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**BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH**

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In the Matter of the Application of  
PacifiCorp for Approval of an IRP Based  
Avoided Cost Methodology for QF  
Projects Larger than 3 Megawatts

Docket No. 03-035-14

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**REBUTTAL TESTIMONY OF RICH COLLINS**

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Wasatch Wind hereby submits the Rebuttal Testimony of Rich Collins in this docket.

DATED this 8<sup>th</sup> day of September, 2005.

Richard S. Collins

/s/ \_\_\_\_\_  
Richard S. Collins  
Representing Wasatch Wind

## CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing was sent by United States mail, postage prepaid, or by email this 11 day of, July 2005, to the following:

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**REBUTTAL TESTIMONY**

**Of**

**RICHARD S. COLLINS**

On behalf of Wasatch Wind

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In the Matter of the Application of PacifiCorp for Approval of an IRP Based Avoided Cost  
Methodology for QF Projects Larger than 3 Megawatts

Docket No. 03-035-14

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September 8, 2005

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1 **Q. Please state your name and occupation.**

2 A. My name is Richard S. Collins. I am an Associate Professor of Economics and  
3 Finance at Westminster College located at 1840 South 1300 East, Salt Lake City,  
4 UT 84108.

5 **Q. On whose behalf are you filing testimony in this Docket?**

6 A. Wasatch Wind, LLC

7 **Q. Have you submitted prefiled testimony in this docket?**

8 A. Yes. I submitted prefiled testimony on July 29, 2005.

9 **SUMMARY OF TESTIMONY**

10 **Q: What is the purpose of your testimony in this docket?**

11 A: I will rebut the testimony of the Division of Public Utilities and the Committee of  
12 Consumer Services witnesses as well as other selected other witnesses.

13 **Q: Could you give a summary of your conclusions and recommendations?**

14 A: Yes. The testimony of the Division of Public Utilities lacks sufficient analysis to  
15 substantiate their recommendations to accept the Company's proposed method for  
16 determining avoided costs. The most egregious fault was a lack of analysis of the  
17 model for its ability to appropriately determine avoided costs for a QF wind  
18 project. I disagree with some of the testimony submitted by the Committee and  
19 point out areas of agreement. I propose an alternative that is compatible with the  
20 Division and Committee's stated values and criteria for judging the validity of a  
21 method. This alternative provides a fair and equitable and efficient way of  
22 determining avoided costs for wind projects. I recommend that the Commission

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1           adopt a variant of my method the Market Benchmark Approach as the appropriate  
2           method to determine avoided costs for wind developers.

3   **Rebuttal of Witness Coon**

4   **Q:    Have you read the testimony of Andrea Coon? Do you agree with her**  
5           **recommendations?**

6   A:    Yes, I have read her testimony and no, I do not agree with many of her  
7           recommendations.

8   **Q:    Is Ms. Coon the Division's expert witness for evaluating the Company's**  
9           **DRR model and the proposed methodology for calculating avoided costs.**

10 A:    Yes, she is.

11 **Q:    What method does Ms. Coon recommend?**

12 A:    She recommends the adoption of the Company's proposed variant of the  
13           Differential Revenue Requirement method (DRR) as a permanent methodology  
14           for determining avoided costs for QFs between 3 MWs and 99 MWs.

15 **Q:    On what evidence does Ms. Coon base her recommendation?**

16 A:    Ms. Coon states in her testimony that the "Division has used the GRID model in a  
17           rate case setting and Division personnel performed numerous runs both in the last  
18           rate case as well as for the current docket."

19 **Q:    Does this statement give you confidence that the Division has performed an**  
20           **adequate analysis of this model for determining avoided costs.**

21 A:    Unfortunately it does not. In a data request to Ms. Coon I asked her to specify the

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1 numerous scenarios runs and their results that the Division made for this docket. I  
2 also requested that the Division explain why the results of these runs led them to  
3 conclude that the model was appropriate for determining avoided costs for a wide  
4 variety of potential QFs. The Division replied:

5 “5 MW resource, 160 MW no-firm resource and three others that our  
6 analyst cannot recall based upon the fact that the scenarios had to be  
7 deleted due to our earlier computer problems. They gave the DPU  
8 confidence in the model because to the best of our remembrances, the runs  
9 produced results that we thought were logical.” (DPU response to WW  
10 Data Request 1.3)

11 It appears the Division was not able to provide the results of any of the model runs  
12 nor could they provide any analysis on why they concluded the model was  
13 appropriate for determining avoided costs.

14 **Q: Does five scenario model runs seem to be an appropriate number for testing**  
15 **the validity of a model?**

16 A: No, it is not appropriate; the Grid Model has several hundred variables each of  
17 which can assume a minimum of two or three values. To test only five variables  
18 or scenarios, three of which the Division cannot even recall what was tested does  
19 not provide adequate information to judge the logical consistency or accuracy of a  
20 very complex model. This does not represent a statistically representative sample;  
21 generally one would need a minimum of thirty observations to gain substantial

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1 confidence in the results or conclusions.

2 **Q: Given all the combinations and permutations of the possible scenario runs,**  
3 **does an analyst need to run a very large number of scenarios to confirm a**  
4 **model is logistically reasonable and will yield accurate results?**

5 A: Not, necessarily, if the evaluators understood the internal logic of the model and  
6 could select scenarios and runs that would test specific outcomes of the model  
7 then its validity could be established with fewer runs. However, a minimum of  
8 thirty runs would be recommended.

9 **Q: Does the Division have access to the internal logic of the model.**

10 A: I don't believe so. When questioned about the Division's understanding of the  
11 logic of the model, it stated that "the Division possesses a manual of algorithms  
12 ("Algorithm Guide"). In addition, doing scenario runs and comparing them to  
13 what would "logically" occur with the given changes can obtain logical  
14 consistency." (DPU response to WW DR 1.7) Unfortunately, this manual only  
15 explains how to run the model, what buttons to push and how to change input  
16 data. I was unable to derive any internal logic from this manual. Furthermore, the  
17 Division did not specify how they would determine what would "logically" occur  
18 when the given changes were made. They did not present a null hypothesis or  
19 apriori criteria to test the consistency of the model.

20 **Q: How did the Division determine which scenarios to run and how did it verify**  
21 **that the results were accurate.**



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1 A: According to the answer to Wasatch Wind's data request 1.6 "The Division's  
2 selection of initial scenarios was random. The Division looked mainly for logical  
3 consistency rather than making a judgment of "accuracy".

4 **Q: Has the Division made any GRID scenario runs for a wind project.**

5 A: No, it has not.

6 **Q: Does the Division's analysis provide any confidence to a QF developer that its  
7 interests would be well represented by this state agency?**

8 A: No it does not.

9 **Q: How might one overcome this lack of confidence?**

10 A: Either the Division or some other state agency would have to rigorously test the  
11 model with a greater number of runs and explain why the results are logical and  
12 consistent with reality or QF developers would have to understand the model so  
13 that they could validate its results. A third possibility would be for developers to  
14 hire consultants to review the model. These last two alternatives place  
15 substantial time and financial burdens on the developer.

16 **Q: Surely, there must be dozens of consulting firms that could provide this  
17 service?**

18 A: As far as I know, the GRID model is not used by any other utility in the country  
19 and a consulting firm would have to come up to speed on the workings of this  
20 particular model before it could confirm the validity of its results.

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1 **Q: Would it be appropriate if funds were made available for the training of QF**  
2 **personnel or their consultants on the workings of the model?**

3 **A:** Yes, particularly given the lack of confidence in state agencies' efforts to date.

4 **Q: Witness Coon testifies that the Division supports a number of adjustments**  
5 **that are proposed by the Company such as the type of power being delivered,**  
6 **QF availability during daily or seasonal peak periods, the ability of the utility**  
7 **to dispatch the QF, the reliability of the QF as well as the type of generation**  
8 **technology and fuel source. Do you agree with her recommendations?**

9 **A:** No. Let me preface my remarks, these adjustments are not appropriate for a wind  
10 project because most of these costs adjustments are not relevant. The Company  
11 and the Division are conceptually inconsistent with their analysis. The proposed  
12 method first starts out using a 525 MWs CCCT to estimate both capacity and  
13 energy costs, they then make adjustments to this estimate to reflect the differences  
14 between a thermal resource and intermittent resource. The error in their thinking  
15 is to start with a CCCT to evaluate an intermittent resource. In fact, the resource  
16 that a wind QF will replace is a non-QF wind project not a thermal resource. The  
17 IRP has already analyzed the tradeoffs between thermal resources and wind and  
18 concluded that 1400 MWs of wind resources are necessary to achieve least cost  
19 least risk. Thus, the most consistent and accurate costs that a QF wind project  
20 will avoid is another wind project. The costs of integrating this resource into the  
21 system have already been analyzed by the IRP model. Thus no further adjustments  
22 need to be made. The only adjustment that is appropriate for wind QFs is to

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1 differentiate between different capacity factors and differences between on peak  
2 and off peak energy production. Adjustments are also warranted to reflect  
3 differences in transmission. If a QF is located within the Utah bubble, it will  
4 avoid line losses and also provide benefits to the transmission system in that it  
5 will relieve some transmission congestion. In fact, transmission assumptions  
6 made in the model should be thoroughly investigated.

7 **Q: What transmission assumptions are you referring to?**

8 **A:** My understanding of the model is that it does not include non-firm transmission  
9 as an option to transport power to off-system markets. This will lead to an  
10 underestimation of avoided costs because it will force the back down of thermal  
11 plants, i.e., coal plants.

12 **Q: Does the Division have a position on this issue?**

13 **A:** When asked why the Division did not run any scenarios to test the impact of  
14 relieving transmission constraints for off-peak sales. The Division responded that  
15 “The Division is not convinced that using non-firm transmission for long term  
16 planning and cost calculation is appropriate.” (WW DR 1.5)

17 **Q: Is non-firm transmission currently available?**

18 **A:** Yes, please refer to Roger Swenson’s direct testimony for evidence of non-firm  
19 transmission. (See Swenson direct page 9 lines 4-12)

20 **Q: How would ignoring existing non-firm transmission affect the calculation of**  
21 **avoided costs?**

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1 **A:** To ignore non-firm transmission for off-system sales would lower avoided costs.

2

3 **Rebuttal of Artie Powell Testimony**

4 **Q: Dr. Powell is the policy witness for the Division and supports the adoption of**  
5 **the Company's DRR model. What support does Dr. Powell give for his**  
6 **recommendation?**

7 **A:** Dr. Powell would like the method for determining avoided costs to be consistent  
8 with the theoretical construct of avoided costs. He relies almost exclusively on  
9 the Tellus Report to guide his understanding of the proper way to calculate  
10 avoided costs. He quotes the report extensively in his testimony.

11 **Q: Do you agree with the Tellus report from a theoretical perspective?**

12 **A:** Yes, I do. The Tellus report strongly recommends the use of an **IRP** production  
13 cost optimization model to estimate avoided costs. However, the Company's IRP  
14 model is technically unable to calculate avoided costs at this time. There are also  
15 problems with access to the IRP model due to proprietary restrictions on its use.  
16 The Company's proposal is a variant of the Tellus's recommended method.

17 **Q: How would Tellus recommend as the appropriate method to calculate the**  
18 **avoided cost of a wind project?**

19 **A:** I queried Dr. Rich Rosen by email on this subject, Dr. Rosen is a principal of the  
20 Tellus Institute and their resident expert in IRP and avoided costs, he responded

21 "…you asked how to calculate avoided costs for a certain amount of wind  
22 resources, eg., 500 MW. There is only one correct answer to this problem.

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1           You create a least cost plan with (plan A) and without (plan B) the 500  
2           MW of wind resources, but strip out all costs for the 500 MW of wind  
3           from the calculation of revenue requirements of plan A with the wind  
4           resources. You subtract the remaining revenue requirements of plan A  
5           from those for plan B. This difference is the avoided costs for the wind.”

6           Thus the proper way to determine the avoided cost of a wind project is to run a  
7           production cost model with and without wind, not a CCCT.

8   **Q: Did the Company or the Division make such a run?**

9   **A:** Not to my knowledge.

10 **Q: Are wind resources included in the GRID Model?**

11 **A:** I believe that there are some wind resources that are listed in the model, but to my  
12 knowledge they are not included in the dispatch.

13 **Q: Was this issue brought up for discussion in technical or settlement**  
14 **conferences. If so, what results were expected from GRID model runs with**  
15 **and without a given amount of wind resource.**

16 **A:** Yes, this issue did come up in discussions; Laren Hale indicated that the resulting  
17 runs would yield a differential in costs that was exactly equal to the cost of the  
18 wind project that was removed from the second run. This would be true if the  
19 wind project removed was a contract or an estimate of the cost of the wind  
20 project.

21 **Q: Would such estimation be consistent with the Division’s testimony on the**  
22 **proper way to determine avoided costs?**

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1 **A:** The Division supports the Tellus approach; Dr. Rosen has indicated that the above  
2 method would be the best way to estimate the avoided cost of a wind project.

3 **Q: It would appear that the Division should support such a method then?**

4 **A:** It would appear so if they remained consistent with their direct testimony.

5 **Q: If I understand your answer correctly, the GRID model using the proper**  
6 **zero cost resource, i.e., a wind resource to estimate the avoided cost of QF**  
7 **wind project would yield the value of the contracted wind project removed or**  
8 **the cost of the estimated project that PacifiCorp would have built?**

9 **A:** That is correct.

10 **Q: If the removed wind resource was the Company's best estimate of the cost of**  
11 **its next wind resource then the GRID model would estimate the avoided costs**  
12 **at the costs of the removed wind project. Isn't this just another way of**  
13 **saying that the GRID estimate of the avoided cost of wind is consistent with a**  
14 **proxy estimate of the cost of a wind project or the cost of a recently executed**  
15 **wind contract?**

16 **A:** You are correct, in the case of estimating the avoided costs for a wind project the  
17 results are basically the same using a proxy or the GRID results or a recently  
18 executed contract.

19 **Q: Given the Division's preference to observe Ockam's razor, which method**  
20 **should the Division recommend?**

21 **A:** If the three methods produce the same result then the simplest method should be  
22 selected.

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1 **Q: Why is there any controversy in choosing between the above discussed**  
2 **methods for calculating the avoided cost for wind?**

3 **A:** I don't know. Although I prefer the proxy method, I would accept any of the  
4 above discussed methods to calculate avoided costs for wind. What I strongly  
5 oppose is the use of the GRID model with a zero cost resource 525 MW gas fired  
6 thermal resource to estimate the avoided cost of a wind resource. This is an apple  
7 to orange comparison and is inconsistent with the theoretical construct of avoided  
8 costs that the Division holds so dear.

9 **Q: The Division specifies the conditions under which the proxy plant method**  
10 **would be a reasonable alternative to the DRR method. In your opinion, does**  
11 **a wind resource meet those conditions?**

12 **A:** Yes, a wind resource does meet the necessary conditions specified by DR. Powell.  
13 The conditions include:

14 1. That the operating characteristics of the proxy plant closely match  
15 those of the alternative resource being evaluated.

16 Both a non-QF and a QF wind resource will be intermittent thus their operating  
17 characteristics will only vary by capacity factor and the percentage of projected  
18 production on peak versus off peak. Adjustments can be made to avoided costs  
19 that can reflect these differences in capacity factors and on and off-peak  
20 production.

21 2. The alternative resource exactly replaces the entire capacity and energy  
22 of the proxy plant.

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1 The proxy plant, either a contract price or the estimated cost of a Company-owned  
2 resource will provide similar capacity and energy as an alternative resource, i.e.,  
3 the QF resource. Again, if there are differences in capacity factors and production  
4 profiles then adjustments can be made.

5 3 The alternative resource does not significantly affect other plant  
6 additions or system operations.

7 If a QF wind project is replacing a similar non-QF wind project then the impact on  
8 plant additions or system operations should be minimal. Thus, wind QFs meet  
9 the conditions for accepting a proxy as an appropriate method of determining  
10 avoided costs.

11 **Q: Should the Division reevaluate your proxy model proposal?**

12 A: According to Dr. Powell's direct testimony on page 10, yes the Division should  
13 evaluate this proposal and if it meets their conditions and caveats recommend it  
14 for adoption. However, the main point is, all three proposed methods yield very  
15 similar results, A GRID model run using wind resources as the zero cost  
16 resource, the latest contract price or the estimated cost for the Company to build a  
17 wind resource will yield similar, consistent and acceptable results.

18 **Q: Dr. Powell recommends that power purchase agreement with a QF will affect**  
19 **the Company's capital costs and such cost should be reflected in the contract.**  
20 **Do you agree with his analysis and recommendation?**

21 A: I agree with much of his analysis but not his final recommendation. Dr. Powell  
22 quotes two sources in the beginning of his testimony that negate his conclusions.



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1 The Energy Information Agency, (EIA) states “there is no conclusive evidence  
2 that power purchase agreements from non-utility generators raise the cost of  
3 capital to the utilities which purchase the electricity.” See page 12 line 220 of  
4 Powell’s direct testimony Furthermore, Lawrence Berkeley Labs and EIA find  
5 “more evidence to support the notion that utility construction raises the cost of  
6 capital than the (PPAs) do. (See page 15 line 274 of Dr. Powell’s direct testimony  
7 for complete reference)

8 **Q: Dr. Powell recommends that an adjustment to the contract price be made to**  
9 **reflect the potential for increased cost of capital resulting from a PPA, but**  
10 **adjusted by a 15% risk factor rather than the Company’s proposed 50% risk**  
11 **factor. Do you agree?**

12 **A:** No, I do not agree that an adjustment to the contract price for a QF should be  
13 made unless the Company can show that its cost of capital will increase as result  
14 of the contract. Further, they must show that their cost of capital would increase  
15 more than if they were to build a similar resource. In other words, the burden of  
16 proof is on the utility. But yes, I do agree that if an adjustment is made a 15% risk  
17 adjustment is more appropriate.

18 **Q: Does a debt imputation adjustment appear to be justified for a wind**  
19 **contract?**

20 **A:** It depends on how the contract is structured. My understanding is that debt  
21 imputation is most often considered when a PPA has a capacity payment

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1 associated with it. QF wind contracts can be structured in a way that precludes a  
2 capacity payment.

3

4 **Rebuttal of Abdinasir Abdulle**

5 **Q: Dr. Abdulle supports the position that the green tags or RECs associated**  
6 **with QF renewable energy should stay with the QF developer. Do you agree?**

7 **A:** Yes, PURPA did not contemplate RECs and FERC has ruled that nothing in  
8 PURPA grants the utility the right to take the RECs from a QF without  
9 compensation. Wasatch Wind supports the Division's position on REC  
10 ownership.

11 **Q: Dr. Abdulle supports the Company's position on calculating capacity**  
12 **payments to QF wind developers. Do you agree?**

13 **A:** No I do not. First, Wasatch Wind believes that a financial viable contract does  
14 not have to explicitly break out payments into capacity and energy. If recognition  
15 of the contribution to capacity is required in payments, we recommend that it be  
16 shown by a differential between on-peak and off-peak prices. Higher on peak  
17 pricing will reflect the contribution of wind production to capacity needs and will  
18 create the incentives to reward on peak production.

19 **Rebuttal of Phil Hayet Testimony**

20 **Q: Mr. Hayet refers to the Company's proposed method for determining**  
21 **avoided costs as a combination of a proxy model and a variant of the DRR**  
22 **approach. Avoided capacity costs are determined with a proxy model and**

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1           **energy costs are estimated using a variation of the DRR method. Do you**  
2           **agree with Mr. Hayet's critique of this approach?**

3    A:    Yes, I do. Mr. Hayet argues convincingly that the use of a zero-cost 525 MW  
4           plant as described in his direct testimony on page 7-8 is an a unreasonable  
5           approach for estimating avoided costs. He recommends that the second run of the  
6           GRID model use only a zero cost resource of the same size as the QF requesting  
7           indicative prices. I concur with his recommendation and recommend its adoption  
8           if the GRID model is selected as the method for determining avoided energy costs.

9    **Q:    Mr. Hayet agrees with the Company's proposal to cap energy prices at the**  
10           **fuel cost of a CCCT unit. Do you care to comment?**

11   A:    The cap should not be enforced if the CCCT is running at maximum capacity and  
12           other higher energy cost units are on line. In this instance the calculated energy  
13           cost should reflect the unit or purchase that is actually backed down or avoided.

14   **Q:    Mr. Hayet testifies on the Company's proposed adjustments related to**  
15           **renewable QF projects such as Green Tags, capacity payments adjustments**  
16           **and integration costs. Would you care to comment on his testimony?**

17   A:    Mr. Hayet disagrees with the Company on the issue of **Green Tags** and provides a  
18           more credible interpretation of FERC's stand on this issue. I agree with Mr.  
19           Hayet's conclusion that Green Tags should stay with the QF developer. Mr.  
20           Hayet's position on **capacity credits** for QF wind projects is a bit confusing. He  
21           argues that a QF wind project that reaches a 35% capacity should receive a 20-

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1           30% credit for capacity payments rather than the Company's 20% offer. Yet, he  
2           cites other studies that indicate that wind's contribution to capacity of might be  
3           higher. I maintain that if capacity payments are going to be calculated based on  
4           the capacity factor achieved during on-peak hours then the QF facility should  
5           receive that same fraction for a capacity payment. In other words, a 35% on-peak  
6           capacity factor QF wind facility should receive a 35% capacity payment. By  
7           restricting the capacity factor to on-peak hours you are measuring the contribution  
8           of capacity when the utility most needs it. However, I believe that it is more  
9           productive to avoid this debate about avoided capacity costs for wind projects and  
10          differentiate prices based on production on-peak and off-peak. With regard to  
11          **integration costs**, Mr. Hayet's questions the Company's estimate of \$4.64/MWH  
12          and requests that the GRID model be used to estimate integration costs. I am not  
13          convinced that the GRID model is capable of such estimation. I also question  
14          whether integration costs are costs that can be avoided. If a QF wind project  
15          replaces a non-QF project than integration costs are not really relevant in the  
16          calculation of avoided costs. Integration costs will be incurred by the Company  
17          with either resource, thus, the cost in not avoidable.

18   **Q:     Would you like to comment on any other intervener's testimony?**

19   A:     Yes, I would. Mr. Townsend recommends an improvement to the Company's  
20          proposed method of calculating avoided capacity costs. He recommends the  
21          inclusion of transmission costs into the calculation. I agree that transmission costs  
22          should be considered in the calculation of avoided cost, both capacity and energy

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1 costs. If a QF facility is located within the Utah bubble it should be given a credit  
2 for line losses and credit for relieving transmission congestion. Mr. Townsend  
3 also recommends a number of model assumptions be changed so they more  
4 accurately reflect reality. For example, the capacity factor of the zero cost  
5 resource should be more reflective of the resource that will actually be avoided.  
6 Instead of a 100% capacity factor, the zero cost resource should run at the  
7 assumed capacity factor of the avoided resource. In addition, assumptions  
8 regarding the size of the off-system sales market during low-load hours should  
9 reflect the actual market. The availability of transmission both firm and non-firm  
10 should be modeled to reflect what is actually available. If the GRID model is  
11 chosen as the method for determining avoided costs then these assumptions  
12 should be reviewed and set so they reflect reality. The Commission should order  
13 the Division to study these issues and perform model runs to test their effect on  
14 avoided costs. If the Commission can not determine the value of these  
15 assumptions in this case it should direct the Division to convene a technical  
16 conference to see if consensus can be reached or more evidence presented to the  
17 Commission to make the appropriate determination.

18 **Q: Does that conclude your rebuttal testimony?**

19 A: Yes.