BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH

IN THE MATTER OF THE PETITION OF WASATCH WIND, LLC FOR APPROVAL OF A CONTRACT FOR THE SALE OF CAPACITY AND ENERGY FROM THEIR PROPOSED FACILITIES,	)	Docket No. 06-035-42
AND	)	and Docket No. 06-035-76
THE MATTER OF THE APPLICATION OF PACIFICORP FOR APPROVAL OF POWER PURCHASE AGREEMENT BETWEEN PACIFICORP AND SPANISH FORK WIND PARK 2, LLC	)	VOLUME 2

BEFORE: CHAIRMAN CAMPBELL

COMMISSIONER ALLEN

COMMISSIONER BOYER

March 1, 2007 * 1:30 p.m.

Location: Heber Wells Building
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Salt Lake City, Utah 84111

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P R O C E E D I N G S

CHAIRMAN CAMPBELL: Back on the record in docket number 06-035-76 and docket number 06-035-42. We will turn to you, Mr. Brockbank, for your continued cross-examination of Dr. Collins.

MR. BROCKBANK: Thank you, Mr. Chairman, Commissioners.

CONTINUED CROSS-EXAMINATION

BY MR. BROCKBANK:

Q. Dr. Collins, please refer to your direct testimony, pages 8 through 10. I'm not going to refer to any specific line here, but I'll give you a minute to get there. If you can let me know when you're there, please.

A. Yes.

Q. Are you there? Thank you.

In these pages of your testimony, this is where, at least in part, where you describe the studies that were used to justify your proposed increase of approximately 3.3 percent to the price of the Power Purchase Agreement; is that correct? In these pages?

A. Yes.

Q. Isn't it true that in all of the studies that you performed, you either added or removed generation output or megawatts at Spanish Fork, the Proxy, or other units?

A. We formed two sets of studies. First set of studies, we looked and took power out of Wolverine and injected it into Spanish Fork substation. We took the power out at Goshen where the interconnection is at Wolverine, and injected the 19 megawatts into Spanish Fork substation.

Q. Okay. So I think the answer is yes, then, that you either added or removed generation from either the proxy or the Wolverine?

A. That's correct. That's the way you would perform these power photo models. You have to have the base case and then you look and inject power into the system at the location you want to analyze, and in doing so you have to take out generation at some point so the system can balance.

Q. Did you perform studies to determine what the base case or the baseline losses of the system were?

A. I believe so.

Q. Can you show me where the results of the base case are? I wasn't able to see any kind of a

base case.

And perhaps, Mr. Chairman, this might be a good place because this is one of the few questions that I think I'm going to be asking Dr. Collins where we would want to reference Exhibit 2.1 from Mr. Unger's testimony. And we weren't sure whether that would be introduced formally or not. So Rocky Mountain Power would like to at least introduce this as an exhibit of ours to show what was served on us so that we are all looking at the same piece of documents, if I may.

CHAIRMAN CAMPBELL: That would be great.

MR. BROCKBANK: May I approach the witness?

CHAIRMAN CAMPBELL: Go ahead.

MR. BROCKBANK: Mr. Chairman, for the record I would like to state that this exhibit was served upon Rocky Mountain Power electronically as part of Mr. Unger's testimony, and the handwriting on the exhibit is mine. I put page numbers on here for the sake of or for the ease of referring to the pages in the hearing. And also on page 3 and page 4 at the top, the handwriting is mine on the description, "Midpoint to Summer Lake Losses" on page 3, and "Malin to Summer Lake Losses" on page 4. That was

the description that was on the tab on the Excel spreadsheet of these.

And I want to just clarify one thing as well on this exhibit. In the hearing last week, we referenced six pages. Just for clarity of the record, the last two pages, page 3 and page 4, each of those was broken into two pages in the other version we were looking at. So the six pages is equivalent to these four. It's just that they are consolidated.

CHAIRMAN CAMPBELL: All right. As far as our naming convention, we are going to label this Cross Exhibit 1. I believe this is our first Cross-Examination exhibit.

MR. BROCKBANK: Okay. Thank you.

Rocky Mountain Power would move that Rocky Mountain Power Cross Exhibit Number 1 be admitted into evidence.

CHAIRMAN CAMPBELL: Are there any objections?

MR. PROCTOR: No objections.

MS. SCHMIT: No objections.

CHAIRMAN CAMPBELL: It's admitted.

Q. (By Mr. Brockbank) Mr. Collins, back to the question as far as if this is helpful or not,

referencing this exhibit, you had indicated that I believe you had established some kind of a baseline or base cases for losses on the system.

A. That is correct.

Q. And can you please just show me where that is?

A. On Wasatch Wind in Exhibit 2.1, titled Loss Analysis, Rocky Mountain System. It should be Rocky Mountain Power System. On the first column, the first headline is Megawatt Losses, and the column underneath that is Base Case. So, for example, we used the WECC Heavy Winner base case, or case for 2006. We ran that normally with Wolverine running as it would with no Spanish Fork generation. And the base case shows that there was 255.06 megawatts of losses on the Rocky Mountain system.

Q. But this includes the Wolverine project, correct?

A. It includes the Wolverine project that was as it would normally run.

Q. Before calculating any loss impact, however, by either the Proxy, the Wolverine project, or the Spanish Fork project, isn't it necessary to first establish a system baseline from which to measure the impact of introducing these two projects

onto the system, even before you introduce the Proxy or the Spanish Fork project?

A. That's correct. And that's exactly what we did.

Q. I don't think so. Again, the heading on page 1 says Spanish Fork with plus 19 megawatts, Wolverine with minus 19 megawatts. Doesn't that indicate that you put in 19 megawatts at Spanish Fork and removed 19 megawatts at Wolverine?

A. That heading there is telling the scenarios that we ran. We ran the base case, which is shown under the Base Case column. And then when we ran it with 19 megawatts injected at Spanish Fork and removed 19 megawatts at Wolverine, that is a loss that is represented under the column With Spanish Fork Generation.

Q. Okay, so the 255.06 represents the base case without any impact from Wolverine or Spanish Fork Wind project?

A. No. It has Wolverine in it as it normally runs. Wolverine is up and running. And so it is parting the system. So it is base case.

(Speakerphone interruption.)

MS. SCHMIT: Hearing room.

MR. UNGER: This is Michael Unger coming

in. I'm sorry. My regular telephone on my desk didn't seem to be able to make that connection. I'm calling from my cell phone. Hopefully we have plenty of charge.

CHAIRMAN CAMPBELL: We are currently involved with the cross-examination of Dr. Collins.

Please continue.

Q. (By Mr. Brockbank) Dr. Collins, are you aware that Rocky Mountain Power performed some power flow studies that established a baseline of current system losses also without including the Spanish Fork project or the Proxy project?

A. Are you referring to the study that you did and presented at the summer's technical conference?

Q. Yes. I believe you referred to it as Mr. Adams's modified method?

A. Yes. And those results that were reported only concern losses at I believe the subtransmission level.

Q. And we are going to talk about that. But you know what I'm talking about? You are familiar with that?

A. Yes.

MR. BROCKBANK: I would like to introduce,

Mr. Chairman -- and I have also erroneously marked it as Exhibit Number 6. I imagine this would be labeled Rocky Mountain Power Cross Exhibit Number 2.

If I may approach the witness?

CHAIRMAN CAMPBELL: Go ahead.

Q. (By Mr. Brockbank) Do you recognize this exhibit, Dr. Collins?

A. I do.

MR. BROCKBANK: Okay. Again, for the record I would like to just describe the exhibit as the handwriting on the exhibit is mine, Mr. Chairman. The lettering A through F is mine for ease of referring to this in the hearing. And the handwritten summary is mine, as well, just summarizing the results of each of the three runs.

Q. (By Mr. Brockbank) Do you recall, Mr. Collins, from the technical conference -- one other question first. You also issued a Data Request to Rocky Mountain Power, and this was served on you under a Data Request; is that correct?

A. Yes. This was Data Request 5.1. We asked for all results of power flow studies that the company had and analyzed for Spanish Fork and Wolverine.

Q. Do you recall from the technical

conference that this summary represents study results from the entire PAC EAST system?

A. I believe so, but I'm not sure it was directly mentioned. But that was what I thought it was of.

Q. Okay. Do you recall that the losses under these studies are calculated, as you pointed out earlier, from the respective geographical zones where the generation of the respective projects will be consumed? In other words, for lines A and B where it addresses Without Wolverine Creek and With Wolverine Creek, the loss measurement or calculation is only referring to the specific zones. Do you recall Mr. Adams describing that in the technical conference?

A. Yes.

Q. Let's walk through this a little bit. Look at item A on the exhibit. Do you see that?

A. I do.

Q. Item A conducts a power flow study or represents the results of a power flow study to measure system losses for a heavy load scenario without adding either the Proxy or Spanish Fork. Do you see where I'm referring to?

A. Are you talking about --

Q. In letter A, it says System Losses Without

Wolverine Creek. This is just representing the PAC East system.

A. Yes.

Q. Okay. Isn't it true, as I think you've referenced earlier, that by conducting the power flow study without including the Spanish Fork or the Proxy, we will have essentially a system baseline loss?

A. With and without? I'm not sure I understand you.

Q. Let me rephrase that and make it more clear, hopefully. By conducting a power flow study without including either project, either the Proxy or your Spanish Fork project, essentially we are establishing a system baseline for losses.

A. No, I guess I wouldn't agree with that. I think the system baseline should be as the system is currently running. And it's currently running with Wolverine. Wolverine is producing power, and that's part of the baseline.

Q. But what we are trying to do here, aren't we trying to measure the impact of having the Wolverine project added to the system and the Spanish Fork project added to the system?

A. We are trying to make a comparison between

the line losses attributed to Spanish Fork versus the line losses attributed to Wolverine.

Q. Correct. I agree with that. And that's exactly what I'm saying. However, in order to do that, don't you have to establish a baseline -- in order to measure the impact of Wolverine and compare it to your project, don't you have to establish a baseline not including the Wolverine project?

A. I guess I would qualify that. Yes, you have to have a difference. But the difference that this study has done was to take the entire Wolverine output out of the base case and then put in Wolverine, the entire amount of Wolverine production, into the case in which you could measure the changes.

Now, we are here to look at what the contribution of 19 megawatts at Spanish Fork is. So I think there's an error here in that you should have run a base case with Wolverine and then take 19 megawatts out of Wolverine so we can make a megawatt by megawatt comparison. Wolverine, I believe, is 64 megawatts, something like that. So if you take the difference in area generation kilowatts, it was 161,500 and then it's 236,500. That's about 65 megawatts. Is that correct? I mean, I'm just looking at it. So I think there was an error made in

the way you constructed this base case and incremental generation study.

Q. By including the Wolverine load into the base case, your base case essentially is not complete in that you are including the Proxy method, you are including the Proxy contract already into your base case; and by doing so you can't compare the Proxy, the addition of the Proxy to the system with the addition of the Spanish Fork project to the system. Can you?

A. I'm not sure I understand. Could you repeat that question?

Q. Sure. By including the Wolverine or the Proxy project into your base case and not running a base case without the addition of the Proxy, aren't you skewing the results, essentially, by already -- when you are trying to compare the addition of the Wolverine project to the system with the addition of the Spanish Fork project to the system.

A. What we did with our study was to run it with Wolverine in the base case, because it is part of the base case. And now we are trying to figure out if we back down 19 megawatts of Wolverine and increase Spanish Fork by 19 megawatts, then we will get a direct comparison. And that's precisely what

our study did.

Now, Mr. Adams's study, I'm not sure. His is looking at with and without Wolverine, and that's looking at the impact on line losses of an additional 65 megawatts. And then you compare that to with and without Wasatch Wind, and that's comparison of 19 additional megawatts. You're sort of comparing apples and oranges. Or maybe it's citrus, oranges and grapefruits. One is bigger than the other. And I don't think you can make a fair comparison of the two.

Q. Let's get back to this exhibit that I've just passed out. Whether you agree or not with Mr. Adams, do you see here that he has, for his base case, he has run a system loss base case without including either the Wolverine Creek or the Spanish Fork project; is that correct?

A. Yes. That's what it is labeled.

Q. Okay. Then look to the far right column under letter A where it says Losses Load Ratio. Do you see that?

A. I do.

Q. You see there that it shows 5.05 percent?

A. I do.

Q. In other words, according to Mr. Adams's

study, there's a baseline loss factor of 5.05 percent, correct?

A. That's correct.

Q. Now let's look to item B. Do you recall from your review of this document and from the technical conference, that this model run now keeps all other factors equal on the system except for it adds on the addition of the Wolverine project. Do you see that? That's what letter B does. It adds the proxy resource.

A. I'll take your word for that.

Q. Okay. Then the results of the item B run show losses to load ratio of 4.96 percent. You see that in the far right column?

A. That's correct.

Q. So isn't it true, then, by running a power flow study - whether you agree with Mr. Adams or not, we are talking here about his model - isn't it true that by running the power flow study to establish first a baseline loss factor and then running the second power flow study that is identical to the baseline but adds in only the Proxy plant, one could reasonably determine the impact of the Proxy plant on the system? Would you agree with that?

A. The entire output of the Proxy plant on

zones 652 and 840 only.

Q. Right.

A. But that is not the system. The system is much larger, and there are impacts on the system that are not reported in this study.

Q. Well, okay. We may come back to that. Isn't it true that nearly all of the load of either the Spanish Fork project or the Proxy project is going to be consumed within these two zones?

A. I'm not certain that we can trace electrons in your system. So I can't answer yes or no to that.

Q. Isn't it true that according to basic laws of physics, that the electricity is going to flow to the sink where there is the least resistance?

A. I believe that's true.

Q. And isn't that least resistance the load that is closest to the generation source?

A. It very well could be. But the real issue is not where the energy flows. It's what is the impact on the entire system? What generation gets back down as a result of either Wolverine or the generation from Spanish Fork? And it is the losses associated with that generation that gets back down that is of critical importance in determining how

Spanish Fork or Wolverine is going to affect line losses on the system.

Q. Let's compare the results of these two power flow runs: Establishing a baseline without Wolverine Creek and adding the benefit of Wolverine Creek to the system. Do you see there, this is my handwritten note where it says Change in System Loss which is negative 0.09 percent. Do you see that?

A. Yes. That's based on the percent of load.

Q. And in other words, in layman's terms, by adding on the Proxy resource onto the system in these two zones where the load is consumed, the addition of Wolverine Creek will actually reduce losses in those zones by approximately nine/one-hundredths. Is that correct? According to this study? .09 percent?

A. Yes.

Q. Okay. Letters A and B represent a proxy to establish the baseline. Now let's look at specifically some of the results from the runs that were done with respect to your project, the Spanish Fork Wind Park. Do you recall here that item C establishes a baseline loss factor for heavy load scenario. It establishes a loss factor of 8.59 percent. See on the right column there?

A. I do see that.

Q. Do you understand that letter C, the runs here in C and D and E and F respectively are analogous to the comparisons in A and B. In other words, in item C do you recall, Dr. Collins, that according to Mr. Adams's revised methodology that you refer to it as, without the addition of your plant, and again this is -- you stated earlier, I believe, that the analysis is consistent or it reflects all of the Pac East system. However, the loss factor is for the two zones referenced. Correct?

A. That's correct.

Q. Okay. So the loss factor, the baseline loss factor for zones 720 and 671, which are the zones surrounding your area, is an 8.59 percent. Correct?

A. That's what this exhibit says.

Q. Okay. Similarly, in item D, do you recall from your review of the exhibit and from the technical conference that this model run keeps all factors equal, only adding in the addition of your project? That's what item D --

A. What exactly do you mean "all factors equal"?

Q. It means -- let me explain that. If a base case model run was conducted, which is the heavy

summer case in item C, which does not include the addition of your project, the only variable that was changed in conducting the run on item D was the addition of the Spanish Fork Wind Park project. Do you understand?

A. That is not correct. Something else was changed in the two runs. And what was changed is that 19 megawatts was backed down somewhere. And I believe in this case it was backed down at Jim Bridger.

Q. That wasn't my question, though.

A. It was exactly your question. You said everything else remained the same. Ceteris paribus, as an economist would say. And that is simply not true. Because if you inject 19 megawatts into the system and you haven't changed loads, where is the power going to go? You have to have the system balance in order for a power flow study to run. So you back down 19 megawatts of power at Bridger, Jim Bridger plant.

Q. If you backed down 19 megawatts of power at Bridger plant -- I see what you are saying. The point is -- well, let me ask the question rather than say what the point is.

If you are, as we established above, in

comparing the Wolverine project to the base case in Wolverine, we are doing the same thing below with the addition of your project. We are running the model without the addition of your project, and then we are running the model again with the addition of your project.

A. Yes. And backing down Jim Bridger. And for Wolverine Creek they ran it without the 65 megawatts and then they ran it with the 65 megawatts from Wolverine Creek, and they backed down Jim Bridger.

Q. Okay. If they backed down Jim Bridger to add on the Spanish Fork Wind project, then the difference of adding your project onto the system is essentially a negative 0.05 percent; is that correct?

A. Yes. Your study indicates that there's very little impact of these two wind projects on the subtransmission system. Very little line loss differences.

Q. I would agree with you on that. The same thing took place in the two runs on item E and item F. We don't need to look at them in depth but --

A. Well, I'd like to make a comment on item E and F.

Q. Let me ask the question first and then

I'll give you all the time you need to make your comment. E and F is a similar run, isn't it, in that C and D addresses heavy summer, E and F is addressing light load case. Do you see that?

A. I do.

Q. And I will let you make whatever clarification you need to.

Item E essentially runs the system loss factor for those two zones where the load is consumed from your project, and it results in a loss factor of 13.89 percent. Do you see that?

A. I do.

Q. Adding in with your project, there is a system loss factor of 14.05 percent. Do you see that?

A. I see that, yes.

Q. So the change in system losses actually by adding your project on, results in increased losses according to Mr. Adams.

A. That's what this indicates; that's correct.

Q. Okay. Now, I said I would let you clarify. Please.

A. The clarification is you've done half of the analysis. The other half of the analysis is to

do a comparable study with Wolverine under the same light load cases. It could very well be that under light load cases for Wolverine, we could have an increase in system losses that are greater than the increase in system losses associated with Spanish Fork. So I am unable to draw any kind of conclusion when I'm making a comparison between Spanish Fork and Wolverine in light load conditions.

Q. Dr. Collins, hasn't the Commission ordered that the appropriate methodology for determining what it cost, payments to wind QFs in Utah, is to compare those wind projects to a proxy project?

A. Exactly. And that's my point.

Q. And I believe, Dr. Collins, wouldn't you say that throughout these proceedings, you have made the point frequently that the power flow studies, the addition of variables, the inclusion or the exclusion of variables, is fodder for having the results fall from all over the place?

A. I'm confused about what that question was about.

Q. Let me rephrase it. Isn't it true that in this proceeding you have said, and in your testimony, indeed you have talked about the challenges, the difficulty in using power flow studies precisely

because they are so variable intensive?

A. No, I don't think that's my testimony. My testimony is that of all the methods that have been presented here to date, the power flow study is the most sophisticated, the best estimate of transmission line losses.

Now, is it perfect? No. Are there problems with it? Will they give us a hundred percent certainty? No. But there isn't a model out there that will give us one-hundred percent certainty. We used the grid model to determine not just line losses, which is three, maybe four percent of the revenues that a QF is going to receive, but the entire amount of revenues. And there are, fraught within that grid model, all kinds of assumptions and all kinds of issues that any power flow model or any production cost model is going to have.

Q. Dr. Collins, please refer to page 7 of your direct testimony.

CHAIRMAN CAMPBELL: Mr. Brockbank, do you mean to move the admission of Cross Exhibit 2?

MR. BROCKBANK: I do. Thank you, Mr. Chairman.

CHAIRMAN CAMPBELL: Are there any

objections?

MR. PROCTOR: No objection.

MS. SCHMIT: No objection.

CHAIRMAN CAMPBELL: All right. It's admitted.

Q. (By Mr. Brockbank) Are you there?

A. I am.

Q. And I'd be happy to have you read this. I assume the Commission has read your testimony. Essentially in lines 12 through 21 aren't you describing the pitfalls, the difficulties of using power flow studies to determine line losses?

A. Yes. I wanted to make the Commission aware that there is no perfect model out there. And so I tried to be honest and up front and say, you know, that these models, our model, has a number of weaknesses, I guess. Or in utilizing this model, there are a number of weaknesses.

One thing that you would have to do, in order to get a definitive answer, if you wanted to get a definitive answer you should run 8760 runs per year for twenty years. And that would give you a definitive answer based on the assumptions of the model. Now, none of us have that kind of money or time or effort to extend to answer this problem. If

you might recall, the Division, when they were analyzing the grid model, ran only six runs out of the multi-millions of runs that could be done. And they ran them based on random selection. And yet they put their stamp of approval on the grid model. So you can't expect an absolute definitive answer.

What we tried to do in running this model, which is very sophisticated, it's dynamic, it takes into account all of the variables that are relevant in determining line losses, was to take a sample that we felt would represent different loading conditions, different seasons, different years, so we could get an idea of what the impacts of Spanish Fork would be on the system versus what the impact is with Wolverine on the system. And our results found that out of the eleven runs that we made, ten of them show that there was about an average of 3.3 percent difference.

Q. Professor Collins, if I may. I appreciate that. That was a nice speech but my question was doesn't the language on page 7 of your direct testimony, lines 12 through 21, describe the pitfalls of using a power flow methodology for calculating line losses?

A. Yes, it does.

Q. Okay. Let's get back to the exhibit, Cross Exhibit Number 2. Now for the good stuff. We have described here, comparing A and B, C and D, E and F, correct? That where they include or establish a baseline, and whether you agree or disagree I want to make sure you understand that at least we are talking about what the methodology is. A and B compares a baseline with and without Wolverine. C and D compares a baseline with and without Wasatch Winds project or your Spanish Fork project in the heavy summer case. And E and F compares with and without your Spanish Fork project in a light load case; is that correct?

A. That's what was run.

Q. Okay. Now, let's compare for a moment the impact to the system of adding the Wolverine proxy project and compare that with the impact on the system of adding your Spanish Fork project. Okay? Do you see, Professor Collins, that the change in system loss by adding the Wolverine proxy project is a negative 0.09 loss? In other words, losses are reduced by 0.09 percent? Do you see that?

A. See, I do.

Q. Okay. Similarly, with C and D, losses are reduced, by adding your project, by a .05 percent as

well in the heavy summer, and a .14 percent in the light load. Do you see that?

A. Yes. It's right here in front of me.

Q. Okay. With the results of this analysis, doesn't the addition of the Spanish Fork project actually result in fewer losses saved or avoided than the addition of the proxy project?

A. That's what this study indicated. But this study, again --

Q. That's all we are talking about right now. I understand that you have difficulties with the assumptions and such.

A. Can I finish my answer? This is comparing apples to oranges. You are comparing 65 megawatts in and out versus 19 megawatts in and out. Now, if you had put 65 megawatts of Wasatch Wind in and out of its area, I'm sure it would have resulted in fewer line losses.

Q. Dr. Collins, does the proxy method for payment of avoided costs that this Commission established take into account the size of the qualifying facility or the proxy project?

A. It does not. But you are dealing with incremental line losses. When you are dealing with incremental line losses, you have to deal with

incremental production. So it's a different issue.

Q. Okay. Let's set aside the Proxy contract and the Proxy project for a moment and just focus on the impact of the losses from your project. The difference -- isn't it true that the difference between adding the Spanish Fork project, if you take the two scenarios for the Wasatch Wind project, the heavy summer and the light load cases, that if you average the savings of negative 0.05 percent and a positive .14 percent, you are essentially getting a result of your project causing, by my math, an additional .045 percent in losses on the system. Do you see that?

A. No. I'm confused. Which exhibit are you referring to?

Q. I'm referring to the same exhibit.

A. So we are at Rocky Mountain Power Cross 2?

Q. Yes.

A. Okay.

Q. If I --

A. You just added up and took an average of all these, or just added them up?

Q. No. Just the two results. Just the change in system losses.

A. Okay. Change in system losses for

Wolverine was .09.

Q. No. Right now I'm just looking at the impact to the system in those zones where the load from your project is consumed. I'm looking at the C and D comparison and comparing it and averaging it with the E and F comparison.

A. There's no justification to average those. I mean, I explained this before. In order to look at the light load conditions, you have to have results for Wolverine in light load. So as far as I'm concerned, I can't interpret this one iota unless I have what the results are for Wolverine in light loads. Because you have to make a direct comparison.

Q. Didn't you just say a little bit ago that -- strike that.

Do you agree at least that the results that we have been discussing come from Mr. Adams's so-called modified model, that you refer to it as?

A. I don't have any independent verification. I'm taking your word for it, yes.

Q. But you were at the technical conference.

A. Yes, I was.

Q. You received this in a Data Request?

A. I have never seen the model, so I take the Company's word for it that they ran it based on the

assumptions that are on the page.

Q. But in your testimony, you refer to Mr. Adams's modified --

A. I do.

Q. Okay. Let's turn to page 8 of your surrebuttal testimony. Please let me know when you are there.

A. Yes.

Q. Dr. Collins, could you please read the first sentence of your answer beginning on line 9.

A. "It is true that Mr. Adams used the modified models to run his case study and that his model may be more accurate than the base case we used to estimate losses on the system." That's the first sentence.

Q. Okay. Thank you. Do you believe that the power flow studies generally provide the Commission with enough comfort or enough solid evidence to justify that Utah rate payers should pay you more for your project for avoiding line losses?

A. I do.

Q. Let's go back to page 7 of your direct testimony. We referred to this just a moment ago. I'd like to turn back to it. Please let me know when you are there.

A. I'm there.

Q. Could you please read your answer, your entire answer from lines 12 to line 21 into the record.

CHAIRMAN CAMPBELL: It's already on the record. Go ahead and ask your question related to that testimony, but it is on the record and we have read it.

MR. BROCKBANK: Okay. Thank you.

Q. (By Mr. Brockbank) Isn't it true that in your own testimony you call into serious doubt the usefulness and accuracy of calculating line losses using power flow studies, Dr. Collins?

A. No, I wouldn't say I call into serious doubt. I just raise the issues that surround the use of this model. I don't call --

Q. Okay. Let's look at some of the specific language, then. In line 12, doesn't it say, "Unfortunately, the models will not give us an unequivocal answer to the issue of line losses"?

A. That's correct.

Q. And doesn't it say that a number of issues must be resolved?

A. That's correct.

Q. And then doesn't it say, going down to

line 16, "In this case it would be every hour for twenty years"?

A. That's what I just said.

Q. Right. And then doesn't it say in line 18 that the results are only valid if the assumptions of the base case prove true in reality?

A. That's true for any model.

Q. Okay. So let me ask the question again. In your own testimony don't you call into serious doubt the usefulness and accuracy of using these kinds of models to calculate line losses?

A. I point out the weaknesses. I don't call that serious doubt.

Q. Isn't it true, Professor Collins, whether you agree or disagree, Mr. Clements's methodology comparing the Spanish Fork project to the Proxy project shows that no line loss savings occurs?

A. That's what his method shows.

Q. Isn't it true that whether you agree or disagree, Dr. Abdulle's methodology in which he digs deeper into the distribution system shows that no line losses savings result?

A. I'm not sure I would agree with that. I don't think Dr. Abdulle has performed his analysis correctly.

Q. Again, whether you agree or disagree with the analysis that Dr. Abdulle performed, isn't --

A. His testimony is that there should be no line losses.

Q. And isn't it true that you, yourself, stated that Mr. Adams's methodology is "more accurate" than your model?

A. Did you say results, or his model?

Q. I said that his methodology.

A. No. His methodology is not more accurate. His model is more detailed, but he failed to show what the line losses were for the entire system. He limited his analysis to just the line losses associated with the areas directly around Wolverine and the areas directly around the Wasatch Winds project. And that's not what the line losses are occurring. The line losses are going to occur based on what actually gets back down.

Q. I want to refer again to your surrebuttal testimony on page 8. This is your testimony, isn't it? "It is true that Mr. Adams used a modified model to run his case study and that his model may be more accurate than the base model we used to estimate losses on the system"?

A. That's correct. His model may be more

accurate. His method is flawed. His model is accurate. We wish we could have had that model to make our runs. We requested from the company to make those runs, and the company declined. So the model has much more granularity. It does model the sub-transmission line losses. But as Mr. Adams's results show, those line losses at the subtransmission level are very small. And in essence, that bolsters our argument. We perform line losses at the higher level, the higher voltage transmission levels, and we found substantial differences.

Now, Mr. Adams ran the model but he reported only the results for the subtransmission sector, and those show that there was very little line losses. Now, I would be able to assume that you combine the two results, and you are going to see, at the subtransmission level, low line losses and at the high voltage transmission system, high or significant line losses. And so in essence we have a completed study. It would have been much better to run the whole thing based on the modified model. But that wasn't done for this case.

Q. To summarize, isn't it true that all of the models that have been discussed in these proceedings, when performed correctly, show that no

line loss savings occur by adding the Spanish Fork Wind Park project to the system?

A. I don't know where you are getting that. Absolutely not. I show that the models that were used by the Division and the Company are inadequate, deficient, they do not take into account the important variables in determining line losses. And the only one that -- we have Mr. Adams's study, but that was never presented on the record by the company. They didn't present that. The only evidence on the record that includes all of the variables that is dynamic is our studies that use the power flow results.

Q. Dr. Collins, hasn't it been presented on the record? Wasn't it discussed at the technical conference?

A. Well, that wasn't on the record.

Q. Was it discussed at the technical conference?

A. It was.

Q. Was it served on you pursuant to a Data Request?

A. It was.

Q. And haven't we been discussing it here on the record?

A. But the company didn't put it forward as evidence.

Q. In rebutting your power flow study, isn't that what we are doing right now?

A. That's true.

MR. BROCKBANK: No further questions, Mr. Chairman.

CHAIRMAN CAMPBELL: Ms. Schmid, any questions?

MS. SCHMIT: I have just a couple.

CROSS-EXAMINATION

BY MS. SCHMID:

Q. Mr. Brockbank asked you questions about Dr. Abdulle's testimony and you answered that. I'd like to pursue your thoughts on that a little bit further. In economics, isn't it true that margin represents the last unit; is that correct?

A. When economists talk about marginal costs, in theory they look at the very last unit. But when you apply theory to practice, you will find that marginal cost is very, very difficult to measure. Almost impossible. The only example of marginal costs that I think is done down to the last kilowatt is production cost modeling for electric utilities.

But when you are looking at it from a perspective, a practical perspective, if you are adding something in, you are going to take the last units added. Now, sometimes it will be one unit added, and if it is one unit and you can measure the costs associated with that one unit then you have been able to match practice with theory. But many times production is not one additional unit. It is going to be an increment, an additional increment.

The additional increment in this case was 19 megawatts. What Dr. Abdulle did when he calculated his megawatts miles was to take the average megawatts miles. So he took, rather than -- he took all 65 megawatts and calculated the average. Now, this is the same complaint I have with Mr. Brockbank. In his studies they took 65 megawatts and compared it to 19 megawatts. You have to take 19 megawatts and compare it to the last 19 megawatts produced by Wolverine. In that case, you'll find that Dr. Abdulle's calculation of megawatts miles would change.

Q. Unfortunately, I'm not a doctor in economics and I went out to coffee far too often during the economic classes that I did take, so please bear with me in the next question. So of the

power produced by the proxy plant, the 65 megawatts, what is the last or what would you consider the marginal production?

A. It would be 65 megawatts minus 19, so it would be that increment.

Q. But the whole bundle is produced at once; isn't that correct?

A. No, not necessarily. You can take turbines out of production to decrease the maximum amount of what was produced.

Q. But isn't it true that the production of the proxy plant was the 65 megawatts?

A. Yes.

Q. Okay. And isn't it also true that the megawatts produced are not color coded, so building on what Mr. Brockbank asked and you answered, isn't it logical and consistent with principles of physics that the megawatts, the electricity, will flow first to the closest place it can go?

A. That's true. We are dealing with -- that's the physics of the issue. But we are trying to deal with the economics of the issue.

Q. And I'm not sure I see the difference, but thank you. Those are all my questions.

CHAIRMAN CAMPBELL: Mr. Proctor, any

questions?

MR. PROCTOR: Yes, Mr. Chairman. Thank you.

REDIRECT EXAMINATION

BY MR. PROCTOR:

Q. On page 6 of your direct testimony, Mr. Collins, you made the statement that the Spanish Fork Wind Project is 4.5 miles from Mapleton (Rocky Mountain load), and connected at 46 kv level and is not stepped up or down. Are you assuming that the Mapleton load would absorb or use all 19 megawatts output from the Spanish Fork Wind project?

A. It would at times, and at times it would not.

Q. For the purpose of your calculation of the impact of adding the Spanish Fork Wind project, are you assuming that all 19 megawatts will always be absorbed at Mapleton?

A. I'm not sure, because this is not a method that I would propose or adopt. I was just rebutting Dr. Abdulle's testimony. So if you'll give me a second so I can read through this and remember exactly what I did.

Q. Okay.

A. To tell you the truth, I don't think I

made any assumptions about whether all of it would be absorbed at Mapleton or not.

Q. Well, you also discuss what you understood to be the same configuration with the Wolverine project; and that is there was 14 miles to the interconnection and then it travelled up to another 16 miles with some voltage changes to get to another load. What assumptions did you make about the Wolverine project with respect to how much of its produced energy would be absorbed at the first point of interconnection?

A. I assume that the first part of their production would be consumed at the substation and to the areas closest to the substation, much like was discussed before, following the physics of it. And so when I looked at the last units, the marginal units, those would be to the furthest loads. And so if I was to use Dr. Abdulle's method, I would look and see the last 19 megawatts that was consumed from Wolverine and measure the average megawatt miles of that 19. And then I would compare it to the 19 megawatt miles consumed at Spanish Fork area.

Q. Okay. Well, going back to my questions, how far is your point of interconnection at the Spanish Fork project with Rocky Mountain Power?

A. It is 1.2 miles.
Q. And how far -- I assume then approximately 3.3 miles further down the line is the Mapleton load; is that correct?
A. I believe the Mapleton load is 4.5 miles from the substation.
Q. From the point of interconnection?
A. No, not from the point of interconnection. From the point of -- our interconnection is 1.2 miles from the substation, and I don't know this for a fact but I'm assuming that Mapleton load is 4.5 miles from the Spanish Fork substation.
Q. So total from the point of interconnection of the Spanish Fork Wind project and Rocky Mountain is another six miles, approximately?
A. Yes, that's correct.
Q. And that assumes, of course, that a hundred percent of your 19 megawatts would be going to Mapleton; is that fair?
A. Well, Mapleton, I think it's got a load of something between 10 and 12 megawatts.
Q. Okay. And did you consider or analyze the Wolverine project to determine how much of their output would be absorbed at its first point of intersection or the first load after that point of

intersection?

A. I assume that the first would be -- first power would be absorbed at the substation.

Q. Okay.

A. But again, this is a fallacious method to calculate line losses because it only takes into account just one small aspect.

Q. And you are suggesting that my questions are fallacious, Dr. Collins.

A. No, no, I don't.

Q. I'll accept your apology for that.

You've heard testimony from Rocky Mountain that, in essence, the point of interconnection and the point of the first load for the Wolverine project is essentially the same point?

A. Exactly, yes.

Q. All right. Are you familiar with this Commission's definition of what a line loss is?

A. That's a good question.

Q. Let me read it to you. It's found on page 13 of the Commission's order of April, 2006 in Docket 03-035-14. It says, "The 2001 transmission study reveals line losses are a function of transmission line distance, voltage level, and transformation between voltage levels." Would you accept that as

being an accurate statement?

A. The 2001 transmission line loss study was looking at average line losses for the PacifiCorp system.

Q. System-wide average line losses.

A. Yes. And what we are looking at is incremental line losses. So I believe that they have stated that it is a function of distance, it's a function of transformation, it's a function of current. But we also have to look at, if we are going to look at incremental line losses, we have to look at what gets back down.

Q. But if we aren't looking at incremental, that would be an accurate definition of what a line loss is, is it not?

A. I believe so.

Q. And if you look at it on a system-wide basis, that would also be an accurate definition of what line losses are.

A. For a system-wide basis, yes.

Q. In preparing your testimony and trying to develop an analysis, or excuse me, a methodology to calculate the line losses associated with the Spanish Fork project, did you inquire at all of any other jurisdiction's methods for calculating such line

losses?

A. You know, I attempted to. I called a couple of people I know in different commissions, and they didn't have an established. So I attempted. And then I attempted to call some other people and I just wasn't able to make contact.

Q. Did you make any inquiry of other public utilities' commissions decisions on this issue?

A. I did not.

Q. Are you familiar at all, in your work with wind power or QFs, with the term generation leader multiplier? And if you're not, we will go on.

A. I'm not.

Q. When the Wolverine contract was negotiated, that was as a result of a request for proposals, as I understand it. Is that your understanding?

A. Yes, it is.

Q. And may we assume, and do you assume on behalf of Spanish Fork, that when that price was set through a competitive process, that price includes the line loss that is experienced either increasing or decreasing the line losses that PacifiCorp experiences, measured on the system as Wolverine found it at the time? In other words, before and

after Wolverine was added?

A. My recollection of the company's testimony is that they did not consider line losses when they negotiated that contract.

Q. Let's assume that's true. For the purposes of your petition here to establish line losses, however, this Commission has directed that you compare your project with a proxy. In this case it is the Wolverine avoided costs.

A. That's correct.

Q. So one must assume for this purpose that there is a line loss calculation within the price that Wolverine received.

A. I don't follow that logic.

Q. You are being paid the same price, adjusted for other characteristics but the same voided price, voided cost, pardon me, as Wolverine. Correct?

A. That's correct.

Q. So whatever line loss Wolverine either added to the system or subtracted from the system, in other words benefitted the system, you are receiving that amount, are you not?

A. Yes, I believe so.

Q. So in order to increase the avoided cost

that Utah rate payers would pay, you would have to establish that you are, in fact, saving additional line losses over and above what Wolverine is receiving; correct?

A. That's what we tried to do. We tried to compare our line losses with the line losses associated with Wolverine.

Q. So if Wolverine accepted the system as it found it for the purpose of setting the price, and we have assumed that included line losses, either adding to the line loss and therefore reducing the price, or saving line losses and therefore increasing the price. That was the system as they found it. Would it not then be logical for Spanish Fork also to take the system as it finds it, without Wolverine, in order to have an apples to apples comparison?

A. Without Wolverine?

Q. Yes.

A. Without 19 megawatts of Wolverine.

Q. Well, cannot you calculate the line loss on a megawatt basis?

A. We attempted -- we measured the line losses at a 19 megawatt basis, yes.

Q. Per megawatt?

A. Per megawatt? I'm not certain.

Q. Okay.

A. The level -- you know, if you can measure it at one megawatt or 100 kilowatts, I'm not certain exactly where the line is drawn between the accuracy of the model and the level of decrement in load.

Q. Would it surprise you that some jurisdictions use a method to calculate line loss that's actually calculated on a per generator basis, on an hour by hour basis, both reality and forecast in days ahead?

A. Is that for -- would it surprise me?

Q. Yes.

A. I'm not sure.

Q. Would it surprise you that, in fact, a similar calculation can be used to calculate the line losses associated with a qualified facility near load and a qualifying facility some distance from the load?

A. No, that wouldn't surprise me.

Q. All right.

A. I think there are ISOs that do precisely that.

Q. And that would be the California ISO in particular?

A. I'm not sure about California. I do know

that the New England ISO and the PJM ISO do locational marginal pricing.

Q. Would it surprise you that in determining line losses by an ISO, that essentially what they are trying to do is balance the system and also create a method to settle on a price for short-run avoided costs? Not long term contracts. Short-run avoided costs?

A. Okay. And you are talking about the California --

Q. The California system.

A. Could you repeat that question?

Q. Would it surprise you that that's what they are using, those hour by hour calculations for, is to create a settlement method by which they can develop a pricing system and a way to compensate all generators, including QF on a short-run basis for --

A. Yes. I think that's my understanding of how the ISO sets prices.

Q. But that's not applicable to a twenty year contract that has literally thousands of hours where you're fixing a price today, would it be?

A. No. It's not equivalent.

Q. Okay. And would it surprise you --

A. There's different risks associated with

both of those.

Q. And that's some of the complicating factors that I believe you referred to when you were commenting on Mr. Clements's testimony. I believe you called it a simplistic method that lacks accuracy.

A. That's correct.

Q. Because known variables are left out of the analysis.

A. That's correct.

Q. But you have also acknowledged that in this particular case, you're only looking at a very small window, which you believe is representative of twenty years. But the fact is, it is still a very small window when you did your power flow studies in this case.

A. We were limited in resources, so we could not do unlimited runs; that's correct.

Q. Okay. And that's unfortunate, but that is in fact where we find ourselves. We have to do with the information we have available. Is that fair?

A. Yes. We could either look at a representative sample of a method that is robust, sophisticated, accurate, at that point in time, or we can use a method that has been acknowledged by all

parties as being deficient, in that it does not take into account all variables.

Q. But there are some common variables that this Commission determined, one of which was distance.

A. That's correct.

Q. Voltage changes.

A. That's correct.

Q. And relationship to its consumption point or load.

A. That's correct. And that was for average line losses.

Q. Would you agree with Dr. Abdulle's calculations, not quarrelling with his method but looking objectively at his calculations, does that accurately reflect the difference between the distances, voltage changes, and the load location, Wolverine and Spanish Fork? Not whether it's the right method, but are his calculations correct?

A. His calculations, according to my understanding of economics and marginal analysis, are incorrect.

Q. How about geography, distance, multiplication, division, just the basics, the way he has calculated it. Not on the basis of a system

impact, marginal impact. None of that. Just the way he calculated the numbers.

A. Well, it's hard for me to -- did he do his math correctly? Is that what you asked?

Q. Yes.

A. Given his assumptions, which again I have said I don't believe are correct, I believe he did his math correct.

Q. What about Mr. Clements and Mr. Adams; again, if you assume that the distance, the location of the load, voltage increases or decreases are as they described them between Wolverine and Spanish Fork, would their calculation be correct?

A. I have particular problems with Mr. Clements's method. Is his calculation correct that if you measure line losses as the distance between the interconnection and the nearest substation, it will, quote, unquote, absorb the load? Given that Wolverine is connected at Goshen substation, which has a large enough load to absorb the production from Wolverine, yes, his method comes to a conclusion that no QF could possibly earn line losses.

Q. Well, under your method, will a qualifying facility ever not get line losses?

A. Oh, absolutely.

Q. And do you in any way -- does your method in any way discriminate against the isolated qualifying facility immediately next to a large load, where it is some distance from the Wasatch Front?

A. Would my method --

Q. Discriminate against them by depriving them of any line loss?

A. Our method is going to calculate the impacts of two different generators on the system. And it has no prejudice.

Q. Will the next power flow study performed for the next wind QF include Spanish Fork's 19 megawatts?

A. If it gets on line, yes.

Q. Yes, it would? Okay. I have no further questions. Thank you, Dr. Collins.

CHAIRMAN CAMPBELL: Let's take a 15 minute recess.

(A break was taken.)

CHAIRMAN CAMPBELL: Back on the record.

Commissioner Allen?

COMMISSIONER ALLEN: Thank you, Mr. Chairman.

Dr. Collins, I just have a few questions to try to help me understand how these models work.

It's not something I delve in a lot in my business.

When you are defining these models, are there industry standards or guidelines for the inputs and variables that you use, or are they dictated by the software? How does that work?

DR. COLLINS: The models collect data from the utilities themselves. So it's WECC that puts this data together and puts these models together. The models are -- I look at it as sort of the inputs to the model. So you are going to have this computer model that is run by Power World or some other software company. And what they do is they get case studies, and that looks at all the generation and all of the loads. And then all of the transmission and transformers, they try to duplicate the Western Electric system. And so they get that information from the utilities themselves.

Now, the utilities generally don't give the information about their lower subtransmission system. In fact, WECC doesn't generally request that subtransmission information because it's not as important to the entire system as a whole. And it also increases the complexity of the model.

COMMISSIONER ALLEN: You ran eleven of your own; is that correct?

DR. COLLINS: What we did is we got base cases from WECC and we had Power World run these cases. And yes, we ran eleven cases. We actually made more than eleven runs but -- and let me try to explain that.

We made five runs that directly compare, taking power out of Wolverine and putting it into Spanish Fork. And so we had that set. Then we had a comparison where we tried to back down other generation. All right? And we relied on what got backed down based on the grid model. So we made six runs for Spanish Fork, and then we made six additional runs for Wolverine so we can get the -- we had six runs in which we can make comparisons between those two.

COMMISSIONER ALLEN: But did you select some of the variables or is that done for you, or do you just select the criteria and what you want to test?

DR. COLLINS: All we selected was we selected the cases, all right? And part of our selection process was what was available. And we tried to choose things that we felt were representative. Different seasons, different years, different load conditions. And then what we did was

you inject power into Spanish Fork, and then you have to decide where do you take the power out of? So that was our input into the modeling.

COMMISSIONER ALLEN: And based on what little I know about how economists manage their analysis - I think the world of econometrics is sometimes referred to in terms of testing your information - I asked Dr. Abdulle if this kind of analysis could be subjected to quantitative reliability, and he said no. Would you agree with that assessment?

DR. COLLINS: Not really. I have attempted to get information about the reliability of this model run compared with the accuracy of the model itself. And Mr. Unger has or will testify that he asked this question of the personnel of Power World and they assured him that yes, it was well within the accuracy of a Power World model.

COMMISSIONER ALLEN: Actually calculating confidence levels?

DR. COLLINS: That, I tried to get and I was unable to get that. But I did get -- and I'm not sure -- there was some miscommunication, but I did not personally talk to the personnel at Power World. If I had, I would have asked exactly for that.

COMMISSIONER ALLEN: Thank you.

COMMISSIONER BOYER: Dr. Collins, I have a couple of questions. They have been asked but I'm going to try to ask them in a little different way.

The proxy plant, the Wolverine generating plant, delivers power at the load, is metered at the load, and its full capacity is consumed at the load as I understand it; is that correct?

A. I don't believe it's correct.

Q. In what regard isn't it correct?

A. Well, what is your definition of "the load"? At the substation itself?

Q. No. Where it's actually consumed.

A. Okay. It is metered at -- it is interconnected and metered right at the substation.

Q. Okay.

A. There is a load at the substation itself. And then it travels to other areas, some as much as twenty miles away, some as little as -- I can't remember what the -- it's two or three miles away.

Q. And you are talking about the distribution system from the substation to the end user?

A. That's right.

Q. Would it be fair to say that if any generating plant would avoid system line losses, it

would be either Wolverine or one like it, situated or I mean delivering right at the load or very close to the load?

A. No.

Q. There are other --

A. I wouldn't make that conclusion. What you have to look at is what sorts of resources get backed down as a result of Wolverine, what sorts of resources get backed down as a result of Spanish Fork. Because it's going to change the configuration of the system as a whole. And so if you can back down a generator that is located far away, you are going to avoid the line losses that were associated with delivering that power from afar to the load.

COMMISSIONER BOYER: I understand that part of your position and your argument, and your testimony was earlier that you used the grid model to determine which plant would be backed down. Did you use the grid model to determine what would be backed down to accommodate the Wolverine generation?

DR. COLLINS: Yes.

COMMISSIONER BOYER: And what plant was that?

DR. COLLINS: Well, it turned out it was very similar to what was backed down by Spanish Fork.

Most of what was backed down were market transactions. And I would say 80 percent were market transactions as opposed to thermal resources. And that was the reason that we selected these hubs and we selected generation near those hubs.

COMMISSIONER BOYER: And so those market purchases, that power would have to be transported then over some distance on the transmission system.

DR. COLLINS: That's correct.

COMMISSIONER BOYER: Similar to Bridger; hundreds of miles?

DR. COLLINS: It could be, yes.

COMMISSIONER BOYER: Would it be fair to say that under our prior order and the pricing that you were advocating for Wasatch Wind, that to get something, a price that is higher than the avoided cost, higher than the proxy price which we are using as the avoided cost, you would have to distinguish Wasatch Wind from Wolverine, its characteristics, in some fashion?

DR. COLLINS: That's correct.

COMMISSIONER BOYER: But you just said that the line losses that would be avoided by backing down Bridger are substantially the same as the market purchases.

DR. COLLINS: No.
COMMISSIONER BOYER: You didn't say that.
DR. COLLINS: No.
COMMISSIONER BOYER: I don't want to put words in your mouth.
DR. COLLINS: I said that, but I didn't mean that.
COMMISSIONER BOYER: You didn't mean that?
DR. COLLINS: That's precisely what these modeling efforts measure and calculate is as you back down different resources, what is the differential in line losses between this base case and when you back down a plant somewhere else as a result of power being produced either by the proxy or by the QF? And so we measured what the line losses were associated with Wolverine, and we measured what the line losses were associated with Spanish Fork, and we found that Spanish Fork avoided more line losses than Wolverine. One of the sort of common sense views of it is Wasatch Wind is located close to the major load in the PacifiCorp system, the Wasatch Front.
COMMISSIONER BOYER: Do you have any explanation for why the grid system selected Bridger to back down rather than a closer, more expensive plant like Mona?

DR. COLLINS: The grid system did not predict that Jim Bridger would be backed down.

COMMISSIONER BOYER: I thought that was your testimony; that that's --

DR. COLLINS: No. My testimony was that the company just picked that plant as a convenient plant to use as the plant that they were going to back down. There was no economic justification that I could find of why they chose Jim Bridger. I think it was just as a matter of convenience.

COMMISSIONER BOYER: I see. If they had selected a generator that was closer to the substation there in Mapleton, would that have made a difference in your calculations?

DR. COLLINS: In my calculations?

COMMISSIONER BOYER: Said another way, would Wasatch then avoid more line loss costs than Wolverine does to the system?

DR. COLLINS: If the back down generation was --

COMMISSIONER BOYER: Closer to the load.

DR. COLLINS: To the Wasatch load?

COMMISSIONER BOYER: Yes. You'd be pushing electrons a shorter distance, would you not?

DR. COLLINS: That's correct. But we are

looking at avoided line losses. So if -- I'm not absolutely certain, but if we ran that case with a power flow study, it would tell us precisely what the differences in line losses were.

COMMISSIONER BOYER: Let me ask you a quick question about your calculations on the last page of your surrebuttal testimony. And maybe I'm reading this incorrectly, but it looks like the conclusion one could draw from those calculations is that Wasatch actually increases line loss to the system rather than diminishes them. These are all positive numbers, 4 percent, 2 percent.

DR. COLLINS: I appreciate your asking me questions on this, because this is something on the record I don't think that is on the record, but it hasn't been adequately explained.

What the exhibit, surrebuttal, Wasatch Wind Surrebuttal Exhibit 1.1 shows, it was Mike Unger's attempt to measure what the line losses would be just associated with running power from Spanish Fork to Santaquin. So he'd got the conductor size, and the transformers, and was able to calculate how much power would be lost taking the power from Spanish Fork to Santaquin. And you are correct, Mr. Boyer, that it does show added line losses associated

with running power from Spanish Fork to Santaquin. We chose Santaquin because that was the furthest load or it was a load that was a good distance away from the generation at Spanish Fork.

What this does not show, though, it was our attempt to say, "Let's try to calibrate how much losses there are at this subtransmission level," because our model did not model the subtransmission level. So we were trying to get an idea of, you know, is it a huge number or is it a small number?

Now, when we calculated the transmission, the avoided transmission losses at the higher level, it averaged about 3.3. The transmission losses associated with just running electricity down this line was 1.4 to 1, depending on the load conditions. But that's only half of the equation.

The second half, that we did not do, was we have to look at when we ran power down to Santaquin, what did we back off? What sort of generation got backed off so we could provide power to Santaquin? If that generator happened to be down in southern Utah, then we would have avoided a lot more line losses. So yes, there was going to be the line losses associated with delivering power from Spanish Fork down to Santaquin. But we would have

avoided delivering power from, say, Hunter all the way to Santaquin. And that part of the analysis was not included simply because we didn't know which one to choose. I guess we could have chosen one to perform that analysis. But what it states is this is the maximum amount of line losses that would be associated with the subtransmission level. And that's assuming that there was no other line losses associated with generating power from some other source. Does that make sense?

COMMISSIONER BOYER: Yes. I understand your position. Would it be fair to say that the calculations that you have performed and also those of the other parties, Dr. Abdulle and Mr. Adams and Mr. Clements, are attempts to estimate or predict what line loss would be? They are not actual measurements, and I think you explained that. Is that correct?

DR. COLLINS: Yes. They are estimates.

COMMISSIONER BOYER: And I think Commissioner Campbell asked this question but let me ask it in a different way. Have you made any attempt to calculate what the margin of error might be in those calculations, plus or minus 5 percent or 1 percent or 20 percent or 50 percent?

DR. COLLINS: I think that might be a better question to address to Mr. Unger.

COMMISSIONER BOYER: Okay.

DR. COLLINS: But what we have been assured is that these are fairly accurate measurements. And Mr. Unger will talk about how the model worked. It's an iterative process. And they try to match loads at buses, at the .1 megawatt level. So there might be as much as 100 or 500 megawatts of load coming in and out of a bus. And this will keep -- it won't allow the system to solve until the maximum amount allowable is .1 megawatt difference between what goes in and what goes out. So it is really a very accurate model. And what we have been told is that the accuracy on the line losses is as high.

COMMISSIONER BOYER: You may not know the answer to this question, and please say so if you don't. But we have heard in other proceedings, we have heard the system described as an innertube with generators inflating the innertube and pinpricks representing load drawing electrons out of the load. In other words, a fairly dynamic system. Do you happen to know if the introduction of 19 megawatts would, in fact, result in backing off -- is there 19

megawatts of flexibility in the system or not?

DR. COLLINS: Absolutely. It's got to. If you add 19 megawatts into the system, something has got to back down.

COMMISSIONER BOYER: It's that close? When we are talking about a system with 7000 or something?

DR. COLLINS: Yeah.

COMMISSIONER BOYER: And 19 megawatts will still --

DR. COLLINS: Yep. It will.

COMMISSIONER BOYER: Okay. That's all I have.

COMMISSIONER CAMPBELL: It seems like we are all asking a similar point. I'm going to follow up on Commissioner Allen and Commissioner Boyer. You used the term when you were making a distinction that one method used a representative sample. I need to understand what you mean by that, because on the one hand you are saying you did eleven hours versus 2000 hours. I think statistically one would say that is not a representative sample.

DR. COLLINS: If I said "representative sample," I did not mean it in terms of a statistical representative sample. I meant it as a sample that

represents the system. And again, I wish our resources were more so that we could have done a representative sample, but they weren't.

COMMISSIONER CAMPBELL: Okay. I think we are finished. Any follow-up questions?

MR. BROCKBANK: No further questions.

MR. PROCTOR: Nothing, thank you.

CHAIRMAN CAMPBELL: Thank you, Dr. Collins. Before we get to Mr. Unger, I would like to pose a question to Mr. Adams on Cross Exhibit 2, since he is the expert on this exhibit and Dr. Collins was giving his best guess at what was behind this. For the record, we'd like to make sure we understand that. Now, the question is when you add system losses with Wolverine Creek or with Wasatch Wind, did you back down a unit? And if you did so, which unit?

MR. ADAMS: Yes, Mr. Chairman. The model power flow system will normally have an automatic unit somewhere on the system which is what we call a swing machine. And in this case the swing machine was Jim Bridger. PacifiCorp normally uses Jim Bridger just because it is the biggest unit on the system and it gives us the ability to avoid shaking up the subtransmission system by using a smaller unit

somewhere closer to the system.

COMMISSIONER CAMPBELL: And how would you describe your selection of Jim Bridger in comparison to what the grid model would back down?

MR. ADAMS: Well, again, the power flow model doesn't try to deal with economics. It deals with strictly physics, and we are trying to figure out the robustness of a system based on voltage and thermal constraints. And so our power flow models don't really get into the grid model at all as far as economics. Now, if we know economically a unit would be backed off, we could change the model to try to match what the grid model would do. But normally for power flows we don't.

CHAIRMAN CAMPBELL: Thank you. Mr. Unger, are you ready?

MR. UNGER: I am.

CHAIRMAN CAMPBELL: If you would raise your right arm to the square.

MICHAEL W. UNGER,

called as a witness, being first sworn, was examined and testified as follows:

CHAIRMAN CAMPBELL: As far as qualifying

the witness and getting his testimony on the record, Dr. Collins are you going to do that? Let's let Mr. Proctor do that.

MR. PROCTOR: Dr. Collins asked me to do so.

DIRECT EXAMINATION

BY MR. PROCTOR:

Q. Mr. Unger, my name is Paul Proctor. I'm an Assistant Attorney General and I represent the Committee of Consumer Services. We are tasked by the legislature with the obligation to assist persons in appearances before this Commission, and so I'm going to ask you a few questions just to lay a foundation for your testimony.

A. All right.

Q. Would you state your name and your business address, please.

A. My name is Michael W. Unger. I'm associated with Elcon Associates. Our business address is 12670 Northwest Barnes Road, Portland, Oregon, 97229.

Q. Mr. Unger, on whose behalf are you appearing here today?

A. This would be Wasatch Wind.

Q. My understanding is that you earlier filed testimony and it was styled as direct testimony and marked as 1.12 -- pardon me, it was filed on the 12th of January, I'm sorry, consisting of two pages and it also contained an exhibit that had been marked as Exhibit 2.1; is that correct?

A. That's correct.

Q. If I were to ask you the questions that you addressed in that written testimony today, would your answers be the same?

A. They would be the same. The only thing that I would say is that Exhibit 2-1 was intended only to be the first sheet. It was the result of an Excel spreadsheet and we had other tables, other sheets to back up our sheet Number 1, which is a summary table. Those other sheets are supportive data and I'm afraid that they got into the submission and I have only confused the issue.

Q. Let me ask you a few questions.

A. So I'd like my testimony to only be sheet one.

Q. Let me ask you a few questions about that for clarification sake.

A. All right.

Q. And bearing in mind that apparently this

four-page document is already into evidence as the Rocky Mountain Power Cross Exhibit Number 1?

A. Okay.

Q. You filed a written copy, hard copy of the testimony, and what exhibit was attached to that hard copy?

A. I believe we called it Exhibit 2-1.

Q. Was it the one-page document?

A. Well, it was intended to be.

Q. Well, on the paper copy, we just had that single page to it; is that correct?

DR. COLLINS: That's correct.

A. Right. That was my intention, was the one-page document.

Q. And it was the electronic version that resulted in the inclusion of the full spreadsheet rather than just a single page; is that correct?

A. That's correct.

Q. All right. Do you have any corrections or amendments to any of the substance of your testimony or to the page that you have marked and included as Exhibit 2.1?

A. No.

MR. PROCTOR: On behalf of Wasatch Wind, we would move to admit into evidence the testimony of

Mr. Unger.

CHAIRMAN CAMPBELL: We will mark that Wasatch Wind Exhibit 2.0, with attached Exhibit 2.1, as well as a three-page Exhibit 2.2 which is his resume. Are there any objections to the admission of this testimony?

MR. BROCKBANK: No objection.

MS. SCHMIT: No objection.

MR. PROCTOR: None.

CHAIRMAN CAMPBELL: It's admitted.

Mr. Brockbank?

MR. BROCKBANK: Thank you, Mr. Chairman.

CROSS EXAMINATION

BY MR. BROCKBANK:

Q. Good afternoon, Mr. Unger. I think you get the Most Patient Person in These Proceedings award. We appreciate your sticking around through last week and today to get to some of these questions.

You have approximately one-and-a-half pages of testimony, half of which describes your finding; is that correct?

A. Yes.

Q. I'd like to look for a few minutes at

Exhibit 2.1 of your testimony. As you know, there was some confusion and Mr. Proctor just referred to that and I think we all understand your explanation, and I appreciate that.

A. All right.

Q. I think you used the words, "The other sheets that were attached," I think the words you said were "supportive data;" is that correct?

A. It was data related to the same power flows, only basically represented different segments of the system. The second sheet was for the whole WECC system. That's the whole western part of the U.S. And the third and fourth sheets applied to some single circuits that we thought should be included in our analysis.

Q. Okay. Mr. Unger, how many power flows did you run, approximately, in preparing your testimony for this docket?

A. The power flows that we ran are all represented on the first sheet. And we had, let's see, 17 cases and so that would be, the power flows would be represented there. Some of them -- actually, more power flows than 17 were run because some of them were base cases and some of them then showed the results of inserting a generation at

either Wolverine or Spanish Fork.

Q. Okay. Thank you. So there were approximately 17 runs to arrive at your conclusions on page 1 of --

A. Seventeen comparisons, and I'd have to look through and see -- in addition to that there were the base cases. I'd have to look through here and see how many unique base cases there were. So it's probably on the order of 25 total power flow studies.

Q. Okay. And isn't it true, Mr. Unger, that you performed approximately -- well, at least over forty studies in addition to those on page 1 that I believe you called supportive data?

A. No. They are the same power flow studies, only the results were different portions of the electrical system.

Q. So the studies on the WECC system, the results for the studies on the WECC system and the Midpoint to Summer Lake and the Malin to Summer Lake, those are subsumed in the studies performed that are summarized on page 1?

A. Yeah. They are all part of the same studies.

Q. Okay.

A. They are not unique. On page 1 that's all of the studies that we did.

Q. Okay. Can you show me how, for example -- I'm looking on page 2 on your WECC.

A. Yes.

Q. Where it says, on the right column, Percent Change, all the way, three lines from the bottom, and the bottom says that there was an increase in line losses of 5.79 percent and 4.21 Persian. Do you see that, Mr. Unger?

A. I do.

Q. Can you please explain to me how that was included on the results for page 1?

A. In that case, you could turn that around and say that the page 1 results were included in the WECC case. The WECC case is the whole western part of the U.S. On page 1 we are talking about the PacifiCorp East system plus the two circuits that we talked about.

Q. Okay.

A. So the 4.21 and the 5.79 are for the whole system. And if we go on page 1, the WECC Heavy Winter 2001 would be under the eleventh study from the top there.

Q. I'm sorry. Can you please identify that

again, Mr. Unger?

A. It would be the WECC Heavy Winter 2011, which would be minus 0.37.

Q. Okay. So again, I didn't catch that. Can you explain to me how the 5.79 increase in losses is reflected in that?

A. Okay. All right. 5.79 applies to the whole western part of the United States. And if we look on page 1, the 1.11 percent applies only to the PacifiCorp East system plus the two circuits that we singled out.

Q. You are going to have to walk me through that. You said the 1.11. Where are you looking?

A. Let's look on Exhibit 2.1, the first page.

Q. Yes.

A. And as we go down the Percent Change column.

Q. Yes, sir.

A. We have five values and then we have two values and then two more values. The last is 1.11.

Q. Yes, I see that. Thank you.

A. Okay. That should correlate with the 5.79 on the next page.

Q. I'm having a hard time understanding how that correlates to the 5.79. Can you explain that to

me in lay terms, please?

A. The 5.79 applies to the whole system. The 1.11 applies to the PacifiCorp East system.

Q. Okay. I think I understand what you are saying. Thank you for your patience on that.

A. Sure.

Q. So let's look at page 2 again. The averages that are included in your recommendation that rate payers pay an additional 3.3 percent in line loss savings are only including the top five runs on page 1; is that correct?

A. No. They include the top 11. If you take the percent change on page 1 and the first eleven entries there, average that, you get 3.3 percent.

Q. I see. Okay. Thank you. Let's look at page 3. That would be the one that I have labeled on Rocky Mountain Power Cross Exhibit 1 that I believe the electronic copy was labeled Midpoint to Summer Lake Losses. Do you have that in front of you, Mr. Unger?

A. I do.

Q. Did you perform those model runs, as well, in preparing for your testimony in this docket?

A. They were part of the power flow studies, yes.

Q. Okay. Isn't it true that if you average the results of the percentage change on Midpoint to Summer Lake, you have a result of a negative 0.036 percent, or about a hundred times less than your recommended 3.3 percent in line loss savings?

A. If we average the percent changes, and you said that was what? Minus .1 percent or something?

Q. Minus 0.036 percent.

A. Okay. You would get the average incremental losses in a percent basis, percent of 19 megawatts on that circuit. But that's only a portion of our study area, if you will, which was all of PacifiCorp East system plus the two circuits that go from PacifiCorp East over to the western part of the country, or in "the valley" as we call it here. And so unfortunately that's part of the confusion that I appear to have caused by including this. This is just applied to one circuit. This shouldn't be added in with the PacifiCorp East system.

Q. Okay. Because the run that you ran for that one system, and I guess the same would be true for the run on page 4, the Malin to Summer Lake Losses, that would also not support your conclusion either in isolation, would it?

A. Well, what is on page 3 and 4, the

difference in losses, has been added into the PacifiCorp East and it is indeed included in page 1 as part of the incremental losses. So page 1 includes, let me just say, incremental losses for three items: One is PacifiCorp East as defined as the Rocky Mountain system; the second is the Midpoint to Summer Lake incremental losses; and the third is Summer Lake to Malin incremental losses. So we have three components that have been added together to get to the first page data.

Q. Okay. Why would you look at these in isolation, then?

A. I didn't look at them in isolation.

Q. Isn't that what pages 2, 3, and 4 are?

A. It was only part of the results of the power flow study. In the power flow study, we can get easily the PAC East losses. That's an output that can be generated easily from the power flow study. I also asked that the incremental losses for these two circuits be determined so that I could add that in to get a complete picture of incremental losses that PacifiCorp might have experienced.

Q. Okay. Thank you.

I have no further questions, Mr. Chairman.

CHAIRMAN CAMPBELL: Ms. Schmid?

MS. SCHMID: Thank you.

CROSS EXAMINATION

BY MS. SCHMID:

Q. Mr. Unger, how are you this afternoon?

A. I'm just fine. Thank you.

Q. Good. I have just a few questions on what was attached to your testimony as Exhibit 2.1.

A. All right.

Q. And I'm referring to the first page.

A. Okay.

Q. There's a column entitled Base Case.

A. Yes.

Q. You've got seven studies under that, let's just call them, the first one being Spanish Fork, plus 19 megawatts and then it runs down and the last three are Wolverine with plus 19, Wolverine plus 19, and Wolverine plus 19 Cholla.

A. Yes.

Q. Do the first four studies assume that Wolverine is running at its capacity, the Base Case?

A. Yes.

Q. And so is the last three, is Wolverine running at its 65 capacity plus an additional 19? I'm confused. I'm sorry.

A. We added 19 more there.
Q. So it's Wolverine plus another 19?
A. Yes.
Q. Okay. Thank you.
A. Might I just make an additional comment on that?
Q. Yes.
A. We could have taken -- well, I also made a run with Wolverine at 65 minus 19 which would be 46, and 65 to see if indeed it made any difference by the fact that I had added 19 to Wolverine at that location above its actual generation, or not. And the results are almost identical. So it didn't make much difference. Did I lose everybody?
Q. You lost me. So where on this page 1 is it with and without Wolverine?
A. Well, the first --
Q. Because there is nothing without Wolverine, right? Or is it under the With Spanish Fork Generation column?
A. Wolverine is in all of the cases.
Q. Okay.
A. In some cases we took 19 megawatts off and in some cases we added 19.
Q. Okay. And that's in the titles?

A. Yes.
Q. Okay. Thank you.
CHAIRMAN CAMPBELL: Any questions, Mr. Proctor?
MR. PROCTOR: Just one.

FURTHER EXAMINATION

BY MR. PROCTOR:

Q. This is Paul Proctor again. And if this question doesn't make sense to you, please tell me.
When you did these calculations on either the page you submitted with your written testimony, Exhibit 2.1, or the other three pages, and you assumed that some unit would be backed down and therefore Spanish Fork would take up that load and serve it. Did you always look at the load that was being served as the one nearest to the Spanish Fork Wind project?
A. That had nothing to do with it.
Q. Okay.
A. In the first five cases there, we didn't really back down any load. We just took 19 megawatts out of Wolverine and put it in Spanish Fork to see what the incremental losses would be if you had this additional generation at Spanish Fork rather than

Wolverine.

In the next one, we took generation out at some remote locations that were close to what the grid model said happened, at occasions where power was purchased from these locations.

Q. Well, doesn't that assume, Mr. Unger, that for example at Rocky Reach, that Rocky Reach was serving the Spanish Fork Wind project load and when you add, such as Mapleton, let's say. So when you add Spanish Fork Wind into the project, Spanish Fork Power, of course, has much less distance to travel than does Rocky Reach. Isn't that an assumption that underlies all of these calculations?

A. You know, I'm not quite sure what you are saying there. But let me just talk a little bit here. With the Spanish Fork and Rocky Reach study, we noted in the grid model that sometimes power was purchased up in the area of Rocky Reach. Spanish Fork Power would be purchased. So we assumed that the purchaser of that power would not, therefore, purchase power from some place else, and we recognize that by reducing the Rocky Reach generation by 19 megawatts. I don't know if that answers your question.

Q. Well, I think it does, sir.

Looked at another way, you're not suggesting that the Spanish Fork Wind is displacing the load that Rocky Reach is supplying located in Oregon, are you?

A. What I am saying is that, as per the grid model, someone from Washington, Central Washington, was purchasing this Spanish Fork Wind Power. And in doing so, they are not purchasing it from someone else. And I assume that that someone else was located closer to the purchaser. And we just elected Rocky Reach just because that happened to be in the area. It could have been any other generator in that area. It wouldn't have made much difference.

Q. Mr. Unger, thank you.

COMMISSIONER ALLEN: Mr. Unger, this is Commissioner Allen.

MR. UNGER: Yes.

COMMISSIONER ALLEN: You may have heard me ask some questions earlier as I was trying to sort out how these models work, and it sounds like you have some engineering experience in these areas. I'm curious, in working with power flow models and specifically as they relate to calculating line losses, predicting them --

A. I can hardly hear you.

Q. I'm sorry. In terms of using models and specifically as they apply to calculating line losses, are you aware or have you ever done follow-up studies or anyone you know that's gone back later and done measured analysis to compare the predicted outcomes with actuals?

A. Well, on a case such as this where we are inserting generation into a network, doing those calculations would be very difficult, or doing those measurements would be very difficult. And I'm not aware of anybody even trying that.

Q. And the nature of my question is of course trying to determine how accurate these predictive models can be. And what you are saying is you still rely on them but you don't have quantitative data to back them up later. Is that a correct assessment?

A. That's correct. I'm sure that measurements of losses have been taken in much simpler systems, say where you have generation go into a load then that is just a single circuit between the two, the generator and the load, and measurements are taken by that. The equations that are used by the load flow program are very standard equations. And the load flow program basically calculates the loads on all of the transformers and

all of the lines that are included in the model. And then once a solution has been achieved, then we can get the losses as just being three times a current squared times the resistance over a thousand for kilowatts or a million for megawatts.

COMMISSIONER ALLEN: Thank you.

CHAIRMAN CAMPBELL: Dr. Collins, did you have any redirect or not?

DR. COLLINS: I actually have a series of questions for Mr. Unger.

CHAIRMAN CAMPBELL: It's got to be in terms of Redirect.

REDIRECT EXAMINATION

BY DR. COLLINS:

Q. You were asked some questions about the WECC study results and in particular the Midpoint to Summer Lake losses that you calculated.

A. Dr. Collins, I can hardly hear you.

Q. I'm sorry. You were asked some questions about the other studies that were part of the electronic submission with your testimony. In particular Mr. Brockbank asked you questions regarding the losses associated with Midpoint to Summer Lake and also -- what was the other one? To

Malin?

A. The other one was Summer Lake to Malin.

Q. Summer Lake to Malin. Now, those were calculations of line losses associated with current flowing towards the western system; is that correct?

A. Well, flowing towards the western system or flowing the other way. I would suspect it was flowing towards the western system.

Q. But it is going to measure losses along those lines; is that correct?

A. Right. Our thought there was that indeed PacifiCorp would end up paying for -- PacifiCorp pays for the incremental losses there. And because we could calculate it easily, we did.

Q. Okay. And so this was our attempt to better represent the system; is that correct?

A. It was our attempt to get as complete an analysis as possible.

Q. So the attempt to average those results with PacifiCorp results would be an incorrect way to analyze it?

A. Yeah. It's comparing apples and oranges. One is the losses associated with the transmission line, and the other is the losses of the PacifiCorp East system. And they are two different things.

Q. So it would not be correct to do any sort of averaging of those things?

A. No. I guess that came from a misunderstanding of our data.

Q. And also, the attempt to average WECC results with PacifiCorp results would be comparing apples to oranges; is that correct?

A. Similar thing. Only in this case, the PacifiCorp losses were a subset of the WECC losses.

Q. Okay. No further questions.

CHAIRMAN CAMPBELL: All right. Thank you, Mr. Unger. Is there anything else we need to take up today?

MS. SCHMIT: Nothing from the Division.

MR. BROCKBANK: No.

MR. PROCTOR: No.

CHAIRMAN CAMPBELL: We will adjourn and take the matter under advisement.

(The proceeding concluded at 3:50 p.m.)

REPORTER'S HEARING CERTIFICATE

STATE OF UTAH)
) ss.
COUNTY OF SALT LAKE)

I, Diana Kent, Registered Professional Reporter and Notary Public in and for the State of Utah, do hereby certify:

That prior to being examined, the witnesses were duly sworn to tell the truth, the whole truth, and nothing but the truth;

That said proceeding was taken down by me in stenotype on March 1, 2007, at the place therein named, and was thereafter transcribed, and that a true and correct transcription of said testimony is set forth in the preceding pages;

I further certify that I am not kin or otherwise associated with any of the parties to said cause of action and that I am not interested in the outcome thereof.

WITNESS MY HAND AND OFFICIAL SEAL this 7th day of March, 2007.

_____

Diana Kent, RPR, CRR
Notary Public
Residing in Salt Lake County