

UNITED STATES PATENT AND TRADEMARK OFFICE BEFORE  
THE PATENT TRIAL AND APPEAL BOARD

WIRTGEN AMERICA, INC.,	)	CASE NOS.
	)	
Plaintiff,	)	IPR2022-01397
	)	Patent 9,975,538
vs.	)	
	)	
CATERPILLAR INC.,	)	
	)	
Defendant.	)	
_____	)	

DEPOSITION OF:

JEFFREY STEIN, Ph.D.

Taken on behalf of the Defendant

May 23, 2023

CATERPILLAR-EXHIBIT 2003  
Wirtgen America, Inc. v. Caterpillar, Inc.  
IPR2022-01397

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I N D E X

Page/Line

THE WITNESS: JEFFREY STEIN, Ph.D.

EXAMINATION BY MR. ARGENTI

5 4

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1           The deposition of JEFFREY STEIN,  
2     Ph.D., was taken by counsel for the  
3     Defendant, on May 23, 2023, commencing  
4     at 8:01 a.m., in the offices of  
5     Patterson Intellectual Property Law,  
6     1600 Division Street, Suite 500,  
7     Nashville, Tennessee, for all purposes  
8     under the Tennessee Rules of Civil  
9     Procedure.

10           The formalities as to notice,  
11     caption, certificate, et cetera, are not  
12     waived. All objections, except as to  
13     the form of the questions, are reserved  
14     to the hearing.

15           It is agreed that Carissa L.  
16     Boone, being a Notary Public and Court  
17     Reporter, may swear the witness, and  
18     that the reading and signing of the  
19     completed deposition by the witness are  
20     not waived.

21  
22  
23           \*       \*       \*

1                   JEFFREY STEIN, Ph.D.,  
2   having been first duly sworn, was examined and  
3   testified as follows:

4                   EXAMINATION

5   BY MR. ARGENTI:

6                   Q.       Good morning.

7                   A.       Good morning.

8                   MR. ARGENTI:   Just because  
9                   counsel had mentioned putting in  
10                  appearances, I'm Matt Argenti from  
11                  Wilson Sonsini on behalf of the patent  
12                  owner Caterpillar in this.   Also  
13                  attending, over the conference line, is  
14                  my colleague Tasha Thomas.

15                  MR. SEKYI:   And I'm William Sekyi  
16                  of Patterson Intellectual Property Law  
17                  Group representing Wirtgen America.

18   BY MR. ARGENTI:

19                  Q.       Could you please -- oh.

20                  A.       I'm Jeffrey L. Stein from  
21                  Rochester, New York.

22                  Q.       Now I can cross my first two  
23                  questions off the outline, Dr. Stein.

24                               Have you ever been deposed before  
25                  today?

1 A. Yes.

2 Q. About how many times?

3 A. Three or four dozen, something of  
4 that order.

5 Q. How many in the last year?

6 A. Last year starting since when?

7 Q. In the last 12 months,  
8 approximately.

9 A. Maybe one other. I'm not sure.  
10 I'd have to check my records.

11 Q. Okay. Well, you're probably  
12 familiar with how things work in depositions, but  
13 I'm going to quickly go through some of the ground  
14 rules to get them on the record.

15 A. Sure.

16 Q. Do you understand that you're  
17 providing your testimony under oath and you're  
18 expected to tell the truth?

19 A. Yes.

20 Q. Is there any reason you cannot  
21 provide complete and accurate testimony today?

22 A. No.

23 Q. Hopefully my questions will be  
24 clear. If you do not understand any question,  
25 please let me know that it is unclear. Under the

1 guidelines for this proceeding, you must ask me  
2 for any clarification. If you do not tell me  
3 otherwise, I will assume that you understand the  
4 question, okay?

5 A. Understood.

6 Q. Please provide verbal answers  
7 rather than nodding your head, for the benefit of  
8 the record and the reporter.

9 A. Of course.

10 Q. And we can take a break any time  
11 that you'd like one, as long as there's not a  
12 question pending, okay?

13 A. Sounds good.

14 Q. And I'll try and take breaks  
15 about every hour or so.

16 A. Sounds good.

17 Q. Are you being compensated for  
18 your testimony in this proceeding?

19 A. Yes.

20 Q. And is that at \$525 an hour? I  
21 believe that's the rate stated in your  
22 declaration.

23 A. Then I'll stand by that.

24 Q. Who's providing that  
25 compensation?

1                   A.        I guess I -- I'm not sure what  
2       the question means or what the question is.

3                   Q.        Who pays you for your work in  
4       this matter?

5                   A.        Well, it -- it -- from a very  
6       straightforward, but not necessarily precise point  
7       of view, I have been providing services to  
8       Mr. Sekyi and other people that he works with.  
9       And I bill through a -- a broker, and I get paid  
10      by that broker.

11                  Q.        Is it your understanding that the  
12      compensation ultimately comes from the Petitioner  
13      Wirtgen in this IP- -- in this IPR?

14                  A.        I would assume so.

15                  Q.        And are you receiving any  
16      compensation in the form of stock or other equity?

17                  A.        No.

18                  Q.        Do you have an ownership interest  
19      in Wirtgen?

20                  A.        No.

21                  Q.        Do you own any Deere & Company  
22      stock?

23                  A.        No. I -- well, let me take that  
24      back. I have mutual funds, and they involve lots  
25      of companies. I would have no idea if Deere was



1 amongst them or not.

2 Q. How much have you billed Wirtgen  
3 or -- or the Patterson law firm, to date, for your  
4 work in this matter?

5 A. I don't know. I'd have to review  
6 my records to come up with a total.

7 Q. Is it more than \$100,000?

8 A. No.

9 Q. Is it more than \$50,000?

10 A. I don't think so.

11 Q. And does that amount include  
12 preparing for and appearing at this deposition?

13 A. No.

14 (Exhibit 1003 was marked.)

15 BY MR. ARGENTI:

16 Q. Dr. Stein, I've just handed you  
17 what has been previously marked as Exhibit 1003.

18 Do you recognize this document?

19 A. Yes.

20 Q. What is it?

21 A. It's the declaration I prepared  
22 in this matter.

23 Q. This declaration was submitted in  
24 support of Wirtgen's petition for inter partes  
25 review of U.S. Patent No. 9,975,538, correct?

1 A. Yes.

2 Q. And if I refer to that patent as  
3 the '538 patent today, will you understand what  
4 I'm referring to?

5 A. Yes.

6 Q. Could you turn to the last page  
7 of your declaration and let me know, is that your  
8 signature?

9 A. Yes.

10 Q. How was that signature added to  
11 this page?

12 A. I don't understand the question.

13 Q. Did you sign the last page of  
14 your declaration with a pen?

15 A. I don't specifically remember how  
16 I signed this particular declaration, but that's  
17 my signature. That was done with my pen. It was  
18 obviously not done on this piece of paper.

19 Q. Well, another way that  
20 declarations are signed sometimes is by  
21 electronically adding a -- an image of a  
22 signature, and I'm -- did that happen here?

23 A. I think --

24 MR. SEKYI: I'll object as lacks  
25 foundation.

1 THE WITNESS: I don't recall how  
2 I provided the signature in this case.

3 BY MR. ARGENTI:

4 Q. Who wrote your declaration?

5 A. This is my declaration. I signed  
6 it. I stand by all the material that's in the  
7 declaration.

8 Q. Did you write your declaration?

9 A. I worked with the attorneys on  
10 the -- on the declaration, just talked about  
11 organization, talked about ideas and wrote  
12 different parts, edited parts. They also wrote  
13 parts. And -- but I had final say on every single  
14 word that's in this declaration.

15 Q. Which parts of your declaration  
16 did you write?

17 A. I wrote the whole thing.

18 Q. Well, you just mentioned that the  
19 attorneys wrote some parts and you wrote some  
20 parts.

21 A. Well, like, the legal standard  
22 parts, they're better at writing that up, so they  
23 wrote that. We talked about it, so.... Relevant  
24 Legal Standards.

25 Q. Which sections of your

1 declaration did you type the first draft of?

2 A. You know, I don't recall  
3 specifically. You know, I know for sure that the  
4 beginning and all of the stuff at the beginning  
5 about who I am, qualifications, experience, I  
6 wrote all of that. It's probably not very  
7 different than what I put in for a first draft.

8 And other sections involving the  
9 -- the analysis of the -- of the patents, I wrote  
10 parts, they wrote parts. It was collaborative of  
11 getting all the words on page, but words are --  
12 are mine.

13 Q. Did you carefully review this  
14 declaration to ensure its accuracy?

15 A. Yes.

16 Q. Sitting here today, do you  
17 believe the declaration is accurate?

18 A. I believe that it is accurate.  
19 There is one change I -- I can relate to you, if  
20 you're --

21 Q. That was going to be my next  
22 question. Is there anything you'd like to modify  
23 or correct?

24 A. It's not that it -- that it's  
25 changed, let's put it that way. It's my status at

1 the University of Michigan. I retired as of  
2 December 2022, and so I'm now -- have emeritus  
3 status rather than the status that's revealed in  
4 here.

5 Q. Since you mentioned your  
6 retirement, I -- I was going to ask -- I did  
7 notice on your CV that you listed yourself as a  
8 professor with Michigan with a New York address,  
9 and I was wondering how that worked. Was that a  
10 remote work setup or something else?

11 At the time that you signed the  
12 declaration, were you living in New York and  
13 working in Michigan?

14 A. I don't remember when I signed  
15 this. Let me -- so I was still working at  
16 Michigan in August of 2022, and I commute back and  
17 forth between Rochester and Ann Arbor.

18 Q. So other than your employment  
19 status as moving to emeritus at Michigan, is there  
20 anything else in your declaration that you'd like  
21 to update?

22 A. Not that I'm aware of at this  
23 juncture --

24 Q. All right.

25 A. -- but something could come up as

1 I'm reviewing it today.

2 Q. Did you do anything to prepare  
3 for this deposition?

4 A. Yes.

5 Q. What did you do?

6 A. I reviewed my declaration, and I  
7 reviewed the -- the prior art that is cited in the  
8 declaration, and I spoke with Mr. Sekyi.

9 Q. Did you review any other  
10 documents beyond the declaration and the cited  
11 prior art?

12 A. Not any other documents that are  
13 not cited in -- on page 9 and 10 of my  
14 declaration.

15 Q. Have you reviewed the IPR  
16 petition in this case?

17 A. Oh, yes, I -- I did review the --  
18 thank you. That reminds me that I did read the  
19 IPR petition, and I also reviewed the patent  
20 owner's preliminary response.

21 Q. And you reviewed both of those in  
22 preparation for the deposition?

23 A. Yes.

24 Q. Did you review the IPR petition  
25 prior to signing your declaration?

1 A. No.

2 Q. Have you reviewed the board's  
3 institution decision in this IPR?

4 A. Yes.

5 Q. Anything else that you now can  
6 remember that you have reviewed in preparation?

7 A. Yeah, sorry. I haven't had  
8 enough coffee this morning. I think that's it.  
9 But if I recall something else, I'll certainly  
10 remind you after reminding myself.

11 Q. And I think you -- you mentioned  
12 that you had spoken to Wirtgen's counsel in  
13 preparation. Who specifically did you meet with?

14 A. I met with Mr. Sekyi.

15 Q. Anyone else?

16 A. Nathan North.

17 Q. And when did that meeting take  
18 place?

19 A. Yesterday.

20 Q. About how long did it last?

21 A. I arrived yesterday at around  
22 8:30, left at around 4:30 but -- you know, went to  
23 lunch. And not -- and Mr. North was not there for  
24 the whole meeting.

25 Q. And was that the only meeting

1 with Wirtgen's counsel in preparation for this  
2 deposition?

3 A. It was the only in-person  
4 meeting.

5 Q. So what other meeting did you  
6 have?

7 A. So we discussed things by -- I --  
8 with Mr. Sekyi over the phone.

9 Q. Anyone else?

10 A. No.

11 Q. Okay. And was that one phone  
12 call?

13 A. It was several --

14 MR. SEKYEI: I'll object as vague  
15 and ambiguous.

16 THE WITNESS: So we arranged to  
17 have several meetings that were  
18 conducted, you know, electronically  
19 before the deposition.

20 BY MR. ARGENTI:

21 Q. So you mentioned that you've been  
22 deposed quite a few times. Have you ever served  
23 as an expert in a patent case before?

24 A. Yes.

25 Q. About how many times?



1           A.       I -- I -- it depends on how you  
2 count cases, and -- but a number of times.

3           Q.       You mentioned, I believe, that  
4 you'd been deposed about three to four dozen  
5 times. Correct me if I'm wrong on that. Were all  
6 of those in the context of working as an expert in  
7 patent litigation?

8           A.       No.

9           Q.       Were the majority of them?

10          A.       I'm not sure what the ratio would  
11 be between that and other activities.

12          Q.       And, I guess, have you served as  
13 an expert witness in other types of litigation?

14          A.       Yes.

15          Q.       What types?

16          A.       What I call product design, trade  
17 secret, warranty product, failure to perform.

18          Q.       I looked it up, your records.  
19 You can find anything online, right? And it  
20 looked to me like you've offered testimony in  
21 about 19 IPRs previously.

22                   Does that sound right?

23          A.       It's -- it's a very round number.  
24 I guess it's probably more accurate than my  
25 memory.

1 Q. And in those IPRs, again, it  
2 appeared to me that you had offered testimony on  
3 behalf of a patent owner once; is that correct?

4 A. I don't know. As I -- as I sit  
5 here today, I'd have to review my records to be  
6 able to answer that accurately.

7 Q. To the best of your recollection,  
8 have you ever offered testimony on behalf of a  
9 patent owner in an IPR?

10 A. I just don't remember.

11 Q. Could you turn to page 13 of your  
12 declaration, please. Paragraph 27.

13 A. (Witness complies.)

14 Q. And in the first sentence of  
15 paragraph 27, you state that: "I understand that  
16 in an inter partes review, claim terms are to be  
17 given their ordinary and customary meaning as  
18 understood by a person of ordinary skill in the  
19 art in the context of the entire disclosure at the  
20 time of the invention."

21 Do you see that?

22 A. Yes.

23 Q. And did you do that here?

24 A. Yes.

25 Q. Turning to the next page of your

1 declaration, in paragraph 29. And there, you  
2 state: "In my opinion, the '538 patent does not  
3 use any unusual claim terms."

4 Do you see that?

5 A. Yes.

6 Q. And in the next sentence, you go  
7 on to say: "Nor do any claim terms appear to be  
8 used outside their ordinary and customary meaning,  
9 as understood by a POSITA and in view of the '538  
10 patent specification and the prosecution history  
11 and other patent content."

12 Did I read that right?

13 A. Correct.

14 Q. So when analyzing the claims of  
15 the '538 patent, you gave the claim terms their  
16 ordinary and customary meaning, correct?

17 A. As it says in that paragraph,  
18 yes.

19 Q. You did not apply any special  
20 definitions to the claim terms in the '538 patent,  
21 right?

22 A. In coming to the conclusions that  
23 are in this declaration, that's correct.

24 Q. Now, turn to page 15 of your  
25 declaration, please, and look at paragraph 31.

1 A. (Witness complies.)

2 Q. And this paragraph is in the  
3 section of your declaration setting forth your  
4 understanding of the legal standard for  
5 determining obviousness, correct?

6 A. I'm sorry, I didn't hear what  
7 page you asked me to turn to.

8 Q. Page 15 --

9 A. Okay.

10 Q. -- paragraph 31.

11 A. I went to paragraph 15. Okay.  
12 Page 15, paragraph 31. Okay. I'm there.

13 Q. All right. And my question is:  
14 This paragraph is in the section of your  
15 declaration setting forth your understanding of  
16 the legal standard for determining obviousness,  
17 correct?

18 A. Yeah. More specifically in --  
19 yeah. I'm sorry. Yes, you're correct.

20 Q. Did you apply these standards  
21 when forming your opinions in this IPR?

22 A. Yes.

23 Q. In paragraph 31, you state:  
24 "Wirtgen America's counsel has explained to me a  
25 number of exemplary rationales under which a

1 POSITA could find a claim to have been obvious."

2 Do you see that?

3 A. Yes.

4 Q. In forming your opinions, you  
5 considered rationales a POSITA might have used to  
6 find a claim obvious; is that right?

7 A. I'm sorry, were you reading? I  
8 -- I don't see where you were just reading from.

9 Q. No, I was not reading. That was  
10 my question to you.

11 A. Okay. I'm sorry. Could you go  
12 back a step, then?

13 Q. Would you like me to repeat the  
14 question?

15 A. Yes, please.

16 Q. In forming your opinions, you  
17 considered rationales a POSITA might have used to  
18 find a claim obvious; is that right?

19 A. I -- I am confused by your  
20 question. Could you rephrase the question?

21 Q. So looking at the first sentence  
22 of paragraph 31 of your declaration: In forming  
23 your opinions, did you consider a number of  
24 exemplary rationales under which a POSITA could  
25 find a claim to have been obvious?

1                   A.       Yes. As explained in paragraph  
2 31, yes.

3                   Q.       And is it true that that analysis  
4 considered if a POSITA was aware of a claim of an  
5 invention, what reasons might have led the POSITA  
6 to conclude the claim was obvious?

7                   A.       Oh, I'm sorry, I don't understand  
8 that question. Could you rephrase the question,  
9 please?

10                  Q.       Looking at the first sentence of  
11 paragraph 31 of your declaration, what is your  
12 understanding of what it means for a POSITA to  
13 find a claim obvious?

14                  A.       Well, as it says: "I understand  
15 that if a POSITA could have arrived at the claimed  
16 invention by," and then I enumerate: "(a),  
17 combining prior art elements known -- to known  
18 methods to yield predictable results; applying a  
19 solution of finite number of identified,  
20 predictable solutions, with reasonable expectation  
21 of success; (c), substituting one known element  
22 for another to obtain predictable results; or (d),  
23 using a known technique to improve similar  
24 devices, parenthetically, (methods, or products)  
25 in the same way, the claimed invention would

1 likely have been obvious to a POSITA. I have  
2 taken at least these rationales under  
3 consideration in analyzing the claims at issue  
4 here."

5 Q. Is it your understanding that in  
6 order for a POSITA to find a claim to have been  
7 obvious, the POSITA needs to be aware of the  
8 claim?

9 A. I mean, obviously, the -- so the  
10 answer is the person of ordinary skill is trying  
11 -- is someone who has this background, knowledge,  
12 and expertise as relevant to the -- to the field  
13 in question. And the question is whether or not  
14 using these number of rationales, the POSITA would  
15 have -- it would have been obvious to a POSITA  
16 with what was known in the art to have come to --  
17 to have combined these prior arts in a way using  
18 known methods to get predictable results.

19 And I'm saying that such a person  
20 would have come to a result that is then the same  
21 as what has been claimed in the '538.

22 (Exhibit 1001 was marked.)

23 BY MR. ARGENTI:

24 Q. Dr. Stein, I've just handed you  
25 what has been marked as Exhibit 1001 in the I PR.

1 Do you recognize this document?

2 A. Yes.

3 Q. This is the '538 patent, correct?

4 A. Correct.

5 Q. And did you review the '538

6 patent in its entirety when preparing your

7 opinions in this case?

8 A. Yes.

9 Q. Turn to column 6, please, of the  
10 '538 patent.

11 A. (Witness complies.)

12 Q. Do you see where claim 1 begins?

13 A. Yes.

14 Q. At line 24, claim 1 recites:

15 "Determining an engine load of an engine."

16 Do you see that?

17 A. Yes.

18 Q. What's your understanding of the  
19 ordinary and customer meaning of engine load?

20 A. So let's -- let me answer that  
21 question by taking the term "engine load" out of  
22 the context of the '538 patent. The customary and  
23 understanding that one of ordinary skill in the  
24 art would have, or for that matter, if I were  
25 talking with my students at Michigan about --



1 about drivetrain design and control, and the term  
2 "engine load" would refer to the amount of power  
3 or the amount of torque at a given speed that the  
4 engine was either producing or it could be, in  
5 fact, absorbing.

6 Q. Is your understanding of the  
7 meaning of "engine load" any different in the  
8 context of the '538 patent?

9 A. So I was just reviewing the '538  
10 for some teachings as to what the '538 means by  
11 "engine load," which was your question, to see if  
12 there was more specific meaning, and I believe  
13 that the '538 means, when it says "engine load,"  
14 what I defined to be engine load before.

15 Q. If we look again at claim 1, in  
16 the next line of claim 1 -- so line 25. The next  
17 line recites: "Adjusting an engine speed of the  
18 engine based on the engine load and one or more  
19 predefined efficiency points," and it goes on from  
20 there. But I want to focus on that first part.

21 Is engine load -- sorry, strike  
22 that.

23 Engine speed is different than  
24 engine load, correct?

25 A. Well, engine speed is a kinematic

1 property of engine, which is the number of  
2 rotations the output shaft is making per unit  
3 time. Load, if expressed as power, is the product  
4 of that speed and the torque that is on the -- on  
5 the engine. So load, if it's power, it's a  
6 product of speed and torque. If load is just  
7 torque, which is also the way people talk about  
8 load, then it's not related to specifically the  
9 speed.

10 When I say that they're not  
11 related, that doesn't mean that -- engine  
12 designers use torque speed maps of engines to --  
13 to provide inscription of how the engine operates  
14 in steady state. They also provide power versus  
15 speed maps of how engines behave, and it's really  
16 the same mapping; it's just you plot power instead  
17 of torque. Both of them are engine load.

18 Q. Okay. I think you answered my  
19 next questions, but just to -- just to make sure  
20 it's clear: Power is the product of the speed  
21 multiplied by torque; is that right?

22 A. Yeah, the shaft speed by the  
23 shaft torque.

24 Q. And it's your understanding that  
25 in that formula, both power and torque are forms

1 of engine load.

2 Do I have that right?

3 A. I'm saying that one of ordinary  
4 skill in the art would not know which of those two  
5 variables you are referring to when you said  
6 "engine load," unless you were specific; that both  
7 of them are engine -- considered engine loads.

8 Q. Torque is typically measured in  
9 units of newton-metres, correct?

10 A. That is one set of units that it  
11 can be measured, and it would be SI units or  
12 System International units.

13 Q. And speed is going be measured in  
14 distance over time, right?

15 A. Well, in -- since this is the  
16 speed of a revolving body, the shaft, it's  
17 measured as typically -- in SI units, it would be  
18 radians per seconds. In engineering terms, it's  
19 usually units of revolutions per minute or  
20 revolution -- yeah, for an engine, revolutions per  
21 minute.

22 Q. Power would typically be measured  
23 in watts, correct?

24 A. That's, again, one common way of  
25 expressing power, but not the only one. It's just

1 a matter of what unit system you're using.

2 Q. And one watt is equal to one  
3 joule per second, correct?

4 A. A watt is an expression of energy  
5 per unit time, and joule is energy in seconds  
6 time. So that's correct. I don't....

7 Q. And more specifically, a joule is  
8 the amount of work done by a force of one newton  
9 when its point of application moves one meter.

10 Do I have that right?

11 A. I'll -- I just don't remember off  
12 the top of my head if that's the precise  
13 definition of a joule. But a joule is energy or  
14 work, and newton over a meter is an expression of  
15 work, yes.

16 Q. Do you have any different  
17 definition of joule you'd like to provide?

18 A. Well, you weren't providing so  
19 much a definition as you were relating it to other  
20 units of -- the variables that have other units.  
21 So I don't have a problem with that.

22 Q. So power has a time component  
23 that torque does not, correct?

24 MR. SEKYI: Objection, vague.

25 THE WITNESS: So I guess I'm not

1                   sure I understand your question. Maybe  
2                   if you could rephrase your question.

3 BY MR. ARGENTI:

4                   Q.       The units, in which power is  
5 expressed, involve time, correct?

6                   A.       So I would say that -- that power  
7 is an expression of the rate of change of work  
8 with time, or energy with time. That's -- that's  
9 true.

10                  Q.       And torque does not involve an  
11 expression relating to time, correct?

12                  A.       That's correct.

13                  Q.       Let's turn to column 4 of the  
14 '538 patent, please.

15                  A.       (Witness complies.)

16                  Q.       And look at line 9.

17                           At the end of that sentence that  
18 begins at line 9, if we look down at line 12, do  
19 you see where it says: "The engine load may  
20 include loads due to the rotor 118, the  
21 hydrostatic arrangement 144, and other parasitic  
22 loads"?

23                  A.       Yes.

24                  Q.       What is your understanding of  
25 what is meant by "parasitic loads" in that

1 sentence?

2 A. So this is saying that, as with  
3 any piece of machinery -- excuse me -- the engine  
4 is producing power, and that part of that power  
5 ends up being directed to doing useful work, as we  
6 say. And in that case, that's what loads due to  
7 the rotor.

8 But then there are also -- some  
9 of the power goes just to, if you will, running  
10 the hydrostatic arrangement, as it's described  
11 here, No. 144. And there are other things  
12 involved in the machinery that are absorbing  
13 power. They could be just frictional losses in  
14 components. There could be other components that  
15 are being used as part of the operation of a real  
16 engine.

17 So there is power that's going to  
18 parasitic loads, and what -- so it's a way of  
19 saying there's a lot of other stuff going on that  
20 absorbs some of the energy from the engine.

21 Q. So do I have it right that the  
22 rotor in that example would not be considered a  
23 parasitic load?

24 A. Well, the sentence distinguishes  
25 it specifically. It -- it could be considered a

1 parasitic load in more general terms. But in this  
2 sentence, the inventor is indicating that there is  
3 power going to the rotor. And he also understands  
4 the hydrostatic arrangement. And there's some  
5 other things beyond those two that will be  
6 absorbing power from the engine.

7 Q. Is the hydrostatic arrangement a  
8 parasitic load in that example?

9 A. I would say that the hydrostatic  
10 arrangement in view of the engine is part of what  
11 are the loads on the engine. In this particular  
12 sentence, the inventor chooses the -- it's  
13 somewhat ambiguous as to whether the hydrostatic  
14 arrangement is concern -- is -- is a parasitic  
15 load.

16 It is a parasitic load in that  
17 it's not the principal reason for the machine's --  
18 it's trying to accomplish a task that is to do  
19 work by the rotor on the road surface, and in that  
20 sense, anything else observing [sic] -- absorbing  
21 power, like the hydrostatic arrangement, could be  
22 considered a parasitic load.

23 The author has chosen to call out  
24 that as one of the power losses in the system,  
25 acknowledging also that there are other power

1 losses that would be occurring, and lumps them  
2 into this term "parasitic loads."

3 Q. We've been going not quite an  
4 hour now, but I'm going to switch gears and move  
5 on to a different exhibit, so it's probably a good  
6 time for a break, if you'd like to take a --

7 A. Sure.

8 Q. Five minutes? Ten minutes?  
9 Whatever works for you.

10 A. Quick break. Five minutes?

11 Q. Does that sounds good?

12 A. Five sounds good. Okay.

13 (Brief recess observed.)

14 (Exhibit 1006 was marked.)

15 BY MR. ARGENTI:

16 Q. Dr. Stein, I have just handed you  
17 Exhibit 1006 in this case.

18 Do you recognize this document?

19 A. Yes.

20 Q. And what is it?

21 A. It's U.S. Patent 9,656,656 B2  
22 issued May 23rd, 2017 to Xing, et al.

23 THE WITNESS: And "Xing" is  
24 X-i-n-g, at least that's the way I've  
25 been saying it.



1 BY MR. ARGENTI:

2 Q. Hopefully, we don't confuse the  
3 reporter. I've been saying it Zing (phonetic),  
4 and I don't know that I can change it at this  
5 point.

6 A. Zing (phonetic), Xing.

7 Q. But this is the reference that  
8 you refer to as Xing in your declaration, correct?

9 A. Correct.

10 Q. And did you review this document  
11 in its entirety in forming your opinions in this  
12 case?

13 A. Yes.

14 Q. Could you turn to column 4 of  
15 Xing, please?

16 A. (Witness complies.)

17 Q. And look at the paragraph  
18 starting at line 38 that discusses Figure 2.

19 Let me know when you're there.

20 A. Yes, I'm there.

21 Q. And starting at line 42, do you  
22 see where it says: "As shown, the transmission 24  
23 may include a hydrostatic unit 30 and a planetary  
24 unit 32. The hydrostatic unit 30 and the  
25 planetary unit 32 may be coupled to a driveline,

1 including a range gear set 34 and may also be  
2 coupled to a load L."

3 A. Yes, I see that.

4 Q. And Xing goes on to say: "For  
5 example, in one embodiment, the load L may  
6 correspond to the drive wheels of the work vehicle  
7 10, e.g., the front and/or rear wheels 12, 14 of  
8 the work vehicle 10."

9 Do you see that?

10 A. Yes.

11 Q. And then Xing goes on to explain  
12 that there are loss factors due to other  
13 components or efficiencies in the machine that  
14 make the engine load greater than just the load  
15 corresponding to the drive wheels, correct?

16 MR. SEKYI: Objection, misstates  
17 testimony [sic]. Misstates facts.

18 THE WITNESS: So let's -- you  
19 were reading very well up until line 44.  
20 And then it says: Alternatively, the  
21 hydrostatic unit 30 and the planetary  
22 unit 32 may be coupled to other suitable  
23 load L, such as loads that include track  
24 drive or separate operating systems of  
25 the work vehicle 10, paren- -- (for

1 example, a power take-off (PTO) [sic].)

2 That's what the rest of the  
3 paragraph reads.

4 Did I read that correctly?

5 BY MR. ARGENTI:

6 Q. You did read that correctly.

7 And I apologize, Dr. Stein, I  
8 have a blank number with no question in my  
9 outline, and I fear I have deleted something.  
10 This is what I get for working on my outline at  
11 4:00 a.m. California time, in the hotel room.

12 I see how my -- my previous  
13 question may not have made sense in view of that.  
14 Just bear with me one second here.

15 All right.

16 MR. ARGENTI: Off the record,  
17 please.

18 (Discussion off the record.)

19 BY MR. ARGENTI:

20 Q. Dr. Stein, can we turn to column  
21 9 of Xing, please. And at line 30, we see that  
22 Xing provides a formula for taking into account  
23 power loss, correct?

24 MR. SEKYI: Objection, misstates  
25 facts.

1 THE WITNESS: You're talking  
2 about in Equation 1 in column 9?

3 BY MR. ARGENTI:

4 Q. Correct.

5 A. It's an equation which relates  
6 the engine power and the engine -- excuse me --  
7 the engine power, the load power requirement, and  
8 the loss due to the system inefficiencies, such as  
9 loss due to power consumption via transmission and  
10 other power-consuming components.

11 Q. That's right. And specifically  
12 the engine power is equal to the load power  
13 requirement plus the vehicle's power loss due to  
14 system inefficiencies, correct?

15 A. Yes.

16 Q. And a little bit above that in  
17 column 9, starting at line 19, Xing explains that:  
18 "The load power requirement generally corresponds  
19 to the amount of power required for the vehicle to  
20 finish useful work."

21 Do you see that?

22 A. Yes.

23 Q. So the load power requirement is  
24 the power needed to do the work associated with  
25 load L that we saw in column 4, correct?

1           A.       Well, just to finish the sentence  
2     you were reading, you said: "...required for the  
3     vehicle 10 to finish useful work, which may be a  
4     function of numerous factors, such as weight of  
5     the work vehicle 10, the type of implement being  
6     hailed by the vehicle, field conditions, and the  
7     like.

8                        "As will be described below,  
9     current load power requirement and the future load  
10    power requirement may be determined for a week  
11    [sic] vehic- -- a work vehicle 10. The  
12    relationship between load power requirement and  
13    power produced by the engine of the work vehicle  
14    is provided below in Equation 1," which we talked  
15    about a few minutes ago.

16           Q.       And so would you agree that the  
17    load power requirement described there is the  
18    power needed to do the work associated with load L  
19    that we saw in column 4?

20           A.       So the load power requirement, an  
21    example in her [sic] -- her [sic], excuse me --  
22    his embodiment, Xing's embodiment, is what is  
23    described in the embodiment at -- in column 4. It  
24    says: "Load L may correspond to drive wheels of  
25    the work vehicle 10, for example, front wheel

1 and/or rear wheels 12, 14 of the work vehicle 10.  
2 Alternatively, the hydrostatic unit 30 and  
3 planetary unit 32 may be coupled to other suitable  
4 load L."

5 So that L that's referred to in  
6 column L is a generic load, which in the  
7 embodiment that's shown in the patent, is the load  
8 in driving the work tractor.

9 Q. And that's the load power  
10 requirement, correct?

11 A. So you have load -- the load  
12 power requirement in her [sic] embodiment is what  
13 would be the power that's delivered to load -- to  
14 load L.

15 Q. And what Xing says is that you  
16 would need additional power, beyond the load power  
17 requirement, due to inefficiencies and other  
18 power-consuming components, correct?

19 A. In act- -- to actually be able to  
20 operate the machine, yes.

21 Q. And that's similar to the  
22 explanation in the '538 patent regarding parasitic  
23 loss, correct?

24 A. Well, let's go back to the '538  
25 patent and that particular...

1                               Where specifically on the '538?

2                   Q.       Previously, we addressed column  
3       4, line 12.

4                   A.       So there's the '538's talking  
5       about the engine load, which may be loads due to  
6       the rotor doing work, and then other components,  
7       which are also absorbing some power. And all of  
8       these need to be -- are -- are added together, if  
9       you will, to create the amount of engine power  
10      that's needed, which is the -- similar to Xing's  
11      Equation 1 in column 9.

12                  Q.       Is the -- when we're looking at  
13      column 4, line 12 of the '538 patent, and when it  
14      refers to loads due to the rotor, is that  
15      comparable to the load power requirement in Xing?

16                  A.       Could you repeat the question,  
17      please?

18                  Q.       When we look at column 4, line 12  
19      of the '538 patent and see that it refers to loads  
20      due to the rotor, is that comparable to the load  
21      power requirement in Xing?

22                  A.       So they -- he is talking -- the  
23      '538 is talking about the engine load and says  
24      that the engine loads are due to the rotor loads,  
25      hydrostatic arrangement, and other losses. And

1 this is what Xing is also talking about in  
2 Equation 1, where the engine power is being used  
3 for useful work, which is the P load term of  
4 Equation 1.

5 And then there is the P loss  
6 term, which is the power that's being absorbed by  
7 the hydrostatic arrangement and other components  
8 in the system, which is what the '538 is talking  
9 about in column 4 with the hydrostatic arrangement  
10 144 and other parasitic loads.

11 Q. So let me ask the question maybe  
12 a different way.

13 When we look at the description  
14 in column 4, line 12 in the '538 patent that says  
15 the engine load may include loads due to the rotor  
16 118, the hydrostatic arrangement 144, and other  
17 parasitic loads, which of those different load  
18 components, if any, would correspond to the P load  
19 portion of Xing's Formula [sic] 1?

20 A. It seems as though I just  
21 answered that question. I don't understand how  
22 that question is different than the previous  
23 question. So maybe if you could, clarify for me.

24 Q. Well, then I want to -- I just  
25 want to make sure that I have -- that I understand



1 your response.

2 Is it your under- -- is it -- is  
3 it your understanding that the component of the  
4 engine load that the '538 patent refers to as  
5 loads due to the rotor would correspond to the P  
6 load portion of Xing's Formula [sic] 1?

7 A. So the '538 is saying that the  
8 engine load is doing useful work through the  
9 rotor, which is the mill of, like, a road surface.  
10 And then the engine load also has to supply power  
11 to the hydrostatic arrangement -- that's the  
12 144 -- and other things that require power,  
13 whether they're other components or inefficiencies  
14 in connections, et cetera.

15 So I said that is similar to  
16 Equation 1 of Xing on -- in column 9 where the  
17 engine power, he speaks specifically of power --  
18 or it's not clear what the '538 means by "engine  
19 load." It could mean engine power load or it  
20 could mean engine torque load. The difference is  
21 not really conceptually very different because the  
22 engine loads add up, as well as the engine powers  
23 adding up as being a sum of the power or torque  
24 that is going to the load, to useful work. And  
25 the power or torque that has to be used to

1 overcome driving other components, losses,  
2 whatever you want to call the rest of the things  
3 in the machine, that are taking power from the  
4 engine.

5 So the two lines are -- are  
6 similar in concept, but Xing is specific about  
7 talking about power, where it's a bit unclear what  
8 units '538 is talking about.

9 Q. So if engine load in that portion  
10 of column 4 of the '538 patent was understood to  
11 be referring to engine power, then the engine load  
12 that is composed of those various components,  
13 loads due to the rotor 118, hydrostatic  
14 arrangement 144 and other parasitic loads, the  
15 total engine load would correspond to P engine in  
16 Xing's Formula [sic] 1, right?

17 A. All of those loads combined, if  
18 they are talking about load power, then they refer  
19 to what Xing -- it is similar to what is being  
20 expressed in the Xing reference as to what the  
21 engine power, how it's being distributed to the --  
22 to doing useful work and how it's -- there's some  
23 power that's lost.

24 And that's exactly what is being  
25 expressed here in the '538. It's just not clear

1 whether they're talking about power or torque. In  
2 either case, the concept is quite clear, quite  
3 clear to one of ordinary skill in the art.

4 Q. So the engine load in both the  
5 '538 patent and Xing includes both the load due to  
6 the element that you want to drive, plus other  
7 loads associated with inefficiencies and other  
8 components of the machine, correct?

9 A. You keep asking me the same  
10 question and I keep answering it, but you keep  
11 asking it again. So there's something about what  
12 we're talking about here that's not connecting.

13 Q. Well, it's -- respectfully,  
14 you're not giving me a direct answer.

15 A. I -- please help me.

16 Q. If you agree, then agree.  
17 It's -- I'm -- what I'm trying to  
18 get at is -- and I have asked it a number of  
19 times -- is that in the '538 patent, it refers to  
20 an engine load that's comprised of a number of  
21 components, including the load that's associated  
22 with the work you want to do, as well as loads  
23 associated with losses. And in the Xing  
24 reference, it talks about the engine power that's  
25 comprised of power for the work that you want to

1 do, the load power requirement, as well as power  
2 associated with losses.

3 And so my question is: Setting  
4 aside the issue of whether load is expressed in  
5 power or torque, is the engine load referred to in  
6 line 12 of column 4 of the '538 patent equivalent  
7 to the engine power recited in Xing's Formula  
8 [sic] 1?

9 MR. SEKYI: Objection, asked and  
10 answered.

11 BY MR. ARGENTI:

12 Q. And maybe if you could give me a  
13 yes-or-no answer, we could move on.

14 MR. SEKYI: Counsel, his  
15 testimony was what it is. Asked and  
16 answered.

17 MR. ARGENTI: Your speaking  
18 objections are inappropriate under the  
19 Trial Practice Guide. I'll ask you to  
20 please stop.

21 THE WITNESS: The two sections of  
22 these two references are talking about  
23 the same thing, which is that the engine  
24 driving their respective machines are  
25 producing power, some of which goes to

1 the load and some of which is -- and  
2 therefore, is doing what we call useful  
3 work. And some of the power ends up  
4 being absorbed or used for operating the  
5 other ancillary components in the  
6 machine or absorbed in friction and  
7 other inefficiencies in the machine.

8 And the two are expressing the  
9 same idea that the engine must provide  
10 -- provide energy to -- to both the  
11 useful work and overcome the losses.  
12 And so the two concepts would be  
13 understood, by a person of ordinary  
14 skill in the art, to be equivalent.

15 BY MR. ARGENTI:

16 Q. We looked earlier at claim 1 of  
17 the '538 patent.

18 Do you recall that?

19 A. Yes.

20 Q. And claim 1 recites the term  
21 "engine load." Specifically it says:  
22 "Determining an engine load of the engine," right?

23 A. Yes.

24 Q. Which, if any, of the three  
25 components in Xing's Formula [sic] 1 would you map

1 up to the claim term "engine load," as recited in  
2 the claim 1 of the '538 patent?

3 A. So in my report, I talk about the  
4 -- the Xing reference, or Zing (phonetic)  
5 reference, determination of engine load of the  
6 engine: "In the proposed combination, a POSITA  
7 would have implemented the step of determining an  
8 engine load of the engine from Xing's algorithm.  
9 Xing discloses a controller adjusting engine speed  
10 to minimize fuel consumption based on the current  
11 load of the engine."

12 And it refers to Xing, column 2,  
13 9 through 11 -- excuse me, 9 through 12; column 3,  
14 lines 50 through 67; column 11, 65 through column  
15 12, line 11.

16 "To do this, the controller  
17 determines the engine load using sensors  
18 communicatively coupled to the controller, such as  
19 torque sensors coupled to the engine, for  
20 monitoring the engine torque loads. A POSITA  
21 would have understood that the engine load  
22 measured in terms of torque can be converted to  
23 engine load in terms of power by multiplying  
24 measured torque by engine speed, processor  
25 implemented" -- excuse me -- "the processor

1 implementing the algorithm calculates the load,  
2 power requirement, in parenthesis, (P load), the  
3 amount of power demanded from the machine or the  
4 amount of power required for the vehicle to  
5 accomplish useful work - by measuring the current  
6 power or load (P engine) and estimating the  
7 current power loss (P loss)." Xing column 9,  
8 lines 37 through 56.

9 "The controller calculates the  
10 power load requirement for the proposed  
11 combination using the equation P engine equals P  
12 load plus P loss," which is the equation that we  
13 talked about.

14 Q. Which paragraph was that that you  
15 were just reading?

16 A. I'm sorry, paragraph 78 of my  
17 declaration, page 65.

18 Q. And so now that you've reviewed  
19 paragraph 78 of your declaration, I'll ask again:  
20 Which, if any, of the three components of Xing's  
21 Formula [sic] 1 discloses the engine load recited  
22 in claim 1 of the '538 patent?

23 A. So a person of ordinary skill  
24 would have understood that when you're determining  
25 an engine load of the engine, which is the element

1 we're talking about in the claim, that whether  
2 you're talking about torque or power, you can't  
3 measure the power directly. You can only measure  
4 the engine speed and the engine load, and the  
5 person of ordinary skill in the art would have  
6 understood that those are the things that are  
7 available to you.

8 And that Xing says that the  
9 torque can be measured by a torque sensor, the  
10 speed can be measured by an engine speed sensor,  
11 and thus, the engine torque can be read directly  
12 from that sensor.

13 If you want to call that the  
14 engine loading torque, that's what would be --  
15 correspond to what's being measured by that  
16 sensor. If you read "engine load" as being engine  
17 power load, then that's what the person of  
18 ordinary skill would have arrived at by simply  
19 taking the measured speed and multiplying it by  
20 the measured torque to determine the amount of  
21 power that the engine is required to produce at  
22 that instant in time.

23 Q. So there's that P engine  
24 component, right?

25 A. So that corresponds to the --



1 determining the -- it's the process of measuring  
2 the power output of the engine, if you do it in  
3 terms of load torque times the engine speed. And  
4 that's what Xing calls the power of the engine.  
5 If you want to call it the torque of the engine,  
6 then it would just be the torque sensor.

7 Q. So below Formula [sic] 1 in  
8 column 9 of Xing, at line 37, Xing explains that  
9 the: "Current load power requirement for the work  
10 vehicle may be determined indirectly by  
11 calculating the current engine power (P engine)  
12 and the current power loss (P loss) for the work  
13 vehicle," right?

14 A. "In one embodiment, the current  
15 load power requirement for the work vehicle may be  
16 determined indirectly by calculating the engine --  
17 current engine power (P engine)," which we just  
18 spoke about, "and the current power loss (P loss)  
19 for the work vehicle."

20 Q. And then it goes on to say: "For  
21 example, as indicated above, the controller 116  
22 may be configured to continuously monitor the  
23 engine speed and the engine torque (via sensors  
24 122, 124), thereby allowing for the current engine  
25 power to be calculated by the controller 116."

1 Do you see that?

2 A. Yes.

3 Q. And Xing there refers to sensors  
4 122 and 124, which are depicted in Figure 3,  
5 correct?

6 A. Yes.

7 Q. And those sensors are located at  
8 the engine, correct, and measure the speed and  
9 torque of the engine output?

10 A. Yes.

11 Q. And then -- so in that example,  
12 if we're talking about engine load in terms of  
13 torque, it's the torque at the engine measured by  
14 one of those sensors 122, 124, correct?

15 A. Yeah, one of those sensors -- I  
16 don't remember which one it is; there are two  
17 sensors -- would be providing a measure of engine  
18 torque.

19 Q. And if we're talking about engine  
20 load in terms of power, then that would be the  
21 engine power, which is the product of the speed  
22 sensor multiplied by the torque sensor, right?

23 A. Yes.

24 Q. And then turning back to column 9  
25 in Xing, once you use the engine torque and the

1 engine speed to determine the engine power, then  
2 you can subtract the power loss due to system  
3 inefficiencies to calculate the load power  
4 requirement, correct?

5 A. It says: "Additionally, as will  
6 be described below, the controller may include  
7 component inefficiency [sic] data stored within  
8 its memory that permits the controller to  
9 calculate the current power loss for the work  
10 vehicle 10 based on the current vehicle operating  
11 parameters, such as engine speed, ground speed,  
12 pressure differential within the hydrostatic unit  
13 30, displacement ratio of the hydrostatic unit 30,  
14 the axle temperature and/or various other  
15 monitored and/or calculated operating parameters.  
16 As such, by determining the current engine power  
17 and the current engine power loss, the current  
18 power load requirements may be calculated using  
19 Equation 1," which is the equation we talked about  
20 before.

21 Q. So just to be clear, the load  
22 power requirement in Xing is not the same thing as  
23 the engine load recited in the claims of the '538  
24 patent, correct?

25 A. Yes, could you repeat that just

1 to make sure we're -- I'm hearing what I think  
2 you're saying and vice versa?

3 Q. So just to be clear, the load  
4 power requirement in Xing is not the same thing as  
5 the engine load recited in the claims of the '538  
6 patent, correct?

7 A. The load power requirement cited  
8 in Xing is the power that's going to the work to  
9 do useful work, and that is not the engine load.  
10 The engine load is higher than that, whether  
11 you're expressing it in torque or in power.

12 Q. If we look at the next paragraph  
13 in column 9 that starts at line 57, there Xing  
14 describes an alternative method of determining the  
15 load power requirement, correct?

16 A. So that next paragraph starting  
17 at line 57 through 64 describes an alternative  
18 method of getting at the power load requirement,  
19 that is the power to do useful work, in the  
20 particular embodiment that he's describing by  
21 putting additional sensors to measure the -- what  
22 he calls the axle torque and the axle speed.

23 Q. Right. So in that alternative  
24 method, Xing measures the output of the work  
25 vehicle, not the engine output, to determine the

1 load power requirement, correct?

2 A. I'm not sure how you stated your  
3 question exactly. Could you repeat that, please?  
4 Because it's very difficult to keep all of these  
5 terms clear when you're just speaking in words, as  
6 opposed to writing the things down on paper.

7 Q. So in the alternative method that  
8 Xing describes starting at line 57, it measures  
9 the output of the work vehicle, not the output of  
10 the engine, to determine the load power  
11 requirement, correct?

12 A. So Xing is alternatively  
13 suggesting that power could re- -- that power  
14 could be measured in different locations. And  
15 this alternative description in paragraph 57 is to  
16 say we could locate some sensors downstream from  
17 where the engine is, thereby eliminating some of  
18 the power losses -- not eliminating. But we  
19 wouldn't be measuring them with our sensors, which  
20 are downstream from the losses and can be  
21 measuring a -- an approximation of the useful load  
22 power requirement of the road vehicle.

23 Q. Uh-huh.

24 A. So it's -- that's what is being  
25 suggested there.

1 Q. And, specifically, Xing mentions  
2 one or more, sensors 128 in Figure 3, right?

3 A. Yes.

4 Q. And those are used to measure the  
5 drive axle torque and speed, right?

6 A. Yes.

7 Q. And by multiplying the drive axle  
8 speed and torque together, that leads to a direct  
9 calculation of the power load requirement,  
10 correct?

11 A. It precisely leads to a  
12 calculation of power at the axle, and there are  
13 yet other losses, but it's an approximation of the  
14 amount of power that is going to the -- into  
15 driving the wheels.

16 Q. And in that second alternative  
17 method of calculating the load power requirement,  
18 the losses due to inefficiencies and other  
19 components have already occurred upstream in the  
20 system, right?

21 A. Not completely. There are still  
22 inefficiencies downstream of the sensors that he  
23 indicates 12- -- in Figure 3, 128. Is that what  
24 we said they were? Yeah, 128.

25 So, for example, there -- there

1 are still losses, some losses, fewer losses, by  
2 locating the sensors there, but there are some --  
3 some of the work still goes into, for example,  
4 tire deformation.

5 Q. But losses, for example, due to  
6 the transmission would be upstream, correct?

7 A. Correct.

8 Q. So that means that if you just  
9 measured the output at the drive axle, that  
10 doesn't tell you what the engine output is,  
11 correct?

12 A. It doesn't tell you directly, no.  
13 It is -- because it's not being measured at the  
14 engine. There are components between the engine  
15 and the sensors that are absorbing power.

16 Q. Xing's second method for  
17 calculating load power requirement that starts at  
18 line 57 of column 9 doesn't involve a  
19 determination of engine load, correct?

20 A. I don't understand that -- the  
21 question.

22 Q. What don't you understand about  
23 that question?

24 A. The -- well, if you could  
25 rephrase the question.

1 Q. Does Xing's second alternative  
2 method of determining load power requirement,  
3 starting at line 57 of column 4 [sic], involve a  
4 determination of engine load as recited in the  
5 claims of the '538 patent?

6 A. Xing is asking or is suggesting  
7 that additional sensors could be used in his  
8 algorithm to help in determining the different  
9 kinds of things that are going on in the system  
10 during operation, and the -- the engine power or  
11 the engine load, whether power or torque, would  
12 still need to be known. The better one  
13 understands the engine load and the power load and  
14 the losses and can quantify these things, the  
15 better Xing's algorithm will work in terms of  
16 being able to have the machine operate at its  
17 stated goal of high efficiency.

18 So it's an alternative way to get  
19 at some of those factors. It's still -- you still  
20 need to know what the engine load is.

21 Q. So, Dr. Stein, I didn't ask what  
22 you need to know or what else you could do. I  
23 asked about that paragraph in column 9 starting at  
24 line 57, the alternative method of determining the  
25 power load requirement or load power requirement



1 that involves measuring axle torque and axle speed  
2 to calculate the load power requirement.

3 My question is: That method  
4 described in that paragraph does not describe a  
5 determination of an engine load as recited in the  
6 claims of the '538 patent, correct?

7 A. It simply is telling you that  
8 there are various ways in which the power load can  
9 be required -- can be calculated. It doesn't tell  
10 you that you don't have to still measure the  
11 engine power load.

12 Q. So the paragraph in column 9  
13 starting at line 57 doesn't say not to measure the  
14 engine load, is your testimony, but it also  
15 doesn't say anything about actually measuring the  
16 engine load, in that paragraph, right?

17 A. I think that one of ordinary  
18 skill would understand that -- what this paragraph  
19 is intending, which is that there is -- one could  
20 decide to use additional sensors to help with more  
21 accurately determining what's going on in the  
22 vehicle, and Xing is suggesting such a way of  
23 doing that. And it -- Xing is not suggesting this  
24 alternative to be extracted out of all the rest of  
25 the teaching about how, ultimately, to select the

1 engine speed to operate at so that the efficiency  
2 of the system is at its optimum.

3 Q. Dr. Stein, is it your opinion  
4 that measuring the axle torque and the axle speed  
5 and multiplying them together, as described in  
6 that paragraph of Xing, provides a determination  
7 of engine load?

8 A. I didn't say that. It -- as the  
9 paragraph says, it is an alternative way to -- as  
10 a way to determine the power load requirement.

11 Q. So measuring the axle torque and  
12 the axle speed and multiplying them together to  
13 determine the load power requirement does not  
14 produce a determination of engine load, correct?

15 MR. SEKYI: Objection, form.

16 THE WITNESS: I'm saying that it  
17 -- that one of ordinary skill in the art  
18 would understand that the power being  
19 generated by the engine is going to the  
20 wheels and other places, and you could  
21 measure the axle torque and the axle  
22 speed and the axle power to determine  
23 the amount of power that's being sent to  
24 the wheels of this -- of the Xing  
25 tractor, but they would also understand

1           that while that's an indication of what  
2           the engine load is, according to the  
3           teachings of Xing, Xing is being much  
4           more careful about where the different  
5           powers are flowing in the design of this  
6           kind of machinery.

7                       And as Equation 1 says, there's  
8           engine power, it goes to the load, and  
9           there are other components or what she  
10          [sic] groups as -- or he groups as  
11          losses in the "loss" term. And so one  
12          of ordinary skill would understand that  
13          paragraph in the context of this entire  
14          teaching as I just described.

15 BY MR. ARGENTI:

16               Q.       And, Dr. Stein, you just answered  
17          that measuring the axle torque and the axle speed  
18          and the axle power to determine the amount of  
19          power that's being sent to the wheels is an  
20          indication of what the engine load is.

21               A.       I said it's a -- it's a gross  
22          approximation, because the engine load is  
23          producing power and it's -- some of it's going to  
24          the wheels. So if you didn't have any other  
25          measurements and you wanted to just say: Do I

1 know anything?

2 You could say: Well, I know this  
3 much is going to the wheels, so the engine must be  
4 producing at least this much power.

5 But, of course, it's not in the  
6 teaching of both this patent and the '538. The  
7 patents are being clear that there is power being  
8 produced by a prime mover, by the engine, and then  
9 that power then is delivered through the system to  
10 do useful work. But it also goes to driving some  
11 of the components and their inefficiencies, so  
12 there is energy being lost.

13 And the idea is to run the engine  
14 in an efficient way so that all the power that it  
15 generates is -- it does so in its most efficient  
16 way possible. And so it tries to figure out the  
17 -- from the engine characteristics, but also from  
18 the parasitic losses and the work that's going on,  
19 exactly what the engine is facing, and thus how to  
20 operate the engine so that it's operating as  
21 efficiently as possible in the face of all of  
22 this.

23 Q. It's probably time for a break.

24 (Brief recess observed.)

25 BY MR. ARGENTI:

1 Q. Dr. Stein, why don't we turn to  
2 Figure 4 of Xing. In Figure 4, we see that after  
3 the system determines the load power requirement  
4 for the work vehicle, that's the first step, 202.

5 Do you see that?

6 A. I see that in Figure 4. It's the  
7 -- yeah, it's the top box. Yes.

8 Q. And then the next step in Figure  
9 4 is: "Determine candidate engine speeds to  
10 achieve that load power requirement," right?

11 A. Yes, that's what it says.

12 Q. And we see an example of that in  
13 Figure 5, right? Or I guess -- to be more  
14 precise, I guess I should ask: In Figure 5, we  
15 see a table with information that could be used  
16 when determining which candidate engine speed to  
17 use, correct?

18 A. That's a fair characterization.

19 Q. And in all of the entries in  
20 Figure 5, there's a single load power requirement  
21 of 150 kilowatts, right?

22 A. Yes.

23 Q. And Figure 5 shows three  
24 candidate engine speeds to achieve that load power  
25 requirement of 150 kilowatts, correct?

1 A. Yes.

2 Q. Does Xing explain where those  
3 specific candidate engine speeds come from?

4 A. I think that -- I don't remember  
5 that Xing talks about this in precise terms, but  
6 one of ordinary skill in the art would understand  
7 that there are a limited number of speeds.

8 There's a speed range under which the engine  
9 operates, and you only can choose speeds in that  
10 range. And these are only examples of speeds  
11 within the engine range.

12 I think it's pretty obvious -- it  
13 would be obvious to a person of ordinary skill in  
14 the art what candidate speeds could be chosen.  
15 And I think that the illustration here, is just  
16 convenient numbers that are being pulled out.

17 Q. For each candidate engine speed,  
18 there's a correspondence power loss, correct?

19 A. Yes.

20 Q. And that is reflected in the  
21 third column from the left in Figure 5, right?

22 A. Correct.

23 Q. And those losses could be due to,  
24 for example, the hydrostatic and planetary  
25 components of the transmission, right?

1                   A.       In part.  It's other components  
2 as well, and....

3                   Q.       And included in those "other  
4 components," the loss could be loss associated  
5 with a power take-off or PTO, correct?

6                   A.       Yes, it -- it -- it could be, and  
7 with -- I think Xing uses the fan, fan loads, for  
8 fans that are being driven directly off the engine  
9 as opposed to an electric fan.  And there are a  
10 number of different examples of things that are  
11 absorbing power, and the idea is that at that  
12 candidate speed, if you have done the -- you have  
13 relationships toward -- in your computer program,  
14 such as those in Figure 8, Figure 7, you know,  
15 Figure 9, Figure 10, these are all examples of  
16 looking at the losses in different parts of the  
17 vehicle.

18                               And so if you know what -- the  
19 powers that you're operating at and you know what  
20 speeds you're operating at, you can find the power  
21 loss associated with those components.

22                   Q.       Moving over to the next column in  
23 Figure 5, we see "Candidate Engine Power,"  
24 correct?

25                   A.       Yes.

1 Q. And the candidate engine power is  
2 the sum of the load power requirement plus the  
3 power loss for a particular engine speed; is that  
4 right?

5 A. It's the sum of the information  
6 in column 2 plus the information in column 3, as  
7 per the Equation 1 that we were talking about  
8 before.

9 Q. So the candidate engine power is  
10 the hypothetical power that the engine would  
11 generate if a particular candidate engine speed  
12 was applied, correct?

13 A. So I think what you read is --  
14 I'm not sure where you were reading from, but the  
15 candidate engine power is the sum of the  
16 forecasted load power requirement and the  
17 associated system power loss. So column B and  
18 column C, or column 2 and column 3, for 165  
19 kilowatts for the first row of data corresponding  
20 to a candidate engine would be a 1,500 RPM.

21 Q. And once the candidate engine  
22 powers are determined, the system then calculates  
23 the corresponding candidate engine torque,  
24 correct?

25 That's the next column over, the



1 fifth column?

2 A. Yes.

3 Q. And the candidate engine torque  
4 is determined by dividing the candidate engine  
5 power by the candidate engine speed, right?

6 A. Yes.

7 Q. So Xing's candidate engine torque  
8 is also a forecasted torque value that would  
9 result if a candidate engine speed was selected  
10 and applied, correct?

11 A. If the associated power  
12 requirement is as calculated and if the losses are  
13 accurate, it's a way of approximating the  
14 candidate engine power and candidate engine  
15 torque.

16 It's Xing's algorithm to come up  
17 with a -- trying to get an accurate assessment of  
18 -- on if we operate the engine at this speed, how  
19 much torque will be needed.

20 Q. And once the candidate engine  
21 torques are calculated, Xing then uses the  
22 candidate engine speeds and the candidate engine  
23 torques to assess how to efficiently achieve the  
24 load power requirement, correct?

25 A. I -- I didn't understand where

1 you went in this table from there. I thought we  
2 were moving on to the next column, so forgive me.

3 The next column is Engine  
4 Efficiency, which Xing can then determine, given  
5 the candidate engine speed and the candidate  
6 engine torque, from the torque speed maps that he  
7 has for the given engine.

8 Q. And that's where -- that's Xing's  
9 Figure 11, right?

10 A. Yes, that would be one  
11 representation of Figure -- would be Figure 11,  
12 which is what is kind of a map that is typical  
13 that a person of ordinary skill would expect to  
14 see for an engine map with the fuel consumption  
15 data on it; again, either engine torque and speed  
16 or engine power and speed. And it's similar to  
17 the table in -- Table 4, Pic 4, in the '538  
18 patent.

19 Q. Are any of the other figures in  
20 Xing beyond Figure 11 engine maps for fuel  
21 consumption?

22 A. There are no figures after Figure  
23 11.

24 Q. Anything in Figures 1 through 10?

25 A. In -- so state the -- what's the

1 question again?

2 Q. Beyond Figure 11 in Xing, are any  
3 of the other figures engine maps for fuel  
4 consumption?

5 A. So the other maps, as we talked  
6 about a few minutes ago, Figure 10 is a fan power  
7 consumption; Figure 9, drive axle power  
8 consumption; Figure 8, power take-off power  
9 consumption; Figure 7, planetary unit power  
10 consumption; Figure 6, hydrostatic unit power  
11 consumption.

12 Those are the ends of the maps  
13 that are in Xing.

14 Q. So if we look at Figure 11 of  
15 Xing, the Y axis conforms to engine torque, right?

16 A. Figure 11 of Xing, the Y axis,  
17 the vertical axis, I'm assuming you mean, is the  
18 engine torque.

19 Q. And the horizontal axis is engine  
20 speed, right?

21 A. Yes.

22 Q. And if we look at Xing, column  
23 12, lines 36 to 47 -- let me know when you're  
24 there.

25 A. Which column, please?

1 Q. Column 12, lines 36 to 47.

2 The second half of that paragraph  
3 in the middle of column 12 where it starts: "For  
4 example, Figure 11 illustrates a fuel consumption  
5 map."

6 A. In column 11 [sic], line?

7 Q. 36.

8 A. 36. All right.

9 In the middle of the page. Okay.

10 Q. Right. And you can just review  
11 down to the end of that paragraph, please.

12 A. (Witness reviews document.)

13 So I thought we were talking  
14 about Figure 11. Is that what you wanted to talk  
15 about? I don't see Figure 11 mentioned starting  
16 at line 36 in column 11.

17 Q. I'm sorry, column 12.

18 A. I apologize if I misheard. I  
19 thought you said 11. Okay. (Witness reviews  
20 document.)

21 So I would -- could say that in  
22 line 12 of column 12, Xing does provide more  
23 detail than I had remembered in answering your  
24 question before about how one might consider the  
25 range of candidate engine speeds to use, and

1 there's a fairly interesting description between  
2 lines 12 to line 25. I would say consistent with  
3 what I said before, but providing more detail.

4 Q. Okay. Thank you.

5 A. So I read from between 36 and 48,  
6 or 47.

7 Q. Uh-huh.

8 A. And your question is?

9 Q. So after your -- now that you've  
10 had a chance to review that, if we look at Figure  
11 11, Xing says that that Point 300 in Figure 11 is  
12 the point at the minimum BSFC value, correct?

13 A. Yes.

14 Q. What is a BSFC value?

15 A. Brake-specific fuel consumption,  
16 is what it stands for. It's the same thing that's  
17 in the '538.

18 Q. And is that a measure of  
19 efficiency?

20 A. It is a measure of the amount of  
21 fuel that is used by the engine divided by the  
22 amount of power that the engine is producing in a  
23 steady state -- under steady state load  
24 conditions.

25 Q. So if we go back to Xing's Figure

1 5, we see that the second-to-last column is Engine  
2 BSFC Efficiency.

3 Do you see that?

4 A. Yeah. I have it right here.

5 Q. And then the next column after  
6 that, the last column on the right, is Fuel  
7 Consumption, right?

8 A. Yes.

9 Q. And what's the difference between  
10 a BSFC value and a fuel consumption rate?

11 A. So engine BSFC efficiency is a  
12 measure in terms of fuel used. So that would be  
13 grams per second, for example, or grams per hour,  
14 whatever units you want to represent mass per  
15 time, and then divided by the amount of power  
16 that's being produced by the engine. And so the  
17 SI units here are grams per --

18 Q. I was going to ask about this,  
19 and I don't mean to cut you off, but I think does  
20 -- does it make sense that that "cam" is a typo?

21 A. Yeah.

22 Q. Okay.

23 A. I was just all of a sudden go:  
24 "Cam"?

25 Q. It should be KW, right --

1 A. KW --

2 Q. -- for kilowatts?

3 A. -- yes. Yeah.

4 Q. Okay. On the same page. Thank  
5 you for confirming.

6 A. Okay. Yeah, I looked at that --

7 Q. So with that in mind, I think we  
8 can agree that that's a typo and that KW....  
9 Yeah, you -- you were explaining what BSFC --

10 A. Yeah, so it's --

11 Q. -- is relative to fuel  
12 consumption.

13 A. -- molecules used divided -- I'm  
14 sorry -- by the power, and the power is expressed  
15 in -- in kilowatts. And then the fuel -- so  
16 that's in -- in units of power. And then in -- it  
17 says "a unit conversion" to represent the fuel  
18 being consumed, grams of the fuel per hour.

19 I di- -- I didn't cite  
20 specifically how to convert that, but fuel  
21 consumption is -- in grams per hour is a direct  
22 related to the amount of fuel per hour that's  
23 being used divided by the power. So you eliminate  
24 the power, you get how much fuel. Multiplied by  
25 the power, you get the fuel that's used. And that

1 would be in grams, at grams per hour, at the  
2 forecasted load power requirement.

3 No, not the forecasted. This  
4 would be the candidate engine power, sorry.

5 Q. So looking back at Figure 11 now  
6 and that Point 300 that represents the minimum  
7 BSFC value, what's your understanding of what the  
8 rings radiating out from Point 300 represent?

9 A. Well, I don't believe that Xing  
10 explains what those lines are -- are for. If you  
11 know differently, I'm happy to interpret what he  
12 describes about them.

13 Q. Unfortunately, I would agree. I  
14 don't think Xing does explain what those lines  
15 are, so....

16 A. So -- so, typically, you know,  
17 the world is not quite so simple is that there's  
18 just one operating point that is -- there -- there  
19 are multiple operating points that provide the  
20 same fuel consumption, and these, I believe, are  
21 iso fuel consumption lines.

22 Q. What is an iso fuel consumption  
23 line?

24 A. It means that anywhere on the  
25 line, that the fuel consumption will be the same.



1 But it will be lower than the -- excuse me, it  
2 will be higher, worse fuel used, than the 300  
3 point. So as you get away from that point, you --  
4 the fuel consumption will be higher. As you get  
5 towards that point -- I mean, this is not a real  
6 -- at least that not that I'm aware of. Usually  
7 -- sometimes you can have several islands in a  
8 torque speed map, but -- and -- but this one shows  
9 one where the best performance is, and these lines  
10 represent, would be my understanding, that -- how  
11 a POSITA would understand this, would be lines of  
12 fuel consumption which are higher than at the --  
13 at the Point 300.

14 Q. And would that be in terms of  
15 BSFC values?

16 A. Yes. Or fuel consumption values.  
17 Usually it's expressed in terms of BSC, which is  
18 what I felt -- well, I don't know, Point 300, I  
19 guess, is the number of the point. I don't know  
20 if 300 is supposed to represent a BSFC value.  
21 It's not a very good one.

22 Q. I think we -- I think we looked  
23 at that already. And at line 44, column 12 -- 43,  
24 44 -- talks about optimal efficiency point 300, at  
25 which the fuel efficiency means its maximized the

1 ID and the penalty assessed for the minimum BSFC  
2 value.

3 A. Right.

4 Q. So I think you previously  
5 explained that that 300 point is the minimum BSFC  
6 value.

7 A. Yes, it is. But, it doesn't  
8 represent -- it represents a value which is the  
9 best, minimum, but 300 is just a label that the  
10 patent uses, like the rest of --

11 Q. It's an element number, right?

12 A. Yeah, element number.

13 Q. It's not a value, right.

14 But so it's your understanding,  
15 though, that if that point 300 is the minimum BSFC  
16 value location on the graph, that then the rings  
17 radiating outward represent changes in BSFC  
18 values?

19 A. Yes.

20 Q. Okay. And just to clarify. A  
21 bit earlier, you mentioned "iso fuel" -- was it  
22 "iso fuel consumption"?

23 A. Yes.

24 Q. Is that capital I, capital S,  
25 capital O?

1                   A.       No. Iso as meaning "equal,"  
2   Latin for equal. Iso lines are lines that are  
3   similar slopes --

4                   Q.       Got it.

5                   A.       -- right? Iso.

6                   Q.       Thank you.

7                               So now we go back to Figure 5.  
8   And as we already mentioned, the last column on  
9   the right is labeled "Fuel Consumption." So the  
10   values in that Fuel Consumption column are  
11   calculated by multiplying the BSFC efficiency  
12   value times the associated candidate engine power.

13                              Do I have that right?

14                   A.       Yeah, let's do that. Multiply  
15   212 by 165. Should come out to 34,980. Anybody  
16   got a calculator? I do. So 212 times 16- -- no,  
17   candidate -- yeah, fuel efficiency is 212,  
18   candidate engine power is 165. Multiply is  
19   34,980.

20                   Q.       And that fuel consumption value  
21   in the right most column is what Xing is  
22   ultimately interested in, correct?

23                   A.       I think that's not correct. It's  
24   certainly one of the main focussing of the  
25   teachings, to try to minimize fuel consumption,

1 but one can minimize fuel consumption by not using  
2 the milling machine at all, right?

3 So you're trying to operate this,  
4 and so the question is: How do you need to  
5 operate your machine so if you -- in the case of  
6 the milling process, you're trying to control the  
7 milling speed cutter or the drum cutter, the  
8 rotor, to be turning at a specific speed. And so  
9 how can I maintain that rotor at a given speed and  
10 with potentially changing, you know, disturbances,  
11 because the loads are changing, the inefficiencies  
12 are potentially changing, how do I keep the -- the  
13 cutter turning at the right speed or the rotor  
14 turning at the right speed and at the same time  
15 meeting those process requirements that my --  
16 using as little fuel as I can. Or -- be as  
17 efficient as I can.

18 But that means fuel use.

19 Q. So would you agree that Xing is  
20 concerned with figuring out the engine speed that  
21 will achieve the load power requirement while  
22 consuming the least amount of fuel?

23 A. Could you say that again, because  
24 there was a lot in that question?

25 Q. So would you agree that Xing is

1 concerned with figuring out the engine speed that  
2 will achieve the load power requirement while  
3 consuming the least amount of fuel?

4 A. No, I -- I wouldn't agree with  
5 that statement. It's not the load power  
6 requirement. It's the total engine power  
7 requirement that is important. And that's one of  
8 his teachings, is that you can't just look at what  
9 the engine power is. You have to find out where  
10 the engine power is going and being able to  
11 forecast how much of that energy is going to be  
12 used by those different places, where it goes.

13 And so the fuel -- the minimum  
14 fuel use is associated with the -- the engine  
15 operating the machine and accomplishing all of its  
16 -- all of its work.

17 Q. So when you just said that it's  
18 the total engine power requirement that is  
19 important, were you referring to the Candidate  
20 Engine Power column in Figure 5?

21 A. The candidate engine power is how  
22 -- is one of the steps in how the -- how Xing's  
23 algorithm figures out which of these powers can be  
24 delivered by the engine most efficiently. And  
25 then it implements the speed that it came up with

1 that candidate engine power and adjusts the  
2 transmission ratios so that the actual speed of  
3 the engine times that transmission ratio -- or  
4 with the transmission -- excuse me, with the  
5 speed, desired speed that you want to go to, and  
6 the engine speed that you picked from these --  
7 this calculation, you deliver to the engine  
8 regulator, it measures the engine speed, it says:  
9 Okay, the desired speed for the rotor is  
10 such-and-such; therefore, set the transmission  
11 ratio to such-and-such a value.

12 If I do that, the hope is that  
13 I'll be operating close to this candidate engine  
14 power value, and, thus, I'll be consuming the  
15 least amount of fuel I can get away with.

16 Q. We're going to turn back to your  
17 declaration now. Could you turn to page 66,  
18 please?

19 A. (Witness complies.)

20 Q. All right. Here, starting with  
21 the heading "d)," you address the claim 1  
22 limitation regarding adjusting engine speed,  
23 right?

24 A. Yes.

25 Q. And as we see in the heading,

1     which I believe just repeats the relevant claim  
2     limitation, the engine speed is adjusted based, in  
3     part, on one or more predefined efficiency points,  
4     correct?

5                   A.       At least partially based on  
6     predetermined fuel consumption rates, and it  
7     provides for an optimum engine speed for different  
8     engine loads.

9                   Q.       Right, right. So I was going to  
10    go on. I was going to -- let me, just for the  
11    sake of the record, ask my next question.

12                            The claim requires that the  
13    predefined efficiency points are at least  
14    partially based on predetermined fuel consumption  
15    rates, correct?

16                   A.       That's -- I mean, you read the  
17    claim language correctly. So that's what it says.

18                   Q.       And the claim also requires that  
19    the predefined efficiency points provide optimum  
20    engine speeds for different engine loads, correct?

21                   A.       Well, you left off the part that  
22    says: "...partially based on predetermined fuel  
23    consumption rates," which I think is important,  
24    because I'm not really very clear about what  
25    predefined efficiency points are if they're not

1 based on fuel consumption rates.

2 But at any rate, that's what Xing  
3 practices and that's what the '538 uses is fuel  
4 consumption.

5 Q. Well, is it your understanding  
6 that that claim limitation reciting predefined  
7 efficiency points has two requirements for what  
8 those predefined efficiency points are or do?

9 And they follow right after, so  
10 I'll ask -- I just want to make sure we're on the  
11 same page in terms of understanding what the claim  
12 requires.

13 So this claim requires that the  
14 predefined efficiency points are at least  
15 partially based on predetermined fuel consumption  
16 rates, right? You agree that that's what the  
17 claim says?

18 A. I agree that's what it says, yes.

19 Q. And then the claim also requires  
20 that the predefined efficiency points provide  
21 optimum engine speeds for different engine loads,  
22 correct?

23 A. Could you rephrase your question  
24 slightly, or as much as you'd like.

25 Q. Let me try this. The end of the



1 claim element in heading d) says: "...and  
2 providing optimum engine speeds for different  
3 engine loads," right?

4 A. Those are the words in the claim,  
5 yes.

6 Q. Okay. What in the claim provides  
7 optimum engine speeds for different engine loads?

8 A. Okay. Could you repeat your  
9 question, please?

10 Q. What in the claim provides  
11 optimum engine speeds for different engine loads?

12 A. It's the -- it's this information  
13 that is assumed to be available on the  
14 predetermined efficiency points based on fuel  
15 consumption rates that allow you to choose the  
16 speed and -- and to try to determine from these  
17 efficiency points how much fuel you're going to --  
18 to use at that engine speed, given the engine  
19 loads.

20 And the map that is shown in the  
21 '538 as an -- as an example of this is shown in  
22 Figure 4. It shows relationships for the prime  
23 mover in terms of engine speed and engine load and  
24 shows which regions have how much fuel  
25 consumption.

1                   So you can find a pair of engine  
2 speeds and torques and see whether or not they  
3 meet a fuel efficient region. Try another pair,  
4 you can find a more fuel efficient region or not.

5                   So the claim refers one of  
6 ordinary skill in the art to a representation of  
7 the engine such as given in Figure 4. That's what  
8 somebody of ordinary skill in the art would  
9 understand as being used to find the optimum  
10 speed.

11                  Q.       So just to be clear, is it your  
12 understanding that the predefined efficiency  
13 points recited in this limitation have to: One,  
14 be at least partially based on predetermined fuel  
15 consumption rates; and two, provide optimum engine  
16 speeds for different engine loads?

17                  A.       So the -- the algorithm, the  
18 controller implemented method, is adjusting the  
19 engine speed, and it's adjusting the engine speed  
20 in such a way that it provides for an optimum  
21 engine speed for -- for different engine loads.

22                        So for each engine load, then  
23 there's a speed and efficiency at that operating  
24 point, and the algorithm is adjusting the engine  
25 speed based on a speed that's going to give good

1 fuel efficiency. Because there's more than one  
2 speed that can be used for the engine. It can  
3 operate at different speeds and still meet the  
4 requirement of turning the rotor at the desired  
5 speed because of the transmission -- transmission  
6 ratio that's going to be adjusted in the latter  
7 part of the claim.

8 So at this point it's just  
9 looking at the -- what would happen if you adjust  
10 the engine speed, given the -- an engine load and  
11 looking at how much fuel one uses in trying to  
12 provide an optimum engine speed for different  
13 engine loads.

14 Q. So is it your understanding,  
15 then, that in claim 1, it need not be the  
16 predefined efficiency points specifically that  
17 provide optimum engine speeds for different engine  
18 loads?

19 A. The fuel consumption at a given  
20 torque-speed combination is what determines how  
21 efficiently you can operate at. So the -- the  
22 idea is to choose an engine torque-speed pair that  
23 will allow the machine to meet its engine  
24 requirements, but also do so at minimum fuel  
25 consumption. Just like Xing was trying to do.

1                   Q.       When you say "the idea" in that  
2     last answer, are you referring to the idea -- what  
3     idea?

4                   A.       The way that a person of ordinary  
5     skill in the art, reading this patent and seeing  
6     this claim, would understand the claim element to  
7     mean what I just said.

8                   Q.       So I -- I'm asking, I think, a  
9     different, simpler question. Is it your  
10    understanding of claim 1 that the claim language  
11    providing optimum engine speeds for different  
12    engine loads modifies the previously recited  
13    predefined efficiency points such that that's a  
14    requirement of the predefined efficiency points?

15                  A.       The way that the science works is  
16    that the predefined efficiency points don't care  
17    about what speed the engine operates at or what  
18    torque the engine operates at. It just tells you  
19    where you can operate and for a particular fuel  
20    cost.

21                               So it shows you -- the engine map  
22    on -- in Figure -- Figure 4, I think it is --  
23    Figure 4 tells you -- shows you, by these fuel  
24    efficiency numbers that are listed in Figure 4,  
25    where is the most efficient place to operate your

1 vehicle, and that would be the high-efficiency  
2 areas which are these cross Xs, the boxes that  
3 have that pattern associated with high fuel  
4 efficiency as indicated in the legend of the  
5 figure.

6 Q. Is it your opinion, Dr. Stein,  
7 that Figure 4 of the '538 patent disclosed  
8 predefined efficiency points providing optimum  
9 engine speeds for different engine loads?

10 A. It's telling the -- the one of  
11 ordinary skill that the speed of the engine can be  
12 adjusted. It's teaching to adjust the speed by  
13 looking at that table in the predefined  
14 high-efficiency areas and choose an operating pair  
15 of speeds and engine loads, for different engine  
16 loads, that give the best so-called optimum speeds  
17 for different engine loads.

18 So giving the best fuel economy.  
19 That's the way someone would read that element of  
20 the claim. Not someone, but a person of ordinary  
21 skill in the art.

22 Q. Okay. So I asked about Figure 4,  
23 and I think your answer, at least finished, on the  
24 claim language. So do I have it right, though,  
25 that you would agree that predefined efficiency

1 points providing optimum engine speeds for  
2 different engine loads is a requirement in the  
3 claims?

4 A. I mean, you just read part of  
5 what it says there, so I'm not going to say that  
6 that's not in the claim. I'm saying what -- this  
7 element of the claim which starts with adjusting  
8 an engine speed of the engine based on "the engine  
9 load," which is the engine load you just  
10 determined, determining "an engine load of the  
11 engine," adjust "an engine speed" of "the engine"  
12 based on "the engine load" in one or more  
13 predetermined efficiency points, at least  
14 partially based on fuel consumption and providing  
15 optimum engine speeds for different engine loads.

16 So you are adjusting the speed of  
17 the engine, given the engine loads, to operate at  
18 these fuel-efficient regions of the torque-speed  
19 map.

20 Q. So below the heading now, if we  
21 look at paragraph 80 of your declaration, you  
22 discuss Xing's methods of determining engine speed  
23 adjustments, right?

24 A. Yes, I see paragraph 80.

25 Q. And you refer to Xing's Figure 5,

1     which we've discussed, correct?

2                   A.       Yes.

3                   Q.       Could you please review  
4     paragraphs 80 and 81 of your declaration and let  
5     me know what aspect of Xing you're relying on as  
6     disclosing the predefined efficiency points  
7     recited in the claim.

8                   A.       (Witness reviews document.)

9                   Okay. I've read those two  
10    paragraphs over again.

11                   And your -- could you repeat your  
12    question that was on -- pending?

13                   Q.       What aspect of Xing are you  
14    relying on as disclosing the predefined efficiency  
15    points recited in the claim?

16                   A.       So this -- these paragraphs are  
17    showing how we would understand Xing to be  
18    practicing this element of the claim, adjusting  
19    the engine speed based on trying to provide an  
20    optimum engine speed for different loads. And we  
21    already went through in -- in the table, Figure 5,  
22    of Xing, showing how it's adjusting -- it's  
23    looking for the speed that is going to have the  
24    system operate at the most efficient or lowest  
25    fuel consumption.

1                   So it's looking for an engine  
2 torque and engine speed that gives you the best  
3 fuel consumption. That would be column 1 and  
4 column 5, fifth column over, which is Candidate  
5 Engine Torque. Using that along with the fuel map  
6 in Figure 11, which has the fuel efficiency points  
7 that are claimed or the internal representation in  
8 the controller of how much fuel the engine uses,  
9 depending on what the engine speed and torque are.

10                   So Xing goes through and says: I  
11 have some options here. I can move around in this  
12 space. I'm adjusting -- I can adjust the engine  
13 speed, so what engine speed am I going to adjust  
14 to? I'm going to adjust to an engine speed that  
15 ends up giving me an operating point in this  
16 torque-speed space that is highly efficient as  
17 defined by these fuel-efficiency regions that --  
18 or points that are talked about in the claim but  
19 are shown as regions in the Figure 11 in Xing.

20                   Q.       Okay. So then it's your opinion  
21 that the predefined efficiency points recited in  
22 the claim are disclosed by the various ring-shaped  
23 regions in Figure 11?

24                   Do I have that right?

25                   A.       Well, you -- you used different



1 language, so I would say no.

2 Q. Okay.

3 A. I would say that Figure 11  
4 represents an engine map with fuel consumption  
5 regions shown on it, high efficiency, lower  
6 efficiency, which is the same kind of information  
7 that's provided in the '538 patent with Figure 4,  
8 which is a torque-speed representation of the  
9 engine with regions of efficiency fuel consumption  
10 shown as boxes that are -- have different kinds of  
11 shading, depending on how high or low the fuel  
12 consumption is, based on testing that they did.  
13 Just like the testing that you would -- that Xing  
14 did to get the Figure 11.

15 Q. Does Xing's Figure 11 disclose  
16 the predefined efficiency points recited in claim  
17 1 of the '538 patent?

18 A. I think that Xing does disclose  
19 an engine map with fuel consumption regions that  
20 allow the determination of the optimum operating  
21 condition in the same way that the '538 discloses  
22 a fuel efficiency representation of an engine with  
23 fuel consumption regions.

24 They are well-known  
25 representations in the art of how engine

1 characteristics of torque and speed look, and with  
2 the additional information included, which is  
3 often done this way, of how much fuel is used at  
4 any location in the figure. The two figures  
5 represent representations of engines, and fuel  
6 consumption and engines are quite commonplace.

7 Q. So was that a "yes"? Is it your  
8 opinion that Xing's Figure 11 discloses the  
9 predefined efficiency points recited in claim 1?

10 A. So the language "predefined  
11 efficiency points" is not very clear to me,  
12 because the '538 doesn't really define them, other  
13 than it shows an example that it -- in its  
14 description. And I look at that figure and say:  
15 Okay. This is what they're doing with these  
16 predefined efficiency points based on fuel  
17 consumptions and the torque-speed map. Oh, that's  
18 what Xing has over here in his representation.

19 They are -- I don't exactly know  
20 what fuel efficiency points are based partially on  
21 fuel consumption, except I understand that the  
22 embodiment that they provide that presumably is  
23 consistent with that claim language is also found  
24 in Xing.

25 Q. So is it your opinion that Xing's

1 Figure 11 discloses the predefined efficiency  
2 points because Figure 11 is used for the same  
3 purpose as the '538 Figure 4?

4 A. I'm saying that Figure 4 is used  
5 by the '538 patent to represent the information or  
6 the procedure, the control algorithm that's  
7 described in the claim language and the claim  
8 element that we're talking about.

9 And I understand that claim with  
10 some difficulty, because of the lack of -- because  
11 of the language or the lack of description of fuel  
12 efficiency points in the specification of the  
13 '538, except that it gives this nice Table 4,  
14 which is a common way of representing engine  
15 efficiencies in the form of a torque-speed map.  
16 And once I saw that, I said: Okay. That's what  
17 -- this is at least what they mean, the '538, and  
18 that's exactly what I find in the -- in Xing.

19 And so that's how I understand --  
20 have come to understand that claim element.

21 MR. SEKYI: Counsel, we've been  
22 going for about --

23 MR. ARGENTI: Yeah, it's a good  
24 time for a break. We can do that.

25 (Brief recess observed.)

1 BY MR. ARGENTI:

2 Q. Dr. Stein, could you turn to page  
3 79 of your declaration, please. That's where you  
4 address claim 4.

5 A. (Witness complies.)

6 Q. And as you note in heading b),  
7 claim 4 requires that the engine speed is  
8 automatically adjusted based on detected changes  
9 in the engine load, correct?

10 A. Yes.

11 Q. And claim 4 also requires that  
12 the engine speed is automatically adjusted  
13 according to one or more predetermined  
14 relationships providing a plurality of the  
15 predefined efficiency points, right?

16 A. Yes.

17 Q. Now if we could, turn to page 99  
18 of your declaration, please, addressing claim 11.

19 A. (Witness complies.)

20 Q. Claim 11 also requires  
21 automatically adjusting the engine speed according  
22 to one or more predetermined relationships  
23 providing a plurality of predefined efficiency  
24 points, correct?

25 A. Yes.

1 Q. Okay. We can turn back to 79  
2 now, page 79. And in the last sentence of  
3 paragraph 100, you state: "Xing teaches an  
4 algorithm where a controller of the resulting  
5 modified" --

6 A. Just a minute.

7 Q. Oh, sorry.

8 A. I got to find it.

9 Q. Page 79, three lines up from the  
10 bottom.

11 A. Okay. Is that the -- I thought  
12 you were talking about the last --

13 Q. I think that's the last sentence  
14 of paragraph 100, right? Are we at the same spot?

15 A. No. Oh, yeah. Yeah, yeah, yeah,  
16 okay.

17 Q. Okay.

18 A. Good.

19 Q. So that sentence reads: "Xing  
20 teaches an algorithm where a controller of the  
21 resulting modified milling machine would have  
22 automatically adjusted engine speed based on  
23 changes in detected load according to one or more  
24 predetermined relationships providing a plurality  
25 of predefined efficiency points."

1 Did I read that right?

2 A. Yes.

3 Q. And in support of that assertion,  
4 you cite, at the end of paragraph 100: "Xing  
5 column 9, lines 4 through 64; column 10, lines 16  
6 through column 12, line 11; and column 12, lines  
7 26 through 63," right?

8 A. Yes.

9 Q. I want to focus on the  
10 "predetermined relationships" part of claims 4 and  
11 specifically, okay?

12 A. The predetermined relationships,  
13 okay. Can you just give me a second? I'd like to  
14 read --

15 Q. Yes.

16 A. -- all of paragraph 100.

17 (Witness reviews document.)  
18 Okay.

19 Q. Okay. What aspect of Xing are  
20 you relying on as disclosing the predetermined  
21 relationships providing a plurality of the  
22 predefined efficiency points?

23 A. And I go on to explain all of  
24 this in paragraph 101, of how Xing teaches being  
25 able to adjust engine speed automatically to be

1 adjusted based on detected changes in the load,  
2 and then according to one or more predetermined  
3 relationships providing a polarity [sic]" -- pul-  
4 -- plurality -- why can't I say that word -- the  
5 plurality of the predefined efficiency points."

6 Plural. Plurality. Thank you.

7 Q. What were you just referring to  
8 there?

9 A. I mean, I -- I was reading the  
10 claim, saying that paragraph 101 gives more detail  
11 about how Xing practices -- how one of ordinary  
12 skill would understand that Xing practices what is  
13 being taught in claim 4, Element B, which is a  
14 deep-ended claim of the '538.

15 Q. I could be wrong, but I don't --  
16 I don't think you used the term "predetermined  
17 relationships" in paragraph 101, do you?

18 A. (Witness reviews document.)

19 I guess I don't use those  
20 particular words again, but.... I don't see the  
21 words expressed in paragraph 101, or the following  
22 two paragraphs, but I do see a description of how  
23 I believe a person of ordinary skill in the art  
24 would utilize the Xing teachings in the Willis  
25 reference, to have a machine that performs -- that

1 -- that practices the claim 4 of the '538.

2 Q. Well, practices claim 4 of the  
3 '538 absent any analysis regarding the  
4 predetermined relationships recited in the claim,  
5 correct?

6 A. So the -- no. I believe that  
7 these -- the relationships that the claim is  
8 referring to, we talked about the predefined  
9 efficiency points before, represented in the  
10 '538's Figure 4 -- let me check to be sure that  
11 I'm remembering Figure 4 (indicating) -- which is  
12 the basis of the '538's -- or it's the  
13 representation the '538 uses in its embodiment to  
14 help one of ordinary skill in the art understand  
15 what the '538 means by "predefined efficiency  
16 points" based on fuel consumption, that we talked  
17 about in the earlier claim, claim 1, claim element  
18 language.

19 And the same applies here, that  
20 the '538 is talking about one of ordinary skill in  
21 the art would understand that claim 4 is, again,  
22 referring to using the predetermined relationship  
23 that's in Figure 4, or in Xing's case in Figure  
24 11, and other relationships that Xing uses, one or  
25 more relationships, that help relate to finding



1 out the optimum operating condition and adjusting  
2 the engine speed so that you come out with that  
3 operating -- you know, that the engine is  
4 operating at an efficient region, so-called  
5 plurality of predefined efficiency points.

6 Q. All right. So is it your  
7 opinion, then, that Xing's Figure 11 discloses the  
8 predetermined relationship recited in claims 4 and  
9 11 of the '538 patent?

10 A. That's one of the pieces of  
11 information that Xing discloses as predetermined.  
12 It also provides the information that we've talked  
13 about going through in the other figures that Xing  
14 uses, which are efficiencies of the different  
15 components and trying to figure out the loss,  
16 power loss, element.

17 So there are other relationships  
18 there that are predetermined that Xing uses that  
19 one of ordinary skill would understand when  
20 applied in -- with Willis, would give them a  
21 machine that operates at the operating conditions  
22 that you want but with good fuel economy. Optimum  
23 fuel economy.

24 Q. And do those other predetermined  
25 relationships relating to power loss and the other

1 figures of Xing, would they satisfy the  
2 predetermined relationships recited in claims 4  
3 and 11, in your opinion?

4 A. Well, I haven't really tried to  
5 understand exactly what these predetermined  
6 relationships are, because I don't think they're  
7 very clearly described by the '538, and I look to  
8 what the teachings of the '538 are in terms of the  
9 figures in the specification.

10 And also being a -- looking at  
11 what a person of ordinary skill would know and  
12 understand that, okay, all this claim is doing  
13 here -- not all that it's doing, but what it's  
14 recommending, what it's teaching is to use a  
15 figure like Figure 4 and other relationships that  
16 relate to calculating or determining what speed  
17 you should be operating at given a particular load  
18 and considering the fuel consumption  
19 characteristics.

20 It doesn't limit it only to  
21 looking at engine characteristics, and Xing uses  
22 additional predetermined information to help it  
23 come up with a more accurate description of what  
24 the engine will be -- what conditions the engine  
25 will be operating at as things are adjusted.

1 Q. And is that part of what you were  
2 relying on when forming your opinions that claims  
3 4 and 11 are obvious in view of Xing?

4 A. I believe that as my declaration  
5 states in paragraphs 100, 101, 102, 103, that  
6 those paragraphs articulate, as I just said, the  
7 use of the information that is -- that one of  
8 ordinary skill would understand or what is being  
9 pointed to -- not pointed to, but being described  
10 by claim 4 in the '538 and understand that Xing's  
11 teachings -- well, let me -- let me -- I'm saying  
12 this the wrong way.

13 Because the one of ordinary skill  
14 would see the teachings of Xing in the context of  
15 Willis and would have -- it would have been  
16 obvious to that person of ordinary skill to adjust  
17 the engine in a power split trans- -- transmission  
18 in a milling machine application with Willis to  
19 allow operation at a desired cutter speed that  
20 operates at a minimum fuel use, or optimum  
21 efficiency.

22 Which is what is claimed in the  
23 '538. Actually is claimed outside of the -- the  
24 bounds of a milling machine, but is claimed more  
25 generally in the '538.

1                   Q.       I understand that that's your  
2       ultimate conclusion. I'm more interested in your  
3       specific opinions, Dr. Stein.

4                               Is it your understanding, do I  
5       have it right, that Xing Figures 6 through 11 all  
6       disclose examples of the predetermined  
7       relationships recited in claims 4 and 11; and that  
8       you would look to all of those in determining that  
9       those -- those claims are obvious?

10                  A.       I'm just saying that those are  
11       examples of the teachings of Xing, which are  
12       predetermined relationships that help determine  
13       the efficiency of your overall system.

14                  Q.       Which, if any, of Xing's Figure 6  
15       through 11 specifically are you relying on in  
16       forming your opinions regarding obviousness for  
17       claims 4 and 11?

18                  A.       So as I explained before and as  
19       it says here in -- in paragraph 101: "As  
20       explained with respect to claim limitation 1[b]  
21       above, Xing's algorithm measures and determines  
22       the current engine power needed to meet the  
23       machine's combined current load power requirement  
24       (P load) and the current power loss due to system  
25       inefficiencies (P loss)."

1 Xing, column 9; lines 27 through  
2 44.

3 "In addition, using efficiency  
4 data stored in memory, Xing's algorithm estimates  
5 current power loss based on current vehicle  
6 operating parameters."

7 Xing, column 9; 44 through 53.

8 "Having determined that current  
9 engine power and estimated current power loss, the  
10 algorithm calculates the current -- the machine's  
11 current load power requirement (P load)."

12 Xing, column 9, 53 through 56.

13 "Based on the continuous  
14 monitored engine loads, the controller calculates  
15 the polarity of engine settings using efficiency  
16 data such as the fuel consumption maps."

17 So in that description of the  
18 Xing algorithm, which we already went through  
19 before, it's using those Figures 5, 6, 7 to help  
20 it be able to estimate the losses in the system  
21 for these candidate engine speeds, and thus, be  
22 able to find the optimum -- to adjust the speed of  
23 the engine to an operating point that will be at  
24 minimum fuel use.

25 Q. I understand your opinions

1 regarding how Xing's algorithm operates, but  
2 because you didn't use the term "predetermined  
3 relationships" in your analysis, I'm still having  
4 trouble figuring out what aspects of Xing, that  
5 you just described, you would map specifically to  
6 the predetermined relationships recited in these  
7 claims.

8 MR. SEKYI: Objection.

9 BY MR. ARGENTI:

10 Q. So I would ask again: Which, if  
11 any, of Xing's Figures 6 through 11 would you rely  
12 on as disclosing the predetermined relationships  
13 recited in claims 4 and 11?

14 MR. SEKYI: Objection: Form,  
15 asked and answered.

16 THE WITNESS: So I -- I do -- if  
17 I look at Xing, all of this information  
18 in Figures -- Figures 6, 7, 8 are just  
19 examples of things that can be  
20 considered in terms of predetermined  
21 relationships that are used for  
22 determining P loss. They are examples.

23 BY MR. ARGENTI:

24 Q. Are they then examples of type --  
25 the types of predetermined relationships recited

1 in paragraphs 4 and 11?

2 A. I think that, you know, it's, as  
3 we described before. Figure 11 is a predefined  
4 relationship, as the claim language talks about  
5 one or more predetermined relationships. This is  
6 a relationship between torque and speed of the  
7 engine and the fuel use. So that is an example.

8 Xing provides more information  
9 than that in -- that fit into the general  
10 teachings of the -- of the patent. One of  
11 ordinary skill would -- would understand that they  
12 can use this information for helping determining  
13 the operating -- opt- -- adjusting the speed to  
14 the optimum operating condition using this  
15 predetermined language, and I -- the predetermined  
16 relationships, excuse me.

17 So these are predetermined  
18 relationships. And I -- so I think that that  
19 probably is sufficient, without repeating what  
20 I've already said.

21 Q. So do I have it right, then, that  
22 you are not relying on Xing's Figures 6 through 10  
23 as examples of the predetermined relationships  
24 recited in claims 4 and 11?

25 A. So I said that these were

1 examples of predefined information that leads to  
2 finding the operating -- optimum operating  
3 condition. So it isn't necessary -- these are  
4 just examples. And -- and if one were going to  
5 practice Xing's algorithm, one would presumably  
6 use the characterizations of some of the  
7 components that are listed here, maybe not all of  
8 them, maybe others that aren't listed here,  
9 depending on the machine design.

10 And regardless of how much of  
11 that information is used, the person who's  
12 practicing -- a person of ordinary skill in the  
13 art would have a, when combining Xing with Willis,  
14 machine that is -- that reads on claim 4 of the  
15 '538 patent, that meets the limitation.

16 Q. So is it your opinion that  
17 regardless of whether you're relying on Figure 6,  
18 Figure 7, 8, 9, 10, 11 of Xing, regardless of  
19 whether you're relying on any of those, that the  
20 predetermined relationships are disclosed by Xing?

21 I'm just trying to understand  
22 what you're relying on as disclosing the  
23 predetermined relationships.

24 MR. SEKYI: Objection: Form,  
25 asked and answered.



1 THE WITNESS: Yeah, I didn't say  
2 -- I don't agree with your  
3 characterization of what I said. I -- I  
4 would say that the initial -- or one of  
5 the main parts of Xing's algorithm is to  
6 have this predetermined relationship  
7 between the torque and speed and  
8 consumption of fuel by the engine.  
9 That's Figure 11.

10 So one of ordinary skill is going  
11 to be trying to modify the engine  
12 according to the characteristics that  
13 are contained therein to find the  
14 optimum.

15 And the other information is what  
16 Xing teaches, to be able to do that in a  
17 way that is an improvement over the  
18 prior art. How much of the  
19 predetermined information that one of  
20 ordinary skill in the art would want to  
21 make use of there is -- is a design  
22 choice.

23 BY MR. ARGENTI:

24 Q. During any of our breaks today,  
25 did you discuss your testimony or my questions

1 with Wirtgen's counsel?

2 A. No.

3 Q. Barring any follow-up after  
4 redirect, that's the end of my questions.

5 MR. SEKYI: No redirect.

6 MR. ARGENTI: All right. Thank  
7 you, Dr. Stein.

8 THE WITNESS: Thank you. Thank  
9 you for coming all the way out here.

10 FURTHER DEPONENT SAITH NOT.

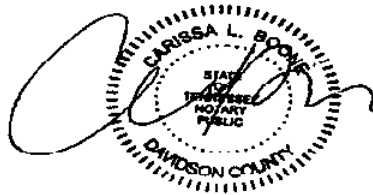
11 (Proceedings concluded at  
12 12:07 p.m. Central.)

REPORTER'S CERTIFICATE

I certify that the witness in the foregoing deposition, JEFFREY STEIN, Ph.D., was by me duly sworn to testify in the within entitled cause; that the said deposition was taken at the time and place therein named; that the testimony of said witness was reported by me, a Shorthand Reporter and Notary Public of the State of Tennessee authorized to administer oaths and affirmations, and said testimony, Pages 5 through 106 thereafter transcribed into typewriting.

I further certify that I am not of counsel or attorney for either or any of the parties to said deposition, nor in any way interested in the outcome of the cause named in said deposition.

IN WITNESS WHEREOF, I have hereunto set my hand this 1st day of June 2023.



Carissa L. Boone, LCR No. 382  
My License Expires: 6/30/2024

E R R A T A

I, JEFFREY STEIN, Ph.D., having read the foregoing transcript, Pages 5 through 106 do hereby certify said testimony is a true and accurate transcript, with the following changes (if any):

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\_\_\_\_\_  
JEFFREY STEIN, Ph.D.

\_\_\_\_\_  
Notary Public

My Commission Expires: \_\_\_\_\_