

**-BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH-**

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IN THE MATTER OF THE APPLICATION OF	)	
ROCKY MOUNTAIN POWER FOR APPROVAL OF	)	DOCKET No. 20-035-34
ITS ELECTRIC VEHICLE INFRASTRUCTURE	)	Exhibit No. DPU 1.0 R
PROGRAM	)	
	)	
	)	

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**REDACTED**

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

Rebuttal Testimony of

ROBERT A. DAVIS

November 4, 2021

**REDACTED**

Docket No. 20-035-34  
DPU Exhibit 1.0 R  
Robert A. Davis

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## INTRODUCTION

2 **Q: Please state your name and occupation.**

3 A: My name is Robert A. Davis. I serve in the capacity of Utility Technical Consultant at the  
4 Utah Department of Commerce-Division of Public Utilities (“Division”).

5 **Q: What is your business address?**

6 A: My business address is 160 East 300 South, Heber Wells Building-4<sup>th</sup> Floor, Salt Lake  
7 City, Utah, 84111.

8 **Q: On whose behalf are you testifying?**

9 A: The Division.

10 **Q: Are you the same Robert A. Davis that provided direct testimony in this docket?**

11 A: Yes.

## 12 PURPOSE of REBUTTAL TESTIMONY

13 **Q: What is the purpose of your rebuttal testimony?**

14 A: Based upon information provided after my direct testimony was filed, my rebuttal  
15 testimony revises my conclusions regarding *Net CO<sub>2</sub> Reductions* over varying mileage  
16 assumptions as reflected in the accompanying work paper — DPU Workpapers RAD

17 1.1.<sup>1</sup>

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<sup>1</sup> See Division witness Mr. Robert A. Davis, Rebuttal Testimony, Docket No. 20-035-34, November 4, 2021, DPU Workpapers RAD 1.1 – Average KWH Price & Emissions Calculation 11-4-2021.

18 The Division’s silence on any issue in this proceeding should not be construed as  
19 acceptance or agreement. The Division reserves the right to challenge issues that arise, by  
20 any intervenors or Rocky Mountain Power (“RMP”), in its surrebuttal testimony or as  
21 this case progresses.

22 **EMISSION REDUCTION MODELING**

23 **Q: Please summarize the work and investigation that has been performed in this**  
24 **docket.**

25 A: The Division continues to review the application, testimony, exhibits, and other data as it  
26 becomes available along with the testimony, attachments, and exhibits filed by other  
27 parties.

28 The Division has had conversations with RMP seeking clarification and additional  
29 support for the assumptions and concepts used by RMP in its application and testimony.  
30 The Division has also reviewed RMP’s responses to its data requests and those of other  
31 stakeholders received after the filing of direct testimony.

32 **Q: Would you offer a brief synopsis of the Division’s analysis and conclusions leading**  
33 **to the filing of your rebuttal testimony?**

34 A: Yes. In my direct testimony, I identified an area of concern with Mr. Campbell’s analysis  
35 that needed further investigation.<sup>2</sup> When varying the mileage in Mr. Campbell’s RMP  
36 Workpapers JAC 1, Emissions Calculation Tab, while holding all other assumptions

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<sup>2</sup> See Direct Testimony of Division witness Mr. Davis, Docket No. 20-035-34, October 19, 2021, pages 11-12.

37 constant, the Division noted that the Net CO<sub>2</sub> Reduction per Year (lbs.) decreased as  
38 mileage increased. This seemed counterintuitive to the success of the electric vehicle  
39 infrastructure program (“EVIP”) and led the Division to conclude that *as additional*  
40 *electric vehicles (“EV”) are added, the energy needed to charge those EVs causes more*  
41 *CO<sub>2</sub> from the generation resources than is saved by the EVs.*<sup>3</sup>

42 The Division revised Mr. Campbell’s JAC 1 in DPU Workpapers RAD 1.1, to take a  
43 more granular approach in understanding the relationship between expected EV adoption  
44 in years 2026 and 2031. We specifically considered mileage, megawatt-hours (“MWh”)   
45 needed to charge the potential number of EVs going forward, CO<sub>2</sub> emissions from the  
46 generation to charge EVs, and net CO<sub>2</sub> reduction.

47 **Q: Please explain the Division’s revisions to Mr. Campbell’s JAC 1.**

48 A: The Emission Calculation model in JAC 1 assumes that each additional EV, based on the  
49 Utah State University’s (“USU”) adoption study,<sup>4</sup> will replace one internal combustion  
50 engine (ICE”) automobile. Mr. Campbell based his analysis on an average annual  
51 mileage of 11,500 miles, and an annual 4.6 per metric ton factor of CO<sub>2</sub> reduction per car.  
52 This assumption is based on statistics from the Environmental Protection Agency

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<sup>3</sup> Id., lines 205-207.

<sup>4</sup> See RMP witness James Campbell’s, Direct Testimony, Docket No. 20-035-34, August 23, 2021, RMP Exhibit JAC 5 – USU Analysis 8-23-21.

53 (“EPA”) where an average ICE automobile that travels 11,500 miles annually getting 22  
54 mpg, emits 8,887 grams of CO<sub>2</sub> annually.<sup>5</sup>

55 The Division continues to vet USU’s study and supplemental response to DPU data  
56 request 4.2.<sup>6</sup> The Division’s revised analysis includes RMP’s supplemental data for the  
57 2026 and 2031 EV adoption assumptions from 31,000 and 150,000, to [REDACTED] and  
58 [REDACTED] respectively.<sup>7</sup> Utilizing the same EPA assumptions, the Division’s revised  
59 analysis considers changes in the CO<sub>2</sub> reduction per year factor as the mileage varies for  
60 years 2026 and 2031.

61 **Q: Will you explain the Division’s revisions in DPU Workpapers RAD 1.1 compared to**  
62 **Mr. Campbell’s JAC 1?**

63 A. Yes. In my direct testimony at line 196, I stated that the Division updated Mr. Campbell’s  
64 JAC 1 Exhibit, Emissions Calculation Tab, with the responses provided by RMP through  
65 data request DPU 1.28 and Attachment 1.28, based on RMP’s recently filed 2021  
66 Integrated Resource Plan (“IRP”).<sup>8</sup> In addition to these modifications, the Division’s  
67 revised analysis varies the annual mileage from 5,000 to 25,000 miles per year and  
68 adjusts the additional EVs per RMP’s supplemental response to DPU DR 4.2. And lastly,

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<sup>5</sup> See EPA “Greenhouse Gas Emissions from a Typical Passenger Vehicle,” March 2018,  
<https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle>.

<sup>6</sup> RMP’s supplemental response to DPU DR 4.2 provides an updated spreadsheet with greater detail for USU’s Bass Model analysis.

<sup>7</sup> RMP CONF supplemental response to DPU DR 4.2, Docket No. 20-035-34, November 1, 2021, TAB Emissions Calculation.

<sup>8</sup> *Supra* n2, lines 196-199.

69 the Division’s analysis calculates the annual CO<sub>2</sub> reduction per year factor (“Factor”) for  
70 each mileage assumption. The rest of the modeling assumptions are unchanged.

71 **Q: Will you offer your conclusions from the revised analysis?**

72 A: Yes. The Division’s initial conclusions that Net CO<sub>2</sub> Reductions per Year decreased as  
73 mileage increased, holding all other assumptions constant, did not make sense, leading  
74 the Division to revise its analysis based on Mr. Campbell’s model. The revised analysis  
75 illustrates a greater reduction in CO<sub>2</sub> per year as more EV miles replace ICE miles shown  
76 in Table 1.<sup>9</sup>

**Table 1**

Emission Reduction Calculations								
Year	Additional Evs (#)	EV Miles per Year	Annual CO <sub>2</sub> (MT) per ICE Car Factor*	CO <sub>2</sub> Reduction Per Year from EVs (MT)	MWh used to Charge EVs	CO <sub>2</sub> System Emissions to Charge EVs (MT)	Net CO <sub>2</sub> Reduction Per Year (MT)	Net CO <sub>2</sub> Reduction Per Year (lbs)
2026	[REDACTED]	5,000	2.02	54,150	44,237	15,129	39,021	86,026,970
		10,000	4.04	108,300	88,473	30,258	78,042	172,053,941
		11,500	4.65	124,545	101,744	34,796	89,749	197,862,032
		15,000	6.06	162,450	132,710	45,387	117,064	258,080,911
		20,000	8.08	216,600	176,946	60,516	156,085	344,107,882
		25,000	10.10	270,751	221,183	75,644	195,106	430,134,852
2031	[REDACTED]	5,000	2.02	248,410	202,932	39,978	208,432	459,513,915
		10,000	4.04	496,820	405,864	79,955	416,865	919,027,829
		11,500	4.65	571,343	466,743	91,948	479,394	1,056,882,004
		15,000	6.06	745,229	608,796	119,933	625,297	1,378,541,744
		20,000	8.08	993,639	811,727	159,910	833,729	1,838,055,659
		25,000	10.10	1,242,049	1,014,659	199,888	1,042,161	2,297,569,574

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<sup>9</sup> *Supra* n1.

78 **Q: Does the Division's revised analysis show a net reduction in CO<sub>2</sub> as EVs and EV**  
79 **miles increase?**

80 A: Yes, qualified by the assumption that one EV replaces one ICE automobile.<sup>10</sup> If not, then  
81 the conclusions become less meaningful. For example, an EV buyer may purchase an EV  
82 as a second car and continue to use an ICE automobile but not add as many miles per  
83 year on the EV as the ICE automobile for whatever reason and vice versa. It is difficult to  
84 make direct comparison between the technologies.

85 **Q: Are there other observations from the Division's revised analysis?**

86 A: Yes. The Division is interested in understanding the relationship between net CO<sub>2</sub>  
87 reductions per year as EVs replace ICE automobiles over varying annual mileages. The  
88 Division is also interested in the amount of CO<sub>2</sub> emissions from PacifiCorp's fleet  
89 generation as a result of charging the additional EVs, and the required capacity in MWh  
90 needed to meet the increased load from charging the additional EVs.

91 However, when analyzing the three criteria listed above to determine net CO<sub>2</sub> reductions,  
92 the Division's analysis implies that the percentage of increased benefit decreases for each  
93 five-thousand-mile increase (increases at a decreasing rate). The Division did not study  
94 this phenomenon for any mileage over 25,000, as it is not typical for light car  
95 applications to exceed this mileage in a year. Illustrations 1 through 3 show a flattening

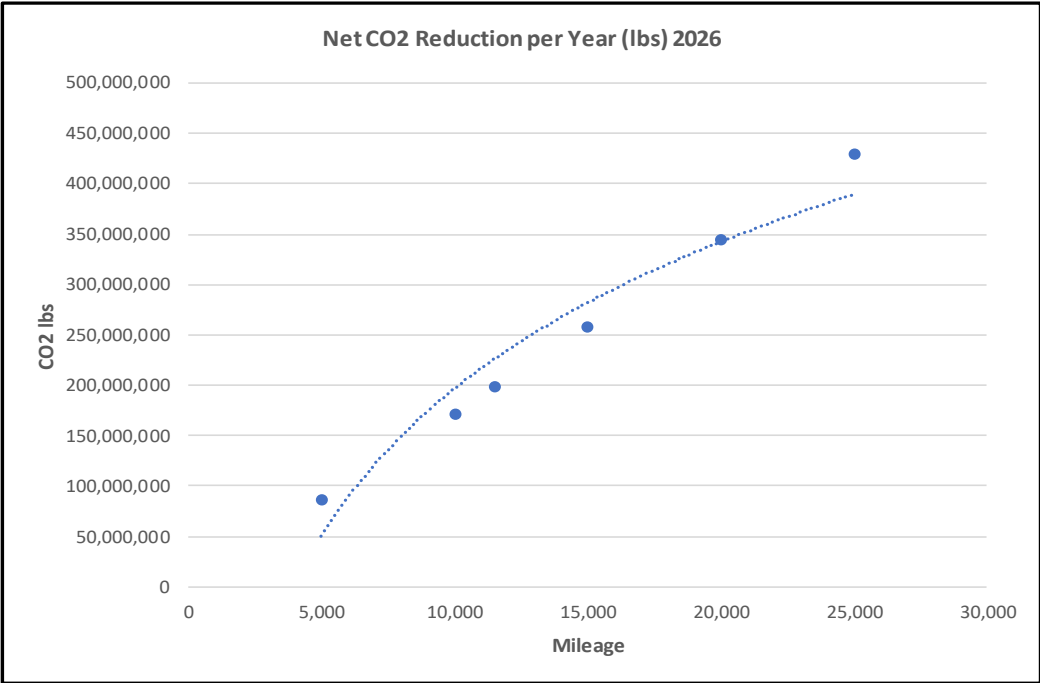
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<sup>10</sup> The Division notes that there is no credible way of knowing how many ICE automobiles are actually replaced with an EV.



96 of the curve (logarithmic) for 2026 Net CO<sub>2</sub> Reduction per Year, CO<sub>2</sub> Reduction per Year  
97 from Additional EVs (MT), and MWh used to Charge EVs, respectively.<sup>11</sup> The Division  
98 notes that the same phenomenon occurs for 2031.

99 **Illustration 1**



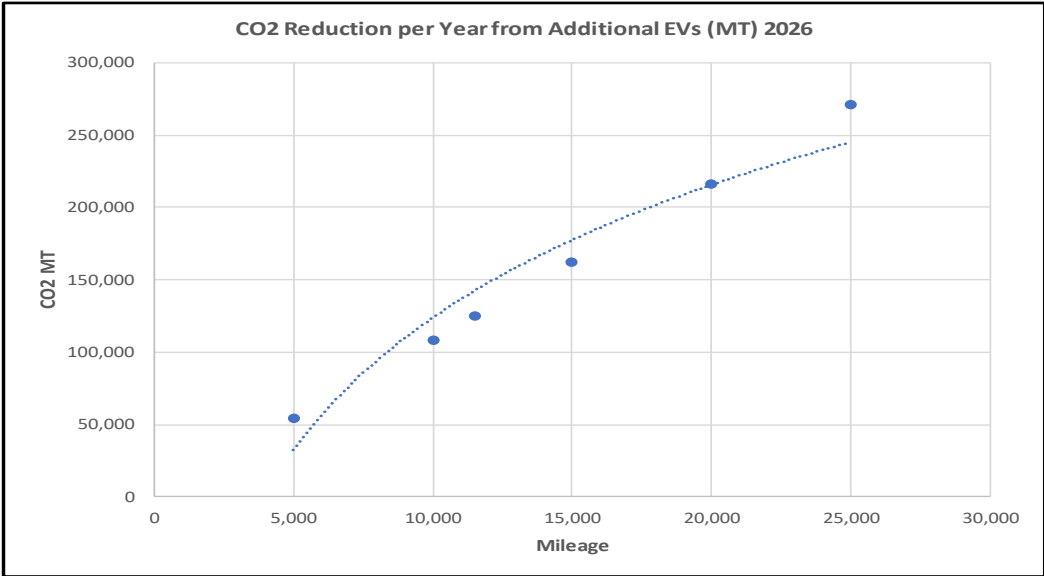
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<sup>11</sup> *Supra* n1.

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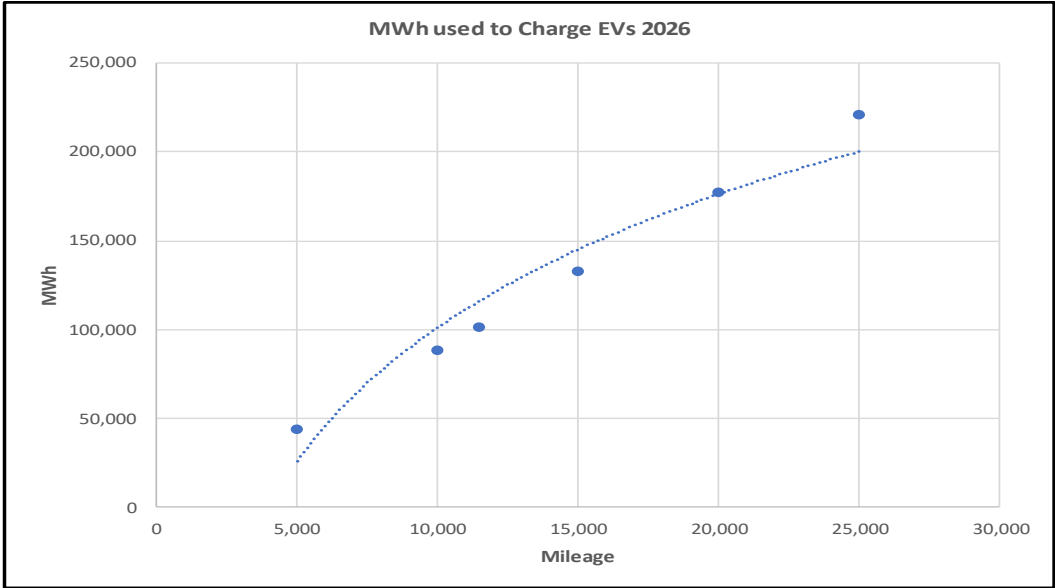
Illustration 2



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103

Illustration 3



104

105 It does not make sense that the MWh needed to charge the EVs based on miles would  
106 decrease as mileage increases, because it takes an accumulative amount of MWh (0.33  
107 kWh per mile)<sup>12</sup> of charge to accommodate the mileage.

108 The Division continues to search for answers to explain why this phenomenon is  
109 occurring and to look for a better way to analyze the costs and benefits of the emissions  
110 component of this program and EV charging into the future.

111 **Q: Should the Commission reject RMP's application based on these conclusions?**

112 A: No. The emission reduction requirement of Section 54-4-41(7)(a) is a prudence  
113 requirement and part of the reporting and review process as the EVIP proceeds if  
114 approved.<sup>13</sup> While these results suggest some unreliability in the analytical approach, it  
115 need not be fatal.

116 The analysis for the emissions calculations, and the overall potential of the EVIP  
117 program, are based on the Bass Model prepared by USU. The Division is less skeptical of  
118 the results of the model after its discussions with RMP and USU, but still has concerns  
119 with the adoption estimates. The Division continues to analyze USU's results provided in  
120 DPU DR 4.2 supplemental.

121 **BASS MODEL**

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<sup>12</sup> *Supra* n1, Cell D22.

<sup>13</sup> See Utah Code Annotated Section 54-4-41(7)(a), [https://le.utah.gov/xcode/Title54/Chapter4/54-4-S41.html?v=C54-4-S41\\_2020051220200512](https://le.utah.gov/xcode/Title54/Chapter4/54-4-S41.html?v=C54-4-S41_2020051220200512).

122 **Q: Please explain the Division’s observations of USU’s Bass Model.**

123 A: The Division has lessening concerns with the three main assumptions used in the Bass  
124 Model (“Model”): the market potential  $M$ , the  $p$  factor or degree of innovation, and the  $q$   
125 factor or degree of imitation. Of lesser concern are the discrepancies between the  
126 assumptions for mileage and price per kWh used in the Model and those used by Mr.  
127 Campbell in JAC 1.<sup>14</sup>

128 In response to questions from the Division, RMP and USU representatives explained how  
129 the three Bass Model assumptions were derived. The market potential, or  $M$  parameter, is  
130 derived from historical data from the Alliance of Automobile Manufacturers and the Utah  
131 Division of Motor Vehicles (“DMV”). The Division continues to vet USU’s market  
132 potential calculations but has less concern after its discussions with the USU  
133 representatives.

134 For each of the four scenarios, USU calibrates the  $p$  and  $q$  parameters using the built-in  
135 Solver function in Excel. The Solver function minimizes the sum of squared errors,  
136 defined as the difference between the actual number of EVs on the road and the Bass  
137 Model’s prediction of that number. The actual number of EVs was determined using the  
138 sources mentioned above for the years 2011 through 2020. Except for one discrepancy in  
139 the use of the market potential, the Division concludes that the use of the Bass Model and

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<sup>14</sup> The Bass Model uses 10,000 miles and \$0.12 per kWh versus JAC 1 of 11,500 miles and \$0.15 per kWh, respectively.

140 the calibration of the p and q parameters, and the derivation of the market potential are  
141 reasonable.

142 **Q: Please explain the discrepancy in the use of the market potential in the Bass Model.**

143 A: RMP reports on four electric vehicle adoption scenarios using the USU Bass Model  
144 study. The first scenario, the base scenario, is without the RMP program. As originally  
145 provided in response to DPU 4.2, this scenario is compared to three scenarios of market  
146 or adoption uptake, thirty percent, forty-five percent, and sixty percent. Each scenario  
147 uses the total market potential to estimate the adoption of EVs over the study period,  
148 2011 through 2050. However, in its review of the response to DR 4.2, the Division noted  
149 that the three uptake scenarios used a larger market potential than the base scenario, 1.8  
150 million versus 0.93 million. This penalizes the adoption of electric vehicles under the  
151 base scenario.

152 For example, focusing on the years 2026 and 2031, at December 2026, the total adoption  
153 predicted by the Bass model is approximately three percent lower than it would be if the  
154 higher market potential were used. For December 2031, the predicted adoption for the  
155 base case is approximately eleven percent less. For the end of the study, December 2050,  
156 the base adoption level is about forty-seven percent less as a result of using the lower  
157 market potential.

158 There are other issues with the application of the Bass Model as originally presented in  
159 response to DPU 4.2. However, after speaking with RMP and USU representatives, RMP

160 submitted a supplemental response to DPU 4.2. The issues with the application of the  
161 market potential and the other issues that the Division raised were addressed in this  
162 version of the Bass Model. The supplemental response was received only days before  
163 filing this rebuttal testimony and the Division continues to evaluate the response.  
164 However, a preliminary review of the supplemental information indicates that the issues  
165 with the original Bass Model do not substantially alter the conclusions about market  
166 adoption numbers presented in RMP's application or testimony.

167 **Q: Would you summarize the Division's observations of the assumptions used in the**  
168 **Bass Model?**

169 A: Yes. RMP responded to the Division's data request DPU DR 4.2 providing answers to  
170 many of the Division's questions. The Division followed up those responses with further  
171 discussions with RMP and USU representatives.

172 During those discussions, both RMP and USU personnel admitted to some discrepancies  
173 in the Bass Model. However, neither RMP nor USU felt those discrepancies would lead  
174 to significant differences in the modeling. USU revised its Bass Model with better  
175 explanations and corrections in its supplement to DPU DR 4.2, submitted on November  
176 1, 2021. The Division includes those pertinent revisions in its analysis as stated above.  
177 The Division plans to continue its review of the corrections and address any further issues  
178 in surrebuttal, or at hearing if needed.

179 **SUMMARY**

180 **Q: Would you summarize the Division's review and conclusions for RMP's EVIP**  
181 **proposal?**

182 A: Yes. The Division has reviewed the numerous data requests asked by the Division and  
183 other parties and concludes that RMP's application for its proposed EVIP program still  
184 lacks sufficient evidence that the program and ensuing projects are in the public interest.

185 Based on the foregoing additional analysis, along with that already filed in direct  
186 testimony, the Division still concludes that RMP's EVIP program design poorly supports  
187 the public interest requirements of Utah Code Section 54-4-41, specifically, Section 54-4-  
188 41(4)(d), and recommends the Commission not approve RMP's application. The  
189 Division's statutory assignment is to advocate the public interest.<sup>15</sup> When the Division  
190 cannot determine that a proposal is in the public interest and has concerns about prudence  
191 as outlined in Section 54-4-41, it has to recommend the Commission reject the proposal  
192 until such time that it can be proven, with proper support, to be in the public interest and  
193 prudent.

194 **Q: Does this conclude your rebuttal testimony?**

195 A: Yes.

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<sup>15</sup> See Utah Code Section 54-4a-6, <https://le.utah.gov/xcode/Title54/Chapter4A/54-4a-S6.html>.