

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

HALLIBURTON ENERGY	)	
SERVICES, INC.,	)	
	)	IPR2021-01032
Petitioner,	)	
	)	IPR2021-01034
VS.	)	
	)	IPR2021-01036
U.S. WELL SERVICES,	)	
LLC,	)	IPR2021-01038
	)	
Patent Owner.	)	
	)	
	)	

ORAL AND VIDEOTAPED DEPOSITION
OF
ROBERT SCHAAF
JUNE 29, 2022

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ORAL AND VIDEOTAPED DEPOSITION OF
ROBERT SCHAAF, produced as a witness at the
instance of the Defendant and duly sworn, was
taken in the above-styled and numbered cause
on June 29, 2022, from 9:02 a.m. to 2:47 p.m.,
before KATERI A. FLOT-DAVIS, CSR, CCR, in and
for the State of Texas, reported by machine
shorthand, pursuant to the Federal Rules of
Civil Procedure and the provisions stated on
the record herein.

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P R O C E E D I N G S

THE VIDEOGRAPHER: We are on the record on June 29, 2022, at approximately 9:02 a.m., Central Time, for the remote video deposition of Robert Schaaf in the matter of U.S. Well Services, Inc., versus Halliburton Company.

My name is Jacob Figueroa. I am the videographer on behalf of Lexitas.

Will counsel please introduce themselves for the record, who they represent, beginning with the party noticing this proceeding.

MR. TOBIN: This is David Tobin from Baker Botts on behalf of Petitioner Halliburton Energy Services, Inc.

Also with me on the line is Brendan Shen.

MR. EVANS: This is Taylor Evans from the law firm of Hogan Lovells on behalf of patent owner, U.S. Well Services, LLC.

Also on the line with me is

1 Jay Yates from Patterson and Sheridan.

2 THE VIDEOGRAPHER: Will the court
3 reporter please swear in the witness.

4 (Witness sworn.)

5
6 ROBERT SCHAAF,
7 having been first duly sworn, testified as
8 follows:

9
10 EXAMINATION

11 BY MR. TOBIN:

12 Q. Good morning, sir.

13 A. Good morning.

14 Q. Could you please state your full
15 name and address for the record.

16 A. Robert Schaaf, S-c-h-a-a-f, 607
17 Frankfort Avenue, Huntington Beach, California
18 92648.

19 Q. Thank you, sir.

20 MR. TOBIN: I didn't hear it on the
21 read on, so just so the record's clear
22 and folks know, the deposition is being
23 taken simultaneously in IPR2021-01032,
24 2021-01034, 2021-01036 and 2021-01038.

25 Q. (BY MR. TOBIN) Mr. Schaaf, do you

1 understand that video and audio of the
2 deposition is being recorded today?

3 A. Yes, I do.

4 Q. Great.

5 I'll try to ask clear questions,
6 but if there's an audio delay or if you don't
7 understand the questions, just let me know and
8 I can repeat it or try to clarify it.

9 And if you need a break, just let
10 us know and we can go off the record.

11 Again, this isn't a marathon, so
12 I'll try to take breaks every hour. So if you
13 need one more frequently or -- that's fine.
14 Just let me know and we'll -- we'll take a
15 break.

16 A. Okay.

17 Q. Sir, do you understand you've been
18 sworn to testify truthfully to the best of
19 your ability, just as if you were in a court
20 before a judge or a jury?

21 A. Yes, I do.

22 Q. Is there any physical or other
23 condition that would prevent you from giving
24 truthful and accurate testimony here today?

25 A. No.

1 Q. And I think I recognize the
2 artwork, but where are you physically located
3 right now?

4 A. At Patterson Sheridan's offices in
5 Houston.

6 Q. Is there anyone else in the room
7 with you?

8 A. Taylor Evans is.

9 Q. Anyone else?

10 A. Nope. That's it at the moment.

11 Q. If anyone else joins the room --
12 just because we're all on video and can only
13 see a limited view of things, if anyone else
14 joins in the room, will you let me know?

15 A. Yes. I can do that.

16 Q. Thank you.

17 Sir, did you bring any notes or
18 other documents with you to the deposition?

19 A. Not -- not that I'm going to use.
20 I just have my back- or my case where I have
21 my computer and stuff.

22 Q. Okay.

23 And if there's a document you need
24 to reference that's on there, just let me know
25 and we can take a break and access that.

1 Sir, I see you're on video, so
2 you're using some kind of computer.

3 Is this your own personal laptop?

4 A. No.

5 Q. Is it a -- a firm laptop that
6 you're borrowing from Patterson Sheridan?

7 A. I -- I assume so. I haven't been
8 told that specifically.

9 Q. So the deposition is being
10 conducted over a Zoom-like interface.

11 I'll -- when we get to an exhibit,
12 or if you need an exhibit, just ask for it.
13 I'll drag it into the Chat window here.

14 You'll then have the ability to
15 download it, and it will most likely be a PDF
16 file. You can scroll through it, read
17 whatever pages you want, skip around, just
18 like you would any document on your computer.

19 Generally, do you understand how
20 that works?

21 A. Generally, yeah. It's always a
22 video challenge these days, so...

23 Q. Understood.

24 If there's any access- -- any
25 difficulty accessing any of the documents,

1 just let me know and we'll -- we'll get that
2 resolved.

3 A. Okay.

4 Q. Can you summarize your educational
5 background, please.

6 A. Yes.

7 I graduated from the University of
8 Southern California with a degree in chemical
9 engineering. I -- since that time I took
10 graduate business classes at Cal State
11 Bakersfield. And then also I've taken endless
12 courses, industry courses, related to the oil
13 and gas industry and other types of things
14 that are somehow related to -- to work.

15 Q. When was the first time you ever
16 visited a hydraulic fracturing site?

17 A. Probably 1981.

18 Q. Well, that's definitely before I
19 visited a hydraulic fracturing site.

20 Since then, how many hydraulic
21 fracturing sites would you estimate you
22 visited?

23 A. Probably in range of 50 to a
24 hundred, but that's just a guess.

25 Q. So as a ballpark estimate, you've

1 visited about 50 to a hundred hydraulic
2 fracturing site over your career?

3 A. Yes.

4 Q. Have you ever been to an electric
5 hydraulic fracturing site?

6 A. No.

7 Q. What is your understanding of what
8 an electric hydraulic fracturing is?

9 A. Well, that's where they use
10 electrical equipment for all the operations.

11 Q. Would there be any diesel equipment
12 on an electric hydraulic fracturing site?

13 A. Well, there could be, but that's --
14 it's all relative to what the situation is.

15 Q. What do you mean by that?

16 A. Well, there -- there could be
17 things that -- where other equipment from
18 other companies come to support it that could
19 have diesel with it.

20 Q. What other equipment would have --
21 could have diesel with it on an electric
22 hydraulic fracturing site?

23 A. Well, you could have trucks that
24 have it. You could have, potentially, pumps
25 for other operations and pumps for other well

1 site operations that are involved with the
2 fracture but -- fracturing but aren't doing
3 the fracturing work itself.

4 Q. So if -- if there's an electric
5 hydraulic fracturing site, why would there be
6 diesel pumps for other operations?

7 A. Just because of the nature of
8 the -- the -- what you have to do in an oil
9 field, is that there's all kind of things
10 going on at a well during the well operations,
11 and some of them might require bringing
12 equipment in.

13 Q. Is there any examples you have in
14 mind about diesel pumps on an electric
15 hydraulic fracturing site?

16 A. Well, for instance, you might need
17 some more water brought to the site, and a
18 truck -- a diesel truck would bring that water
19 to the site.

20 Q. Are you familiar with a pump down
21 pump?

22 A. Yes.

23 Q. Are you familiar with diesel pump
24 down pumps?

25 A. Yes.

1 Q. What are some of the reasons why a
2 diesel pump down pump would be used on an
3 electric hydraulic fracturing site?

4 A. Because you -- there would be a
5 number of potential reasons, but one of them
6 might be just that you want -- you don't want
7 to use the electric pumps for that operation,
8 or also you don't have the capability -- in
9 some instances, have the capability of doing
10 that.

11 Q. Are there any other reasons?

12 A. There could be endless reasons,
13 depending on the situation, because each --
14 each well site -- each well is different and
15 potentially it could do fractures in many
16 different ways.

17 So you can be dealing with many
18 different types of equipment that could be
19 going down a -- a well.

20 So with that, it would depend on
21 the situation itself and why you would be
22 needing an extra pump or needing something to
23 do that -- that work.

24 Q. So for certain situations there are
25 advantages to using diesel pump down pumps

1 over electric pump down pumps?

2 A. Could you repeat that?

3 I didn't get the first part of that
4 question.

5 Q. So there could be advantages for
6 using diesel pump down pumps even if you have
7 an electric hydraulic fracturing site?

8 A. It would depend on the situation.
9 In certain situations, yes, there could be
10 advantages. In certain situations it wouldn't
11 be advantageous.

12 Q. So you understand that the
13 U.S. Well patents date -- purport to date back
14 to 2012; is that right?

15 A. Yes. That's my understanding.

16 Q. By -- by 2012, do you consider
17 yourself to have been at least a person of
18 ordinary skill in the art?

19 A. Yes.

20 Q. Over the course of these
21 proceedings, you've reviewed several filings
22 from -- or declarations from Dr. Robert
23 Durham, correct?

24 A. Yes.

25 Q. All right.

1 Do you consider to him to have been
2 a person of at least ordinary skill in the art
3 by 2012?

4 A. Yes.

5 Q. By 2012, what kind of hydraulic
6 fracturing technology units or operations have
7 you personally worked on?

8 A. Could you repeat that question? I
9 don't know quite what you...

10 Q. By 2012, what kind of hydraulic
11 fracturing technologies have you personally
12 worked on?

13 A. I guess I -- I'd have -- you would
14 have to be a little more definite with that
15 question. That doesn't -- that's -- I don't
16 really know what you're getting at there.

17 Q. By 2012, did you have experience
18 with fracturing pumps?

19 A. Yes.

20 Q. By 2012, did you have experience
21 with motors to drive hydraulic fracturing
22 pumps?

23 A. I'm not sure.

24 Q. By 2012 did you have experience
25 with blenders on fracturing sites?

1 A. Yes.

2 Q. Are there any other units you've
3 personally worked on by 2012 related to
4 hydraulic fracturing?

5 A. When you say "any other" types,
6 what -- I don't know what you mean by that.

7 Q. You don't understand what a -- a
8 unit is on a fracturing site?

9 A. A what?

10 Q. A unit.

11 A. That's a very vague term. I don't
12 understand what exactly you mean by that.

13 Q. So did you -- by 2012, did you have
14 any experience with sand units?

15 A. When you say "sand units," I --
16 that's not a very specific term. That's -- to
17 me, that just means that you can -- it's --
18 it's dealing with the sand itself.

19 But there's all kinds of ways to
20 deal with sand, you know, things that are
21 dealing with the sand.

22 Q. So let me ask a different question.

23 By 2012, have you designed -- had
24 you designed any systems for hydraulic
25 fracturing?

1 A. I guess I would ask what do you
2 mean by "design."

3 Q. Do you have an understanding of
4 what the word "design" means, as an engineer?

5 A. Yes, I do.

6 But what I will say is I've worked
7 with the design of them, but -- and so -- but
8 I don't know if -- if that would answer your
9 question.

10 Q. When you say you've worked with the
11 design of them, you've worked with the design
12 of what?

13 A. Hydraulic fracturing systems that
14 would -- for -- for specific purposes.

15 And I guess --

16 (Simultaneous speaking.)

17 Q. What --

18 A. -- I should add that when a person
19 works on the design, there's usually multiple
20 people working on the design. So it's not
21 just one person that's designing it. It's
22 multiple people in various different
23 capacities.

24 So what your definition of "design"
25 is, is probably different than what my

1 definition of "design" is, or what it would
2 mean.

3 Q. What's your definition of "design"?

4 A. A person who's involved in the --
5 in the setup of an operation.

6 Q. Okay.

7 Have you been a person involved in
8 the setup of an operation of fracturing pumps
9 on hydraulic fracturing sites?

10 A. I've been involved in the setup
11 of -- of fracture -- fracturing jobs, yes.

12 Q. Have you been a person who's
13 involved in the setup of generators on a
14 fracturing site?

15 A. Yes.

16 Q. Have you been a person involved in
17 the setup of trailers on hydraulic fracturing
18 sites?

19 A. Yes.

20 MR. TOBIN: I want to discuss with
21 you some basics of hydraulic fracturing.
22 And for that I'm going to add an exhibit
23 to the chat window.

24 This is previously marked as
25 Exhibit 2005.

1 (Exhibit No. 2005 Previously
2 Marked.)

3 MR. TOBIN: And this is a
4 declaration you submitted for the '410
5 and '601 patents.

6 And let me know when you have it.

7 THE WITNESS: Okay.

8 We might need a little bit of help
9 in here.

10 Or -- I do have the declarations in
11 front of me, or I could access them on
12 paper if that would be helpful.

13 MR. TOBIN: Whatever is easier for
14 you.

15 THE WITNESS: Uhm...

16 Q. (BY MR. TOBIN) And just to make
17 sure we're talking about the same one, this is
18 an exhibit that's marked Exhibit 2005 in the
19 lower right-hand corner on the cover.

20 In the center of the page it says,
21 "Patents: 9,410, 410 and 8,789,601."

22 A. Yes. Yeah. It's U.S. Well
23 Services Exhibit 2005. Yes, sir.

24 Q. Okay.

25 Is that the one you have in front

1 of you now in paper?

2 A. Yes.

3 Q. Great.

4 Can you also see it on the screen?

5 A. Yes.

6 Q. Is what's shown on the screen, when
7 I'm looking at Exhibit 2005, does that match
8 what you see in paper in your version?

9 A. It looks like it does, yes.

10 Q. Great.

11 In your paper version, are there
12 any notes in there, or --

13 (Simultaneous speaking.)

14 A. No.

15 Q. -- highlighting?

16 A. No.

17 Q. So -- very good.

18 This is -- Exhibit 2005 is an
19 exhibit -- is a declaration you signed and
20 submitted?

21 A. Yes.

22 Q. If you look at what's labeled,
23 print page -- at the bottom right corner, do
24 you see how there's Page X of Y?

25 A. Where are you looking at?

1 Q. At the bottom right corner of the
2 cover it says, "Page 1 of 45."

3 A. Yes.

4 Q. Great.

5 If you go to Page -- go to Page 35
6 of 45.

7 A. Okay.

8 Q. Is that your signature on
9 October 12th, 2021?

10 A. Yes, it is.

11 Q. Okay.

12 Just to make sure we're looking at
13 the same thing.

14 So let's go to Page 15 of 45.

15 A. Okay.

16 Q. Do you see a -- do you see a
17 section called, "Technology Background"?

18 A. Yes.

19 Q. And this was a section you drafted
20 to help give the judges an understanding of --
21 of some of the basics of fracturing
22 technology?

23 A. Yes.

24 Q. And looking at Paragraphs 39, 40
25 and 41, here again you are drafting this to

1 give the judges a background of some of the
2 technology that came before the U.S. Well
3 patents, correct?

4 A. Yes.

5 Q. The -- Paragraphs 39 to 41, this is
6 technology background that would have been
7 well-known to a person of skill in the art
8 before 2012, correct?

9 I'm sorry, 39 and 40.

10 A. Yes. Paragraphs 39 and 40 would be
11 known by POSITAs, yes.

12 Q. Sorry.

13 And you -- I think I heard you
14 term -- use the term "POSITA," P-O-S-I-T-A.

15 You understand that to be short for
16 a person of ordinary skill in the art?

17 A. Yes.

18 Q. Okay.

19 So do you see on Page 16 of 45
20 there's a graphic, or a diagram?

21 A. Yes.

22 Q. With the caption: "Schematic
23 diagram of wellbore above gas bearing
24 formation"?

25 A. Yes.

1 Q. Describe for me at a high level why
2 you included this figure in your declaration
3 and -- and what -- what you were intending to
4 show with it.

5 A. Well, it schematically shows what
6 you are doing during a fracturing job and
7 what -- what's actually happening downhole,
8 and the general idea of the results that you
9 get from doing a fracture job.

10 Q. Would you agree that in order to
11 perform hydraulic fracturing, it is necessary
12 for the fluid that is pumped into the wellbore
13 by the fracturing pumps to flow into the
14 formation and cause the fracture?

15 That's just what hydraulic
16 fracturing is?

17 A. Yes. The fluids crack or fracture
18 the formation.

19 Q. And that basic process of just
20 fluid pumped into a wellbore, flowing into a
21 formation and causing cracks, that was known
22 before 2012, correct?

23 A. Yes.

24 Q. That same process was true whether
25 the pumps were powered by diesel or powered by

1 electric motors, correct?

2 A. Yes.

3 Q. So this is part of the basic
4 concept in hydraulic fracturing.

5 How does the fluid get from the
6 wellbore into the formation?

7 A. From the wellbore into the
8 formation?

9 Q. Yes.

10 A. Well, it's -- it's flowing down the
11 wellbore at high pressures and then it
12 enters -- once it gets there to the formation,
13 it enters the formation either through -- in
14 some cases, they've been open hole, and in
15 more recent cases, most of the wells nowadays
16 they perforate the wells, which it goes
17 through a hole in casing that's down there.

18 Q. So the two processes you just
19 mentioned, entering through an open hole or
20 through perforation in casing, were both of
21 those known before 2012?

22 A. Yes.

23 Q. So I want to ask you a few more
24 questions about the perforation in the casing
25 way in which fluid enters a -- the formation.

1 A perforation is a hole in the
2 casing, correct?

3 A. Yes.

4 Q. Usually the hole is shot through
5 the casing by a shape charge?

6 A. It's shot by a -- a perforating
7 gun, yes.

8 Q. And that process was in use well
9 before 2012, right?

10 A. Yes.

11 Q. The perforation in the casing acts
12 as an orifice that opens the wellbore to the
13 formation?

14 A. Yes.

15 Q. Then the perforation -- using a
16 perforation gun to provide an orifice for
17 fluid to enter the formation, that was
18 well-known technology by 2012, right?

19 A. Yes.

20 Q. Looking at the picture in
21 Paragraph 39 of your declaration, can you
22 describe where the perforations and fluid
23 entering the formation is shown in that figure
24 on Paragraph 39?

25 A. Okay. You mean the -- the thing

1 that's on the same page as Paragraph 40, that
2 diagram?

3 Okay.

4 Q. Yes, sir.

5 A. Just so we're making sure we're on
6 the same page. Yes.

7 If you go down to where it says
8 "gas bearing formation" on the picture, and
9 you look and you see where there's, like,
10 little vertical lines at various points along
11 that run, that's the -- where -- that's casing
12 there.

13 The perforations would be at
14 each -- that intersect where the up and down
15 lines and the horizontal lines go there.

16 Q. I think I understand, sir. So I'll
17 try to graphically describe it as well.

18 So if we look just above
19 Paragraph 40 on your declaration, there is
20 there is an L-shaped portion of pipe or casing
21 going into the -- into the gas bearing
22 formation.

23 A. Yes.

24 Q. Would you call that a pipe or a
25 casing?

1 A. Well, it is pipe, but it's referred
2 to in the oil industry as -- as casing.

3 Q. Okay.

4 Thank you, sir.

5 So the -- the casing goes into goes
6 into what we're going to call the gas bearing
7 formation.

8 That was just a basic feature of
9 hydraulic fracturing since well before 2012?

10 A. Yes.

11 Q. And then there are designated
12 orifices in that casing through which fluid
13 can enter the formation, correct?

14 A. Yes.

15 Q. And that also is a well-known
16 process, just a basic feature of hydraulic
17 fracturing, how it works?

18 A. I guess I'm not -- I -- there is
19 holes -- I agree with you that there is
20 holes -- there are holes put in the casing.

21 I don't -- it's -- and it would be
22 part of what you need to do to fracture the
23 well, to get some kind of opening there into
24 the formation.

25 Q. Okay.

1 And -- and, again, those types of
2 processes were routinely performed before
3 2012, correct?

4 A. Yes.

5 Q. So, just out of curiosity, do you
6 see the Footnote 1, which has a reference from
7 where you obtained that figure?

8 A. Yes.

9 Q. -- (inaudible) -- was there a
10 reason you chose the treehugger.com website
11 for that?

12 A. That's -- yes. That's where it was
13 obtained from. I believe that's where it was
14 obtained from. It's quite a while ago.

15 Q. Any reason you chose that
16 particular website?

17 A. No.

18 Q. Let's turn to your declaration,
19 Page 17 of 45.

20 Do you see there's a mechanic shown
21 here, labeled "Hydraulic fracturing wellsite
22 with diesel-powered equipment on vehicles"?

23 A. Yes.

24 Q. And the figure you're providing in
25 your declaration represents a typical diesel

1 fracturing spread prior to 2012?

2 A. I would -- I'd say it's -- it could
3 be representative of it. There's not
4 really -- there's so many different variations
5 that -- but I think this would be a good
6 representation of it.

7 Q. The picture in your declaration
8 would be a good representation of a diesel
9 fracturing spread prior to 2012?

10 A. Yes. It would be a good picture to
11 explain what -- generally what it looks like
12 at a fracturing site.

13 Q. With reference to this figure in
14 your declaration on Page 17 of 45 of
15 Exhibit 2005, how would a typical electric
16 fracturing spread be different than this
17 diesel fracturing spread you've shown?

18 A. Well, the difference would be that
19 instead of using diesel power, you would be
20 using electrical power for your operations,
21 and in some way you would have to get that
22 electrical power to your equipment.

23 Q. All right.

24 Any other differences?

25 A. Well, this is just a general

1 schematic or overview of it.

2 So in -- from that point of view,
3 that -- generally, you have all the same
4 things that you need for -- for the fracturing
5 part of it.

6 Q. Okay.

7 So is it fair to say that a
8 frac- -- a fracturing spread would be similar
9 to a -- sorry.

10 Let me ask a different question.

11 Is it fair to say that an electric
12 fracturing site would have a similar layout to
13 a diesel fracturing site, with the exception
14 of -- that you would need cabling for
15 electrical power to power various units?

16 A. I don't -- in -- in general, yes.
17 But then in the specifics it could be very
18 different, depending on what -- where you're
19 at, what you're doing, how you're setting it
20 up.

21 So, I mean, what -- what this shows
22 is that you've got a well in -- that you're
23 going to fracture.

24 You have fracturing pumps. You
25 have to have sand and frac fluids. You need

1 to have water out there. You need to have
2 blenders. And you need to have chemical
3 storage trucks.

4 Q. And all those units that you just
5 mentioned would be needed both on an electric
6 fracturing site and a conventional diesel
7 fracturing site, correct?

8 A. Well, you would need all that
9 material in order to perform a frac.

10 Q. Whether diesel was your source of
11 power or electricity, you would need all those
12 materials, correct?

13 A. Yes. Because that's -- these are
14 the materials that it takes to frac a well.

15 Q. So do you see in your figure you
16 show something called the "Data Monitoring
17 Van"?

18 A. Yes.

19 Q. Is a data monitoring van and data
20 van -- are those the same thing?

21 A. Probably, yes.

22 Q. What is the purpose of a data
23 monitoring van on a -- on a fracturing site?

24 A. Well, when you start the fracture
25 job, that's -- usually that's where the pumps

1 are controlled, and that's where you're
2 watching the pressures and temperatures and
3 all -- all that's going on out there, and
4 making any adjustments as the -- as the job is
5 moving forward.

6 Q. Does the data van act as a
7 centralized controller for a fracturing
8 operation?

9 A. When you say "centralized
10 controller," I guess that -- you would have to
11 define that a little bit better.

12 Q. Do you have an understanding of the
13 term "centralized controller"?

14 A. I do, but it could be used in many
15 different ways.

16 Q. What's your understanding?

17 A. Well, it's -- it's -- my
18 understanding -- or what I would say to the
19 question is that the centrali- -- it's a place
20 where the frac is being monitored and where
21 you -- people who are watching it can change
22 outputs or rates of what's being pumped.

23 Q. And using your definition, would
24 you agree that a data van acts as a
25 centralized controller?

1 A. From that point of view, yes.

2 Q. You mentioned the data van controls
3 the pumps and watches pressure and
4 temperature.

5 Is that just in data vans over the
6 last few years, or has that been true in data
7 vans since even before 2012?

8 A. Yes. That's been -- that was true
9 before 2012.

10 Q. Okay.

11 Do you see on the picture you show,
12 "Sand and Frac Fluid Storage Tanks"?

13 A. Yes.

14 Q. And also in your picture you show
15 "Frac Blenders."

16 A. Yes.

17 Q. Describe for me, please: How does
18 the sand get from the sand storage tank to the
19 frac blender in fracturing sites prior to
20 2012?

21 A. Well, even before 2012 there were
22 different ways that it would get there. But
23 they -- it has to be somehow moved from the
24 storage to the blender, either by -- by some
25 type of equipment -- transfer equipment.

1 Q. What kind of transfer equipment
2 were you aware of, prior to 2012, for moving
3 sand from the sand storage tank to the frac
4 blender?

5 A. Prior to 2012, I didn't really pay
6 that much attention to it so I couldn't tell
7 you how many different ones.

8 Q. Well, based -- based on what you
9 know today, what kind of equipment was
10 generally used prior to 2012 for transferring
11 sand from the sand storage to the frac
12 blender?

13 A. Well, you know, there -- there's
14 conveyor belts. There's just by gravity, by
15 dropping it into -- from the -- from the
16 storage containers into the -- going to the
17 blender. So it's getting there by gravity.

18 Or there's some kind of mechanism
19 by which it's -- it's transferred to it, kind
20 of like what you use a pump for, for fluids,
21 but more for moving solids.

22 Q. Are you familiar with an -- I may
23 mispronounce it -- an auger, a-u-g-e-r?

24 A. Yes.

25 Q. Is that one of the known pieces of

1 equipment to help transfer sand from the sand
2 storage to the frac blender?

3 A. Prior to 2012, I'm not sure whether
4 it was or wasn't.

5 Q. You're not sure whether augers were
6 used before 2012?

7 A. Yeah. I'm not sure of that, no.

8 Q. All right.

9 So I'm going to go to a different
10 piece of your declaration here.

11 Let's turn back to Page 16 of 45,
12 please. This is Paragraph 40 of your
13 declaration, Exhibit 2005.

14 And do you see a sentence that
15 says: "Providers of well services own and
16 operate a variety of specialized equipment,
17 which is transported to well sites on
18 vehicles"?

19 Do you see that?

20 A. Yes.

21 Q. And I know it's written in the
22 present tense here, but that was also -- that
23 statement was also true before 2012, correct?

24 A. Yes.

25 Q. Okay.

1 The specialized equipment, is that
2 the kind of equipment that is shown on -- in
3 the figure in -- on the following page?

4 A. In general, yeah. It's -- it's
5 just referring to fracturing equipment that's
6 designed for doing frac jobs. And that's
7 what -- that's why it's specialized.

8 Q. The fracturing equipment was
9 transported to well sites on vehicles.

10 What kind of vehicles were used
11 prior to 2012 to transport fracturing
12 equipment to -- to well sites?

13 A. Trucks.

14 Q. And the kinds of trucks that would
15 transport fracturing equipment to well sites,
16 these are the big semi-trucks with 18 wheels
17 or so?

18 A. In a lot of cases, yes; not in
19 all -- that's some of it there, but the --
20 (Simultaneous speaking.)

21 Q. It was known in 2012 to load
22 fracturing equipment onto trailers, correct?

23 A. Well, when you say "fracturing
24 equipment," much of the fracturing equipment
25 prior to 2012 were just part of, like, trucks

1 that came out there that already had the
2 equipment on the trucks themselves.

3 Q. I see.

4 So fracturing equipment prior to
5 2012 was -- was mounted on trailers. That was
6 pretty common.

7 A. Well, I -- no, I wouldn't say
8 "mounted on trailers." The trucks were
9 specifically designed to carry the -- or take
10 the fracturing equipment.

11 Q. And the trucks that were designed
12 to carry the fracturing equipment had trailers
13 on them to hold the fracturing equipment.

14 A. Not necessarily.

15 Q. Are you saying trailers were not
16 used prior to 2012 for fracturing equipment?

17 A. I'm saying that trailers were used
18 for some of the equipment or some of the
19 things that were used in the frac job, but
20 not -- not all of them.

21 Q. So what kinds of equipment were
22 typically transported with trailers prior to
23 2012, on a fracturing site?

24 A. Well, the -- the -- I don't know if
25 there's anything specifically I could say, but

1 sometimes storage units were -- were put on
2 trailers.

3 Q. Was it pretty common for fracturing
4 pumps to be put on trailers prior to 2012?

5 A. In certain places, yes, but not --
6 in most places that were -- fracturing pumps
7 were on specifically designed trucks that had
8 that equipment.

9 Q. Are you familiar with what a skid
10 is?

11 A. Yes.

12 Q. What is a skid?

13 A. A skid is a -- used, where you put
14 a piece of equipment on what's called a skid,
15 and so that could be lifted up and transported
16 easily on the back of a truck.

17 Q. So the purpose of skids was to help
18 transfer equipment on and off of the truck?

19 A. Yes. And it also provides so that
20 you can put, you know, multiple pieces of
21 equipment or fittings and anything else on
22 that skid itself.

23 So the skid is usually multiple
24 pieces of equipment or piping and equipment,
25 or something that makes it so it's useful.

1 Q. Was one of the considerations in
2 2012 for laying out a hydraulic fracturing
3 site -- was it reducing the footprint of the
4 equipment on the site?

5 A. In some cases.

6 Q. And it was known that space can be
7 at a premium in hydraulic fracturing sites?

8 A. In some cases that's -- that's
9 true, not in all cases.

10 Q. And I wasn't asking -- I didn't use
11 the word "all."

12 But it -- but it was known that in
13 some sites, to reduce the footprint of
14 equipment on that site, correct?

15 A. Yes.

16 Q. And would you agree that one way to
17 reduce footprint, prior to 2012, on a
18 hydraulic fracturing site was to reduce the
19 number of trailers or trucks on that site?

20 A. That would be one -- one way of
21 doing it, yes.

22 Q. Was it also known -- would you
23 agree that one way to reduce the number of
24 trailers or trucks on a hydraulic fracturing
25 site was to combine multiple pieces of

1 equipment on the same trailer or truck?

2 A. That would be one technique, yes.

3 Q. Are you familiar with hydraulic
4 fracturing sites having multiple pads?

5 A. When you say "multiple pads," I
6 think you'll need -- just so we're clear,
7 you'll need to define that a little bit
8 better.

9 Q. By "multiple" I mean two or more.

10 A. Okay. I -- not "multiple"; the
11 "pad" part. What -- what exactly do you mean
12 by "pad"?

13 Q. Do you have an understanding of
14 what a pad is on a hydraulic fracturing site?

15 A. I -- I know when somebody refers to
16 something with a site, it's a pad. But that
17 could have a -- multiple definitions.

18 Q. What's your understanding of what a
19 pad is on a hydraulic fracturing site?

20 A. Well, if -- if you have one well
21 the pad is, kind of, the area around the well
22 that's accessible to equipment.

23 Q. But, given your understanding of
24 the word "pad," prior to 2012 were there
25 hydraulic fracturing sites with more than one

1 pad?

2 A. Well, see, that's -- that's why I'm
3 saying that that's a very indefinite term, and
4 you'll have to define it better in order to
5 make a -- a clear answer for that.

6 Q. What's indefinite about the term
7 "well site"?

8 Or is it the word "pad" that's
9 indefinite?

10 A. It's the word "pad" that -- that's
11 used for multiple different things in the oil
12 industry.

13 Q. Prior to 2012, on hydraulic
14 fracturing sites was there ever a need to
15 transport fracturing equipment from one place
16 on the site to another place on the site?

17 A. Transfer equipment from --

18 Q. No, transport.

19 A. Okay.

20 Do you mean from one well to
21 another well?

22 Q. Yes, sir.

23 A. Yes. If you wanted to -- depending
24 on, you know, where the well was, yes. If you
25 wanted to frac one well and then go and frac

1 another well, yes, you would definitely need
2 to transport the equipment from one well to
3 another well.

4 Of course, that -- that says if
5 they're at different locations. In certain
6 places -- and it's done quite more often here
7 in the last 10, 15 years -- they -- sites have
8 been built with multiple wells at one site, so
9 that you could set up frac equipment at
10 this -- at one location and then just go from
11 well to well and frac one well after another
12 at that particular site.

13 Q. And another reason, am I correct,
14 that prior to 2012 trucks or trailers were
15 used was so that fracturing pumps could be
16 moved from one well site to another well site?

17 A. Prior to 2012, yes, you could use
18 trucks to go from one well to another well.

19 Q. And that was something that was
20 common in the industry?

21 A. Yes.

22 Q. Staying with the same document,
23 turn to Page 15 of 45, please, Paragraph 39.

24 You say -- you write: Hydraulic
25 fracturing is a process that increases the

1 amount of oil and gas produced from wells.

2 The process involves pumping fluid into a
3 wellbore at a high pressure."

4 Do you see that?

5 A. Yes.

6 Q. What rates of pressure would you
7 consider high pressure?

8 A. Well, it's well-known to a person
9 in -- in the industry what "high pressure"
10 would mean.

11 Q. What does "high pressure" mean?

12 A. Well, to a POSITA the pressure is
13 what -- they would understand what the "high
14 pressure" is.

15 Q. I'm asking you was that
16 understanding is.

17 A. Well, I think, generally, a POSITA
18 would agree that 8,000 to 12,000 psi would be
19 considered high pressure.

20 Q. Would pressure above 12,000 psi be
21 considered high pressure?

22 A. It could be considered, yes.

23 Q. Would pressure below 8,000 psi be
24 considered high pressure?

25 A. To some people, you know, somewhat

1 below it would be, you know, maybe the
2 7,500 psi, that would -- that would be
3 considered high pressure.

4 But, in general, it's -- it's
5 agreed upon that 8,000 to 12,000 psi is high
6 pressure.

7 Q. Is it generally agreed upon that
8 5,000 to 15,000 psi is high pressure?

9 A. No.

10 Q. You would not consider 5,000 psi to
11 be high pressure?

12 A. Not when -- not when we're
13 considering frac jobs, yeah. That is correct.

14 Q. Can hydraulic fracturing take place
15 at a pressure that is not considered high
16 pressure?

17 A. Yes. It depends on the formation
18 that you're fracturing. So if you're
19 fracturing -- some formations, especially
20 shallower formations, they -- they don't have
21 to go at high pressures.

22 Q. Well, some formations, such as
23 shallower formations, could be fractured at --
24 at low pressure, correct?

25 A. Yes. I mean, I guess that -- I

1 would have to see what your definition of "low
2 pressure" is to agree with that entirely, but,
3 in general, that would be the case.

4 Again, it depends on the formation
5 and what -- what we're talking about.

6 Q. Sure.

7 So -- but the point is -- is
8 that -- and I think I understand what you're
9 saying, is that you would consider high
10 pressure to be about -- let me know if this is
11 correct.

12 You would consider high pressure to
13 be about 8,000 to 12,000 psi, but that certain
14 fracturing jobs can take place at pressures
15 that are not high pressure.

16 A. Yes.

17 And it's dependent on the formation
18 itself, when the formation cracks or
19 fractures.

20 So the -- the hydraulic pressure or
21 the pressure on the formations is what
22 determines what it takes to fracture a well.

23 Q. And in some formations the -- the
24 pressure needed to fracture those formations
25 may not necessarily be high pressure.

1 A. That's correct. Yes.

2 MR. TOBIN: So I'm going to put
3 another document in the Chat window.

4 I think this is one you've seen
5 before. This has already been labeled
6 Exhibit 1013.

7 (Exhibit No. 1013 Previously
8 Marked.)

9 And let me know when you're able to
10 download it.

11 But I would also ask the
12 videographer to put it up on the screen,
13 please.

14 Q. (BY MR. TOBIN) So Exhibit 1013 is
15 labeled:

16 "Gardner Denver."

17 "Well Servicing Pump."

18 "Model GD-2500Q Quintuplex."

19 "Operating and Service Manual."

20 Do you see that, sir?

21 A. Yes.

22 Q. And this is a document you've seen
23 before?

24 A. Yes, I have.

25 Q. Okay.

1 I'll direct you to a certain page.

2 Turn to Page 20, please. It's

3 labeled "20" at the bottom right corner.

4 It says, "Halliburton Exhibit 1013,

5 Page 20."

6 Do you -- can you see that?

7 A. Yes.

8 MR. TOBIN: Can I ask the

9 videographer to zoom out, please, so

10 that Mr. Schaaf can -- can see the full

11 page?

12 THE VIDEOGRAPHER: (Complies.)

13 Q. (BY MR. TOBIN) And you agree that
14 Exhibit 1013 is disclosing specifications of a
15 Gardner Denver pump, correct?

16 A. Yes.

17 Q. Is the Gardner Denver GD-2500Q pump
18 one that is configured to pump fluid into a
19 wellbore at high pressure?

20 A. It depends on how the -- the pump
21 is set up and -- and what your expectations
22 are of the -- of the frac job, if you're going
23 to use it for fracking.

24 I mean, that's what my assumption
25 is.

1 Q. Uh-huh.

2 Do you see it can reach psis of
3 13,500 in one case, or 17,800 in another case?

4 Would --

5 (Simultaneous speaking.)

6 A. And -- oh, I'm sorry.

7 Q. And there's a given example of
8 stroke length and diameters.

9 So would you agree that the Gardner
10 Denver GD-2500Q pump is configured -- can be
11 configured to pump fluid into a wellbore at
12 high pressure?

13 A. Again, it depends on the specific
14 pump and how it's set up, what size plunger
15 and what type of rates that you have.

16 So it -- yes, it's a "yes" and "no"
17 answer. It depends on the setup and what your
18 expectations are of the pump.

19 Q. Would you consider any of the
20 setups, between plunger size and displacements
21 shown on the table, to be high-pressure
22 setups?

23 And you see that it's for a "Well
24 Stimulation Application."

25 Would you consider any of those

1 shown in the table to be high-pressure setups?

2 A. Yes. There are some ways if
3 you're -- if that was your -- the goal is to
4 have high pressure, you could set this pump up
5 to do that.

6 Q. And by "set this pump up to do
7 that," you're talking about picking a
8 particular plunger size or displacement?

9 A. That's correct, yes.

10 And excepting the fact that you are
11 going to be limited on how much fluid you can
12 pump.

13 Q. But you would agree, at least --
14 all that said, you would agree that shown on
15 Page 20 of Exhibit 1013 are several examples
16 of a high-pressure pump, correct?

17 A. That it has the capability of -- of
18 doing it if -- if -- depending on your
19 expectations are.

20 Q. So does -- whether or not a pump is
21 a high-pressure pump, does that depend on what
22 your expectations are?

23 A. Yes. Because that's -- that's
24 what -- if you're designing for
25 high-pressure -- pressure frac jobs, you want

1 a pump that can do high pressures.

2 If you don't need that and are more
3 concerned about rates, you would not set it up
4 for rates -- I mean, you would set it up for
5 rates, but not the high pressure, if that's
6 what -- you're more concerned about the rates
7 that you're pumping at.

8 Q. Do you see how on Page 13 there
9 are -- in the table there are several table
10 entries shown -- shown for various psis?

11 A. Yes.

12 Q. And psi is a pressure rating?

13 A. Yes.

14 Q. So for -- on Page 20 of
15 Exhibit 1013, for those setups showing a
16 pressure in the range of 8,000 to 12,000 psi,
17 you would agree that those are high-pressure
18 configurations?

19 A. Yes. If that was your goal on
20 these -- to set up the pump that way, get that
21 range of pressures, yes, that -- I would agree
22 with that.

23 I'm --

24 (Simultaneous speaking.)

25 Q. So this -- I'm sorry?

1 A. And I'm assuming that, like at the
2 top where it says 100, 150, 250 and 330, those
3 are different models of the pump.

4 Q. It says "Displacement at Pump
5 RPM..."

6 Do you see that?

7 A. Yes.

8 Q. So to show -- excuse me.

9 And I lost my page. I'm sorry.
10 Let me get back to it.

11 So just to pick one particular
12 example, do you see that there's an entry for
13 a displacement at pump RPM 100 for a five-inch
14 plunger size that will deliver 10,000 psis?

15 Correct?

16 A. Yes.

17 Q. So would you agree that for that
18 five-inch plunger size, this Gardner Denver
19 Exhibit 1013, Page 20, is disclosing a
20 high-pressure pump?

21 A. For that particular -- yes. For
22 the plunger size five and the 100 type, I
23 guess, would be a way -- would -- that we --
24 that has the capability of high pressure.

25 MR. TOBIN: I think I'm at a -- I'm

1 at a good stopping point for now. Let's
2 take a short break and reload on coffee
3 and then come back in a few minutes,
4 please.

5 THE VIDEOGRAPHER: The time is
6 9:58 a.m. We are going off the record.

7 (Brief Recess Taken.)

8 THE VIDEOGRAPHER: The time is
9 10:07 a.m. We are back on the record.

10 MR. TOBIN: Thank you.

11 Q. (BY MR. TOBIN) Mr. Schaaf, are you
12 familiar with what a turbine generator is?

13 A. Yes.

14 Q. What's your understanding of what a
15 turbine generator is?

16 A. Well, it's -- I guess, it simply is
17 a generator that uses a turbine, which is
18 something that spins to create electricity.

19 Q. For how long have turbine
20 generators been around?

21 A. Quite awhile. I don't know exactly
22 when they were first used.

23 Q. Would you at least say that turbine
24 generators have been around for several
25 decades by now?

1 A. Yes.

2 Q. What do turbine generators use as a
3 fuel source?

4 A. I guess -- the ones I've been
5 familiar with have used natural gas as a fuel
6 source.

7 Q. What turbine generators have you
8 been familiar with that use natural gas as a
9 fuel source?

10 A. The ones that I've dealt a lot with
11 are Solar -- the company is called Solar, but
12 it's -- they're not solar-generated. But
13 that's a division of Caterpillar, I believe,
14 or at least it used to be.

15 Q. For --

16 (Simultaneous speaking.)

17 A. Uhm --

18 Q. -- how long -- I'm sorry.

19 A. I was just going to add that I know
20 GE makes them, too, but I'm not as familiar
21 with them.

22 Q. For how long have you been working
23 with turbine generators in the hydraulic
24 fracturing context?

25 A. Not very long.

1 Q. For how long have turbine
2 generators been used in the hydraulic
3 fracturing context?

4 A. I don't know.

5 Q. In terms of the -- what is your
6 understanding of how a gas turbine generator
7 starts?

8 A. What do you mean, "starts"?
9 I don't know what...

10 Q. Well, would you agree that a gas
11 turbine generator needs a source of
12 electricity to start?

13 A. It could. I mean, there's --
14 there's other ways that you can probably
15 figure out how to start it.

16 Q. What would that source of
17 electricity be?

18 A. Well, it could be a battery.

19 Q. Are you familiar with gas turbine
20 generators being used in remote locations,
21 like offshore?

22 A. Yes.

23 Q. For how long have gas turbine
24 generators been used at -- in offshore
25 applications?

1 A. Any offshore application, or
2 just...?

3 They've been used in any offshore
4 application for quite a long time.

5 Q. Several decades now?

6 A. Yes.

7 Q. What about in the oil and gas
8 context?

9 How long have gas turbine
10 generators been used in offshore applications?

11 A. Gas turbine generators have been
12 used quite a bit for various applications for
13 offshore operations for quite awhile.

14 Q. What applications are you aware of
15 that -- in which turbine generators have been
16 used offshore for quite awhile?

17 A. Well, they've been used to create
18 electricity for operation -- for operating
19 platforms.

20 Q. For offshore drilling platforms?

21 A. For production platforms, for
22 drilling platforms.

23 Q. Is it fair to say that turbine
24 generators have been used for several decades
25 by now to produce electricity for offshore

1 drilling and production platforms?

2 A. I would -- I would say generally,
3 yes. I mean, I -- I don't know exactly how
4 much long they've been used for, but they have
5 been used quite a bit.

6 Q. You -- you would agree they've been
7 used quite -- well before 2012, right?

8 A. Yes. Yes.

9 Q. For offshore -- for turbine
10 generators, was it known that -- to use a
11 battery to start the turbine generator?

12 A. That's one way, yes.

13 Q. And that's been one way to start a
14 turbine generator for several decades now?

15 A. I would think so, yeah.

16 Q. You mentioned one of the companies
17 that you were familiar with that manufactures
18 turbine generators is General Electric.

19 A. Yes.

20 Q. Are you familiar with any models of
21 turbine generators by General Electric?

22 A. Not specifically, no.

23 Q. Have you heard of the TM2500 from
24 General Electric?

25 A. No.

1 Q. So taking you back to the 2012
2 timeframe, in what sizes were turbine
3 generators label?

4 A. I couldn't -- I couldn't answer
5 that without doing some research.

6 Q. Do you have a general range or
7 ballpark?

8 A. No, I don't.

9 Q. So -- and I should have specified.
10 I used the term "sizes" in terms of power
11 output.

12 Is that how you understood the
13 term?

14 A. That's how I would -- that's how I
15 would define it.

16 But I know that there's turbine
17 generators of all different sizes. They're
18 usually used in larger applications.

19 Q. All right.

20 Are you familiar with the general
21 physical dimensions of a turbine generator,
22 and how much footprint they take up?

23 A. I would just be guessing at that,
24 the specifics on something like that.

25 Q. Have you ever operated a turbine

1 generator on a fracturing site?

2 A. I haven't been -- I -- not the
3 specific operator, no. I'm not an operator of
4 turbine generators.

5 Q. Have you ever designed any aspect
6 of hydraulic fracturing to use a turbine
7 generator?

8 A. No.

9 Q. Have you ever seen a turbine
10 generator in the field?

11 A. Yes.

12 Q. When was that?

13 A. What's -- I don't know when --
14 specifically, I've seen them in the 19- --
15 late 1990s.

16 Q. So in the late 1990s when you saw a
17 turbine generator in the field, do you have
18 a -- can you give me a little more context as
19 to what that application was?

20 A. It was for providing power to on
21 offshore platform.

22 Q. In the 1990s when you saw that
23 turbine generator, what -- do you know what
24 its fuel source was?

25 A. Natural gas.

1 Q. So using natural gas to power
2 turbine generators, that was known at least in
3 the 1990s when you went and saw it, right?

4 A. Yes.

5 Q. For turbine generators to be
6 powered by natural gas, was that -- was there
7 some kind of compressor to compress the
8 natural gas when you saw it in the 1990s?

9 A. It typically -- the one I did,
10 it -- we had enough pressure from the gas
11 coming from the well that we didn't need to
12 put the compressor there.

13 But it's not -- it's typical that
14 you would need a compressor to get the
15 pressures up to what you would need for a -- a
16 turbine generator.

17 Q. And that's even back in the 1990s,
18 it was pretty typical to use a compressor to
19 increase the pressure of the natural gas to
20 power a turbine generator?

21 A. Yes.

22 Q. I want to ask you a few -- well,
23 actually, before we go there, do you still
24 have your declaration up on the screen?

25 A. I've had it in front of me.

1 Q. Okay.

2 So can you -- so we're on
3 Exhibit 2005. This is the declaration you
4 submitted for 9,410,410 and 8,789,601.

5 That's the document you have in
6 front of you, still?

7 A. Yes.

8 Q. Okay.

9 Let's turn to Page 18 of 45,
10 Paragraph 42.

11 Do you see in the last sentence you
12 say: "Electric pumps also require specialized
13 systems for control, such as a variable
14 frequency drive (VFD), which can control speed
15 and torque for alternating (A/C) motors"?

16 Do you see that?

17 A. Yes.

18 Q. And you agree with that statement,
19 because you wrote it, right?

20 A. Yes.

21 Q. Would you agree that a variable
22 frequency drive acts as a local controller for
23 a hydraulic fracturing pump?

24 A. It operates at being able to
25 control the speed of the pump or the output of

1 the pump.

2 Q. The variable frequency drive
3 controls the speed of the pump, correct?

4 A. Well, it controls the speed of the
5 motor, which then controls the speed of the --
6 of the pump.

7 Q. So, in effect, the variable speed
8 controller, as you say here, is a -- is a
9 specialized controller for an electric pump.

10 Is that fair?

11 A. For an AC pump, yes, an alternating
12 current pump.

13 Q. What is an alternating current
14 pump?

15 A. Well, it's just a pump that runs on
16 alternating current, as opposed to direct
17 current.

18 Q. All right.

19 Is that what you would understand
20 an electric pump to be, is a pump that runs on
21 alternating current or direct current?

22 A. Yeah. Well, if it runs on
23 electricity, that would be an electric pump,
24 yes. That's...

25 Q. Why does an electric pump require a

1 variable frequency drive for control?

2 A. Well, an -- an AC electrical pump
3 requires a variable frequency drive because
4 you need to be able to control, at -- for a
5 frac job you need to control the output of
6 what you're pumping, so that you can pump it
7 at the rates and pressures that you need it.

8 Q. What does a diesel pump for -- use
9 as its local controller?

10 A. Typically, it uses something like a
11 throttle to -- to do that.

12 Q. So does a -- a variable frequency
13 drive act like a throttle, but for an electric
14 pump?

15 A. Yes.

16 Q. In terms of -- have you ever seen
17 variable frequency drives on a -- on a
18 fracturing site?

19 A. I don't believe so.

20 Q. In -- in terms of physical
21 proximity, would you agree that the variable
22 frequency drive would need to be located very
23 near the fracturing pump?

24 A. That would be, probably, a good
25 idea, yes.

1 Q. Why is that?

2 A. Well, just to keep all the
3 equipment that you're -- that's working
4 together close by, so that you don't lose
5 any -- you don't have any problems in the
6 transmission of power.

7 Q. Would you agree that a variable
8 frequency drive should also be located near
9 the electric motor that it's powering?

10 A. That's a good idea. That makes
11 it -- there's less things that you have to
12 deal with.

13 Q. Would it also be a good -- so, for
14 example, would it have been a good idea to put
15 the variable frequency drive, electric motor
16 and fracturing pump all on the same truck or
17 trailer?

18 A. That would be a good idea, yes.

19 Q. And putting the electric -- the
20 variable frequency drive, motor and pump on
21 the same trailer would have the advantage that
22 all of those units could be picked up and
23 transported together, right?

24 A. That would -- that would -- that
25 would be something that, if -- if we can set

1 up, would be a good idea.

2 Q. Putting a variable frequency drive,
3 pump and motor all on the same trailer would
4 also provide for better signal transmission
5 from -- between the components, correct?

6 A. That's possible, yes.

7 Q. The -- you say -- do you see
8 where -- in Paragraph 42 where it says
9 "...torque for alternating current motors"?

10 A. Where are we?

11 Q. We're in Paragraph 42 of your
12 declaration. You used the term "torque." I
13 want to ask you about that.

14 A. Specifically, which -- oh.

15 Q. Let me read -- I'll read the
16 sentence again, just so that the record is
17 clear, the sentence in Paragraph 42.

18 You say, "Electric pumps also
19 require specialized systems for control, such
20 as variable frequency drive (VFD), which can
21 control speed and torque for alternating
22 current (AC) motors."

23 Do you --

24 (Simultaneous speaking.)

25 A. Yes.

1 Q. -- see that?

2 A. Yes.

3 Q. All right.

4 And what's your understanding of
5 torque in the context of motors?

6 A. Well, it's the ability to twist and
7 turn; so, in other words, the ability to put
8 out pressure, ultimately.

9 Q. And just thinking back to high
10 school, the units of torque are generally
11 foot-pounds?

12 A. I think you're right. It's been
13 awhile since I've done -- worked with torque.

14 Q. That's fine.

15 Have you ever heard of torque
16 referenced as a pound-foot?

17 A. I think so but, again, I -- I --
18 it's been quite awhile since I've been in --
19 in physics classes.

20 Q. All right.

21 Is a variable frequency drive also
22 required to monitor parameters of a motor?

23 A. Again, can you repeat the question?

24 Q. Is a variable frequency drive also
25 required to monitor parameters of a motor?

1 A. It could be -- it -- it's not
2 required to, but it could be used for it. Or
3 there could be things associated with it to --
4 to do that.

5 Q. All right.

6 For how long have variable
7 frequency drives been known?

8 A. For -- I mean, for -- in general,
9 it's been quite a while. I mean, for -- for
10 other -- for other applications, if that's --
11 if that's the question.

12 Q. When you say "quite awhile," can
13 you give me an approximate decade for -- of
14 how long variable frequency drives have been
15 known?

16 A. Well, I know that they were known
17 in the 1980s. We used them for submersible
18 pumps in wells that produce the fluid.

19 And in that case the frequency
20 drive was on the surface and the pump was down
21 at the bottom of the hole. So -- so they were
22 quite a bit separated from each other in that
23 particular application.

24 Q. And that particular application
25 was -- that was in the oil and gas context?

1 A. Yes.

2 But I think I should add there that
3 at that time they were -- the -- they were --
4 the variable frequency drives were very
5 limited.

6 And so when you had to have high
7 torque, you would have to go to direct
8 current, which -- which that's where some
9 technologies advanced here in the last, say,
10 10 to 15 years, where -- I don't know the
11 exact amount of time, where variable frequency
12 drives on AC motors were -- were -- were more
13 applied, and a technology that was used more
14 often.

15 Q. But you would agree that in the
16 larger oil and gas context, variable frequency
17 drives have been used since at least the
18 1980s, right?

19 A. In some -- yeah. In some places,
20 that's the case.

21 I'm just saying that there was
22 limitations on what they could be used for
23 back then. And -- and some of the issues with
24 them have -- over the last, shorter term, been
25 resolved -- or not resolved -- people have

1 come up with solutions for.

2 Q. People have come up with solutions
3 for -- for variable frequency drives.

4 Are you aware of any companies that
5 were in the business of selling variable
6 frequency drives?

7 And -- and I should say selling.
8 I'm not talking about distributing. I'm
9 talking about manufacturing.

10 What companies have you been aware
11 of that manufactured variable frequency
12 drives?

13 A. Yeah, I don't -- I don't -- I
14 didn't get much into who was making them. I
15 was buying -- or working with the people that
16 were using the equipment, had the application
17 for them. So...

18 Q. So even going as late as 2012,
19 though, if we go back -- if we push the -- the
20 timing to 2012, are you aware of any companies
21 that were manufacturing variable frequency
22 drives?

23 A. I wouldn't -- I wouldn't say for
24 sure I know the answer to that question. So I
25 don't want to give an incorrect answer there.

1 I would have to check to see which companies
2 actually made them.

3 Q. That's not something you've looked
4 into before --

5 (Simultaneous speaking.)

6 A. No.

7 Q. -- as far as you know?

8 A. No.

9 Q. All right.

10 What about A- -- ABB?

11 Are you familiar with that company?

12 A. Yes, I am.

13 Q. What is ABB?

14 A. Well, it's a company that either
15 distributes -- mostly, I've been aware of them
16 as a company that has equipment available for
17 applications in the oil industry and other
18 industries.

19 I mean, they're a pretty big --
20 pretty big company that has quite an array of
21 different pieces of equipment that it sells.

22 And I -- you know, I don't know the
23 details of whether they actually make them or
24 not.

25 Q. Do you know if ABB has sold

1 variable frequency drives?

2 A. It wouldn't surprise me, but I
3 don't know specifically if they do or not.

4 Q. What about Toshiba?

5 Are you familiar with Toshiba
6 Industrial as a --

7 (Simultaneous speaking.)

8 A. Yes.

9 Q. What is your familiarity with
10 Toshiba Industrial?

11 A. They make -- like ABB, they make a
12 lot of different pieces of equipment available
13 to -- to the oil industry and many other
14 industries.

15 Q. Bringing you back to 2012, was it
16 known that Toshiba Industrial was a company
17 that made equipment available for the oil and
18 gas industry?

19 A. Yes.

20 MR. TOBIN: I'm going to -- let me
21 add another exhibit to the Chat window,
22 if I haven't done it yet.

23 (Exhibit No. 1002 Previously
24 Marked.)

25 MR. TOBIN: This is Exhibit 1002.

1 It's U.S. Patent No. 9,410,410.

2 Q. (BY MR. TOBIN) That's a patent
3 number you've heard of before, I assume,
4 right?

5 A. Yes.

6 Q. If I refer to this patent as the
7 '410 Patent, you'll know I'm talking about
8 9,410,410?

9 A. Yes.

10 Q. This is a patent for which you've
11 provided at least several declarations by now
12 and have reviewed pretty thoroughly?

13 A. Yes.

14 Q. So I want to ask you questions
15 about a few pieces in this patent.

16 First off, let's start with
17 Figure 1.

18 What's generally shown in Figure 1
19 of the '410 Patent?

20 How would you describe that figure?

21 A. Uhm, that's a fracturing layout.

22 Q. All right.

23 And Figure 2, you would also
24 characterize that as a fracturing layout?

25 A. Yes.

1 Q. So let's turn to Column 3. That's
2 on Page 5 of the exhibit.

3 A. Okay.

4 Q. And scroll down, starting around
5 Line -- there's a paragraph starting at
6 Line 54.

7 A. Okay.

8 Q. Do you see the paragraph begins:
9 "The VFD can be designed..."?

10 A. Yes.

11 Q. And a few lines down it refers to
12 "National Electrical Manufacturers
13 Association."

14 Do you see that?

15 A. Yes.

16 Q. What is the National Electrical
17 Manufacturers Association?

18 A. It's just a trade association that
19 deals with electrical equipment and sets
20 standards.

21 Q. Is that a trade association you
22 knew about before you started working on the
23 case with U.S. Well?

24 A. Yes.

25 Q. Is that -- to those in the

1 hydraulic fracturing industry, is NEMA a
2 well-known organization?

3 A. I would -- I would guess so.

4 Q. And designers of electric motors
5 would want to make sure that their motors were
6 compliant with the specifications set forth by
7 NEMA?

8 A. Yes. That's -- that's primarily
9 what they're known for.

10 Q. If you look, starting at Line 62,
11 it says: "Furthermore, with respect to
12 control capabilities, the VFD can provide
13 complete monitoring and protection of drive
14 internal operations, while communicating with
15 an operator via one or more user interfaces."

16 Do you see that?

17 A. Yes.

18 Q. When it's talking about "...the VFD
19 can provide complete monitoring and protection
20 of drive internal operations," by "drive" it's
21 talking about the variable frequency drive,
22 correct?

23 A. Well, it includes that and it could
24 include other aspects of it.

25 Q. And I think I understand what

1 you're saying, is that it may include other
2 aspects.

3 But just the word "drive," that's
4 talking about variable frequency drive, VFD,
5 correct?

6 A. Well, it doesn't specifically say
7 that. That's why I say it could be more than
8 just the VFD that it can provide information
9 on, which would be -- which would make sense
10 to do.

11 Q. I know it doesn't say that, but
12 just the word "drive," you interpret as -- VFD
13 stands for variable frequency drive?

14 A. Well, it could mean that.

15 But I also see that, yeah, it's
16 including the effects of the VFD on other
17 operations.

18 Q. Do you -- do you see that in this
19 passage here?

20 A. On -- on the second, "For example,
21 motor diagnostics can be performed
22 frequently..."

23 Q. Well, towards the end of that
24 paragraph, do you see where it says, "The
25 electric motor diagnostics can be disabled, if

1 desired, when using, for example, a
2 low-impedance or high-speed electric motor"?

3 (Pause.)

4 A. Yes --

5 (Simultaneous speaking.)

6 Q. That's in --

7 A. -- yes, I --

8 Q. -- Column 4.

9 A. -- see that.

10 Q. Why would a person of skill in the
11 art want to disable diagnostics when using a
12 low-impedance or high-speed electric motor?

13 A. Well, in certain -- in certain
14 situations your readings can be misleading --
15 misleading, and so you might want to disable
16 them, just so that your -- your -- that
17 things -- you don't need the specific readings
18 for that, and they may be misleading if you
19 get them.

20 Q. Well, I'm asking specifically about
21 the low-impedance or high-speed electric
22 motor.

23 What relevance does the motor being
24 low-speed (sic) or high-impedance (sic) have
25 an disabling diagnostics?

1 A. Well, I don't know specifically,
2 but I know that there's always situations that
3 could cause it to -- that you would want it to
4 do that.

5 Q. What does the motor being a
6 low-impedance or high-speed electric motor
7 tell you about the situation in which you
8 would want to disable diagnostics?

9 A. Well, the -- I don't know
10 specifically.

11 Q. What other parameters could be used
12 to selectively disable electric motor
13 diagnostics, besides the fact of it being a
14 low-impedance or high-speed electric motor?

15 A. None other, that I'm aware of.

16 Q. When you say none other than (sic)
17 you're aware of, is that just because you're
18 looking at what's written in the patent here?

19 A. But also because I don't -- I'm not
20 aware of any other reason you would want to do
21 that.

22 Q. And I guess there's a disconnect
23 here. I -- I'm not understanding.

24 The fact that the motor is
25 low-impedance or high-speed -- what effect

1 does that have on why you would want to
2 disable diagnostics?

3 A. I don't know specifically, but I
4 also know that there's always reasons that you
5 would want to take off the diagnostics in --
6 in an operation, because some applications
7 don't render themselves well to diagnostics
8 during those applications.

9 Q. So there's reasons to disable
10 diagnostics -- if I understand what you're
11 saying, there's reasons to disable electric
12 motor diagnostics that have nothing to do with
13 the fact of you using a low-impedance or
14 high-speed electric motor?

15 A. No, that's not what I said.

16 Q. So clarify for me, please.

17 A. What I said is that there are
18 sometimes reasons that you would want to
19 disable diagnostics. And a couple of them
20 could be low-impedance and high-speed electric
21 motors, because they could be -- give readings
22 that would be misleading to you.

23 Q. What readings could a low-impedance
24 or high-speed electric motor give that could
25 be misleading to you?

1 A. I don't know, specifically.

2 Q. And you said sometimes there are
3 reasons you would want to disable diagnostics.

4 What are all the reasons you're
5 aware of.

6 A. Well, if they're operating
7 incorrectly, you're getting misleading
8 information in a certain application.

9 Or if they're not working properly,
10 and that, by doing so, that they could force
11 you to shut down when you don't really need to
12 shut down.

13 Q. What operations are you aware of in
14 the context of diagnostics here that could be
15 operating incorrectly or not working properly
16 and force you to shut down?

17 A. That happens with just about any
18 kind of diagnostic equipment.

19 Q. So there would be reasons why a
20 person of skill in the art would want to be
21 able to disable diagnostics for any kind of
22 operating equipment?

23 A. There's different view- -- points
24 of view on that. But in -- but there are
25 cases where your diagnostics are giving you

1 incorrect readings and are preventing you from
2 doing your -- whatever operation it is you're
3 trying to do.

4 Q. Is that anything new in this
5 patent, or it's been known for awhile --
6 before 2012, about the reasons to disable
7 diagnostics?

8 A. Well, the ability to be able to
9 disable them is -- is important, that if you
10 can have that capability, or it could be
11 important to -- it's important and it's -- but
12 it's not necessarily a feature that could be
13 there.

14 So it's a feature that -- that's
15 like an additional feature that's available.

16 Q. When you say "an additional feature
17 that's available," do you mean -- what do you
18 mean by that?

19 A. Well, I mean, it's just giving you
20 a different option of what you can do.

21 Like in a car, it's just like a --
22 you know, when you have something where you
23 can, like, change the speed of your wipers.
24 You don't -- it's an additional feature.

25 Q. When you say "it's an additional

1 feature," you mean an additional feature in
2 the patent?

3 A. In this case, yes.

4 Q. So is this additional feature of
5 disabling diagnostics something that's new or
6 novel?

7 A. Well, it's -- it's new -- it could
8 be new in this particular instance.

9 I haven't analyzed this particular
10 ground but, as far as I know, it's -- it's --
11 it's a feature of the equipment, so that --
12 that -- other equipment might not have this
13 feature, which could -- which is -- which
14 could potentially be very important.

15 Q. And as you read Lines 2 to 4 of
16 Column 4 of the '410 Patent, is it the
17 variable frequency drive that is disabling
18 electric motor diagnostics or is it something
19 else that would be disabling the electric
20 motor diagnostics?

21 A. I don't understand that question.

22 Q. Well, Paragraph -- Lines 2 to 4 are
23 written in the passive voice.

24 Do you see, "Electric motor
25 diagnostics can be disabled..."?

1 A. Yes.

2 Q. So I would like to ask that

3 converting to the active voice.

4 Which component or person or thing

5 would be doing the disabling?

6 A. You mean -- when it says "can be

7 disabled," that means that -- to me, that --

8 that means that someone can disable it.

9 Q. How would someone disable electric
10 motor diagnostics?

11 What would they do to disable
12 electric motor diagnostics?

13 A. Well, it depends on how it's set
14 up, but I assume it could be done by -- if you
15 had a switch that could do it, in some
16 instances.

17 Q. You would agree that the
18 '410 Patent here does not tell a person of
19 skill in the art what steps they can do to
20 disable the electric motor diagnostics; it
21 just says it can be done, correct?

22 A. Well, the patent is not meant to be
23 an instruction manual.

24 Q. The patent is not meant to be an
25 instruction manual?

1 A. Well, I mean, to tell you exactly,
2 you know, "Push this button here," "Push that
3 button there," as far as the operation of the
4 equipment.

5 Q. But you would agree with me that
6 one of the precepts of patents is that they're
7 supposed to teach people of ordinary skill in
8 the art how to make and use the inventions of
9 the patent.

10 Is that something you're familiar
11 with?

12 A. Not specifically, no.

13 Q. Would one of skill in the art
14 already know how to disable electric motor
15 diagnostics such that the patent doesn't need
16 to tell them the specific ways to do it?

17 A. Yes. Because they would know that
18 there's a -- they -- by what's said here, is
19 that there is a method by which it can be
20 done.

21 Q. Got it.

22 So before 2012, even -- you agree
23 that we need to look at patents from the
24 date -- the original filing date, the priority
25 date.

1 Is that --

2 (Simultaneous speaking.)

3 A. Yeah.

4 Q. -- (inaudible) --

5 A. I agree.

6 Q. And when you did your analysis in
7 this case, that's the perspective that you
8 provided, was looking at how one of ordinary
9 skill in the art would look at the patents
10 from the time of their priority date, right?

11 A. That's correct. Yes.

12 Q. At the time of the priority date of
13 the '410 Patent, a person of ordinary skill in
14 the art would have already known how to
15 disable electric motor diagnostics, correct?

16 A. If they were shown how to -- you
17 know, what -- what -- by reading what's in the
18 patent, they would know that it's possible to
19 do it.

20 Q. And they would know how to do it,
21 correct?

22 A. Well, they would know it could be
23 done.

24 Q. Would a person of ordinary skill in
25 the art know how to disable electric motor

1 diagnostics, as of 2012?

2 A. I guess I -- you would have to be a
3 little bit more specific on what -- what
4 exactly you're getting at on that, because
5 I -- I think I've answered the question, that
6 they would know it can be done and that there
7 was -- there was a mechanism in order to do
8 it.

9 Q. Was enabling and disabling electric
10 motor diagnostics a feature that was known in
11 the art before 2012?

12 A. In this particular instance, I
13 would say maybe not. But I don't -- I don't
14 know.

15 Q. You're not sure one way or the
16 other?

17 A. No.

18 Q. And -- I'm sorry. I think there
19 was a double negative there. I said, "You're
20 not sure," and then you said, "No, so am I
21 correct: You're not sure?

22 A. I'm not sure.

23 Q. Okay.

24 Thank you for that.

25 Looking at Column 4 again, you see

1 where it says, again, "a low-impedance or
2 high-speed electric motor"?

3 A. Yes.

4 Q. Are those -- when it says the word
5 "or," are those two synonyms or is that
6 describing two different kinds of motors?

7 A. I think it's -- it could be either.

8 Q. So there are low-impedance,
9 low-speed electric motors that --

10 A. I -- I haven't looked into that
11 closely, but I would -- I guess there could
12 be.

13 Q. And, similarly, there are
14 high-impedance, low-speed electric motors?

15 A. I don't know.

16 Q. Would you agree with me that -- so
17 in addition to a low-speed or high-speed --
18 low-impedance or high-speed electric motors,
19 there's a whole slew of other parameters that
20 could be used for -- as reasons to enable or
21 disable electric motor diagnostics?

22 A. I think it's important to know that
23 it can be done. That's -- that's -- that's
24 what's important here.

25 Q. Well, I don't think that answered

1 my question.

2 So do you need me to repeat it?

3 A. Well, it may not answer your
4 question, but I can't guess what everybody
5 else is going to do. I just know that having
6 that capability is a feature.

7 Q. And because -- when you say you
8 can't guess what everyone else is going to be
9 able to do, is that because there's many
10 reasons why a person would want to disable
11 electric motor diagnostics and there's many
12 situations that could arise where they would
13 want to disable electric motor diagnostics?

14 A. I wouldn't say many reasons, but
15 I'm sure there are reasons that people would
16 want to do that.

17 Q. Is a low-impedance motor less
18 reliable than a high-impedance motor?

19 A. I don't know.

20 Q. Is a high-speed electric motor less
21 reliable than a low-speed electric motor?

22 A. I don't know.

23 Q. Is a high-speed electric motor --
24 does the fact that it's high-speed provide
25 some additional reason why the diagnostics

1 should be disabled?

2 A. There may be readings that would be
3 misleading if you had a high-speed electric
4 motor.

5 Q. Could there also be readings that
6 could be misleading if you have a low-speed
7 electric motor?

8 A. I don't know. There could be, but
9 I don't know.

10 Q. Does the fact that a motor is low
11 impedance provide any condition that is more
12 likely to occur, to give rise to the need to
13 disable electric motor diagnostics?

14 A. I don't know.

15 Q. Is it fair to say that the -- this
16 '410 Patent doesn't tell you very much about
17 enabling or disabling electric motor
18 diagnostics? It just says that it can be
19 done?

20 A. In this -- in this area here, yes.
21 I would agree that that -- it's just letting
22 you know that it can be done.

23 Q. And there's not some other area of
24 the patent you're thinking of, is there, that
25 gives more information --

1 (Simultaneous speaking.)

2 A. Not that I --

3 Q. -- about --

4 A. -- can think of right off the top
5 of my head, no.

6 Q. All right.

7 So let's turn to Column 2 of the --
8 I think it's Column 2.

9 Yeah.

10 Let's turn to Column 2 of the
11 patent, please --

12 (Simultaneous speaking.)

13 A. Okay.

14 Q. -- the '410 Patent.

15 And I'm looking at Columns --
16 sorry -- Lines 16 to 18.

17 Do you see: "Furthermore, the
18 electric motor can have a high temperature
19 rating of about 1,100 degrees C, or more"?

20 A. Yes.

21 Q. Are you aware of any actual
22 electric motors that have a high temperature
23 rating that high?

24 A. I couldn't -- I would have to do
25 some research to come up with that.

1 Q. Does that seem like a typo,
2 1,100 degrees C, a high temperature rating of
3 a motor?

4 A. I don't know.

5 Q. Do you know what the melting point
6 of steel is?

7 A. Not off the top of my head.

8 Q. All right.

9 Would it surprise -- do you
10 understand that steel melts at about a little
11 over 2,000 degrees, maybe around 2,300 degrees
12 Fahrenheit?

13 A. It -- it's depends on which steel
14 you're talking about, as well.

15 So that's -- so that it -- I can't
16 specifically answer that question. I don't
17 know the answer without looking it up in a
18 table.

19 Q. Yeah.

20 Have you -- as part of your
21 investigation, have you looked -- well.

22 As part of your investigation, have
23 you looked at whether this 1,100 degrees C is
24 a reasonable number for a high temperature
25 rating of a motor?

1 A. No, I haven't.

2 Q. All right.

3 So you don't have any opinions one
4 way or another on -- let me ask a different
5 question.

6 So if I understand, are you --
7 you're not aware one way or the other if any
8 motors actually can operate at
9 1,100 degrees C?

10 A. I'm not -- I don't know one way or
11 another.

12 Q. And I could do the math for you,
13 but do you have a general sense of what
14 1,100 degrees C is in Fahrenheit?

15 A. I know it's pretty high.

16 Q. Yeah.

17 Would you agree -- well, I'll
18 represent 1,100 degrees C is about
19 2,012 degrees Fahrenheit.

20 A. That sounds like it's in the
21 ballpark.

22 Q. In your decades of experience in
23 hydraulic fracturing, have you ever heard of a
24 motor operating at around 2,000 degrees
25 Fahrenheit?

1 A. I've not ever really looked into
2 that, so I don't really have an opinion on
3 that.

4 Q. But you would agree 2,000 degrees
5 Fahrenheit is pretty high, right?

6 That's the kind of temperature you
7 would find in the kilns.

8 A. It's very hot, yes.

9 Q. That's the kind of temperature you
10 would find in, maybe -- in a kiln, k-i-l-n?

11 A. I don't know what types of
12 temperatures you'd find in a kiln. I mean --
13 so...

14 Q. And -- and your background -- I was
15 a chemical engineering undergrad, too, and so
16 I have an additional respect for a fellow
17 chem E.

18 You understand, 2,000 degrees
19 Fahrenheit is not the kind of temperatures
20 that steel is typically designed to withstand.

21 A. I know that's very high. But I
22 also know that, you know, we're -- in
23 technology today we have to deal with higher
24 and higher temperatures all the time, so --
25 for different applications.

1 Q. But do you think in 2012 there may
2 be some motors out there that can withstand
3 2,000 degrees Fahrenheit or 1,100 degrees C?

4 Or do you just --

5 (Simultaneous speaking.)

6 A. It wouldn't --

7 Q. -- (inaudible) --

8 A. -- it wouldn't surprise me, but I
9 don't know.

10 Q. Let me go a little bit later into
11 the patent.

12 Oh, yeah.

13 You agree that in patents, patents
14 describe a mix of things. It can describe
15 things that are known before, to set the
16 stage, and then it can provide -- describe
17 what the patent -- is new to the patent,
18 correct?

19 A. Yes.

20 Q. Okay.

21 I want to turn to Page 6 of the
22 '410 Patent, please, at the -- at the
23 paragraph starting at Line 44.

24 A. Okay.

25 Q. And why don't you take a moment to

1 read the '410 Patent, Column 6, Lines 44 to --
2 to 58.

3 A. That paragraph?

4 Q. And then if we could -- Column 6,
5 Lines 44 to 58.

6 A. (Witness reviewing exhibit.)

7 Okay.

8 Q. Okay.

9 You would agree that Column 6,
10 Lines 44 to 48 (sic), are -- is describing
11 something very similar to the technology
12 background that we talked about earlier, just
13 basic features of hydraulic fracturing that
14 have been known for decades?

15 A. Yes.

16 Q. So let's turn back --

17 MR. TOBIN: I think I'm done with
18 this. Give me just a minute.

19 Yeah.

20 Q. (BY MR. TOBIN) Let's turn back to
21 your declaration, Exhibit 2005.

22 A. Okay.

23 Q. And let me know when you have that
24 in front of you.

25 A. I do.

1 Q. Okay.

2 Very good.

3 And I want to turn towards the end
4 of your declaration, where -- it starts on
5 Page 29 of 47.

6 Let me -- actually, I misspoke.
7 I'm sorry about that.

8 It's Page 28 of 45.

9 It starts at the bottom, 74.

10 A. Okay.

11 Q. Okay.

12 And this is a section where you
13 describe what's known as secondary
14 considerations of nonobviousness; is that
15 right?

16 A. That's correct.

17 Q. And what is your understanding of
18 what secondary considerations of
19 nonobviousness are used for?

20 A. Well, in this case it's used for --
21 to show the commercialization of the equipment
22 and process.

23 Q. And in your mind what -- what does
24 that mean?

25 What relevance does that have on

1 whether the patent is obvious or not obvious?

2 A. Well, the secondary consideration
3 is -- is, kind of, standing on its own, as far
4 as what it -- what it tells, that the -- that
5 there's actually been use of this process, and
6 successfully used in making money.

7 Q. What relevance does it have if a
8 process has been used to make money, on
9 whether that process -- or product is
10 obvious -- on whether a patent is obvious or
11 not?

12 A. (Witness reviewing exhibit.)
13 Well, in Paragraph 30 I do mention
14 that: "I have been instructed that" -- the --
15 "obviousness is a question of law premised
16 on" -- the -- "underlying issues of fact, all
17 of which must be considered, including the
18 scope and content of" ... "prior art, the
19 level of ordinary skill in the art, the
20 differences between the claimed invention
21 and" ... "prior art, and secondary
22 considerations of nonobviousness.

23 "I understand that a patent for a
24 claimed invention may not be" --
25 claimed (sic/as read) -- "if differences

1 between the claimed invention and" ... "prior
2 art are such that the claimed invention as a
3 whole would have been obvious before the
4 effective filing date of the claimed invention
5 to a person having ordinary skill in the art
6 to which" -- "which the claimed invention
7 pertains."

8 Q. Do you have a general understanding
9 of what that paragraph you just read means,
10 and how to apply it?

11 A. Well, that -- I've been instructed
12 that if -- if there are secondary
13 considerations, such as commercialization,
14 that that needs to be considered in the
15 analysis of it.

16 Q. And have you considered the
17 secondary considerations in your analysis?

18 A. Yes.

19 Q. And did the secondary
20 considerations inform your analysis as to
21 whether any of the U.S. Well patents are
22 obvious or not obvious?

23 A. Well, the -- the secondary
24 considerations showed that U.S. Well Services
25 was commercializing the -- the technology.

1 Q. And when you say U.S. Well was
2 commercializing the technology, for which
3 patents was U.S. Well commercializing the
4 technology?

5 A. Well, for all the patents that were
6 in question today.

7 Q. All right.

8 You understand one of the patents
9 in question today is the '410 Patent?

10 A. Yes.

11 Q. And, in your view, U.S. Well
12 commercialized the technology of the
13 '410 Patent?

14 A. Or elements of it, yes.

15 Q. Well, when you say -- are you
16 saying commercialized the patent or elements
17 of the patent?

18 Which one was your opinion based
19 on?

20 A. Well, that they were
21 commercializing the patent, the entire patent.

22 Q. Got it.

23 Is that --

24 (Simultaneous speaking.)

25 A. That's my understanding.

1 Q. Is that also true, that U.S. Well
2 was commercial- -- and you understand that one
3 of the patents you're here for today has the
4 last three digits, 030, the '030 Patent?

5 A. Yes.

6 Q. And is it your understanding that
7 U.S. Well was commercializing the technology
8 of the '030 Patent at issue in IPR2021-01038?

9 A. Yes.

10 Q. What does it mean to commercialize
11 the technology of a patent?

12 A. Well, my understanding is that that
13 means that you're actually using it and
14 making -- making money doing it from the
15 patent information.

16 Q. By using it -- so as part of your
17 considerations of nonobviousness, when you say
18 "using the patent," do you mean that U.S. Well
19 was making a product or performing a process
20 that practices the claims of the patent?

21 A. Yes.

22 Q. So in forming -- so for the
23 '030 Patent at issue in IPR2021-01038 --

24 A. Hold on just a second. Let me get
25 that patent out so I can be looking --

1 (Simultaneous speaking.)

2 Q. Sure.

3 A. -- at it.

4 Q. Okay.

5 Do you want me to add it to the
6 screen?

7 Would that help you?

8 A. That's okay. If I can get myself
9 organized here.

10 Q. Yes, sir.

11 A. (Witness reviewing document.)

12 Q. I'm sorry. I think you opened a
13 document.

14 Just so we can know what you're
15 looking at, can you refer to the cover of that
16 document and tell me what it is, please?

17 A. Sure.

18 It's the: Halliburton Energy
19 Service, Inc., and Cimarex Energy Company,
20 Petitioners, versus U.S. Well Service, LLC,
21 Patent Owners.

22 "Case Number IPR2021-01038.

23 "Patent 10,408,030.

24 "Declaration of Robert Schaaf."

25 Q. Yes, sir.

1 So -- so Patent No. 10,408,030,
2 that's what I had in mind, was the
3 '030 Patent.

4 Is that how you understood it?

5 A. Yes.

6 Q. And the declaration you're looking
7 at from IPR2021-01038 is Exhibit 2008,
8 correct?

9 A. Yes.

10 Q. Got it.

11 (Exhibit No. 2008 Previously
12 Marked.)

13 Q. (BY MR. TOBIN) Would it help if I
14 repeated my original question, now that we're
15 all on the same page?

16 A. I think so, yes.

17 Q. All right, sir.

18 So in forming your opinions as to
19 secondary considerations regarding the
20 '030 Patent, was it your understanding that
21 U.S. Well, the patent owner, either sold
22 products or services that practiced the claims
23 of the '030 Patent?

24 A. When I -- when I wrote the -- put
25 together the -- the declaration, that was my

1 belief.

2 I have come to understand that
3 U.S. Well Services does not pump down
4 equipment -- does not pump down equipment into
5 wells, but that they -- they have -- they have
6 licensed the information or the technology to
7 ProFrac, which does do that.

8 Q. So at the time -- so at the time
9 you wrote your dec- -- I see.

10 So U.S. Well has never made or sold
11 products or services that pump down -- that do
12 pump down operations; is that your
13 understanding?

14 A. Pump down things like our
15 perforating guns or that type of thing,
16 that -- that type of pump down.

17 Q. I see.

18 Where did you get that
19 understanding?

20 A. From the -- the attorneys that I --
21 I'm working with.

22 Q. Okay.

23 So when you wrote your original
24 declaration -- turn to Page 97 -- I'm sorry --
25 Paragraph 97, please, on Page 34.

1 When you say, "Based on my review
2 of the U.S. WS Clean Fleet technology and the
3 '030 Patent, the Clean Fleet technology
4 embodies the claimed features of the
5 '030 Patent," was that an understanding you
6 got from someone else?

7 A. That was my understanding at the
8 time.

9 Q. Okay.

10 And it turns out that understanding
11 in Paragraph 97 is not correct, right?

12 A. Partially not correct, yes, That
13 the pump down -- or that the pump actually
14 pumping down of the equipment, the handling of
15 the equipment itself, that U.S. Well Services
16 does -- did not actually do, or hadn't done.

17 But they had licensed it to -- the
18 technology to ProFrac, who did do that type of
19 work.

20 Q. When did ProFrac start doing that
21 type of work, the pump down?

22 A. I don't know.

23 Q. What -- do you know if it was this
24 year or the previous year?

25 A. I -- I have no idea.

1 Q. Okay.

2 So for all you know, U.S. Well
3 Services or its licensees may never have
4 practiced the '030 Patent up until, let's say,
5 this year.

6 You're not sure when, right?

7 A. Well, in -- I guess it would --
8 what I would like to say is that it's kind of
9 misleading, in the fact that in the oil fields
10 there's lots of people out there, when you're
11 doing different types of operations,
12 especially when you're doing frac jobs, and so
13 if you're actually handling equipment or not,
14 you're -- you're somewhat involved in the
15 operation.

16 So you're involved with, say,
17 pumping it down. And so it could be -- the
18 interpretation could be a wider range.

19 And that's why, when I became aware
20 that it may have been misleading, what I was
21 saying there, I wanted to make that clear,
22 that that was misleading.

23 But -- but I wasn't intending to be
24 misleading. It's just that it wasn't being
25 done by U.S. Well Services themselves.

1 Q. And, sir, just to be clear, I would
2 never accuse you of intending to be
3 misleading. Mistakes happen.

4 A. Yeah.

5 Q. So in Paragraph 98, when you say --
6 Paragraph 98 of your '030 declaration,
7 Exhibit 2008, when you say, "The operation of
8 the Clean Fleet technology embodies the
9 claimed features of the '030 Patent," is
10 that -- intentionally or not, is that an
11 incorrect statement?

12 Clean Fleet does not embody the
13 claimed features of the '030 Patent?

14 A. I would not -- I would say it
15 would -- it does embody them, with the
16 exception that they have not commercially done
17 or handled equipment that they -- that was
18 sent downhole.

19 Q. Okay.

20 So Clean Fleet -- so would a more
21 correct statement be that: Operation of the
22 Clean Fleet technology embodies some of the
23 claimed features of the '030 Patent, but not
24 all?

25 A. Yeah. I would say -- I would say

1 it would be more -- it says all -- all the
2 features except for the handling of the
3 equipment that's being sent downhole -- being
4 pumped downhole.

5 Q. And so, again, so Clean Fleet
6 technology does not embody all of the claimed
7 features of the '030 Patent, correct?

8 A. That's -- that, I can live with.
9 Not all of them.

10 Q. Let's turn back to your '410 Patent
11 declaration, please.

12 Let me know when you're there.

13 A. Okay. I'm there. I've got the
14 declaration in front of me.

15 Q. Okay.

16 So please turn to Page 29 of 45 of
17 Exhibit 2005.

18 And this is in the IPR2021-01032
19 and 01033.

20 A. Okay.

21 Q. Got it?

22 Okay.

23 Are you there?

24 A. Yes.

25 Q. So do you see -- in Paragraph 77,

1 you say, "...it is my opinion that the Clean
2 Fleet product is coextensive with the
3 challenged claims of the '410 Patent" -- and
4 then there's more.

5 Do you see that?

6 A. Yes.

7 Q. When you were forming your opinions
8 in this case, what did you understand the term
9 "coextensive" to mean?

10 A. That -- that the Clean Fleet
11 product had -- had all the claims of the
12 '410 Patent.

13 Q. How were you able to determine
14 that?

15 A. By looking at the brochures and
16 equipment of what -- what was in their
17 products, and getting information about --
18 from sources, of whether or not that -- that
19 this was capable of doing these things.

20 Q. Did anyone provide you with facts
21 that you relied on in determining that Clean
22 Fleet was coextensive with the challenged
23 claims of the '410 Patent?

24 A. I -- I guess I don't -- you would
25 have to be a little more specific than that.

1 Q. Which piece of my question was not
2 clear?

3 A. I guess -- well, can you repeat the
4 question?

5 Q. Sure.

6 Did anyone provide you with any
7 facts that you relied on for your analysis
8 that the Clean Fleet product is coextensive
9 with the challenged claims of the '410 Patent?

10 A. Well, I did -- on -- on my
11 declaration, I did work with the attorneys on
12 what I was putting together, just so that we
13 were -- that I fully understood what was going
14 on, and that, if I did have any questions,
15 that they would be able to provide answers for
16 me so that I would be able to put together
17 a -- a correct declaration.

18 Q. And I -- and I want to ask this
19 very carefully, so I'm just going to ask a
20 "yes" or "no" answer.

21 Did -- did the attorneys provide
22 you facts that you relied on regarding whether
23 the Clean Fleet is coextensive with the
24 challenged claims of the '410 Patent?

25 A. I can't -- I don't know -- I don't

1 think I can answer that "yes" or "no."

2 Q. Is that because you don't know the
3 answer to my question or you don't want to
4 answer it?

5 A. Well, it's just that I can't answer
6 it "yes" or "no." I would have to give a
7 longer answer.

8 Q. Well, "no" is a pretty short
9 answer, right?

10 A. Well, I guess that's why I don't
11 want to be incorrect or misleading here,
12 because they provided me with lots of
13 materials that I relied upon to come up with
14 the declaration that was here.

15 And so to say that they gave it to
16 me would -- would not be correct. But they
17 did provide me information and provided
18 answers to questions that -- that helped me
19 come up with my opinions on this matter.

20 Q. Did you interview anyone as to
21 whether or not Clean Fleet practices the
22 claims with any of the U.S. Well patents?

23 A. Did I interview anyone?

24 No, I did not interview anyone.

25 Q. Did you speak with any of the

1 inventors as to whether Clean Fleet practices
2 any of the claims of the challenged patents?

3 A. No.

4 Q. Did you speak with any employees or
5 officers of U.S. Well in determining whether
6 Clean Fleet practices any of the claims of the
7 challenged patents?

8 A. No.

9 And I got it put in here, is that
10 the attorneys in this case, as well as every
11 other case I've worked with, have specifically
12 asked me not to talk with anyone besides
13 themselves on these matters.

14 Q. Okay.

15 So when you state that "Clean Fleet
16 product is coextensive with the challenged
17 claims of" -- "with the challenged claims,"
18 you understand that there's been several
19 versions or generations of Clean Fleet over
20 the years, correct?

21 A. Challenged -- you kind of blurred
22 there, but you said there's, kind of,
23 different generations of the Clean -- Clean
24 Fleet product?

25 Was that the question?

110

1 Q. Yes, sir.

2 Do you understand that there's been
3 different generations of Clean Fleet over the
4 years?

5 A. Yes. And this is -- this is
6 referring to Clean Fleet Gen 1.

7 Q. Got it.

8 Do you know which fleet number that
9 was, by any chance?

10 Or do you just --

11 (Simultaneous speaking.)

12 A. No.

13 Q. -- refer to it by generation?

14 A. Yeah.

15 No, I don't know that.

16 Q. Okay.

17 So it's your opinion that Clean
18 Fleet Generation 1 practiced the claims of the
19 '410 Patent?

20 A. Yes.

21 Q. And do you know when Clean Fleet
22 Generation 1 practiced the claims of the
23 '410 Patent, what year?

24 A. Not specifically, no.

25 Q. Do you have an estimate?

1 A. I think about 2014.

2 Q. And was it sufficient -- for you to
3 conclude that there were secondary
4 considerations of nonobviousness, was it
5 sufficient for you to conclude that the Clean
6 Fleet Generation 1 practiced the claims of the
7 '410 Patent?

8 A. Could you repeat that question?

9 Q. Let me ask a different question.
10 That wasn't a very good question.

11 So I'll -- I'll withdraw that
12 question.

13 So let's turn back to Paragraph 77
14 of your declaration.

15 And I think here you give the
16 reasons why you think Clean Fleet is
17 coextensive with the challenged claims of the
18 '410 Patent. And that's because "...each
19 comprise electric pumps powered by at least
20 one electric motor and a VFD."

21 A. Yes.

22 Q. The -- and so in your view, the
23 fact that Clean Fleet Generation 1 had pumps
24 powered by at least one electric motor and a
25 VFD, that means that Clean Fleet

1 Generation 1 was coextensive with the claims
2 of the '410 Patent, correct?

3 A. Yes.

4 Q. Do you know whether U.S. Well
5 designed or manufactured any of its own pumps
6 that it used in Clean Fleet?

7 A. I don't know the specifics on what
8 all they did -- you know, what they did or
9 didn't do.

10 Q. Do you know whether or not
11 U.S. Well designed or generated -- withdrawn.

12 Do you know whether or not
13 U.S. Well designed or manufactured its own
14 electric motor or variable frequency drive for
15 use in Clean Fleet?

16 A. Again, I don't know specifically
17 what -- you know, what they did. And it's
18 always, kind of, questionable about what --
19 you know, how much somebody does in these
20 days, because everybody is so specialized in
21 how you define it.

22 Q. Do you expect that U.S. Well is the
23 kind of company that would have been able to
24 design and manufacture its own pumps, motors
25 or VFD, or do you expect they would have

1 bought them from someone else?

2 A. Well, that's where it gets into
3 where it gets to be tricky, because, like,
4 it's my understanding that Sysco doesn't build
5 anything; they just design it and sell it.

6 And so that's where it's kind of
7 hard to answer questions like that, on what
8 exactly a company does as far as the equipment
9 that's done, because U.S. Well Services does
10 frac jobs.

11 So --

12 (Simultaneous speaking.)

13 Q. That's --

14 A. -- that's --

15 Q. -- something -- I'm sorry. I
16 didn't mean to cut you off, sir.

17 A. -- but that's -- that's their
18 business.

19 Q. All right.

20 So U.S. -- U.S. Well does -- are
21 you familiar with the kinds of companies in
22 2012 that would have designed -- withdrawn --
23 that would have manufactured fracturing
24 fleets?

25 A. No.

1 Q. Sitting here today, are you
2 familiar with any companies that manufacture
3 fracturing fleets?

4 A. I -- I couldn't tell you which
5 one -- who does that.

6 Q. All right.

7 So turn to Page -- Paragraph 79,
8 please, on Page 30 of 45.

9 You say, "I understand that the
10 commercial success of the Clean Fleet product
11 is due to the addition of all-electric motors
12 and electric pumps."

13 A. Yes.

14 Q. All right.

15 And what do you understand
16 "commercial success" to mean, in the context
17 of secondary considerations of nonobviousness?

18 A. Well, in this case their fleet was
19 more highly -- was more utilized than the
20 average frac fleet, from the different
21 companies around.

22 So the fact that they -- there was
23 more demand for the electric motors and pumps
24 made that a commercial -- be considered a
25 commercial success.

1 Q. When you say that it was more
2 utilized than the average frac fleet, what was
3 the utilization of U.S. Well?

4 A. I don't know exactly what it was,
5 but I -- at this point, when I was doing the
6 report, I knew it was high -- much higher than
7 the average frac utilization.

8 Q. What was the average frac
9 utilization in Two Thousand- -- what was the
10 average frac utilization for which you were
11 comparing?

12 A. Well, the frac utilization of
13 different companies that -- that do that type
14 of work.

15 Q. Which other companies were you
16 comparing U.S. Well against?

17 A. Just in general, the industry as a
18 whole.

19 Q. How much more utilized was
20 U.S. Well than the average frac fleet?

21 A. I don't know specifically, to
22 answer that question. I just know it was more
23 at this point.

24 Q. When you say -- what do you mean by
25 "more at this point"?

1 A. Well, at this point, meaning that I
2 didn't -- I didn't look back -- or I didn't
3 review the numbers about how much more or less
4 it was being utilized.

5 Q. So in forming your opinions as to
6 commercial success in this case, across the
7 various patents you've opined on, you didn't
8 review the financial numbers to determine
9 commercial success?

10 A. Yes, I looked at, you know --- or I
11 was -- I was able to look at the rates that --
12 their usage, whether -- their equipment and
13 compared it to the industry as a whole, to
14 come up with that understanding -- or
15 statement.

16 Q. Well, those rates aren't provided
17 in your declaration here.

18 Do you have a way to tell me what
19 those rates were, the rates of U.S. Well
20 compared to the industry as a whole -- the
21 rates of utilization?

22 A. I would have to confer with the
23 attorneys, but whether we were able to put a
24 supplemental declaration or something else to
25 provide that.

1 But I think that -- that's
2 possible, that we could do that. But I agree,
3 I don't have it in the report itself.

4 Q. And sitting here today, you don't
5 know what the rate of utilization for
6 U.S. Well against the industry was, correct?

7 A. Not off the top of my head right
8 now, no.

9 Q. When you were looking at the rate
10 of utilization in the industry, what did you
11 define "industry" to be?

12 Was it all fracturing companies,
13 electric fracturing companies, or something
14 else?

15 A. All fracturing companies.

16 Q. All right.

17 So all frac- -- you said you
18 compared U.S. Well.

19 So that would include diesel
20 fracturing companies?

21 A. Yes.

22 Q. Did you do any -- in forming your
23 opinions on secondary considerations across
24 the challenged patents, did you do any
25 investigation as to what U.S. Well's market

1 share was against the other companies?

2 A. Not specifically, no.

3 Q. In forming your opinions as to
4 commercial success in this case, did you do
5 any kind of discount or consider what effects
6 marketing or advertising would have on that
7 commercial success?

8 A. I guess I -- I don't know exactly
9 what you mean by that.

10 Q. Well, you realize sometimes
11 companies are successful not necessarily
12 because they have great products, but because
13 they have really great commercials or
14 advertising.

15 You do understand that, right?

16 A. Yes.

17 But --

18 (Simultaneous speaking.)

19 Q. So what I -- but so what I was
20 asking you: Did you do any investigation as
21 to the effects of commercial success
22 attributed to any kind of marketing or
23 advertising?

24 A. Well, I would assume some of the
25 success was due to the fact that there was a

1 demand for electric motors and pumps.

2 And so if that was part of the
3 market- -- if you consider that part of the
4 marketing, then yes, that -- that would be
5 part of it.

6 But that would be because they were
7 making it known that they have that, and for
8 the companies that were interested in that
9 kind of activity, then they would have it.

10 Q. And so your understanding that
11 U.S. Well was commercially successful because
12 they offered electric motors and electric
13 pumps, correct?

14 A. Yes.

15 Q. So are electric -- so there's
16 electric -- two terms here. There's "electric
17 motor" and "electric pumps."

18 What is an electric pump?

19 MR. EVANS: Counsel, we've been
20 going for a little more than an hour
21 here.

22 Do you mind if we take a break if
23 you're at a good place?

24 MR. TOBIN: Yes.

25 Can I ask that we answer this

1 question, and then let's take a break?

2 Just because there's a pending
3 question.

4 MR. EVANS: That's fine.

5 THE WITNESS: Well, it's just that
6 it makes clear that there are motors and
7 there are pumps. And a lot of times you
8 define electric pumps as -- just because
9 they're being powered by electricity.

10 MR. TOBIN: Got it.

11 I may come back to that, but let's
12 take a break.

13 THE VIDEOGRAPHER: The time is
14 11:27 a.m. We are going off the record.

15 (Brief Recess Taken.)

16 THE VIDEOGRAPHER: The time is
17 11:34 a.m. We are back on the record.

18 Q. (BY MR. TOBIN) So, Mr. Schaaf,
19 before the break we were talking about
20 electric pumps.

21 And would you agree it's possible
22 to have an electric pump that does not use an
23 electric motor?

24 A. Well, let me get back to the
25 paragraph we were talking about. I've closed

1 it up.

2 Q. Yes, sir.

3 I can reorient you, if that will
4 help.

5 A. Yes.

6 Q. We were -- we were in Exhibit 2005,
7 your declaration in the 1032 and 1033 cases,
8 and we were talking about Paragraph 79.

9 A. Okay. I'm back with you. Let's go
10 ahead.

11 Q. All right.

12 So here you refer to all-electric
13 motors and electric pumps.

14 Do you see that?

15 A. Yes.

16 Q. So you would agree that there is
17 such a thing as an electric pump that does --
18 it does not use an electric motor.

19 Is that right?

20 A. I don't agree with that.

21 Q. And so all -- all pumps -- where
22 did I go wrong?

23 A. Well, when I say "all-electric
24 motors," there's other things that motors are
25 used for on a frac operation, such as the

1 blenders.

2 And electric pumps are -- you know,
3 I was just wanting to be specific that the
4 pumps themselves were electric, as well.

5 Q. So maybe we're agreeing.

6 What do you mean by "the pumps are
7 electric, as well"?

8 Can you describe that for me?

9 A. Well, that they source -- their
10 prime mover is electric -- you know, an
11 electric motor.

12 Q. I got it.

13 So the pump has a -- is a built-in
14 electric motor and an electric pump?

15 A. Well, a pump is really -- there's
16 two parts to the pump, the thing that gets it
17 power to make it move, and then the equipment
18 that actually is moving the fluids there.

19 And so you have a -- a power source
20 and then the -- the -- the movement of the
21 fluid.

22 And so a lot of times they're
23 combined to say they're one thing, because
24 that's -- that's typically how people look at
25 them.

1 And in this case it's -- because
2 we're -- because of the matter that we're
3 talking about, I specified that they're
4 electric pumps, so meaning that it's electric
5 power that's giving the energy to -- to make
6 the pump operate.

7 Q. Okay.

8 Let's go down a couple paragraphs,
9 and Paragraph 81. Here and in your other
10 declaration you talk about a case that patent
11 owner filed against TOPS and Honghua,
12 H-o-n-g-h-u-a.

13 A. Yes.

14 Q. All right.

15 And -- and in your view, Honghua
16 was a competitor of the patent owner?

17 A. Yes.

18 Q. All right.

19 What analysis did you do of the
20 Honghua product, that it was offering?

21 A. Well, we viewed the petition in
22 this matter, and all of the equipment and
23 setups that TOPS and Honghua equipment had
24 were identical to the U.S. Well Services
25 equipment.

1 Q. When you say they were identical,
2 do you mean they used electric pumps and
3 motors?

4 A. The setup, the -- all -- all the
5 elements, as I -- as I mentioned in
6 Paragraph 83:

7 "The competing TOPS and Honghua
8 systems includes:

9 "a system for hydraulically
10 fracturing" ... "underground formation in an
11 oil" -- and (as read) -- "gas well to extract
12 oil" -- and (as read) -- "gas from the
13 formation, the oil or gas well having a
14 wellbore that permits passage of fluid from
15 the wellbore into the formation;

16 "a plurality of" -- "of H-6000HP
17 pumps, which are electric pumps fluidly
18 connected to the well and are powered by at
19 least" (sic/as read) "one electric motor and
20 are configured to pump fluid into the wellbore
21 at high pressure so that the fluid passes from
22 the wellbore into the formation and fractures
23 the formation; and

24 "a variable frequency drive
25 connected to the electric motor to control the

1 speed of the motor and frequently perform" --
2 "performs electric motor diagnostics to
3 prevent damage to" ... "at least one electric
4 motor."

5 And I could continue onward, but I
6 think you get the idea that their -- the --
7 their system was -- was a copy of the
8 U.S. Well Services.

9 Q. Did Honghua and U.S. Well use the
10 same brand of pumps?

11 A. I don't know.

12 Q. Did Honghua and U.S. Well use the
13 same brand of electric motors?

14 A. I don't know.

15 Q. Did Honghua and U.S. Well use the
16 same rating of electric motors, the output
17 horsepower?

18 A. I don't know.

19 Q. Did Honghua and U.S. Well use the
20 same number of fracturing pumps on the site?

21 A. Well, the number of pumps at a
22 fracturing site would vary from well to well,
23 and the necessity of it. So that wouldn't be
24 a fair comparison.

25 Q. Well, was there any instances in

1 which U.S. Well and Honghua used the name
2 number of fracturing pumps?

3 A. I'm sure there were.

4 Q. Okay.

5 Which ones?

6 A. I don't know.

7 Q. Did Honghua and U.S. Well use the
8 same brand of variable frequency drive?

9 A. I don't know.

10 Q. In the U.S. Well setup, how many
11 electric motors were powered with each
12 variable frequency drive?

13 A. Repeat that question.

14 Q. Sure.

15 In the U.S. Well setup, how many
16 electric motors were connected to -- to a
17 variable frequency drive?

18 A. I don't know the number of them.

19 Q. In the Honghua setup, how many
20 electric motors were connected to a variable
21 frequency drive?

22 A. I -- I don't know.

23 Q. Were the pumps -- the Honghua pumps
24 skid-mounted or mounted on something else?

25 A. Well, from the pictures that I saw,

1 it looked like they were skid-mounted.

2 Q. Was Clean Fleet skid-mounted --
3 were the pumps in Clean Fleet skid-mounted or
4 mounted on something else?

5 A. The Clean Fleet was mounted on a
6 trailer.

7 Q. The Clean Fleet was mounted on a
8 trailer -- the --

9 (Simultaneous speaking.)

10 A. Yes.

11 Q. -- pumps were mounted on a trailer,
12 and at Honghua the pumps were mounted on
13 skids?

14 A. From the pictures I saw, that's
15 what it looks like.

16 Q. So if I can summarize, is it a fair
17 summary to say that the reason you think that
18 the TOPS and Honghua system copied from
19 U.S. Well is because they use hydraulic
20 fracturing pumps that are powered by electric
21 motors and controlled by variable frequency
22 drives?

23 A. Well, that -- that starts it.

24 Like I said, I can continue reading
25 onward, if you would like me to, to go through

1 the entire details of why I said it's an
2 identical system.

3 Q. Well, I've listened to what you
4 read and -- and that's what I heard.

5 Are there any other components that
6 cause you to think that the -- that Honghua or
7 TOPS copied from U.S. Well, besides the fact
8 that it has variable frequency drives,
9 electric motors and pumps -- and fracturing
10 pumps?

11 A. Well: "Like the claimed Clean
12 Fleet product, the competing TOPS and Honghua
13 system includes an electrical" -- "electric
14 fracturing system with electric" -- "with an
15 electric motor, electric pump and a VFD.

16 "In my opinion, the TOPS and
17 Honghua system is substantially similar to the
18 claimed Clean Fleet product in the '410" ... "
19 and '601 Patent because each system includes
20 an electric fracturing system with an electric
21 motor, electric pump and a VFD.

22 "In my opinion, TOPS and Honghua
23 America, LLC copied U.S. Well Services's
24 claimed Clean Fleet system because: (1)
25 petitioner had access to the claimed invention

1 and (2) petitioner's competing product is
2 substantially similar to U.S. Well Services's
3 claimed Clean Fleet product.

4 "Based on my review of the
5 competing product and" ... "claimed Clean
6 Fleet product, petitioner's competing product
7 is substantially similar to the" --

8 (Simultaneous speaking.)

9 Q. Well, now you're moving --

10 A. Yeah.

11 Q. -- on from Honghua --

12 A. I'm sorry. I went too far. You're
13 right.

14 Q. Do you remember my original
15 question, sir?

16 A. You -- you asked if those things
17 were all that there were, and I'd say -- I've
18 read -- I've given you my opinion on it.

19 Q. Well, you've read your declaration
20 out loud to me.

21 But I'm reading your declaration,
22 also, Paragraph 84, and the basis for your
23 opinion that the TOPS and Honghua system is
24 similar to Clean Fleet is because each system
25 includes an electric fracturing system with an

1 electric motor, an electric pump and a VFD,
2 correct?

3 A. Yes.

4 Q. So the components you focused on,
5 for similarity -- in fact, the only components
6 you listed -- are electric motor, electric
7 pumps and a VFD, correct?

8 A. I -- I stand by what I put in my
9 declaration.

10 Q. Is what I said not correct?

11 A. I didn't say that.

12 I said I stand by what I put in my
13 declaration.

14 Q. Well, so -- and what's in your
15 declaration is that the Honghua system is
16 substantially similar to the U.S. Well Clean
17 Fleet because each system includes an electric
18 fracturing system with an electric motor,
19 electric pump and a VFD, correct?

20 That's your declaration.

21 A. That's correct, yes. That's what I
22 said in my declaration and I stick by that.

23 Q. So if the -- you're familiar with
24 the Coli reference in this case, correct?

25 A. Yes.

1 Q. If the Coli reference has an
2 electric fracturing system with an electric
3 motor, electric pump and a VFD, would you
4 agree that the Coli reference is substantially
5 similar to the Clean Fleet product?

6 A. No.

7 Q. Well, you agree that the Coli
8 system does have an electric motor, correct?

9 A. Yes.

10 Q. And you agree that the Coli system
11 does have an electric pump.

12 A. Yes.

13 Q. And you agree that the Coli system
14 does have a VFD.

15 A. Yes.

16 Q. Let's now turn to your allegations
17 that petitioner's competing product is
18 substantially similar to Clean Fleet.

19 That's Paragraph 86.

20 A. Yes.

21 Q. And then, Paragraph 89, you say
22 that: "Petitioner copied U.S. Well's" (as
23 read) -- Clean (sic/as read) -- "Fleet
24 system..."

25 Correct?

1 A. Yes.

2 Q. And when you say "petitioner"
3 you're talking about my client, Halliburton,
4 right?

5 A. Yes.

6 Q. So you're -- you're accusing
7 Halliburton of copying U.S. Well's Clean
8 Fleet -- Clean Fleet system, correct?

9 A. Well, that they -- they created a
10 system which was -- which was a copy of the
11 U.S. -- USWS system.

12 Q. Are you accusing Halliburton of
13 copying U.S. Well's claimed Clean Fleet
14 system?

15 A. No. I'm saying that they had a
16 system that was a copy of -- or identical
17 to -- may be the better word -- identical to
18 the USWS system.

19 Q. Okay.

20 So you're not excusing Halliburton
21 of copying U.S. Well's system?

22 A. No. I don't have any evidence of
23 that.

24 But I do know that it is an
25 identical system.

1 Q. And by "an identical system," you
2 mean that both petitioner's system -- well,
3 back up.

4 Let me ask you: You have no
5 evidence that Halliburton copied U.S. Well's
6 Clean Fleet system, correct?

7 A. I don't, no.

8 Q. I'm sorry?

9 A. I don't have any evidence of that,
10 no.

11 Q. Your understanding is that -- and
12 when you say that petitioner's Clean Fleet
13 system is identical to U.S. Well's system, do
14 you know what brand of variable frequency
15 drive petitioner used in its systems?

16 A. No, I don't.

17 Q. Do you know what brand of electric
18 motor petitioner used in its system?

19 A. No, I don't.

20 Q. Do you know what brand of
21 fracturing pump the petitioner used in its
22 system?

23 A. No.

24 Q. Did petitioner and U.S. Well use
25 the same brand of VFD in its system -- in

1 their system?

2 A. Please repeat the question.

3 Q. Did -- did Halliburton and
4 U.S. Well use the same brand of VFD in their
5 systems?

6 A. No -- I don't know. I don't know.
7 I'm sorry.

8 Q. Do you know if Halliburton and
9 U.S. Well used the same brand of electric
10 motors or fracturing pumps in their system?

11 A. I -- I don't know.

12 Q. Have you reviewed any site plans at
13 Halliburton as to how their equipment is laid
14 out?

15 A. I've seen pictures of it in their
16 brochures.

17 Q. Did you cite to any of those
18 pictures or brochures in your declaration?

19 A. I don't believe I did.

20 Q. Do you know what rating of electric
21 motors petitioner used in its systems?

22 A. Just that they had their thing
23 configured, the pump fluids and the wellbore,
24 at high pressures.

25 Q. And you agree that every company in

1 existence over the last several decades have
2 had their pumps configured to pump fracturing
3 fluid into the wellbore at high pressures,
4 correct?

5 A. No, I wouldn't say that's correct.

6 Q. Would you say the vast majority?

7 A. I -- I know that they -- they have
8 them at different pressure ratings over
9 various times for what -- what the particular
10 needs are of their customers.

11 Q. Did U.S. Well and Halliburton use
12 the same fracturing pressure?

13 A. Well, the frac- -- again, the
14 fracturing pressures is always dependent upon
15 what's in -- what the formation -- it takes to
16 frac the formation.

17 Q. Do you -- do you know whether, at
18 any formations, if U.S. Well and Halliburton
19 used the same fracturing pressures?

20 A. Well, if they've fractured in the
21 same formation, at the same depth, they
22 probably had similar fracture pressures.

23 Q. Are you raising a hypothetical or
24 do you have evidence that that occurred?

25 A. Well, just -- just because if

1 they've been out -- I'm just saying that I
2 don't know which particular wells each of them
3 have fractured and where exactly and what the
4 formations were, so...

5 Q. Do you have any evidence that
6 U.S. Well and Halliburton have ever been on
7 the same fracturing site together?

8 A. I don't know if that's happened or
9 not.

10 Q. And so I'm looking at Paragraph 90
11 of your -- of your -- I'm sorry. I said 90.

12 Paragraph 88, the top of Page 34,
13 and I'll -- I'll paraphrase the last sentence.
14 But is it basically your opinion that
15 Halliburton's fracturing fleets are
16 substantially identical to Clean Fleet because
17 both comprise electric pumps, motor and a VFD?

18 A. That -- that summarizes it, yes.

19 Q. And do you think that Halliburton's
20 all-electric fracturing fleet is substantially
21 similar to the fracturing fleet disclosed in
22 the Coli, C-o-l-i, reference?

23 A. Okay. So we're comparing -- just
24 to make sure we're clear, we're comparing
25 Halliburton with the Coli; is that correct?

1 Q. Yes.

2 A. No. Because the Halliburton fleet
3 can frac- -- can fracture at high pressures
4 where Coli can only fracture at medium
5 pressures.

6 Q. I got it.

7 So that's the only difference in
8 your mind.

9 And is that also true with the
10 U.S. -- your comparison of U.S. Well to Coli,
11 that the main -- that the difference between
12 U.S. Well's Clean Fleet and Coli is that Coli
13 is -- can only fracture at medium pressure and
14 U.S. Well can fracture at high pressure?

15 A. Well, that -- that's -- for that
16 specific issue, yes.

17 There are other things that Coli is
18 deficient on, and those were why you -- or
19 Halliburton had to add additional references
20 to -- to come up with why -- why you're -- why
21 you have this matter.

22 Q. So --

23 MR. TOBIN: Somebody's knocking on
24 my door.

25 (Pause.)

1 Sorry about that. That's one of
2 the joys of taking it in my office, is
3 that people knock on my door.

4 THE WITNESS: Well, I know the
5 problem you have.

6 Q. (BY MR. TOBIN) Okay.

7 Yeah.

8 Have you ever been to the Offshore
9 Technology Conference?

10 A. Unfortunately, no, I haven't. I've
11 always wanted to go there.

12 Q. So let's -- let's turn to the --
13 oh, by the way -- let me back up.

14 Now when you said Coli could only
15 fracture at medium pressure, is that based on
16 some limit of the hardware that Coli disclosed
17 or is that just based -- what's that based on?

18 A. It's based on the teachings of
19 Coli, reading through it. That's what its
20 patent is focused on.

21 Q. Is there anything about the
22 variable frequency drives in Coli that would
23 lead you to think that they could not support
24 fracturing at high pressure?

25 A. Well, I don't know, because

1 that's -- it doesn't -- it's not directed
2 towards high pressure, so I can't really give
3 an answer to that. It's only directed toward
4 medium pressure.

5 Q. In your view, what -- what pressure
6 range is considered medium pressure?

7 A. I think, again, a POSITA would
8 understand what that was, but it would -- and
9 so there's going to be differences of opinion
10 on what that is.

11 But, generally speaking, you're
12 talking in the range of, probably, 4,000 to
13 8,000 psi.

14 Q. Uh-huh.

15 Do you know what formation Coli was
16 targeting for fracturing?

17 A. Well, for medium pressures.

18 Q. Do you know what specific
19 formation?

20 A. Well, it -- I don't think that that
21 patent had anything specific about what
22 formations it was after. It was just after
23 medium pressures.

24 Q. Are you familiar with the Horn
25 River Basin?

1 A. Not -- not enough to be able to
2 talk about it.

3 Q. All right.

4 Did you do any investigation as to
5 what pump -- what pumps were used in Coli?

6 A. Well, I don't think it was -- it
7 was specified.

8 Q. All right.

9 So in forming your opinions, Coli
10 did not specify what kind of pump it was
11 using?

12 A. I don't remember if it did. I
13 don't recall if it did or not. But I don't
14 recall any pumps that were specified.

15 Q. How does the -- whether a pump --
16 you would consider a pump a high-pressure pump
17 or not a high-pressure pump, what -- what role
18 does the horsepower play in that?

19 A. Well, just in -- generally, if you
20 want higher pressures, you need more
21 horsepower.

22 And, likewise, if you need higher
23 rates, you need more horsepower. It's just
24 the more horsepower you get, the more you can
25 get out of a pump.

1 Q. What horsepower ranges would you
2 expect the high-pressure pump to operate at?

3 A. I don't -- I would -- I would have
4 to do a little investigation for that. I
5 don't have that off the top of my head.

6 Q. So we may come back to it.
7 I want to ask you a little bit more
8 on your -- the declaration we were talking
9 about.

10 A. Yes.

11 Q. And turn to Paragraph 91. This is
12 Exhibit 2005, your '410 and '601 declaration.

13 And do you see that in your
14 discussion you have a "...long-felt,
15 unresolved, need..."?

16 That's in the first sentence.

17 A. Yes.

18 Q. And what is your understanding of
19 the relevance of a long-felt but unresolved
20 need in an obviousness analysis?

21 A. Well, if there's something that --
22 a need that's out there and that it's -- it's
23 at issue, then there's going to be a need for
24 it.

25 Q. And was one of the needs that was

1 unresolved -- is that in planning large
2 fracturing operations there was a logistical
3 concern about the availability of diesel fuel?

4 A. I don't think that was -- that was
5 a main issue, no.

6 Q. Was that an issue?

7 A. It could be in certain places.

8 Q. Well, here you're talking about the
9 long-felt, unresolved need in avoiding diesel
10 engines.

11 Do you see that in --

12 (Simultaneous speaking.)

13 A. Yes.

14 Q. -- Paragraph 91?

15 A. Yes.

16 Q. And diesel engines, even in 2012,
17 were known to have some disadvantages.

18 Would you agree with that?

19 A. Yes.

20 Q. And one of the known disadvantages,
21 you would agree, with diesel engines is the
22 availability of diesel fuel.

23 A. That's -- that's -- in certain
24 situations that's one of them, yes.

25 Q. Would you agree that -- that one --

1 another disadvantage of diesel fuel is that it
2 required transportation of diesel tankers to
3 the site?

4 A. Again, that potentially could be
5 one disadvantage, yes.

6 Q. Would you agree that a disadvantage
7 of diesel fuel was that it enhanced carbon
8 dioxide emissions?

9 A. Yes. That it -- I guess more
10 broadly it had emissions that came from it
11 that are pollutants and are considered a
12 problem.

13 Q. Was another disadvantage of, as
14 part of this long-felt need, the fact that the
15 facilities to transport diesel fuel occupied
16 more footprint and infrastructure on a
17 fracturing site?

18 A. In a lot of cases that -- that
19 would -- that's true.

20 Q. So in your view, in looking at
21 Paragraph 91, the long-felt, unresolved need
22 that U.S. Well felt was using hydraulic
23 fracturing pumps that would avoid the need for
24 diesel engines.

25 A. Yes.

1 Q. One of the -- and the way U.S. Well
2 solved that need is by using turbine
3 generators to replace the diesel prime movers
4 that were used in conventional site plans.

5 A. Well, is there a question there,
6 or --

7 Q. Do you agree with me?

8 A. That U.S. Well Service provided --
9 (Simultaneous speaking.)

10 Q. Solved the --

11 A. -- (inaudible) --

12 Q. -- solved the problem by using
13 turbine generators to replace the conventional
14 diesel prime movers on fracturing sites.

15 A. Yes. That was part of their
16 solution, yes.

17 Q. Do you know if U.S. Well made their
18 own turbine generator or they bought it from
19 someone?

20 A. I would -- I am assuming they
21 bought it from someone.

22 Q. Does the long-felt, unresolved
23 need -- in your view, in Paragraph 91, one of
24 the reasons that the patents in this case are
25 not obvious is because U.S. Well solved a

1 long-felt, unresolved need?

2 A. Yes.

3 Q. And the way U.S. Well solved that
4 unresolved need is by using electric motors
5 and -- and pumps instead of diesel prime
6 movers.

7 A. And all that goes with that.

8 Q. And all --

9 (Simultaneous speaking.)

10 A. I guess what I'm saying is -- is
11 that in all the technology that's involved in
12 order to make that thing happen, that just to
13 say you've just replaced it with this very
14 much distorts what the real story is.

15 Q. I didn't mean to limit it to
16 variable frequency drives.

17 Was that also what you had in mind?

18 A. Well, the whole -- what I had in
19 mind was the whole patent and everything
20 that -- that was included with it.

21 Q. Looking at the long-felt,
22 unresolved need, were you comparing the whole
23 patent or were you looking at the claims?

24 A. Well, I -- what I'm saying is -- is
25 that -- that the -- there was this long need,

1 but that somebody had to come up with the
2 technology in order to solve that need.

3 And that's what these patents
4 achieved, is by putting the technology
5 together in order to resolve these needs.

6 Q. And "putting the technology
7 together," you're referring to variable
8 frequency drives to control electric motors
9 and -- and pumps?

10 A. I'm referring to all the -- all the
11 elements of the patents.

12 Q. What is an element of a patent?

13 A. I'm sorry --

14 (Simultaneous speaking.)

15 Q. What does that mean?

16 A. -- I'm sorry.

17 The claims of the patent.

18 Q. So turning to, again, some of the
19 previous paragraphs, is there a reason you
20 focused on the electric motors, electric pumps
21 and VFDs?

22 A. Just because, you know, I didn't
23 want to -- in writing the report, I didn't
24 want to have to repeat every element of the
25 patent in my report. That would have got,

1 kind of, tedious.

2 But it -- those are the basics of
3 what we were trying to accomplish, is we're
4 trying to get -- the U.S. Well Service and
5 others were trying to get a system for
6 fracking that was all-electric.

7 And U.S. Well Service was the one
8 that was able to come up with it and what was
9 needed in order to do that.

10 Q. And what was needed was the
11 variable frequency drives, electric motors
12 and --

13 (Simultaneous speaking.)

14 A. That --

15 Q. -- hydraulic --

16 A. -- that --

17 Q. -- fracturing pumps?

18 A. -- that was part of it, yes. But
19 then there's everything else that's involved
20 with the patent.

21 Q. What do you mean by "everything
22 else that's involved with the patent"?

23 A. All -- all the claims that are in
24 the patent.

25 Q. Well, when you say U.S. Well -- so

1 some of the claims talk about trucks having
2 five axles.

3 And you're not claiming U.S. Well
4 invented trucks with five axles, right?

5 A. No, I'm not claiming that.

6 But what I am claiming is -- is
7 that they're -- they put all these elements
8 together in order to come up with the system
9 that would work.

10 Q. Got it.

11 And "come up with a system that
12 would work," you mean that -- that hey could
13 sell?

14 A. Well, that could actually have the
15 technology to effectively fracture formations,
16 including high-pressure formations, and would
17 operate effectively and was able to put a
18 system out that was acceptable to the -- the
19 oil industry and used by the oil industry.

20 Q. You agree that others before
21 U.S. Well fractured high-pressure formations,
22 correct?

23 A. Yes, but not -- not with electric
24 pumps.

25 Q. Got it.

1 So the main difference between
2 U.S. Well, what they did, their technology
3 inventions, and what those who came before
4 them was using electric pumps?

5 A. Yes. And putting -- you know, that
6 they were able to figure out how that was able
7 to be done, which is what the patents are.

8 Q. And the way to figure out how that
9 was able to be done was with driving those
10 electric pumps with electric motors and then
11 controlling the pumps with variable frequency
12 drives.

13 A. If you want to simplify it, that's
14 it.

15 But to -- to get the full story of
16 it, you would have to include all the elements
17 of the patents that we -- we're discussing
18 today.

19 MR. TOBIN: Now I think we're at a
20 breaking point. Let's take lunch and
21 we'll come back.

22 (Brief Recess Taken.)

23 THE VIDEOGRAPHER: The time is
24 12:07 p.m. We are going off the record.

25 (Lunch Recess Taken.)

1 THE VIDEOGRAPHER: The time is

2 1:16 p.m. We are back on the record.

3 Q. (BY MR. TOBIN) Welcome back from
4 lunch, Mr. Schaaf.

5 A. Thanks.

6 Q. I want to follow up on -- I want to
7 follow up on something we were talking about
8 before lunch.

9 Do you recall the discussion of
10 turbine generators running on natural gas and
11 some of the ones that were used on various
12 offshore platforms in the '90s?

13 A. Yes.

14 Q. Okay.

15 And I think you testified, and
16 correct me if I'm wrong, but the turbine
17 generators you saw in use in the 1990s
18 involved the natural gas came from the -- the
19 offshore fields, and that was used to power
20 the turbine generators.

21 Is that right?

22 A. That -- that's correct, yes.

23 Q. And in that case, how did the
24 turbine generator deal with water or
25 particulates that -- that were in that natural

1 gas?

2 A. Well, typically, you clean up --
3 clean up the gas, if it has any problems,
4 before you put it into the turbine.

5 Q. Are you familiar with something
6 called a three-phase separator?

7 A. Yes.

8 Q. What's a three-phase separator?

9 A. Well, in the oil industry, a
10 three-phase separator means that you are
11 separating the oil, water and gas into three
12 different phases.

13 So the -- the gas goes off the top,
14 the water goes off the bottom, and if there's
15 oil, it goes in the middle stage of the
16 separator.

17 Q. And is a -- is a three-phase
18 separator just a basic component that was used
19 in natural gas processing in the '90s or
20 earlier?

21 A. Typically, natural -- you know, if
22 it's just natural gas you're producing, you
23 would just use a two-phase separator, where
24 you're getting the liquids from the -- the gas
25 itself.

1 But I think, to answer your
2 question, the three-phase separator has been
3 well-known for quite awhile.

4 Q. I'll take you again to the turbine
5 generator context we were talking about.

6 Is there any concern with the
7 natural gas condensing on its way to the
8 turbine generator?

9 A. Well, the gas itself, if you were
10 in very cold weather there could be some
11 issues with some of the water in the natural
12 gas that could cause it to -- to create
13 hydrates, which kind of plugged up the -- the
14 supply line.

15 Q. So was it pretty typical in the
16 '90s or earlier to use heaters with the
17 natural gas on its way to the turbine
18 generator?

19 A. I don't know on that one.

20 Q. Okay.

21 And I can't remember if I asked you
22 this or not. If I did, I apologize.

23 Thinking back to before 2012, what
24 sizes of turbine generators, either in terms
25 of horsepower or like, were you familiar with?

1 A. I -- I can't recall specifically
2 what the sizes were and how much the outputs
3 were of them.

4 And there were various sizes, so
5 it's -- it covered from, you know, the
6 smallest sizes to bigger sizes.

7 Q. Were -- prior to 2012, were turbine
8 generators generally available of the kind of
9 size that could power high-pressure fracturing
10 pumps?

11 A. Not to my knowledge.

12 MR. TOBIN: I want to turn to -- to
13 another exhibit that's been introduced
14 in the case. And so I'm going to paste
15 in the Chat window -- let me just make
16 sure I have the right one.

17 Okay.

18 I'm pasting now Exhibit 1050.

19 (Exhibit No. 1050 Previously
20 Marked.)

21 MR. TOBIN: It's about a 45
22 megabyte file, so let me know if you've
23 had a chance to review that.

24 And, Mr. Schaaf, I see you looking
25 through your papers so, if it helps you,

1 this was Exhibit 1050 that was
2 introduced in -- I think it was the --
3 the 1032 proceeding, and maybe a few
4 others.

5 THE WITNESS: I don't know which
6 one that is.

7 MR. EVANS: This is the
8 declaration?

9 MR. TOBIN: Yes. This is a -- this
10 is one of your declarations.

11 THE WITNESS: Okay.

12 And 1050?

13 MR. TOBIN: Yeah.

14 And if you don't have it in paper,
15 I can put it up on the screen and you
16 can look at it that way.

17 THE WITNESS: Yeah. That would
18 probably be better, because I don't see
19 it here.

20 MR. TOBIN: Okay.

21 Q. (BY MR. TOBIN) So let's go to
22 Page 2 of Exhibit 1050.

23 And this is your declaration that
24 you submitted in the U.S. Well versus TOPS
25 case.

1 Do you remember that?

2 A. Yes.

3 Q. Okay.

4 And I'll orient you in terms of
5 date. Let me get you to a page with the date
6 on it.

7 So you can turn, please, to the PDF
8 Page 48.

9 And this is a declaration you
10 submitted on behalf of U.S. Well and dated it
11 on March 6th, 2020?

12 A. Yes.

13 Q. Okay.

14 And that's your signature we're
15 looking at?

16 A. Yes.

17 Q. Very good.

18 Thank you.

19 MR. TOBIN: So let's turn back to
20 Page 2 of that declaration, please.

21 All right.

22 And scroll down to Paragraph 2,
23 please.

24 Q. (BY MR. TOBIN) And, again, back
25 up.

1 It says you were retained by U.S.
2 Well Services.

3 That's the patent owner in this
4 case, yes?

5 A. Yes.

6 Q. And you were asked to review
7 several patents, including the '601 Patent,
8 the '410 Patent, the '728 Patent, the
9 '278 Patent and the '308 Patent, correct?

10 A. Yes.

11 Q. And those are -- those are a subset
12 of all the patents that you've provided
13 opinions on in the IPR proceedings when
14 U.S. Well and Halliburton, correct?

15 A. Yes.

16 Q. Okay.

17 So let's scroll down to Page 8 of
18 the declaration, which is Paragraphs 28 and
19 29.

20 And this was a declaration -- I'm
21 looking at Paragraph 28 -- where were you
22 addressing the meaning of claim terms,
23 correct?

24 A. Yes.

25 Q. And in this analysis that you did

1 against -- for patent owner against TOPS, you
2 said, "I conducted my analysis from the
3 perspective of one of ordinary skill in the
4 art at the time of the invention," and that
5 you assumed that the time of the invention is
6 November 2012, correct?

7 A. Yes.

8 Q. So the -- so as I understand it,
9 the opinions in this declaration were analyzed
10 from the perspective of a POSITA as of
11 November 2012.

12 A. Yes.

13 Q. Let's turn to Paragraph 59, please,
14 which is on Page 21 of the PDF.

15 In there you state: "A variable
16 frequency drive (VFD) is a electromechanical
17 system that controls the speed of an electric
18 alternating current (A/C) motor by varying the
19 input voltage and frequency of the electric
20 motor that is connected to the VFD."

21 And you would agree with that
22 definition, right?

23 A. Yes.

24 Q. And in support of that definition,
25 you cite to Exhibit 4 of your declaration.

1 A. That's what it says, yeah.

2 Q. And so Exhibit 4 of your
3 declaration is something that would have been
4 a reliable source to help support the basics
5 of -- of what a VFD is and what a VFD does.

6 A. Well, not knowing exactly what
7 Exhibit 4 is at this point in time, I would
8 say you're probably right. But not actually
9 seeing --

10 (Simultaneous speaking.)

11 Q. -- (inaudible) --

12 A. -- it -- seeing it, I can't --

13 Q. Sure.

14 So it's within Exhibit -- it's
15 within this Exhibit 1050 submitted to the
16 Patent Office. It starts on PDF Page 80.

17 PDF Page 79, I'm sorry.

18 And this is a cover page for what
19 was Exhibit 4 of your previous declaration?

20 A. Yes.

21 Q. Okay.

22 So let's turn to the next page,
23 please.

24 In the first paragraph it answers
25 the question, "What is a variable frequency

1 drive?"

2 Correct?

3 A. Yes.

4 Q. And the answer this paper gives is:

5 "A variable frequency drive, known as a VFD,
6 is an electronic drive system used to control
7 electric motors. Its purpose is varying motor
8 speed by controlling input frequency and
9 voltage."

10 Yes?

11 A. Yes.

12 Q. And that's a fair definition of a
13 variable frequency drive, that a person of
14 skill in the art would have understood as of
15 November of 2012?

16 A. Yes.

17 Q. Let's turn to the next page of the
18 exhibit.

19 A. All right.

20 Q. And in the second bullet it says --
21 in the second sentence, it says, "VFDs
22 include" --

23 (Simultaneous speaking.)

24 A. It's so --

25 Q. -- "microcomputers" --

1 A. -- long, I don't know exactly where
2 we're at here.

3 Q. Sure.

4 So we're in --

5 (Simultaneous speaking.)

6 A. The second --

7 Q. I'm sorry, sir?

8 A. The second bullet, did you say?

9 Q. Yes, sir.

10 So we're on page PDF Page 81 of
11 Exhibit 1050, and the bullet starts with,
12 "Variable frequency drives allow for constant
13 pressure and automation."

14 A. Okay. Yeah. Now I see where we
15 are at.

16 Q. And, again, given the context of
17 your declaration, it was known in November
18 2012 that variable frequency drives allow for
19 constant pressure and automation.

20 A. Yeah. Yes.

21 Q. Looking at the next sentence, it
22 was also known in November 2012 that: "VFDs
23 include microcomputers or microcontrollers
24 and" -- it -- "can accept instructions from
25 programmable logic controllers."

1 You agree with that, also, right?

2 A. In general, for variable frequency
3 drives, yeah.

4 Q. Let's turn to the next -- the next
5 page of Exhibit 1050.

6 There's a section titled,
7 "Considerations for Variable Frequency
8 Drives."

9 Do you see that section?

10 A. Yes.

11 Q. Okay.

12 If we scroll down to the third
13 paragraph within that section, there's a
14 picture that says, "Safety shutoff/lockout for
15 VFD panel."

16 A. Okay.

17 Q. And to the left of that, the text
18 says, "There should be an emergency kill
19 switch or lockout somewhere on the panel that
20 stops all movement or shuts down all power."

21 Do you agree with that
22 recommendation?

23 A. Well, for this particular apparatus
24 that they're -- they're talking about, it
25 would make sense.

1 They're talking about irrigation
2 equipment, and I think it would be wise for --
3 for that particular application for it.

4 But -- but that's -- the
5 specification here is we're talking -- they're
6 talking specifically about the irrigation
7 pumps.

8 Q. But you would agree -- and, again,
9 this is a document that you cited to the Court
10 in support of your opinions for variable
11 frequency drives.

12 A. For the definition of them, yes.

13 Q. Have you heard about an emergency
14 kill switch used in the context of hydraulic
15 fracturing pumps for the variable frequency
16 drives?

17 A. I have, but not specifically. I
18 couldn't -- I couldn't opine specifically on
19 those type of switches, or kill switches.

20 Q. But you understand what the general
21 purpose of an emergency kill switch is, right?

22 A. Yes.

23 Q. And it was well-known in November
24 of 2012 that a purpose of an emergency kill
25 switch is to be able to quickly shut down a

1 piece of equipment if a safety condition
2 arises.

3 A. Yes. But that's some -- and,
4 again, another feature that you could add to a
5 system if -- if you thought it was necessary,
6 and felt that it would improve your potential
7 product that you have there.

8 Q. I'm sorry?

9 A. That -- that it would improve the
10 product that you have there.

11 Q. And using emergency kill --
12 (Simultaneous speaking.)

13 A. -- (inaudible) --

14 Q. I didn't mean to cut you off. I'm
15 sorry.

16 A. Yeah.

17 I guess what I'm saying is that it
18 would depend on the system that you have and
19 whether this is -- this is something that you
20 would like to have, and would be necessary
21 advancement for the -- the equipment that
22 you're using.

23 Q. You would agree that the idea to
24 use -- to include a switch on a piece of
25 equipment to be able to effectively turn off

1 the equipment quickly was a well-known feature
2 for hydraulic fracturing equipment.

3 A. I don't think that that's
4 necessarily true.

5 Q. You don't think that a kill switch
6 is --

7 (Simultaneous speaking.)

8 A. I --

9 Q. -- a well-known --

10 A. -- I think it would depend -- you
11 know, since there's lots of equipment out at a
12 frac location, that you would have to take --
13 look at the specific examples of where this
14 was being used, or not used, and to understand
15 whether or not this was something that you
16 would want to include in that particular piece
17 of equipment.

18 So I can't make a generalized
19 statement that whether it should be used
20 and/or whether it was known to be used for any
21 piece of equipment.

22 Q. What about for fracturing pumps?

23 Is that -- were you aware of kill
24 switches being used for fracturing pumps?

25 A. I -- I can't recall for sure

1 whether -- that there was something that
2 specifically was a kill switch for a frac pump
3 or not or -- or if, in fact, you know, a
4 specific kill switch for them.

5 Q. You're just not sure?

6 A. That would be -- that would be the
7 best way. Because, you know, the kill switch
8 is kind of a generalized term that could be
9 put in there for -- it could be set up in many
10 different ways.

11 So the specifics -- I would have to
12 look at the specs to say okay, well, this
13 was -- this was typically done here or not
14 typically done here.

15 And that's why I say in this
16 particular example we're talking about
17 irrigation systems, so -- and they -- they
18 find it necessary there.

19 But there's other operations where,
20 depending on how your control setup is -- and
21 they're all different -- whether or not you
22 would have something that would be
23 specifically a kill switch or not.

24 Q. But you would agree with the
25 general concept, that it was known and

1 desirable to include some kind of localized
2 emergency shutoff for your fracturing pumps so
3 that operators could quickly turn them off if
4 they needed to, or if there was some problem.

5 A. I would agree that there's --
6 there -- there's -- there should be a method
7 in which you could turn them off.

8 Q. And there -- you would also agree
9 that there should be a method located
10 somewhere near the pump by which you could
11 turn off the pump?

12 A. Could you repeat the question
13 again?

14 I didn't get the first part of it.

15 Q. Sure.

16 And you would agree that in
17 designing hydraulic fracturing pumps, it was
18 known that there should be some kind of
19 localized way to turn off the pump near the
20 pump.

21 A. I wouldn't agree with that.

22 Q. You don't agree that there should
23 be a way to turn off the pumps in a manner
24 that's located near the pumps?

25 A. Yeah. That's -- I wouldn't

1 necessarily agree with that, that -- that many
2 times kill switches are at remote locations.
3 Because if something really bad goes wrong,
4 you don't want to be near the -- the -- the
5 thing that's going bad.

6 Q. Have you seen -- have you ever seen
7 a kill switch implemented on a fracturing
8 site?

9 A. No, I never have.

10 Q. Is that just not something you've
11 looked for?

12 A. Well, you know, I guess the thing
13 is, I haven't -- the questions you asked, I
14 haven't ever been out there when they -- when
15 an emergency stop has had to take place.

16 Q. Have you ever been on a fracturing
17 site while it was actually operating?

18 A. Yes.

19 Q. Let's turn back to your
20 declaration. This is on, I believe, PDF
21 Page 23.

22 MR. TOBIN: Scroll down, please.

23 No, wrong document. Exhibit 10- --
24 so we're on Exhibit 1050, and we are on
25 PDF Page 23 of 227.

1 Q. (BY MR. TOBIN) And here we have a
2 section called "Power semiconductor."

3 Do you see that?

4 A. Yes.

5 Q. And again, given the context of
6 your declaration, would you agree that in
7 November of 2012, one of ordinary skill in the
8 art would understand that power semiconductors
9 are fundamental components in a VFD?

10 A. Which document are we looking at
11 right now?

12 Just so I'm clear on what we're
13 looking at?

14 Q. We're looking at your previous
15 declaration that you -- that was submitted to
16 the court.

17 A. Well, is this -- yeah. Which
18 one -- which one is it, so I --

19 Q. We're on Exhibit 1050.

20 A. Okay.

21 Okay. So we're back -- so that's
22 why I was confused. We're back to the TOPS
23 exhibit?

24 Q. Yes, we are.

25 A. Okay.

1 Q. Do you need me to repeat the
2 original question?

3 A. Yeah.

4 Can you -- I want to see what
5 section we're on, on this one, because it's
6 been awhile since I've dealt with this one.
7 So I want to --

8 Q. Sure.

9 MR. TOBIN: Can you ask the
10 videographer to scroll up, please, to
11 Paragraph 63, the previous page?

12 Q. (BY MR. TOBIN) Does this help
13 orient you?

14 We're talking about the variable
15 frequency drives and components of the
16 variable frequency drive.

17 A. Okay. Okay.

18 Thank you.

19 Q. Uh-huh.

20 A. Yes.

21 Q. So -- I'm sorry, sir.

22 Were you saying something or do you
23 need me to repeat the question?

24 A. I...

25 (Witness reviewing exhibit.)

1 Okay. So --

2 Q. Let me ask you a different
3 question.

4 Because we're on Paragraph 63, in
5 this paragraph you talk about several elements
6 of the variable frequency drive. You talk
7 about "'...power semiconductor heat sinks
8 having...thermal sensors monitored by a
9 microprocessor to prevent [semiconductor]
10 damage caused by excessive heat'..."

11 That's the section you were --
12 (Simultaneous speaking.)

13 A. Yes.

14 Q. -- you were describing?

15 A. Yes.

16 Q. And you state that: "Each of
17 these" -- (sic/as read) -- "elements described
18 in the claim limitation are familiar
19 components in the industry that would have
20 been readily recognized by a person of
21 ordinary skill in the art at the time of the
22 invention of the '410" ... "'308" ... "and
23 '601 Patent."

24 A. Okay.

25 Q. So you would agree that power

1 semiconductor heat sinks having thermal
2 sensors monitored by a microprocessor to
3 prevent semiconductor damage caused by
4 excessive heat, those were familiar components
5 in the industry that would have been readily
6 recognize by a person of skill in the art as
7 of November 2012, correct?

8 A. They would -- each, individually,
9 would be recognized as such, yes.

10 Q. And if we -- and they would be
11 recognized as just basic components of the
12 variable frequency drive, correct?

13 A. Well, it would be known as things
14 that could possibly be added to it, yes.

15 Q. Added to -- you said -- I just want
16 to make sure we're talking about the same
17 thing.

18 You're talking about components
19 added to a variable frequency drive, correct?

20 A. Yes.

21 MR. TOBIN: Let's turn to the next
22 page, please, where there's a subsection
23 called "Power semiconductor."

24 Q. (BY MR. TOBIN) And still we're in
25 the context of the variable frequency drive in

1 November of 2012.

2 You would still agree that one of
3 ordinary skill in the art would recognize that
4 power semiconductors are fundamental
5 components in a variable frequency drive?

6 A. Yes.

7 Q. Are you familiar with an insulated
8 gate bipolar transistor, or IGBT?

9 A. I -- I couldn't give any -- any
10 opinions on that.

11 Q. And do you have an understanding of
12 what -- what power -- what a power
13 semiconductor is?

14 A. In general, yes. But I'm not --
15 it's basically helping control the VFD.

16 Q. But power semiconductors are the
17 components of the VFD that convert the
18 electrical current to the desired frequency?

19 A. Well, it gives them the -- it
20 controls -- it's, kind of, the controller of
21 that.

22 Q. And -- well -- and I'm looking at
23 the last sentence in this section, where you
24 say, "...those knowledgeable in the art would
25 recognize that 'power semiconductor' describes

1 the device that performs the power conversion
2 required to fulfill the function of the VFD."

3 A. Yes.

4 Q. And that's your understanding
5 today, also, correct?

6 A. Yes. Yes.

7 Q. And that's something that one of
8 skill in the art would have known by November
9 of 2012?

10 A. Yes.

11 Q. In the middle of this paragraph you
12 say, "...it is well-known that improvements in
13 power semiconductor technology over time have
14 increased the viability and performance of
15 industry applications for VFDs."

16 Correct?

17 A. Yes.

18 Q. All right.

19 And that's a statement you agree
20 with?

21 A. Yes.

22 Q. Okay.

23 The improvements in VFDs that
24 happened over time, those improvements
25 happened before November of 2012, correct?

1 A. Well, there were some improvements,
2 though, before 2012, and, you know, I would --
3 I would imagine that things are continually
4 improving on that -- in that area.

5 Q. Well, all technology continuously
6 improves. That's just a basic feature of
7 technology.

8 But when you state in your
9 declaration that "...improvements in power
10 semiconductor technology over time have
11 increased," the time you were referring to is
12 before November 2012, correct?

13 A. Well, I'm -- I'm saying that --
14 that -- I'm just, kind of, saying that, in
15 that it improved in the years leading up to
16 2012. But I'm not excluding the fact that it
17 can continue to improve since then.

18 Q. I understand.

19 And we'll get to Exhibit 5 a little
20 later.

21 But you cite to an Exhibit 5 here
22 in support of your opinions as to what was
23 known about VFDs before November of 2012,
24 correct?

25 A. That is correct.

1 Q. Okay.

2 And so we'll come back to Exhibit 5
3 in a little bit.

4 But here, you're -- the next
5 paragraph, again, you're rendering an opinion
6 as to what one of ordinary skill in the art
7 would have known about heat sinks before
8 November of 2012, correct?

9 A. Yes.

10 Q. And would you agree that one of the
11 known problems with VFDs and their power
12 electronics is that VFDs produce heat?

13 A. Well, anything like that would
14 produce heat.

15 Q. Correct.

16 Any -- any kind of electronics, for
17 that matter, produce heat, right?

18 A. Yes. Yes.

19 Q. And so it was known that, in the
20 context of the power semiconductors for VFDs,
21 that the excessive heat needs to be removed to
22 prevent damage to the -- to the VFD.

23 A. Well, that's -- that's certainly
24 good practice.

25 Q. And that was good practice before

1 2012, right?

2 To remove excessive heat --

3 (Simultaneous speaking.)

4 A. Yes.

5 Q. -- from the power semiconductors?

6 A. Yes.

7 Q. And, in fact, in reference to heat
8 sinks used with power semiconductors in
9 variable frequency drives, those -- heat sinks
10 were a widely known technology, correct?

11 A. Yes.

12 Q. And, in fact, in the last
13 paragraph -- the last sentence: "Heat sinks
14 are used throughout industry and are prevalent
15 in electronic devices, such as the 'power
16 semiconductor' described in the claim
17 limitation."

18 You would agree that, by November
19 of 2012, heat sinks were prevalent with power
20 semiconductors and used throughout industry.

21 A. In general, yes.

22 Q. The next paragraph, your
23 understanding of thermal sensors is pretty
24 similar to mine.

25 But you would agree that, again, by

1 November of 2012, those of skill in the art
2 understood that thermal sensors were just
3 devices to monitor temperature.

4 A. Yes.

5 Q. Are you familiar with what a
6 thermistor is?

7 A. It doesn't ring a bell right now,
8 but I -- I probably conceivably have seen that
9 before.

10 Q. Okay.

11 I was going to ask you if you know
12 that a thermistor was one example of a thermal
13 sensor to monitor temperature.

14 A. It -- it very well could be. I
15 mean, there's -- there's a number of them out
16 there.

17 Q. If we turn to the next page, you
18 have a subsection in here about variable
19 frequency drives called microprocessor.

20 And, again, a microprocessor is
21 just a computing device that can communicate
22 with other devices by sending and receiving
23 signals.

24 That's the understanding you have
25 about a microprocessor in the context of the

1 U.S. Well patents?

2 A. Yes.

3 Q. And you would agree that those of
4 skill in the art, by November of 2012, knew to
5 use a microprocessor to send and receive
6 signals regarding temperature information from
7 thermal sensors.

8 A. Yes.

9 Q. Oh, yeah.

10 So let's talk about the bottom of
11 PDF Page 24, which is Paragraph 65, of your
12 declaration.

13 And, again, this paragraph you're
14 talking about the '410 Patent, the '308 Patent
15 and the '601 Patent, correct?

16 A. Yes.

17 Q. And -- and in the second sentence,
18 you said that: "One of ordinary skill in the
19 art would" -- have (sic) -- "understand the
20 scope of the claims, even without a specific
21 procedure for preventing semiconductor
22 damage."

23 And in the next sentence you say,
24 "Instead, it is clear from the specific
25 arrangement of components that the proposed

1 solution is a specific physical design that
2 can be used 'to prevent damage'" ... "'by
3 excessive heat' by detecting temperature
4 conditions that can damage the power
5 semiconductors."

6 So is it fair -- did I read that
7 correctly?

8 A. Yes.

9 Q. Is it fair to state that by
10 November of 2012, one of skill in the art
11 would have known that removing excessive heat
12 from power semiconductors has the affect of
13 preventing damage?

14 A. I don't think you can draw that
15 conclusion.

16 Q. But you would agree that detecting
17 temperature conditions that can damage the
18 power semiconductors is one way to prevent
19 damage to the power semiconductors for
20 variable frequency drives?

21 A. Well, it's -- it's certainly
22 something that you would -- would want to
23 consider.

24 Q. And -- and when you say that you
25 would want to consider, again, you were

1 speaking from the perspective of a person of
2 skill in the art by November of 2012, right?

3 A. Yes.

4 Q. And then in the last sentence you
5 say that: "Therefore, a person of ordinary
6 skill in the art would recognize that the
7 claim is directed to the specific
8 configuration recited therein, rather than any
9 algorithm or procedure used 'to prevent damage
10 caused by excessive heat.'"

11 Do you see that?

12 A. No, I don't. It needs the page to
13 scroll up.

14 I saw the first sentence.

15 Q. Okay.

16 THE WITNESS: Slow down.

17 MR. TOBIN: Go to the bottom of
18 Paragraph 65, continuing to the top of
19 Paragraph -- of the next page.

20 THE WITNESS: Okay. Yes.

21 Q. (BY MR. TOBIN) So do I understand
22 this correctly, that one of skill in the art
23 doesn't need to be told in November 2012 that
24 you should remove excessive heat, because if
25 you don't it will prevent damage to the power

1 semiconductors? (Sic)

2 That's something they already knew?

3 A. Well, they wouldn't necessarily
4 know that. It's -- it's something that they
5 probably consider, but not necessarily have
6 that in their consideration of what they need
7 to know.

8 Q. That's something that a person of
9 skill in the art in November of 2012 would
10 have at least considered, is that -- is that
11 removing excessive temperature from variable
12 frequency drives, power electronics, they
13 could have considered that that can prevent
14 damage caused by excessive heat.

15 You would agree with that, right?

16 A. Well, that they -- they wouldn't
17 know -- they probably wouldn't know the extent
18 of the damage.

19 Q. But a person of ordinary skill in
20 the art would have known that excessive heat
21 in power semiconductors can damage the power
22 semiconductors.

23 A. I guess that would -- that would be
24 something that you would have to determine
25 what excessive heat is, or how -- how much

1 heat there is to be -- to have a complete
2 answer.

3 But it's something that they
4 definitely should consider, if there's going
5 to be a lot of heat, what it is that you're
6 going to have to do about it.

7 Q. And one of the well-known solutions
8 for removing excessive heat is heat sinks.
9 That's been known for a long time in the
10 electronics industry.

11 A. That's correct. But you would need
12 to know when the -- when the application makes
13 sense or not, and just how to apply it, which
14 is not -- not obvious.

15 Q. And is that what you -- now, I
16 think you're saying this at the end of this
17 Paragraph 65 in your declaration, but the
18 '410, '308 and '601 Patents do not provide any
19 algorithm or procedure used to prevent damage
20 caused by excessive heat.

21 A. Yes.

22 Q. Okay.

23 And the patents don't need to
24 provide an algorithm or procedure used to
25 prevent damage caused by excessive heat,

1 because the claims were not directed to a
2 specific algorithm for removing the excessive
3 heat, correct?

4 A. That's correct, yes.

5 Q. Rather, the -- the claims, as you
6 say, were directed to a specific physical
7 design, including temperature sensors and --
8 and heat sinks and microprocessors to monitor
9 the temperature, correct?

10 A. Yes.

11 Q. So remember -- well, actually,
12 let's go back to Page -- PDF Page 24 of your
13 declaration.

14 A. Of the '410?

15 Q. I'm sorry?

16 A. Are we -- we're still on the TOPS
17 declaration?

18 Q. Yes, sir.

19 And, actually, I'm going to take
20 you to a different page, please.

21 I'm sorry for the confusion there.

22 So let's actually go to Page 35 of
23 your declaration, which is Paragraph 82.

24 And -- and, actually, let's go up
25 to Page 81 -- Paragraph 81, so you can get the

1 context of what section we're talking about.

2 Do you see a section entitled, "'to
3 prevent damage to the...electric motor'?"

4 A. Yes.

5 Q. And here you're talking about
6 preventing damage to the electric motor as
7 used in the '410, '601 and '728 Patents,
8 correct?

9 A. That's correct.

10 Q. Let's look at Paragraph 82.

11 You're quoting the claim language
12 from Claim 10 of the '410 Patent, which is:
13 "...the variable frequency drive frequently
14 performs electric motor diagnostics to prevent
15 damage to the electric motor'..."

16 A. Yes.

17 Q. And frequently performing electric
18 motor diagnostics to prevent damage to the
19 electric motor, you say here, is describing
20 "...concepts that are well-understood to those
21 knowledgeable about the art."

22 A. Okay.

23 Q. And -- and that, again, was from
24 the perspective of November 2010 -- I'm
25 sorry -- November of 2012.

1 A VFD frequently performing an
2 electric motor diagnostic to prevent damage to
3 the electric motor was a concept
4 well-understood to those knowledgeable about
5 the art.

6 You would agree with that, right?

7 A. Yes. In general, yes.

8 Q. And -- and then if we go down a
9 little bit further in the paragraph, you state
10 that: "One of ordinary skill in the art would
11 have understood during the time of the
12 inventions that a 'variable frequency drive'
13 could be designed with instruments to 'perform
14 electric motor diagnostics' on an electric
15 motor."

16 Correct?

17 A. Yes.

18 Q. Again, that's in November 2012,
19 that a person of skill in the art would have
20 understood that a VFD could be designed with
21 instruments to perform electric motor
22 diagnostics on an electric motor.

23 A. Yes.

24 Q. And then we'll get to Exhibit 2 in
25 a little bit.

1 But you cite to Exhibit 2 as an
2 example of a commercial medium voltage drive
3 technology that provide motor supervision
4 functions.

5 A. Okay.

6 Q. Is motor supervision a synonym for
7 motor diagnostics?

8 A. I don't know in this case whether
9 that would be or not. I'd have to check.

10 Q. But that's the language you quoted
11 to support your opinions that a VFD -- it was
12 known that a VFD could be designed with
13 instruments to perform electric motor
14 diagnostics.

15 To support that opinion, you cited
16 language about motor supervision functions.

17 A. Yes. But that's -- you know, I
18 cited it, and that's why I say I don't recall
19 the -- the details of the -- the reference.

20 Q. Okay.

21 I'll get to the reference pretty --
22 pretty shortly.

23 But just to finish up this last --
24 this paragraph, where you say that: "Those
25 knowledgeable in the art would further

1 recognize that the very benefit of performing
2 these electric motor diagnostics is 'to
3 prevent damage to the...electric motor.'"

4 A. Yes.

5 Q. Is that correct?

6 One of skill in the art in November
7 of 2012 would have known that the very reason
8 to do electric motor diagnostics is to prevent
9 damage to the motor?

10 A. Well, that's one of the reasons
11 that you could use for, but it depends on the
12 particular situation and what you're using it
13 for.

14 So, yes, they would know that. But
15 then it would depend on whether there would
16 be need to know, or if that's something that
17 they're concerned with or that's -- exactly
18 what it is they're -- they're getting that
19 information for.

20 Q. Aren't -- isn't a person of skill
21 in the art always concerned with making sure
22 that their motor doesn't get damaged?

23 A. Well, that -- that would be a
24 concern. But just how they're going to go
25 about doing that concern is what would -- what

1 would be the difference, is how much --
2 what -- how big that concern should be and how
3 much that you're going to do in order to -- to
4 deal with it, if anything at all.

5 If you feel like there's very
6 limited aspects for it to do anything, you
7 would maybe not want to put anything in there.
8 You might not want to put any diagnostics in
9 there.

10 Q. You're saying there's reasons why a
11 person -- that if a person of skill in the art
12 is using electric motor diagnostics, a
13 reason -- the very benefit of doing that, you
14 would agree, is to prevent damage to the
15 motor?

16 A. I would say that that's -- that's
17 potentially one use of it, yes.

18 Q. Well, here, to the Court, you said
19 "the very benefit."

20 Is there a reason you're not
21 agreeing with that now?

22 A. No. I'm agreeing with it.

23 I'm just saying that that's -- that
24 limits what the whole picture is.

25 And that particular statement, I

1 agree with, but that doesn't say that that's a
2 complete -- that that completely answers
3 the -- your situation or describes the
4 situation.

5 Q. Well, now -- now I'm confused.

6 Sir, you're not backing away from
7 the statement you told the Court, that those
8 knowledgeable in the art would further
9 recognize that the very benefit of performing
10 these electric motor diagnostics is to prevent
11 damage to the electric motor.

12 You're not backing away from that
13 statement, are you?

14 A. No. I would say that that is a
15 definite benefit of -- of motor diagnostics,
16 but it's not the only benefit.

17 Q. But it is really one well-known
18 benefit, was preventing damage to the motor.

19 A. Yes.

20 Q. Let's turn -- why don't we turn to
21 that Exhibit 2 we talked about, that you used
22 to explain to the Court how one of skill in
23 the art would know about a variable frequency
24 drive to perform motor diagnostics.

25 Do you see your citation to

1 Exhibit 2?

2 A. Yes.

3 Q. Okay.

4 MR. TOBIN: Someone is knocking on
5 my door. I'm so sorry. Let me go on
6 mute for five seconds and then I'll be
7 right back.

8 THE WITNESS: Okay.

9 (Pause.)

10 MR. TOBIN: Sir, I apologize for
11 that interruption.

12 Q. (BY MR. TOBIN) Let's turn to
13 Exhibit 2 of your declaration that you made to
14 the Court.

15 And this is -- in these
16 proceedings, it's Exhibit 1050. It's Page 57
17 out of 227.

18 MR. EVANS: I'm sorry. Say it
19 again.

20 MR. TOBIN: So it's Exhibit 1050 in
21 these proceedings. It is approximately
22 Page 57 out of 227.

23 Make that 56. I'm sorry.

24 And can I ask you to zoom out,
25 please?

1 THE VIDEOGRAPHER: (Complies.)

2 MR. TOBIN: I just want to see the
3 full page.

4 THE VIDEOGRAPHER: (Complies.)

5 MR. TOBIN: Okay.

6 Yeah. Confirmed.

7 Q. (BY MR. TOBIN) So we are on
8 Page 56 of Exhibit 1050.

9 And if you see the cover page,
10 Mr. Schaaf, this is Exhibit 2 that you
11 submitted to the Court to support your
12 declaration about aspects of variable
13 frequency drives that were well-known.

14 Does that look right?

15 A. Yes.

16 MR. TOBIN: Let's turn to the next
17 page, please.

18 And can you zoom out, please, so
19 Mr. Schaaf can get the whole page?

20 THE VIDEOGRAPHER: (Complies.)

21 Q. (BY MR. TOBIN) So remember before
22 lunch we talked about the company, ABB?

23 A. Yes.

24 Q. Yes?

25 A. (No Audible Response.)

1 Q. Let me reask the question. Maybe
2 there was an audio glitch.

3 So before lunch we talked about the
4 company ABB selling industrial equipment for
5 oil and gas companies.

6 A. Yes.

7 Q. And in your previous declaration
8 you submitted a copy of a product brochure for
9 a product from ABB, correct?

10 A. Yes.

11 Q. And this was an example of one of
12 the commercial variable frequency drives that
13 were known in the art by November 2012.

14 A. Okay.

15 Q. And the title of this brochure --
16 product brochure is "Medium voltage AC drive.

17 "ACS 5000, 1.5 megawatt to 36
18 megawatt, 6.0 to 6.9 kilovolts."

19 Correct?

20 A. Yes.

21 Q. Okay.

22 MR. TOBIN: Let's turn to Page --
23 Page 60 (sic) of the Exhibit 1050,
24 please. Just scrolling down a few
25 pages.

1 THE VIDEOGRAPHER: (Complies.)

2 Q. (BY MR. TOBIN) You see there's a
3 table, lower on the page, called "Fields of
4 application."

5 MR. TOBIN: I'm sorry. We're on
6 Page 59 of the exhibit.

7 THE VIDEOGRAPHER: (Complies.)

8 Q. (BY MR. TOBIN) Do you see that?

9 A. Yes.

10 Q. And these commercial variable
11 frequency drives, this product brochure you
12 submitted, one of the fields of application
13 for this commercial variable frequency drive
14 was chemical, oil and gas.

15 A. Yes.

16 Q. Another commercial application for
17 this variable frequency drive was in "power
18 generation," including "gas turbine starters."

19 A. Okay.

20 Q. Specifically for the chemical, oil
21 and gas industry, an application of this
22 commercial variable frequency drive by
23 November 2012 was for compressors, extruders
24 and pumps --

25 (Simultaneous speaking.)

1 A. Okay.

2 Q. -- is that right?

3 A. Yes.

4 Q. And, again, we talked about --

5 MR. TOBIN: Let's go to the next
6 page, please.

7 THE VIDEOGRAPHER: (Complies.)

8 Q. (BY MR. TOBIN) Do you see there's
9 a section called "IGCT semiconductors"?

10 A. Okay.

11 Q. And paraphrasing this paragraph, it
12 was known that in November of 2012, this ACS
13 5000 variable frequency drive uses a power
14 conductor.

15 A. Yes.

16 Q. Lower on the page, there's a -- a
17 figure about this ACS 5000 variable frequency
18 drive.

19 Do you see the "M" with the symbol
20 around it?

21 Lower down on the page.

22 A. Yes.

23 Q. The "M" with the circle represents
24 a motor, correct?

25 A. I would believe so, yes.

1 Q. So in November 2012, this was one
2 commercial variable frequency drive for
3 controlling an electric motor.

4 A. Yes.

5 MR. TOBIN: Let us scroll down to
6 the next page, on Page 61.

7 THE VIDEOGRAPHER: (Complies.)

8 Q. (BY MR. TOBIN) Do you see there's
9 a section called "Transformer flexibility"?

10 A. (Witness reviewing exhibit.)

11 Okay.

12 Q. As of November 2012, why were
13 variable frequency drives connected to
14 transformers?

15 A. Well, trans- -- transformers are
16 used to change the voltage. And so if you
17 have a pump at a different voltage from what
18 your output is, then that's why you would want
19 to change it. But that's -- that's -- that's
20 why it exists.

21 Q. Are you familiar with the step down
22 transformer, what that is?

23 A. Yes.

24 Q. Were step down transformers
25 routinely used with variable frequency drives

1 by November of 2012?

2 A. I don't know. I -- I don't know.

3 Q. Do you know what a step up
4 transformer is?

5 A. Yes.

6 Q. Were step up transformers routinely
7 used with variable frequency drives by
8 November 2012?

9 A. Well, I think it depends on the
10 situation and everything else with any of
11 these things, that, yeah, it could be used,
12 and -- but it wasn't necessarily known to be
13 used with -- with anything in particular, or
14 not used with anything in particular.

15 Q. Well, I'm having a little hard time
16 understanding that.

17 Do you at least agree that it was
18 well-known by 2012, the ability to use
19 transformers with variable frequency drives?

20 A. It was known that you can use
21 transformers, yes. But that --

22 (Simultaneous speaking.)

23 Q. With variable --

24 A. Yeah. It just -- it just depends
25 on what the application was.

1 So whether -- whether it was -- you
2 could use it, but then the application would
3 be the important thing, about what it's going
4 to be used for, and if it's needed to be used.

5 Q. What were the reasons in
6 November 2012 why someone would use a step
7 down transformer in connection with a variable
8 frequency drive?

9 A. Well, again, it would depend on the
10 voltage and what was the required voltage that
11 you needed.

12 Q. So was using a transformer in
13 November of 2012 just an aspect of routine
14 optimization?

15 A. It would -- it would depend on the
16 particular application, whether you can say
17 that or not. In some applications, yes; in
18 others, no.

19 Q. Well, I'm talking about in the
20 hydraulic fracturing industry and in variable
21 frequency drives.

22 Was using transformers to step up
23 or step down voltage a routine application or
24 a routine optimization?

25 A. In -- for hydraulic fracturing

1 jobs?

2 No, it wouldn't -- wouldn't have
3 been.

4 Q. Right.

5 With the variable frequency drives,
6 you would agree that transformers were a
7 routine component that was used with variable
8 frequency drives, to step up or step down
9 voltage as needed.

10 A. Yes. Again, it depended on your
11 application for it.

12 But that's -- that's where I
13 would -- that's where I would -- I would
14 diverge from your -- your question, is that
15 not all applications would know that or would
16 use that.

17 It was just dependent on the
18 application, whether or not it was a typical
19 application or not, or known to be used.

20 Q. You would agree that the component
21 that is used to either step up voltage or step
22 down voltage, if you needed to step up or step
23 down voltage, it was known that a transformer
24 was the component you should use.

25 A. Typically, yes. That was -- that's

1 how you would do it.

2 MR. TOBIN: Let's turn to Page 62,
3 please, of this Exhibit 1050.

4 Q. (BY MR. TOBIN) Do you see there's
5 a picture --

6 MR. TOBIN: And scroll -- zoom out,
7 please.

8 THE VIDEOGRAPHER: (Complies.)

9 Q. (BY MR. TOBIN) There's a picture
10 of a panel with a button, and the description
11 that says: "User-friendly drive control panel
12 for local operation."

13 A. Yes.

14 Q. And you would agree with me that in
15 November 2012, as shown here, it was known to
16 use a local panel for operating a variable
17 frequency drive.

18 A. It was -- it was known technology
19 to use it for various applications, but not
20 all applications.

21 Q. Well, I'm asking about a variable
22 frequency drive.

23 It was known --

24 (Simultaneous speaking.)

25 A. Yes.

1 Q. -- technology to use a panel for
2 local operation as a variable frequency drive
3 by November 2012, right?

4 A. Yes. Strictly just using a VFD,
5 yes.

6 Q. And do you see that here there is a
7 discussion about a "Keypad with multi-language
8 display," "Main supply on/off pushbuttons,"
9 and "Emergency off pushbutton"?

10 A. Yes.

11 Q. And using emergency off pushbuttons
12 was also a known technology for variable
13 frequency drives by November of 2012.

14 A. Yes, in general.

15 Q. And a person would want to use an
16 emergency off pushbutton, as its name implies,
17 in case of an emergency, that they can quickly
18 shut down the components connected to a
19 variable frequency drive.

20 A. For this particular one, yes.

21 Q. Do you have any expectation that
22 this particular ACS 5000 product was the only
23 product in the world to use an emergency off
24 pushbutton as of November 2012?

25 A. No. I'm sure there were others

1 that used it, as well.

2 But there's other situations where
3 there wasn't emergency kill switches.

4 MR. TOBIN: Let's turn a few pages
5 later, Page 66.

6 THE VIDEOGRAPHER: (Complies.)

7 Q. (BY MR. TOBIN) And, again, this
8 was a document you cited to the Court to help
9 explain variable frequency drives and some of
10 the -- the functions of those.

11 And here we have a section called
12 "Monitoring and diagnostics."

13 And it says: "The ACS 5000 is
14 available with an intelligent monitoring and
15 diagnostics system..."

16 Do you see that?

17 A. Yes.

18 Q. So this is an example of the
19 variable frequency drive performing electric
20 motor diagnostics, correct?

21 A. (Witness reviewing exhibit.)

22 So -- so what's -- can you repeat
23 the question?

24 Q. Sure.

25 So this is a page from a product

1 brochure from before November 2012, talking
2 about a variable frequency drive performing
3 electric motor diagnostics.

4 A. Yes.

5 Q. And, in fact, the very next page --

6 MR. TOBIN: If we go to the next
7 page.

8 THE VIDEOGRAPHER: (Complies.)

9 Q. (BY MR. TOBIN) -- it says -- it
10 says that: "Depending on the power rating and
11 the application characteristics, the ACS 5000
12 could be used with induction, synchronous or
13 permanent magnet motors."

14 Correct?

15 A. Yes.

16 Q. So, again, by November of 2012,
17 looking at these two pages together, it was
18 known for variable frequency drives to perform
19 electric motor diagnostics.

20 A. That -- yes, that some variable
21 frequency drives could, in fact, do that.

22 MR. TOBIN: So let's turn to
23 Page 74 -- 73 of your declaration,
24 Exhibit 2050 (sic).

25 THE VIDEOGRAPHER: (Complies.)

1 Q. (BY MR. TOBIN) Do you see there's
2 a section called, "Standard protection
3 functions"?

4 A. Okay.

5 Q. So one of the known standard
6 protection functions -- well, let me back up.

7 So the context of this page is also
8 talking about motors. You can see that in the
9 left-hand column, "Induction, synchronous and
10 permanent magnetic motors."

11 A. Yes.

12 Q. So showing Page 73 of Exhibit 1050,
13 the product brochure is talking about standard
14 protection functions for an electric motor.

15 A. Yeah.

16 Q. Okay?

17 A. Yes.

18 Q. All right.

19 And then it gives an example of
20 motor overload.

21 (Pause.)

22 Yes?

23 A. Yes.

24 Q. Other examples of -- and -- and
25 these standard protection functions, these

1 were different diagnostics the VFD could --
2 was known to do to be able to detect -- detect
3 problems in the motor.

4 A. This particular -- for this
5 particular VFD, yes.

6 Q. So at least for this particular VFD
7 that was in your declaration, one of the
8 problems that it could diagnose in the motor
9 was overcurrent.

10 A. For this particular VFD, yes.

11 Q. Well -- and this was a particular
12 VFD that you cited to the Court to help
13 explain VFD functionality and -- and what it
14 could do and what it was known to do, right?

15 A. Well, yeah. And so VFDs in
16 general, but not necessarily a specific one
17 that's used for any example. This was just an
18 overall review of -- of VFDs, you know,
19 that -- you know, this is -- this is one
20 example of one.

21 It doesn't necessarily represent,
22 and it doesn't represent, all VFDs that are
23 out there and how they function and what
24 they -- and what features that they have.

25 Q. But this was an example of VFD that

1 you chose to cite to the Court to explain
2 the -- the terms -- the claim terms for the --
3 for the U.S. Well patents.

4 A. Yes. And that's -- that's what I
5 used them for.

6 Q. So looking at overcurrent and,
7 again, the variable frequency drive, this one
8 is by November 2012 -- could detect
9 overcurrent in an electric motor, correct?

10 A. Yes.

11 Q. And overcurrent in electric motor
12 is -- that refers to the excess of the rated
13 current of the motor; is that about right?

14 A. That would be generally correct,
15 you know, where it exceeds a certain limit.

16 Q. That's where the current in the
17 motor exceeds a certain rated limit?

18 A. Well, rate limit or whatever you
19 want to set it at.

20 Q. You would agree that overcurrent --
21 it was known that overcurrent can damage an
22 electric motor.

23 A. Yes. If it's -- if it's done for
24 an extended period of time.

25 Q. And in what ways could overcurrent

1 damage an electric motor?

2 A. Well, it -- it could -- I mean,
3 basically, it could ruin the motor if you
4 over- -- if you overrun it for any length of
5 time.

6 Q. And that was just a -- a basic
7 thing known by people that used electric
8 motors, that if you run it for too long in an
9 overcurrent condition, you could ruin the
10 motor?

11 A. It's -- it's general knowledge,
12 yes.

13 Q. And that's been general knowledge
14 for decades, that overcurrent can ruin a
15 motor?

16 A. It's -- yeah. It's generally
17 assumed that you're not going to -- you
18 shouldn't do that for long periods of time.

19 Q. All right.

20 There are several sources of
21 over- -- several things can cause overcurrent
22 in an electric motor, right?

23 A. Yes.

24 Q. You would agree that it was
25 well-known that a short-circuit could cause

1 overcurrent in an electric motor.

2 A. I don't think that that's
3 conclusive of it. It could, but it's not
4 necessarily that's what's -- that's what's
5 causing it.

6 Q. And -- sure.

7 And that's because there are
8 multiple causes of overcurrents in an electric
9 motor, right?

10 A. Yes.

11 Q. And -- and that was known, that
12 there could be multiple causes of overcurrent
13 in an electric motor.

14 A. Yes.

15 Q. The sources of overcurrent in an
16 electric motor could include overload?

17 A. Yeah.

18 Q. It was also known that sources of
19 overcurrent in an electric motor could include
20 a short-circuit.

21 A. Again, that's one potential that
22 could happen, yes.

23 Q. A ground fault was another
24 potential cause of overcurrent in an electric
25 motor.

1 A. That would certainly be something
2 that you would be concerned about.

3 Let's leave at that.

4 Q. Sure.

5 And, in fact, all of them -- a
6 ground fault, short-circuit and overload --
7 are all things that an operator of a motor
8 would be concerned about and try to detect and
9 then -- and then remedy.

10 A. It certainly is helpful if you have
11 that information. But you don't necessarily
12 get that in all situations.

13 This particular one had these
14 protections, but that's not something that you
15 necessarily will have.

16 Q. And I really wasn't asking you
17 about necessarily; I was more -- but I guess
18 you answered my question.

19 At least in this -- in this VFD,
20 the different sources of overcurrent, this VFD
21 that you cite to the Court in November 2012
22 could run diagnostics and detect those sources
23 of overcurrent in a motor.

24 A. Yes. Yes. This one has these
25 features in it.

1 Q. And -- and so keeping up with the
2 overcurrent piece --

3 MR. TOBIN: Let's go to Page 34 --
4 I'm sorry -- 35 of Exhibit 1050.

5 And let me know when --

6 And I'm looking at Paragraph 85.

7 Q. (BY MR. TOBIN) And just give you a
8 context: Here you were addressing the terms
9 of the U.S. Well patents that refer to "if
10 they" -- "if it or if they (as read) become
11 grounded or shorted," right?

12 A. Yes.

13 Q. And in this section you were
14 providing to the Court a tutorial or trying to
15 help them understand what -- the terms like
16 "grounded" or "shorted" or "ground fault" or
17 "short-circuit" mean.

18 A. Yes.

19 Q. And terms like "grounded,"
20 "shorted," "ground fault" and "short-circuit"
21 were terms that were well-known to a person of
22 skill in the art by November of 2012.

23 A. Yes. I would agree with that.

24 Q. By November of 2012, in fact,
25 "grounded" and "shorted" were commonly used to

1 describe ground faults and short-circuits in
2 electrical machinery circuits.

3 A. Yes.

4 Q. "Grounded" or "short" -- and moving
5 on, you would agree that in November of 2012,
6 "ground" -- terms like "grounded" and
7 "shorted" were basic concepts to those of
8 skill in the art.

9 A. Yes.

10 Q. And in addition -- I'm looking at
11 the next paragraph, but in addition to ruining
12 the electric motor, you would agree that
13 ground faults and short-circuits would produce
14 an effect of uncontrolled electric flow
15 leading to equipment shutdown.

16 A. Let's see.

17 Are we talking about something
18 that's said in Paragraph 86?

19 I didn't get --

20 Q. I'm summarizing your Paragraph 87,
21 actually, on the next page.

22 You would agree with me -- and I'm
23 sorry -- the sentence that starts with
24 "Rather" on the third line of Paragraph 87.

25 But, again, keeping it in the

1 context in the spirit of your declaration, you
2 would agree that it was known in November
3 of 2012 that ground faults and short-circuits
4 produced an uncontrolled electrical flow
5 leading to the shutdown of equipment.

6 A. Yes, that they're -- they're
7 definitely things that should be avoided, both
8 ground faults and short-circuits.

9 Q. And ground -- it was known to avoid
10 ground faults and short-circuits to prevent
11 damage of an electric motor.

12 A. Yes. Ground faults and
13 short-circuits are -- if they're happening,
14 that means you have -- you're having problems
15 with the motor and that it could lead to -- to
16 damage to it.

17 Q. And so in November of 2012, a
18 person of skill in the art would have wanted
19 to detect those ground faults or
20 short-circuits in order to prevent further
21 damage to the motor.

22 A. Well, it would be a nice thing to
23 do it, but it's not -- it isn't always done.
24 It depends on the situation and whether or not
25 you think it was necessary to do it, and

1 whether it would be beneficial to your
2 operation.

3 So, yes, it's a good -- it's a good
4 thing, but it's not always done and -- and you
5 need to decide whether it's -- it's -- it's
6 beneficial to do it or not in a particular
7 application.

8 Q. Well, you would agree that
9 preventing damage to a motor is -- is always
10 beneficial, right?

11 A. It's -- I would agree that it's
12 always beneficial.

13 But the -- but the steps you take
14 in order to accomplish that are going to be
15 different for different people in different
16 situations.

17 Q. Well, at least for the exemplary
18 variable frequency drive for the product
19 brochure you provided to the Court, at least
20 that variable frequency drive detected ground
21 faults and short-circuits to prevent damage to
22 the electric motor.

23 A. That's correct.

24 And it's a very -- you know, a very
25 good piece of equipment there. So it's -- it

1 may be used in a highly -- in an informed
2 environment. So that's why they would put
3 that in there.

4 But not -- you're not going to find
5 that in everything that's out there.

6 Q. I'm not asking about everything
7 that's out there. I'm just talking about the
8 kind of things -- concepts that were known to
9 those of skill in the art.

10 And it sounds like we're in
11 agreement, that at least for that variable
12 frequency drive that -- that you provided to
13 the Court, at least for that one, they knew
14 how to detect ground faults and short-circuits
15 to prevent damage to electrical motors.

16 A. Yes. But I wouldn't conclude that
17 that means that it's going to be in every
18 variable frequency drive that can be purchased
19 out there, or used.

20 Q. Well, it sounds like we're in
21 agreement, but you're adding some kind of
22 caveat to that.

23 Is that right?

24 A. Yeah. I think if you're
25 specifically talking about that, the one that

1 I -- that I used as an example in the TOPS
2 declaration, then, yes, it does -- does have
3 all those things in it.

4 But that was an example. It wasn't
5 meant to say that this is the way it is
6 always, everywhere, for all things.

7 Q. But an example that you -- and,
8 again, I'm asking you about that one that you
9 provided to the Court --

10 (Simultaneous speaking.)

11 A. Yes.

12 Q. -- an example you provide to the
13 Court, in that variable frequency drive, it
14 did detect grounds and shorts to protect -- to
15 protect the motor from damage and prevent
16 damage prior to November of 2012, right?

17 A. Yes. In the -- in the brochure,
18 the ABB brochure that I provided to the Court,
19 it does show that they do have those
20 protections in it.

21 MR. TOBIN: Let me check my notes.

22 I think we're almost done.

23 Let's take a five-minute break and
24 then I'll be ready to wrap up.

25 MR. EVANS: Sounds good.

1 THE VIDEOGRAPHER: The time is
2 2:29 p.m. We're going off the record.

3 (Brief Recess Taken.)

4 THE VIDEOGRAPHER: The time is
5 2:33 p.m. We are back on the record.

6 MR. TOBIN: I don't have further
7 questions for today, so I'll pass the
8 witness.

9 MR. EVANS: Okay. Thank you.

10 I have a -- I have just a couple
11 follow-up questions I want to ask, but
12 if you don't mind if we just take a
13 couple minutes to -- for me to organize
14 that.

15 MR. TOBIN: All right.

16 THE VIDEOGRAPHER: The time is
17 2:33 p.m. We're going off the record.

18 (Brief Recess Taken.)

19 THE VIDEOGRAPHER: The time is
20 2:39 p.m. We are back on the record.

21 MR. EVANS: Great. Thank you.

22 I just have a couple of follow-up
23 questions.

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EXAMINATION

BY MR. EVANS:

Q. First off, referring back to Exhibit 1002, which is the 9,410,410 Patent, I want to refer back to a paragraph that Mr. Tobin referred to earlier, which is in Column 6, starting at Line 44 of that patent -- where you are right now, 44 down to 58.

This is a paragraph describing the fracturing process according to, sort of, the technology described in the -- in the patent application -- or the patent specification.

And I'll just read the first two sentences of the paragraph.

"In practice, a hydraulic fracturing operation" -- can -- that should be "can" -- "be carried out according to the following process.

"First, the water, sand and other components are blended to form a fracturing fluid, which pumped down the well by the electric-powered pumps."

So my -- my question is: So the fracturing fluid of the described process then

1 pumps fluid by the well by electric-powered
2 pumps; is that right?

3 A. Yes.

4 Q. And to the best of your knowledge,
5 was fracturing fluid being pumped down a well
6 by electric-powered pump -- was that
7 technology known prior to November 2012?

8 A. No. That technology was not known
9 in 2012.

10 Q. Okay.

11 So that's a new technology being
12 described in this patent specification?

13 A. Yes.

14 MR. TOBIN: Objection. Leading.

15 MR. EVANS: Okay.

16 Q. (BY MR. TOBIN) And then the next
17 question I had, regarding the secondary
18 indicia of nonobviousness which you discussed
19 earlier in the deposition, you discussed some
20 facts related specifically to
21 commercialization of the USWS claimed
22 invention, as well as long-felt but unresolved
23 need in the industry.

24 Where did you learn those facts
25 that you discussed?

1 A. From the file history.

2 Q. To be clear, the file history of
3 the '410 Patent?

4 A. Yes.

5 Q. Okay.

6 MR. EVANS: And I'll just note that
7 that file history has been entered as
8 Exhibit 1005.

9 There was a response that was filed
10 in the '410 Patent history which --
11 which included an affidavit from the
12 client with -- with all the relevant
13 information related to those -- those
14 components of the secondary indicia
15 analysis.

16 That's all I have.

17 MR. TOBIN: I have a few follow-up
18 questions on that.

19

20 EXAMINATION

21 BY MR. TOBIN:

22 Q. So, Mr. Evans --

23 MR. TOBIN: This is David Tobin for
24 petitioner.

25 Q. (BY MR. TOBIN) Mr. Evans was

1 asking about the long-felt, unresolved need,
2 and I think you just answered that you were
3 relying on the prosecution history for the
4 '410 Patent for facts on that long-felt,
5 unresolved need.

6 Is that correct?

7 A. In particular, I was talking about
8 the -- the commercialization of it and how
9 that the U.S. Well Service equipment was
10 utilized -- more utilized than other
11 fracturing equipment during the -- the time
12 period.

13 Q. And is that -- is that the same
14 answer for all the other patents in this case,
15 which you provided opinions on secondary
16 considerations, is that you relied on the file
17 history of the '410 Patent as the basis for
18 your long-felt, unresolved need?

19 A. Well, I -- I used it for the
20 commercialization part of it, the file
21 histories -- the file history.

22 Q. No, but --

23 A. Yeah.

24 Q. Yeah. Right.

25 So you changed that to singular;

1 the file history of the '410 Patent that's
2 used for the commercialization aspect across
3 all of the U.S. Well patents for which you
4 provide secondary considerations, correct?

5 A. Well, for the ones -- yeah,
6 definitely the ones we're talking about today.

7 Q. So the ones we're talking about
8 today, the '410, the '308, the '728 and the
9 '030, your commercialization opinions are
10 based on the file history of the '410 Patent,
11 correct?

12 A. That's correct, yes.

13 Q. In reviewing the file history of
14 the '410 Patent, did you discuss with anyone
15 any of the facts that are alleged there, or
16 did you take them at face value?

17 A. Well, I -- I just read through it
18 and that's where I got my information.

19 Q. Did you undertake any independent
20 investigation to verify that the facts in that
21 '410 prosecution history are correct?

22 A. No, I did not.

23 Q. I want to turn back to the
24 '410 Patent, Exhibit 1002, the passage
25 Mr. Evans asked you about.

1 Do you have it open in front of
2 you?

3 A. Yes, I think so.

4 Q. Okay.

5 And I think Mr. Evans asked you
6 about the first two sentences.

7 Do you recall that?

8 A. Yes.

9 Q. I would like to focus on the
10 remaining sentences.

11 So at Column 6, Lines 48 to 50, it
12 says, "Typically the well is designed so that
13 the fracturing fluid can exit the wellbore at
14 the desired location and pass into the
15 surrounding formation."

16 Was -- is that just a basic,
17 fundamental feature of hydraulic fracturing
18 well before November of 2012?

19 A. Yes.

20 Q. The next sentence: "For example,
21 in some embodiments the wellbore can have
22 perforations that allow the fluid to pass from
23 the wellbore into the formation."

24 Was that a basic, fundamental
25 feature of all hydraulic fracturing operations

1 before November of 2012?

2 A. Well, it -- the fact that it's
3 going through perforations says that, in fact,
4 you could do that before. But that's not how
5 all fracturing jobs were handled.

6 Q. But that was -- but the piece about
7 "the wellbore having perforations that allowed
8 the fluid to pass from the wellbore into the
9 formations," that was still a basic,
10 fundamental feature of numerous hydraulic
11 fracturing operations before November 2012.

12 A. Right.

13 And the operative word is "can have
14 perforations."

15 Q. That that was well-known
16 technology.

17 A. Yes.

18 Q. The next sentence: "In other
19 embodiments, the wellbore can include an
20 openable sleeve, or the well can be open
21 hole."

22 That, too, was well-known
23 technology, just a basic feature of hydraulic
24 fracturing before November of 2012, correct?

25 A. Yes.

1 Q. Then: "The fracturing fluid can be
2 pumped into the wellbore at a high enough
3 pressure so that the fracturing fluid cracks
4 the formation and enters the cracks."

5 That, too, is a basic, well-known
6 feature of hydraulic fracturing operation
7 known well before 2004, correct?

8 A. Yes.

9 Q. And last: "Once inside the cracks,
10 the sand, or other proppants in the mixture
11 wedges in the cracks and holds the cracks
12 open."

13 That, too, was a basic, fundamental
14 feature of hydraulic fracturing operations
15 long before November of 2012.

16 A. Yes.

17 MR. TOBIN: I don't have further
18 questions.

19 Thank you for your time.

20 THE VIDEOGRAPHER: If there are no
21 further questions, the time is 2:47 p.m.

22 This concludes today's deposition.

23 (Deposition Concluded.)

24

25

PAGE	LINE	CHANGE	REASON
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This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

1 I, ROBERT SCHAAF, have read the
2 foregoing deposition and hereby affix my
3 signature that same is true and correct,
4 except as noted above.

5 _____
6 ROBERT SCHAAF

7
8 THE STATE OF _____)
9 COUNTY OF _____)

10 Before me,
11 _____, on this day
12 personally appeared ROBERT SCHAAF, known to me
13 (or proved to me under oath or through
14 _____) (description of
15 identity card or other document) to be the
16 person whose name is subscribed to the
17 foregoing instrument and acknowledged to me
18 that they executed the same for the purposes
19 and consideration therein expressed.

20 Given under my hand and seal of
21 office this _____ day of
22 _____, _____.

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181 NOTARY PUBLIC IN AND FOR
182 THE STATE OF _____
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UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

HALLIBURTON ENERGY	)	
SERVICES, INC.,	)	
	)	IPR2021-01032
Petitioner,	)	
	)	IPR2021-01034
VS.	)	
	)	IPR2021-01036
U.S. WELL SERVICES,	)	
LLC,	)	IPR2021-01038
	)	
Patent Owner.	)	
	)	
	)	

REPORTER'S CERTIFICATION
DEPOSITION
OF
ROBERT SCHAAF
JUNE 29, 2022

I, Kateri A. Flot-Davis, Certified
Shorthand Reporter in and for the State of
Texas, hereby certify to the following:

That the witness, ROBERT SCHAAF, was duly
sworn by the officer and that the transcript
of the oral deposition is a true record of the
testimony given by the witness;

There was a request for examination and
signature of the witness to the deposition
transcript. The original transcript was sent

1 for review on _____ to the
2 witness or to the attorney for the witness for
3 examination, signature and return to me by
4 _____;

5 I further certify that I am neither counsel
6 for, related to, nor employed by any of the
7 parties or attorneys in the action in which
8 this proceeding was taken, and further that I
9 am not financially or otherwise interested in
10 the outcome of the action.

11 Certified to by me this ____ of _____

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Kateri A. Flot-Davis
16 Texas CSR No. 8462
Expiration Date: 12-31-22

((1) 128:24 (2) 129:1 power 170:7 0 01033 105:19 030 98:4,8,23 100:3,20,23 102:3,5 103:4 104:6,9,13,23 105:7 220:9 1 1 21:2 28:6 71:17,18 110:6,18,22 111:6,23 112:1 1,100 88:19 89:2,23 90:9,14,18 92:3 1.5 192:17 10 42:7 67:10 184:12 10,000 51:14 10,408,030 99:23 100:1 10- 167:23 100 51:2,13,22 1002 70:23,25 216:4 220:24 1005 218:8 1013 46:6,7,14 47:4,14 49:15 50:15 51:19 1032 121:7 154:3 1033 121:7 1050 153:18,19 154:1,12,22 158:15 160:11 161:5 167:24 168:19 190:16, 20 191:8 192:23 199:3 203:12 209:4 10:07 52:9 11:27 120:14 11:34 120:17 12,000 43:18,20 44:5 45:13 50:16 12:07 149:24 12th 21:9 13 50:8 13,500 48:3	15 21:14 42:7,23 67:10 15,000 44:8 150 51:2 16 22:19 35:11 88:16 17 28:19 29:14 17,800 48:3 18 36:16 60:9 88:16 19- 58:14 1980s 66:17 67:18 1981 10:17 1990s 58:15,16,22 59:3,8,17 150:17 1:16 150:2 2 2 71:23 80:15,22 88:7,8,10 154:22 155:20,22 185:24 186:1 189:21 190:1,13 191:10 2,000 89:11 90:24 91:4,18 92:3 2,012 90:19 2,300 89:11 20 47:2,3,5 49:15 50:14 51:19 2004 223:7 2005 18:25 19:1,18,23 20:7,18 29:15 35:13 60:3 93:21 105:17 121:6 141:12 2008 100:7,11 104:7 2010 184:24 2012 14:14,16 15:3,5,10,17,20,24 16:3,13,23 22:8 23:22 24:21 25:9,18 27:9 28:3 29:1,9 33:7,9,20,21 34:2,5, 10 35:3,6,23 36:11,21,25 37:5,16,23 38:4 39:2,17 40:24 41:13 42:14,17 56:7 57:1 68:18,20 70:15 79:6 82:22 84:1,11 92:1 113:22 142:16 152:23 153:7 157:6,11 159:15 160:18,22 162:24 168:7 171:7 172:1 173:9,25 174:2,12,16,23 175:8 176:1,19 177:1 178:4 179:10 180:2,23 181:9 184:25 185:18 187:7 192:13 193:23 194:12 195:1,12 196:1,8,18 197:6,13 199:15 200:3,13,24 202:1,16 205:8 208:21 209:22,24 210:5 211:3,17 214:16 217:7,9 221:18 222:1,11,24 223:15 2014 111:1 2020 155:11	2021 21:9 2021-01034 6:24 2021-01036 6:24 2021-01038 6:24 2022 5:4 2050 202:24 21 157:14 227 167:25 190:17,22 23 167:21,25 24 178:11 183:12 250 51:2 278 156:9 28 94:8 156:18,21 29 5:4 94:5 105:16 156:19 2:29 215:2 2:33 215:5,17 2:39 215:20 2:47 223:21 3 3 72:1 30 95:13 114:8 308 156:9 170:22 178:14 182:18 220:8 330 51:2 34 101:25 136:12 209:3 35 21:5 183:22 209:4 36 192:17 39 21:24 22:5,9,10 25:21,24 42:23 4 4 75:8 80:15,16,22 84:25 157:25 158:2,7,19 4,000 139:12 40 21:24 22:9,10 26:1,19 35:12 41 21:25 22:5 410 19:4,21 71:7,19 80:16 81:18 83:13 87:16 88:14 92:22 93:1 97:9,13 105:10 106:3,12,23 107:9,24 110:19, 23 111:7,18 112:2 128:18 141:12 156:8 170:22 178:14 182:18 183:14
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