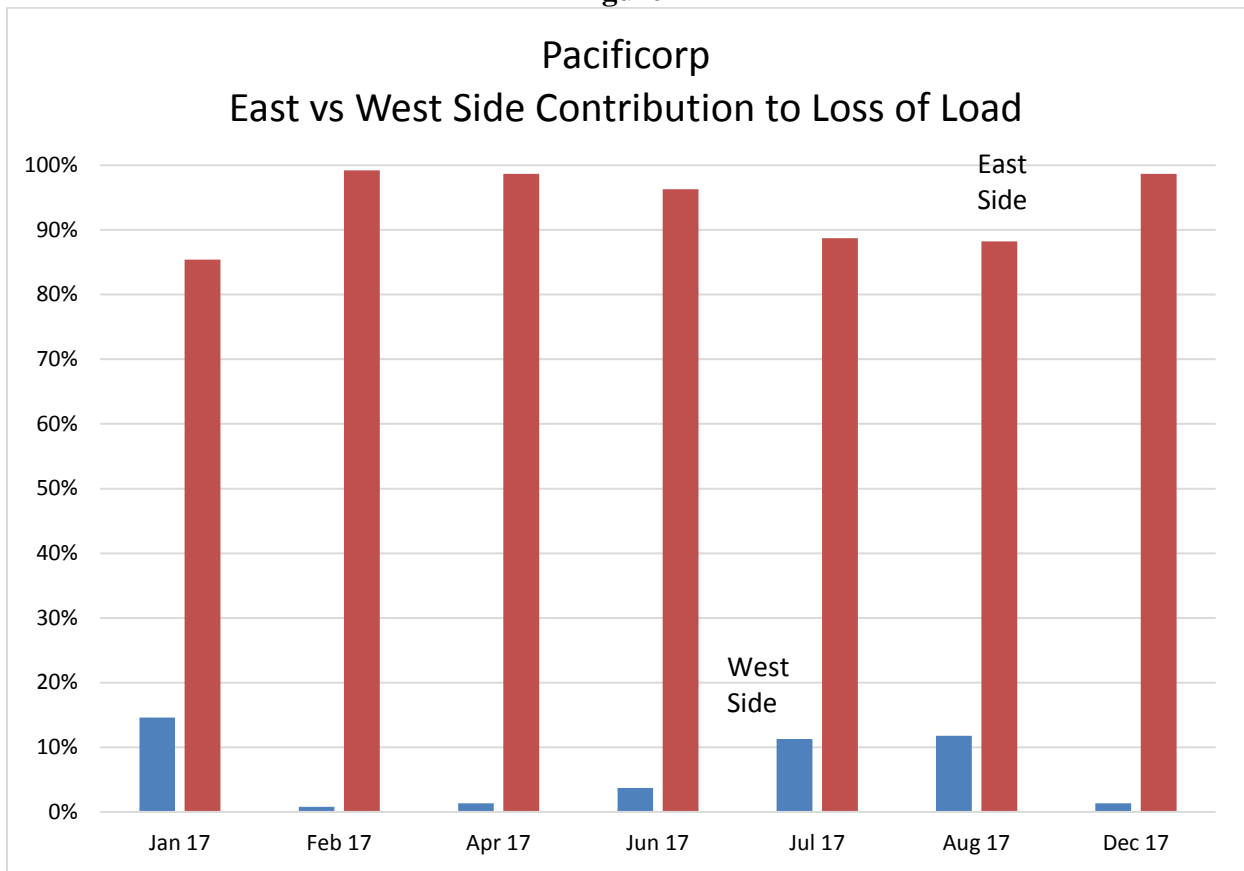
182 With regard to Mr. Dragoon's desire to eliminate all wintertime loss of load events,  
183 based on his belief that they all occurred in the West, I found that was simply not the case.  
184 The following chart contains monthly loss of load events for all iterations performed in the  
185 PaR model broken down by the East and West sides of the System. The results indicate  
186 the percent of monthly LOLP events that occurred on each side of the System, and included  
187 only the loss of load events from areas that were considered in PacifiCorp's capacity  
188 contribution calculations (i.e. Colorado was excluded).

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**REDACTED**

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**Figure 2**



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The results indicate that for each of the summer and winter months, and the April spring month, the percentage of LOLP events that occurred on the East side are significantly greater than what occurred on the West side. The chart also indicates that the wintertime outages do not just occur in the West, but in fact, a larger proportion of the outage events occur on the East side. Based on my examination of the outage data by area, I also found that the wintertime East side outages all occurred in the two Wyoming areas modeled in PaR, Wyoming NE and Wyoming SW. The data also show that these two Wyoming areas had summertime LOLP events.

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**Q. WHY WOULD IT BE POSSIBLE THAT WYOMING COULD HAVE LOLP EVENTS OCCURRING IN BOTH THE WINTER AND SUMMER PERIODS?**

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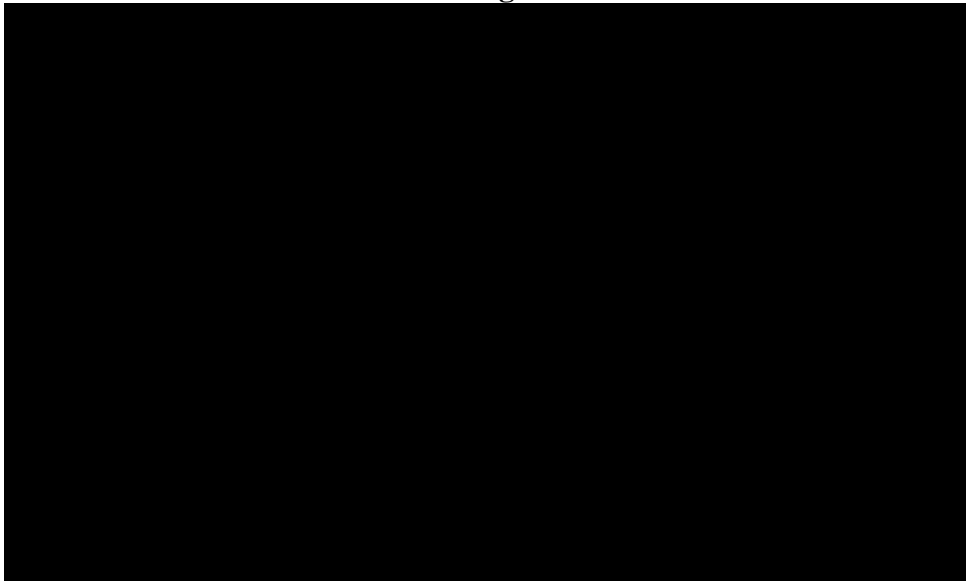
202 A. Because the two Wyoming areas combined have monthly peak demands that are nearly  
203 [REDACTED], as seen in the graph below, and the annual peak  
204 demand for the two areas combined occurs in the [REDACTED].<sup>8</sup>

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206 **Begin Confidential**

207

**Figure 3**



208

209 **End Confidential**

210 Given the random nature of forced outages, it is likely, all else being equal, that Wyoming  
211 would experience the same number of outages in the [REDACTED]  
212 [REDACTED].<sup>9</sup> Therefore, given the [REDACTED] in the Wyoming areas, it is not unreasonable to  
213 expect that wintertime LOLP events would occur in Wyoming, which is on the East side  
214 of PacifiCorp System.

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<sup>8</sup> OCS 2.3.

<sup>9</sup> Note also, from OCS 2.3, energy requirements for Wyoming are nearly [REDACTED].

215 **Q. WHAT WAS THE IMPACT OF MR. DRAGOON'S ANALYSIS IN WHICH HE**  
216 **ELIMINATED ALL LOLP EVENTS THAT OCCURRED IN JANUARY,**  
217 **FEBRUARY, AND DECEMBER?**

218 A. Though Mr. Dragoon eliminated all wintertime LOLP events that he believed occurred on  
219 the West side of the System, he in fact eliminated wintertime LOLP events that mostly  
220 occurred on the East side of the System. As shown in Figure 2 above, the East side  
221 wintertime LOLP events were much more significant than the West side events. As  
222 discussed previously, the result of eliminating LOLP events from winter months was that  
223 the capacity contribution values of solar resources were increased.

224 **Q. PLEASE SUMMARIZE YOUR RESPONSE TO MR. DRAGOON'S**  
225 **ADJUSTMENT FOR WINTERTIME LOSS OF LOAD EVENTS.**

226 A. I disagree that the PacifiCorp System should be evaluated as a non-unified System and that  
227 all wintertime LOLP events should be eliminated from the capacity contribution  
228 calculation. I recommend that this adjustment should be rejected.

229  
230 **IV. MR. DRAGOON'S SECOND CONCERN – MAINTENANCE SCHEDULES**

231 **Q. WHAT WAS THE BASIS OF MR. DRAGOON'S SECOND CONCERN THAT**  
232 **PACIFICORP SCHEDULED TOO MUCH MAINTENANCE IN APRIL?**

234 A. From Figure 1 above, which contains a comparison of monthly renewable resource  
235 capacity factors to System LOLP, it is evident that average monthly LOLP is most  
236 prominent in April, which PacifiCorp notes is due to spring maintenance.<sup>10</sup> Based on his  
237 review, Mr. Dragoon determined that PacifiCorp's maintenance assumptions are "overly

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<sup>10</sup> See page 4 of PacifiCorp's 2014 Wind and Solar Capacity Contribution Study, Exhibit RTL-1 to Rick Link's October 9, 2014 Direct Testimony, Docket No. 12-035-100.

238 aggressive for April”, as he determined that nearly [REDACTED] planned maintenance  
239 outages occur in April than in any other month.<sup>11</sup> Mr. Dragoon found that having too much  
240 maintenance in April led to an overly large number of loss of load events during that month.  
241 Furthermore, having such a large number of loss of load events during a month such as  
242 April, when the solar production is not as significant as it is during the summer, ultimately  
243 lowers the overall capacity contribution value of solar resources based on the CF Method.  
244 Mr. Dragoon recommended spreading out the April maintenance to other months, such as  
245 scheduling 200 MW of the April maintenance in March.

246 **Q. WHAT IS YOUR VIEW OF PACIFICORP’S MAINTENANCE SCHEDULE?**

247 A. I believe that in performing modeling studies it is important to utilize reasonable  
248 assumptions in developing maintenance schedules. Just because there is more maintenance  
249 scheduled in April than any other month, it is not necessarily the case that it is unrealistic.  
250 As Mr. Dragoon even noted, there may be limitations on the availability of maintenance  
251 crews, or problems with obtaining equipment that may lead to the need to schedule  
252 maintenance more in one month versus another. In response to discovery request OCS 4.1,  
253 the Company identified other factors that must be considered in scheduling maintenance  
254 including the availability of required equipment to meet emissions standards, location of  
255 the units, amount of load and reserve obligations and capability of the units, availability of  
256 other generation facilities of the fleet, cost of replacement power and availability of  
257 purchased power. Simply stated, I believe that maintenance should be scheduled optimally  
258 to lower overall System costs, while also taking into account all constraints such as those  
259 just identified. In the case of developing capacity contribution values, it is incumbent on

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<sup>11</sup> Ken Dragoon Direct, page 5, line 54.

260 PacifiCorp to demonstrate it has developed a reasonable maintenance schedule meeting  
261 these objectives.

262 **Q. HAVE YOU IDENTIFIED REASONS WHY IT WOULD NOT HAVE BEEN**  
263 **UNREASONABLE TO SCHEDULE SO MUCH MAINTENANCE IN APRIL?**

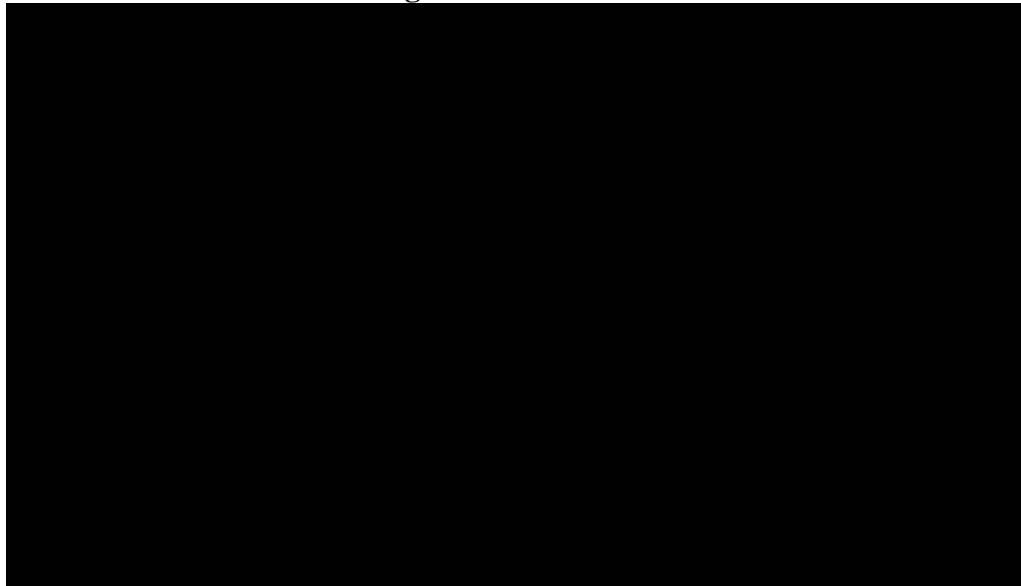
264 A. Yes, as the following two figures below show, PacifiCorp System has the [REDACTED]  
265 [REDACTED] in April as compared to any other month.<sup>12</sup>

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267 **Begin Confidential**

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**Figure 4**



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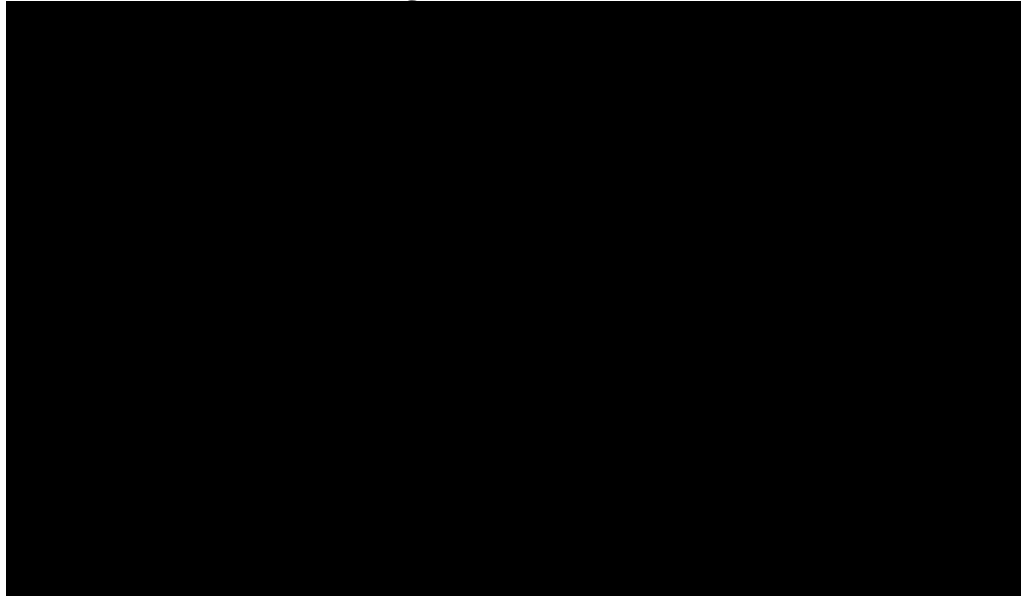
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<sup>12</sup> OCS 2.3.

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**Figure 5**

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278 **End Confidential**

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Because April [REDACTED], it would not be unreasonable to assume that PacifiCorp would schedule the most maintenance in that month compared to the rest of the months.

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In addition, OCS 4.1c asked PacifiCorp whether the 2015 IRP used the same maintenance dates as is used in this capacity contribution study. PacifiCorp stated the assumptions were

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different because they were finalized at two different times. Regardless, Figure 6 below

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shows that both studies are consistent in that considerably more maintenance is scheduled

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in April than in any other month.

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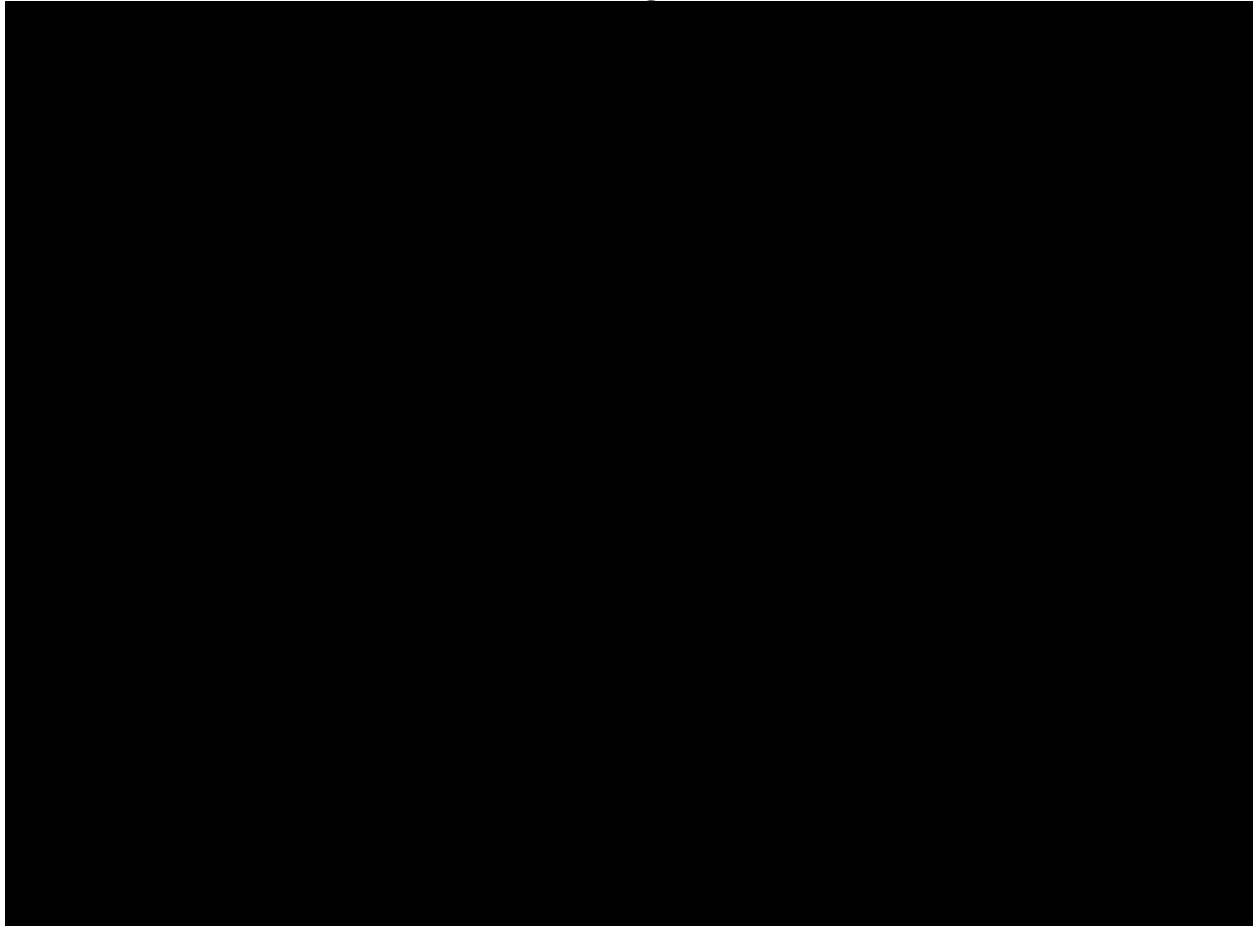


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292 **Begin Confidential**

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**Figure 6**



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295 **End Confidential**

296 **Q. THOUGH MR. DRAGOON BELIEVES TOO MUCH MAINTENANCE WAS**  
297 **INCLUDED IN APRIL, DO YOU THINK IT WAS REASONABLE FOR HIM TO**  
298 **SIMPLY REMOVE ALL LOLP EVENTS FROM APRIL IN THE ANALYSIS HE**  
299 **PERFORMED?**

300 **A.** No, I do not. One cannot simply remove LOLP events from April. Moving maintenance  
301 out of April would require moving it to some other month, and that would necessitate re-  
302 running the entire LOLP analysis. Doing that could possibly lead to even higher amounts

303 of LOLP, or greater production costs, if in fact, PacifiCorp had already developed an  
304 optimal maintenance schedule taking into account all constraints.

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## **V. CONCLUSIONS**

307 **Q. WHAT ARE YOUR CONCLUSIONS FROM REVIEWING MR. DRAGOON'S**  
308 **TWO CONCERNS?**

309 A. First, I strongly disagree with Mr. Dragoon that the PacifiCorp System should not be  
310 treated as an integrated whole for the purposes of this capacity contribution study. As I  
311 discussed, PacifiCorp operates as a single system, in that resources are acquired to serve  
312 system loads, and units are committed and dispatched to serve system loads, subject to  
313 constraints, all with the objective of minimizing system costs. Mr. Dragoon's attempt to  
314 eliminate wintertime LOLP events, based on his assumption that those occurred on the  
315 West side, was misguided, and actually resulted in removing East side LOLP events. Mr.  
316 Dragoon's recommendation not to treat the System as an integrated whole should be  
317 rejected.

318 Second, with regard to maintenance scheduling, I believe that PacifiCorp should  
319 always utilize reasonable maintenance schedules for purposes of the production cost  
320 modeling studies it performs, and I believe it is always incumbent on PacifiCorp to be able  
321 to demonstrate that it has developed optimal maintenance schedule taking into  
322 consideration all constraints for the studies it performs. However, based on Figures 4 and  
323 5 above, I believe it would not be unreasonable for PacifiCorp to have a larger amount of  
324 maintenance scheduled in April compared to other months. Furthermore, I do not believe  
325 that Mr. Dragoon has presented any evidence nor provided adequate support proving that

**REDACTED**

326 the Company's maintenance schedule is unreasonable. Therefore, I am satisfied that  
327 PacifiCorp has developed reasonable capacity contribution values (14.5% for wind, 34.1%  
328 for fixed tilt solar, and 39.1% for single-axis tracking solar), which the Commission should  
329 use in place of the interim capacity contribution values that were set in Docket No. 12-035-  
330 100.

331 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

332 A. Yes it does.

**REDACTED**