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*** CONFIDENTIAL PROTECTIVE ORDER MATERIAL ***

Transcript of Edward C. Kern, Jr., Ph.D.

Date: October 1, 2024
Case: Affordable Wire Management, LLC -v- CCABH, Inc. (PTAB)

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WORLDWIDE COURT REPORTING & LITIGATION TECHNOLOGY

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

_____

AFFORDABLE WIRE MANAGEMENT, LLC,

Petitioner,

v.

CAMBRIA COUNTY ASSOCIATION FOR THE BLIND AND HANDICAPPED, INC.,

Patent Owner.

_____

Case IPR2024-00178

Patent 11,349,291 B2

_____

* CONFIDENTIAL PROTECTIVE ORDER MATERIAL *

Deposition of EDWARD C. KERN, JR., PH.D.

Boston, Massachusetts

Tuesday, October 1, 2024

9:38 a.m.

Job No.: 553477

Pages: 1 - 198

Reported By: Michelle Keegan, RMR, CRR, CSR

Deposition of EDWARD C. KERN, JR., PH.D., held at the offices of:

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Pursuant to notice, before Michelle Keegan, Registered Merit Reporter and Notary Public in and for the Commonwealth of Massachusetts.

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C O N T E N T S

EXAMINATION OF EDWARD C. KERN, JR., PH.D. PAGE
By Mr. Dixon 6

E X H I B I T S

(None marked.)

PREVIOUSLY MARKED EXHIBITS

(Not attached to transcript.)

Paper 17 98
Exhibit 1001 94
Exhibit 1003 120
Exhibit 1004 130
Exhibit 1005 136
Exhibit 2001 95
Exhibit 2038 15
Exhibit 2056 168

** Documents quoted on the record are transcribed as read **

P R O C E E D I N G S

EDWARD C. KERN, JR., PH.D.,

having been satisfactorily identified and duly sworn by the Notary Public, was examined and testified as follows:

EXAMINATION BY COUNSEL FOR

PETITIONER AFFORDABLE WIRE MANAGEMENT, LLC

BY MR. DIXON:

Q. Good morning, Dr. Kern. Thanks for taking the time to sit down with me today.

I'll just go over some ground rules --

A. Sure.

Q. -- so that we can make this as efficient and generate as clear a record as we can. Is that fair?

A. Generate a clear record?

Q. Yes. Is that fair?

A. Yup.

Q. Do you understand that depositions are taken in a question-and-answer format?

A. Yes.

Q. Do you understand that you're under oath

today, as if you were testifying before a judge or a jury?

A. I do.

Q. It is your -- it is important that you testify truthfully and accurately to the best of your ability. Do you understand?

A. Yes.

Q. Is there any reason, whether it be medication or something else, that would prevent you from testifying truthfully today?

A. No.

Q. At any time during the deposition, you can take a break. I'd just ask that you let me finish the pending question and provide an answer before we take that break. Is that fair?

A. That's fair.

Q. If you don't understand or you don't hear one of my questions, please feel free to let me know and I'll either try and rephrase it or repeat my question. So please feel free to just ask for a clarification. Is that fair?

A. I certainly will.

Q. Your counsel may object from time to time. Do you understand that unless your counsel instructs you not to answer, you are required to give an answer?

A. Yes.

Q. Because your testimony is being recorded today by a court reporter, I ask that you let me finish my questions. And sometimes I might pause in the middle of a question, so please just allow sufficient time for me to finish my questions before starting your answer. And that will also allow time for your counsel to object. Is that fair?

A. To let you finish and -- yes, certainly. And let me have time to think.

Q. And related to that, can you please give verbal answers, so try not to use head nodding and stuff like that just so we have a clear record.

A. Yup.

Q. Have you been deposed before?

A. Yes.

Q. About how many times?

A. Once.
Q. What type of matter did you get deposed in?
A. A patent matter.
Q. Was the patent matter before the Patent Trial and Appeal Board?
A. I think so, but this stuff is all pretty new to me. I'm pretty sure it was. Yes. But . . .
Q. Did you offer opinions regarding the obviousness of a patent?
A. I don't recall. Let me finish. I don't recall whether it was obviousness or anticipation.
Q. What is your understanding of the difference between obviousness and anticipation?
A. Oh, gosh. Again, I am new at this, pretty new at this, but the -- the sense I get is that "anticipation" means that the invention disclosed by the patent is entirely demonstrated -- I'm not sure what the right word is -- by a single piece of I guess what you call prior art, whereas the other one, which is -- what, again, is it?

Q. Obviousness?

A. Obviousness.

Obviousness involves the knowledge of a POSITA and looking at a patent and/or several patents or several pieces of prior art that may or may not be patented and the POSITA concluding that it would be obvious to create the thing that's being challenged, this patent that's being challenged.

Is that about right?

Q. It seems like a pretty good description.

A. Good.

Q. You used the term "POSITA." Does that mean person of ordinary skill in the art?

A. That's what I learned in this last few years of doing these kinds of things.

Q. Okay. I just wanted to make sure we're referring to the same term.

A. Yeah.

Q. Did you prepare for your deposition today, Dr. Kern?

A. Yes.

Q. For how long did you prepare?
A. Well, I believe since I've been involved in this case, it's been leading to this deposition and my declaration. So ten months.
Q. Specifically for your testimony today, did you spend time reviewing documents such as your declaration?
A. Yes.
Q. When did you review your declaration in preparation for your testimony today?
A. I reviewed it most recently last night, after dinner.
Q. When did you start reviewing your declaration in preparation for your testimony today?
A. Last week.
Q. Did you meet with your attorneys before your deposition today?
A. Yes. And last week.
Q. About how long did you spend meeting why with your attorneys in preparation for your deposition today?

A. Two days last week and yesterday.
Q. About how much time did you spend preparing your report in this case?
A. My report?
Q. Let me clarify. About how much time did you spend preparing your declaration in this case?
A. There were two declarations. I'm not quite, you know, up on the legalese about the difference between the two.
But the one that was submitted sometime in the spring of 2024 and then one that was submitted in July 2024. And I probably spent -- oh, gosh, how many hours? I'd have to go back and check. At least a week on each of the -- in days. It was spread out over a long period, as you might expect, can imagine.
Q. That's fair. What are the differences between the report -- strike that.
What are the differences between the declaration you submitted in July and the declaration that you submitted in the spring?
MR. MELMAN: Objection to form.

A. The difference I believe is that it responded to the -- is it Omar Beik? I'm not sure how to pronounce the name. Is that correct, Beik?

Q. I believe it's Beik, but I might be mispronouncing it as well.

A. Anyway, I believe that the additional information that went into my July declaration came from reviewing the testimony that Omar Beik provided. There may have been others. I know that was one additional source of information that I was responding to.

Q. When you say you were reviewing the testimony that Omar Beik provided, are you referring to the deposition transcript of Omar Beik?

A. Yes. Oh -- correct, correct. Thank you.

Q. From time to time I might refer to Cambria County Association for the Blind as "CAB." Is that fair?

A. That works for me.

Q. Were you aware of CAB before being asked to offer an opinion in this matter?

A. Could you restate that? I think I heard you, but I'd like to listen to exactly how you said it.

Q. Were you aware of CAB before being asked to offer an opinion in this matter?

A. No.

Q. Were you aware of CAB's cable management systems before being asked to offer an opinion in this matter?

A. No.

Q. If I refer to Affordable Wire Management as "AWM," is that fair?

A. That works.

Q. Were you aware of AWM prior to being asked to offer an opinion in this matter?

A. No.

Q. Were you aware of AWM's cable management systems before being asked to offer an opinion in this matter?

A. No.

Q. So I'm handing you a document that's already been marked Exhibit 2038.

(Exhibit 2038, previously marked, is not attached to the transcript.)

Q. Do you recognize Exhibit 2038, Dr. Kern?

A. It appears to be my declaration. It doesn't have a date on it, but I expect it is the one submitted in July. Is that correct?

Q. I believe if you go to page 88 of Exhibit 2038, it's dated July 25th, 2024. Is that accurate?

A. Okay. Excellent. Thank you. That, I recognize.

Q. So Exhibit 2038 is the declaration that you submitted in this matter in July. Is that right?

A. That's a statement, not a question. Okay.

Q. Is that an accurate statement?

A. Yes.

Q. So if we could turn to page 8 of Exhibit 2038, specifically Paragraph 10, it states that you earned a bachelor of arts with a major in engineering sciences from Dartmouth College in June 1967 and a bachelor of engineering from

Dartmouth's Thayer School of Engineering in June 1968. Is that accurate?

A. That is correct.

Q. Did you take any type of coursework relating to electricity during the course of earning your engineering degree at Dartmouth?

MR. MELMAN: Objection to form.

A. Yes.

Q. Which classes did you take at Dartmouth that related to electricity?

A. Well, electricity is first introduced in physics courses in electricity and magnetism. It's then introduced in electrical engineering in the more engineering sense of circuitry.

I don't recall specifically the course names, but I can assure you that Dartmouth doesn't let people graduate without understanding electricity and magnetism.

Q. I believe that's the entry-level courses, electricity and magnetism, that first discusses electricity.

A. I'm sorry. Now you're --

Q. I'm just talking. It wasn't a question.

Did you take any courses relating to circuitry while earning your engineering degrees at Dartmouth?

MR. MELMAN: Objection, form.

A. Relating to circuitry, it certainly is covered. I'm not sure that the name of the course was circuitry or whatever. Electric circuits are certainly something that's -- I'm familiar with. Yes.

Q. How are you familiar with electric circuits?

A. Electric circuits involve resistors, capacitors, and inductors. In my time, they kind of began to invent transistors. The basics for passive electric circuits are resistors, capacitors, and inductors. And Ohm's law and Kirchhoff's laws and on and on and on relate to voltages and currents in electrical circuits.

And perhaps I've learned a lot more about it in the last 50 years in a practical way, but the mathematics for analysis of electrical

circuits is -- that's something I was trained in.

Q. While earning your undergraduate degrees, did you learn about cross-induction?

A. I probably did not. It would be basically the magnetic coupling of two inductors, and it was probably taught to me in that form rather than with the name "cross-induction."

Q. What does "cross-induction" mean to you?

A. It means inducing a magnetic field from one circuit inducing a current in another circuit.

Q. Is that generally something undesirable, to have one circuit inducing a magnetic field that induces a current in another circuit?

MR. MELMAN: Objection, form.

A. Could you repeat the question?

Q. Is it undesirable to have one circuit induce a magnetic field that then induces a current in another circuit?

MR. MELMAN: Objection, form.

A. Not necessarily. I could add that electric transformers have inductive coupling. So our whole electric power system would not work

without it, so it's not necessarily bad. It's probably good.

Q. Are there any instances where inductive coupling is bad?

A. Yes.

Q. What are some instances where inductive coupling is bad?

A. Inductive coupling can be bad when you are trying to send a signal through a conductor and something interferes with that signal by inducing a current in the signal circuit that adds what is called noise or cross-talk or static in that signal circuit.

Q. Does inductive coupling occur between two power cables?

MR. MELMAN: Objection, form.

You can answer.

A. It depends how you define "power cables." The ordinary meaning of "power cables" to ordinary people would be electric power cables in electric utility systems, which are AC power cables, alternating current.

So there is inductive coupling when you have a change in current that leads to a change in magnetic field that leads to a change in the induced current in another inductive nearby wire.

I think I've forgotten the question now.

Q. Can inductive coupling occur between two AC power cables?

A. Yes. That's what a transformer is.

Q. Outside of a transformer, can inductive coupling occur between two AC cables that are in close proximity to each other?

A. It can, but it would be typically minimal.

Q. Why would inductive coupling be typically minimal between two AC cables that are in close proximity to each other?

A. Because the AC power cables I believe you're referring to would have high levels of current to begin with. And the small amount of coupling would be a very small change in the preponderance of -- it sounds like a legal term, but in the -- the usual level of current in a circuit.

So this would be a small ripple on a large current.

Q. Can inductive coupling occur between an AC power cable and a DC power cable that are in close proximity to each other?

A. There is actually no distinction between an AC and a DC power cable. It's a cable that has either AC or DC current in it.

So if you understand my point?

Q. Yes.

A. A piece of copper doesn't care whether it's AC or DC. There are certain cases where it might.

But the answer is yes. One cable with AC could induce a small amount of current inductively via induction into another cable, be it AC or DC.

Q. Would the induction between a cable carrying AC and a cable carrying DC be minimal, like the induction between two cables carrying AC?

MR. MELMAN: Objection, form.

A. I think I've already answered that question in the last statement where I said that

it doesn't matter. A piece of copper doesn't know the perturbation incurred by induction. It doesn't matter whether the copper next to it is carrying AC or DC. It would be the same.

Q. So a cable carrying AC current has the same magnetic field as a cable carrying DC current?

A. No. The magnetic field from a DC current is steady state to the extent that the DC current is itself really steady state.

So the current -- excuse me. The magnetic field created by a circuit has the same frequency as the AC -- as the frequency of the AC circuit.

So again, most times in the United States, I guess, 60 cycles per second AC would be the thing that we're really talking about when we talk about AC power, as opposed to 50 cycles in many other places.

But whatever the cycles are, the magnetic field fluctuates at the same frequency or it doesn't fluctuate at all, as in the case of DC.

Q. So if the magnetic field fluctuates for an

AC power cable, would that have an impact on the amount of cross-induction that occurs between that AC power cable and a DC carrying power cable?

MR. MELMAN: Objection, form.

A. I got confused. Could you restate?

Q. So you testified that the magnetic field fluctuates for an AC power cable. Correct?

A. The magnetic field created by the current in the AC power cable fluctuates at the same frequency as the frequency of the AC current fluctuation.

Q. Does that magnetic field fluctuation have any impact on the amount of cross-induction that would occur if that AC power-carrying cable was in close proximity to a DC power-carrying cable?

A. Does the current level -- I'm rephrasing your question. Tell me if it's right.

Does the current in an AC cable when fluctuating -- it's always fluctuating. It's AC.

Does the level of the current -- the magnetic field that's created is in linear proportion to the amount of AC current. The

induction in anything else conductive nearby, be it DC cable or whatever, would also be linearly related to the current in the AC cable. It doesn't -- you know what "linear" means?

Q. So do I have it right that the amount of induction occurring as a result of the current fluctuation in an AC cable fluctuates with -- let me strike that. That's a bad question.

What I'm really just trying to understand is, does the induction change with the fluctuating magnetic field for an AC current?

MR. MELMAN: Objection, form.

A. When you say "induction change," are you saying do the induced voltages and currents change?

Q. Yes.

A. Okay. Yeah, I would believe or I would -- I believe they are linearly related. If the AC current in the AC conductor doubles, the magnetic fields double, the induced currents in some other conductor double. Linear.

Q. Do you know if the induced currents in

some other conductor are great enough that it could impact, if it's a data cable, a signal?

Let me rephrase the question. I'm reading it in front of me and it looks confusing.

If the induced currents in the AC conductor double, could they be great enough to disrupt the current in a DC cable in close proximity to the AC conductor?

MR. MELMAN: Objection, form.

A. You changed from "DC" to "signal" just then.

Did you mean to say "signal" rather than "DC"?

Q. I rephrased my question to specify "DC" instead of "signal."

A. Ah, okay. Now read me your question again.

Q. If the induced currents in the AC conductor double with the fluctuation -- I see you're shaking your head.

A. Well, the induced current in the AC cable? We're talking about the AC cable inducing currents

in other things, aren't we, or are we going backwards now?

Q. This is my mistake. Let me go back and clarify the question because I'm seeing I introduced a word I shouldn't have there.

A. Yeah.

Q. So if the AC current in the AC conductor doubles as part of its normal fluctuation --

A. I think you mean if the fluctuation amount doubles.

MR. MELMAN: Dr. Kern, let Attorney Dixon finish his question. He's trying to formulate his question.

Q. If the AC current and the -- sorry.

If the AC current in the AC conductor doubles as part of a fluctuation, would the induced currents be great enough to disrupt the current in the DC cable in close proximity to the AC conductor?

MR. MELMAN: Objection to form.

You can answer.

A. The word "disrupt" is sort of a binary

thing.

So my answer to your question is no. Disruption is not a linear thing. It's a binary thing. It's either disrupted or not disrupted.

Q. So is there any problem with putting an AC cable next to a DC cable, from a cross-induction perspective?

MR. MELMAN: Objection.

A. I don't believe so.

Q. What are some of the reasons why you wouldn't want to put an AC cable in close proximity to a cable carrying DC current?

MR. MELMAN: Objection, foundation.

A. Could you restate, please? I think I heard you.

Q. What are some of the reasons why you wouldn't want to put a cable carrying AC current in close proximity to a cable carrying DC current?

MR. MELMAN: Same objection.

A. First, it depends on the level of current involved. There's a big difference between a milliamp and a megaamp. So there would obviously

be some limits to the answer.

But in general, I don't think it would be generally a problem from a physics and electricity -- from a physical performance perspective for the cables.

However, there are good practices for electricians to organize cables such that other electricians will understand what they see readily.

There are, in certain cases, electrical code provisions which mandate the isolation of AC and DC cables, primarily for the same reason, which is maintenance.

And basically, the ability for a new party looking at something that exists to understand it more readily and more quickly.

Q. Other than isolating AC and DC cables, are there other ways for electricians to organize cables such that other electricians will understand what they are looking at?

A. You know, there are various standards for color-coding different types of electrical cables.

The insulation jacket can be red, white, green, black, in certain DC cases yellow. I wouldn't say separate in a physical sense but to organize and make obvious in a visual way.

Q. What are some of the various standards for color-coding different types of electrical cables?

A. Color-coding?

Q. Yes.

A. They are -- I'm not sure actual standards. They are conventions. Personally, I don't know where those -- if there are rules and regulations on that, but there is definitely -- there's at least for AC power wiring within buildings, premises, there is -- there are standards. I just don't happen to know exactly where they are.

They're probably in the National Electrical Code. I know this more from experience than from reading the law, so to speak.

Q. That makes sense. In your experience, are DC cables always yellow?

A. No.

Q. In your experience, are AC cables ever

yellow?

A. Not in my experience. No.

Q. In your experience, typically what color are AC cables?

A. Depends where you are. I'm sure that power companies on their transmission lines don't worry about the colors. But when you get into a building, AC cables definitely have colors.

I believe that the neutrals are typically white, but I could be wrong. And the hot ones are typically black, and the grounding ones are typically green.

I am quite familiar with DC low voltage circuits where the negative is almost -- is preferentially yellow. The grounded DC is preferentially yellow. But this goes to wiring on boats, not -- on sailboats, not solar panels.

Q. So for solar panels, are there color-coding conventions for different types of electrical cables?

A. I'm not sure. If there are, it's likely -- I'm not sure. I have seen the use of

red and black in solar arrays. And again, the reason for yellow is that black as negative in solar arrays could be confused with a hot wire in an AC circuit.

If a person was not accustomed to -- if a person was in a DC situation and saw a black wire and assumed it was negative, grounded, it could be a very dangerous thing if it happened to be an AC wire that was black and hot.

That's the kind of good housekeeping thing that engineers and, I assume, the electrical codes try to promulgate for safety reasons.

Q. So for the black and red color-coding in solar arrays, what type of current are those cables carrying?

MR. MELMAN: Objection, form.

A. In solar arrays, the current is DC, with certain exceptions for infrequently deployed things such as AC modules, alternating current photovoltaic modules; PV, if you like.

So there's a "never say never" kind of aspect to what you're asking.

Q. Trackers are used with solar arrays. Right?
A. Say it again.
Q. Trackers are used with solar arrays. Right?
MR. MELMAN: Wait. Objection.
You can go ahead.
A. Trackers are used --
Q. -- with solar arrays?
A. Sometimes, not always.
Q. Sitting here today, how often are trackers used with solar arrays?
MR. MELMAN: Objection, form.
A. That's a question that -- when you say "solar array," for example, driving in this morning from 128, I saw about a dozen solar arrays, each one a single module powering a flasher or a signal. Those are not tracking.
There are a way lot more of those in the world than 100-megawatt solar fields, which is a solar array as well that might be tracking.
So if you're measuring this by the number

of solar arrays in the world, the preponderance would not be tracking.

If you're measuring them by -- weighting them by the capacity of the solar arrays, you might begin to see some impact.

The evolution of tracking, in my experience in solar going back to the 1970s, is that it comes and goes. Trackers -- let me give you an example.

If solar arrays were so cheap that the -- if they were so cheap, period, then you wouldn't worry about how much electricity each individual one made. You'd just cover the Earth with them.

If you're trying to -- if you're limited in area or if solar panels are expensive, you might use trackers to get more energy from them, from the individual panels.

Q. So for an industrial-scale solar plant, would that typically use trackers, as of today?

MR. MELMAN: Objection, form.

A. By "industrial," I think the usual term is "utility scale." Is that what you mean?

Q. Yes. For a utility-scale solar plant, would that typically use trackers, as of today?

A. Often. I wouldn't say anything is typical. It depends on the modules, the terrain, the latitude. They are very popular today.

Q. Typically how are those trackers powered?

A. Today?

Q. Today.

A. I think that in the current time frame, the 2020s onward, there has been a movement toward electronic actuators distributed within array fields.

But in the early developmental days of the industry, very often the actuator to drive the tracker -- now -- would have been a long pushrod extending east-west through a north-south array -- north-south, single-axis tracking array.

But trackers -- all trackers aren't the same. In the formative days of the industry -- and as a matter of fact, they're still being made today -- two-axis tracking was fairly common.

With a two-axis tracker, you can get about

140 percent of the amount of energy out of a single solar panel over the course of a year relative to a fixed south-facing solar panel.

With a one-axis horizontal tracker, you can get about 120 percent typically in U.S. latitudes.

This changes if you go to the North Pole or the Equator. But typically you can get 120 percent of a fixed-array kilowatthour production annually from a tracker.

And in between, there are trackers that are tilted one-axis trackers.

And further, when you get to two-axis trackers, you actually have situations of concentrating solar where you use mirrors or lenses to focus light onto a solar panel or solar cell.

So by and large, trackers of the simple north-south axis are becoming more common.

Q. Is AC or DC power used to power the north-south trackers?

MR. MELMAN: Objection, form.

A. I don't know for a fact. I suspect AC power would be used.

Q. Have you been involved in designing PV arrays that use north-south trackers?

A. No.

Q. Have you been involved in designing PV arrays that use trackers at all?

A. No, I have not been involved in the development of a particular product for a tracker.

I am certainly aware of industry friends, associates from the last 30, 40 years, that are doing this, knowing pretty closely what their technology looks like, their business looks like.

Q. But you're not sure if those trackers use AC power?

A. I expect that they use AC power. The problem being that most electric motors -- simple electric motors are -- are or were AC. But now you've got electric vehicles, and that's all DC. So who knows what's coming down the road?

Q. Have you installed trackers in a utility-scale solar plant?

A. No.

Q. Have you installed trackers in any type of solar plant?

A. When you say "installed," have I rolled up my sleeves and been in the array field doing it? No.

Q. Have you been present when trackers have been installed in the array field?

A. I think I might have been once at NREL when they were installing -- National Renewable Energy Laboratory, when they were installing a north-south tracker.

It was in very close proximity to an office that I met with many, many, many times in the 2000 to 2010 time frame when these things were being developed.

Again, most of my experience has been in the development of similar power systems mounting structures, wiring, that sort of thing.

Indeed, I was involved in field work on many of these. The first large-scale system I was intimately involved with was not a tracking

system.

Q. What was the first large-scale system that you were intimately involved with?

A. It was a 1-megawatt power system built in Cagayan de Oro, on the southern island of Mindanao in the Philippines.

Q. What work did you perform in relation to that 1-megawatt power system built in the Philippines?

A. I wrote the procurement specifications for the electric utility that was buying this, overseen by the International Finance Corporation that was sponsoring it.

I reviewed all the proposals. I participated in the selection of the contractor that built it. I reviewed all of the contractor's drawings, electrical, mechanical submissions during the construction.

I didn't supervise continuously, but I visited the site on several occasions, checking to see how it was being built.

Q. What year or years were you performing

your work on this mega -- 1-megawatt power system in the Philippines?

A. Gosh. I believe it was in the -- well, let's see. Time flies when you're having fun.

I believe it was in the 2003 to 2006 time frame. Could have started earlier. And my participation continued during the operational phase, so . . .

Q. Did this 1-megawatt power system in the Philippines have trackers for its solar arrays?

A. No, no. It was fixed, as I said earlier.

Q. Did you do any other work on utility-scale solar prior to your involvement with this 1-megawatt power system in the Philippines?

A. Most of my work involved commercial, industrial and residential scale distributed solar. But most of my work was with electric power companies doing this kind of integration, electronics and wiring stuff.

However, in that same time frame of going back to the mid 1980s into the late 1990s, these were at a time when photovoltaics were not

cost-effective. Everything was developmental.

So in that time frame, there was a project, for example, called the PVUSA project in Davis, California, that I had visited on many occasions. Many? Half a dozen occasions.

And the collegial nature of the industry back in that point in time was such that it was small. People knew each other. We would visit each other's sites. We would get together at professional meetings. We would work on common issues between small- and larger-scale systems.

But mind you, in the 1990s people weren't building megawatt systems other than as -- what is the motivation? It was a lot of money and it wasn't paying a lot.

So it was utilities building things like, for example, the colleague in Austin, Texas, at an Austin electric utility built a 300-kilowatt system back in the late 1980s, I think. And that was a huge event in the industry.

But I built a rooftop system on the top of the electric utility's headquarters building. So,

you know, we're all in the same thing. We know what each is doing.

But the distributed rooftop business preceded the utility-scale business because the -- basically, because the utility-scale solar needs to compete with central-station electric power generation, whereas distributed solar, if it's behind the meter, is valued much more highly than utility-scale solar, which is on the generation transmission grid.

So yeah, it was a small industry, a lot of people very close.

Q. Okay. So around the time you worked on your first project in the Philippines for utility-scale solar, were you working on any other utility-scale solar projects?

A. No.

Q. Since your work on the utility-scale solar project in the Philippines, have you worked on any other utility-scale solar projects?

A. Been involved in them? Yes.

Q. About how many other utility-scale solar

projects have you been involved in?

A. I can think of three that I had a direct involvement in.

Q. What years were you involved in those three utility-scale solar projects?

A. Again, I could be off by a year or two here, but 2005 to 2012. That time frame. These were outside the United States.

Q. Have you been involved in a utility-scale solar project since 2012?

A. Since 2012, I've been doing some pro bono work for my college, my high school, my town. I think a megawatt in the town of Lincoln, keeping my hands in it, 20 kilowatts-ish for Dartmouth College in New Hampshire in the White Mountains, and the other one -- I said three. Oh, the other one -- since 2012 . . .

I forget. It's been mostly pro bono on the side of guidance.

Q. What type of pro bono guidance do you provide on these projects that you've worked on since 2012?

A. Oh, modeling, performance modeling, figuring out the expectations for power production, making sure -- making sure the details were to my liking, the way things were constructed.

A good deal of it financial cross-double-checking.

Q. Did these pro bono projects involve cable hangers?

A. No.

Q. Did these pro bono projects involve trackers?

A. No. I did get fairly close to one small tracking system that Dartmouth College put out, but I was mostly an observer on that.

Q. So you mentioned that you worked on three other utility-scale projects in roughly the 2005 to 2012 time frame. Right?

A. Correct.

Q. Did those utility-scale projects involve trackers?

A. One definitely did not. That was a

5-megawatt plant in south India. One did, but it could have been a concentrating solar thermal tracking system, which is beyond the scope of what you're talking about. But it's, again, covering the land with things that move and make power from sunlight.

And I'm spacing out on the third one right now. Oh, oh, oh. One with Tata Power near Mumbai. I think it was 2 or 3 megawatts.

Q. So in the four utility-scale solar plants, did any of those have AC current-carrying cables?

MR. MELMAN: Objection, form.

A. I -- the short answer is no.

The more caveated answer is probably somewhere within the facility but not adjacent to, abutting, ubiquitously associated with any other cabling, the DC cable.

Q. So when you say the -- somewhere in the facility there would be an AC current-carrying cable, would that be connected maybe to an inverter?

MR. MELMAN: Objection, form.

A. Well, I hadn't thought of that. Yes, certainly. I'm thinking more or less like a typewriter at the receptionist's office. Typewriter, they don't exist anymore.

Q. But it's fair to say that there wouldn't be AC cables within the solar array. Correct?

A. Correct.

MR. DIXON: Now might be a good time for a break. I think we've been going about an hour, if that works for everyone. Maybe five minutes. Is that good?

MR. MELMAN: Sure.

(Recess, 10:47 a.m. to 10:59 a.m.)

BY MR. DIXON:

Q. So can we please turn to page 13 of your declaration, Exhibit 2038.

A. Got it.

Q. In Paragraph 19 you state, "In my opinion, it is vitally important to possess practical real-world experience in solar PV installations to fully understand and grasp the unique technical issues, challenges, and practicalities in this

area of technology. Academic qualifications, while helpful, are alone insufficient."

Did I read that accurately?

A. Yes.

Q. Why did you include this in your declaration?

A. I included this because although I'm an academic, as you discovered, sort of hands-on understanding of the practicality of where things go, how things work, how someone building a system, a solar power system, what they face is in the back of my mind and it needs to be to understand how to make these better.

Q. And when you say "practical real-world experience," do you mean field experience?

A. I mean field experience with solar panels in various instances.

Q. What do you mean by "various instances"?

A. What I mean is that a solar panel is a solar panel whether it's in a megawatt field or in a kilowatt field. The wiring between solar panels is the same on a rooftop as it is on a --

potentially the same on a rooftop as it is on a megawatt-scale system. It all boils down to the same technology.

Q. So when you refer to field experience and practical real-world experience, you're not saying that someone needs extensive utility-scale field experience?

MR. MELMAN: Objection, form.

A. Extensive utility-scale photovoltaic? I think experience can scale, but it can't scale infinitely. There are . . .

Actually, rephrase the question, please, or repeat the question.

Q. Is it vitally important to possess practical real-world experience in utility-scale solar PV installations?

A. It's --

MR. MELMAN: Wait, wait, wait.

Objection, form.

You can go ahead.

A. It's useful. But my experience in smaller-scale systems is also useful in

utility-scale systems.

Q. And that's because the utility-scale systems have common properties with utility scale -- strike that. I said the same thing.

A. You did.

Q. And that's because smaller-scale systems have common properties with utility-scale photovoltaic systems. Right?

MR. MELMAN: Objection, form.

A. Yes.

Q. So for the purposes of your opinions here, your experience in smaller-scale systems can also help inform -- let me rephrase that question.

So your experience in smaller-scale systems helps you -- helped inform your opinions in this matter?

A. Yes.

Q. Do you view your experience in utility-scale systems as necessary to grasp the unique technical issues, challenges, and practicalities in solar PV installations?

A. Your last statement was in solar PV

installations? Are you referring to large or small?

Q. In general.

A. In general, knowledge about solar panels translates to whether there are -- somewhat translates to whether there are a few or many or a lot. The scale of a system, the appreciation of the scale of a system is -- larger scales is also useful to experience them.

Q. When you say it's useful to experience larger-scale systems, what type of experience are you referring to?

A. Being within and among and on a large site as opposed to a small site, logistics, conveniences that one might have at a smaller site that don't exist in a remote larger site. That sort of thing.

Q. What are some of the conveniences one might have at a smaller site that don't exist in a remote larger site?

A. Food, water, air-conditioning, a loading dock, civilization.

Q. What are some of the logistics one might have at a smaller site that doesn't exist at a remote larger site?

A. What are the -- could you restate? I missed one word. What are the -- that you might have?

Q. What are some of the logistics one might have at a smaller site that doesn't exist at a remote larger site?

A. Telephone, a ship-to address, medical services. We're talking about remote places where you're totally on your own versus in a smaller-scale system in an urban environment where you're not.

Q. Are all large-scale solar installations remote?

A. No.

Q. What other type of experience is it useful to have with larger-scale systems?

A. I think appreciation of the difficulties of working on the open terrain, security, pests, vandals -- some things that -- distances;

inspecting something and finding that instead of a one-minute walk it's a half-hour roundabout way to get to some other place on the system that's accessible.

Q. Are there any other types of experience that's useful to have with larger-scale systems?

A. I'm sure there are, but nothing comes to mind at this point.

Q. So if we'd turn to page 14 of Exhibit 2038, specifically Paragraphs 23 and 24. These are titled "Person of Ordinary Skill in the Art." Is that correct?

A. Paragraph -- yes. B, "Person of Ordinary Skill in the Art."

Q. Do you disagree with the petitioner's statement regarding the level of ordinary skill in the art?

A. No.

Q. And you applied the petitioner's statement regarding the level of ordinary skill in the art in offering your opinions in this matter?

A. Yes.

Q. In Paragraph 23 in the statement of the level of ordinary skill in the art, it doesn't refer to experience with utility-scale solar, does it?

A. No.

Q. So for the purposes of this matter, a person of ordinary skill in the art would not need experience in utility-scale solar?

MR. MELMAN: Objection.

A. For this definition, yes.

Q. Let me clarify. Did you just say for "this deposition" or "this definition"?

A. I am saying that this definition of POSITA does not say that it requires experience in solar -- it doesn't mention the word "solar."

Q. So if we turn to page 19, Paragraph 37. Do you see that at the top of the page?

A. Yes, I do.

Q. On the third line up from the bottom of that paragraph, you use the term "balance of systems." Is that accurate?

A. Yes.

Q. What is a balance of systems?
A. Balance of systems is a catchall in the photovoltaic industry for everything other than the module, the PV module.
Q. Would balance of systems include an inverter?
A. If it's not a PV module, yes.
Q. Does balance of systems include the power grid?
A. No.
Q. Where is the line of demarcation between balance of systems and power grid?
A. It's called the point of interconnection within electric utilities, defined by the electric power company, but typically at or near the -- any metering or switchgear that the utility requires to accept the power from the PV system.
Q. Okay. In the first sentence you say, "PV system designers and installers, while seeking to lower both manufacturing and construction costs, are guided and constrained by these NEC safety codes as well as structural codes." Did I read

that accurately?

A. Yes.

Q. What NEC safety codes constrain PV systems designers and installers?

A. Article 690, predominantly. And I think guided and constrained would be the proper . . .

Q. Why do you feel that including "guided" would be proper?

A. Because it shows designers paths forward, not simply things that you cannot do.

Q. So it's recommending paths forward for the development of PV systems? Do I have that right?

A. I missed one word in your statement.

Recommending?

Q. Are you saying that the NEC guides PV systems designers and installers by recommending paths forward for the development of PV systems?

MR. MELMAN: Objection.

A. It doesn't really guide them on pathways, but it informs them of what they should do and what they cannot do, the strengths.

Q. So it recommends them -- strike that.

So it recommends things that they should do in developing PV systems?

A. It says what they can do.

Q. Didn't you just say that it informs them of what they should do and what they cannot do?

MR. MELMAN: Objection, form.

A. It sets out rules for building photovoltaic systems.

Q. And when it sets out rules for building photovoltaic systems, it's your opinion that the NEC guides PV systems designers and installers?

MR. MELMAN: Objection, form.

A. It provides guidelines.

Q. So in Paragraph 37, why did you say that PV systems designers and installers are guided by the NEC safety codes as well as structural codes?

MR. MELMAN: Objection, form.

A. Could you restate that, please? Not restate but just repeat. Why are they . . .

Q. In Paragraph 37, why did you say that PV systems designers and installers are guided by the NEC safety codes as well as structural codes?

MR. MELMAN: Objection, form.

A. Why did I say that? I say that because my experience in actually helping write for -- my group at MIT in the 1970s wrote Article 690, the first drafts of it.

So these were things to make -- guidance to make photovoltaic systems safe and to avoid problems and to avoid people from making shortcuts in the process of trying to lower costs. It says how you should do it to make it safe. So it guides the designers.

Q. And you also say in Paragraph 37 that noncompliance can result in costly failure to pass an electrical inspection and professional liability in the case of an injury, accident, or damage. Is that accurate?

A. That's -- yes.

Q. Who enforces the NEC safety codes?

A. Local authorities having jurisdiction.

Q. If someone were to design a PV system in your hometown, who would be the local authorities having jurisdiction to enforce the NEC safety

code?

A. In the Town of Lincoln, it is the Lincoln electrical inspector, whose name I can't remember.

Q. Does the local electrical inspector for a utility-scale system -- strike that.

For a utility-scale system, would the local town electrical inspector inspect that entire facility?

MR. MELMAN: Objection to form.

A. In most cases, yes. If an electric utility owned it, public electric utility owned it, it might be exempt.

Q. If a public electric utility owned it, would anyone be in charge of NEC code enforcement?

A. I think we're in a gray area here because since the restructuring of the electric power industry in many places, there is an uncertainty as to what is and what is not an electric utility.

But your question again? I'll give you a yes, no, if you repeat your question.

Q. If a public electric utility owned a PV system, would anyone be in charge of NEC code

enforcement?

A. I am not sure. My guess would be no.

Q. Would there be a risk of liability if a utility-scale PV system was not NEC compliant?

A. A risk of liability, certainly.

Q. And because of NEC code enforcement and that risk of liability, it's your opinion that as a general matter PV systems designers and installers are cautious in designing the balance of systems in PV systems?

MR. MELMAN: Objection.

A. Yes.

Q. Because they're cautious, they'll look to the NEC for pathways forward that minimize that risk?

MR. MELMAN: Objection, form.

A. I would refer back and say guided and constrained to minimize that risk.

Q. So moving to the next paragraph, you discuss power collection and aggregation in solar PV facilities. Is that right?

A. Yes.

Q. What do you mean by "solar PV facilities"?
A. Solar power plants.
Q. Solar power plants regardless of size?
A. Yes.
Q. Can you define for me what exactly a PV array is?
A. A PV array is a collection of PV modules wired together.
Q. What is a PV module?
A. A PV module is an assembly of solar cells wired together.
Q. What is a solar panel?
A. The same thing as a solar module.
Q. So -- go ahead.
A. A solar panel and a solar module are somewhat interchangeable. Sometimes people would refer to a solar panel as a panel of modules, so there is ambiguity with the word "solar panel" in the industry jargon.
Q. What is a string of modules?
A. A string of modules is a group of modules connected in series.

Q. So if you'd go to page A2 of Appendix A to Exhibit 2038, does this represent, in the top picture, a string of modules?

A. It's unclear. It's impossible to tell by looking at the picture.

Q. Why is it impossible to tell by looking at the picture?

A. Because you cannot see the back side of the modules to see whether -- how they're interconnected.

Q. In Paragraph 38, you also mention string combiners. What is a string combiner?

A. Page 19?

Q. Page 19. Yes.

A. Paragraph 38? I don't see it.

Q. So starting on the third line there is a sentence that says, "These unique challenges related to, for example, aggregating and collecting power." Do you have it?

A. Yes. Okay. Got it.

A string combiner is a device that connects in parallel multiple strings.

Q. When you refer to "multiple strings," are you referring to multiple strings of modules?

A. Yes. Multiple strings of modules.

Q. How does the string combiner physically connect in parallel multiple string modules?

A. It uses terminations of individual strings to a common bus bar.

Q. What is a termination of individual strings?

A. Usually a connector or a ring terminal.

Q. I'm sorry if I'm asking kind of uninformed questions, but I'm not trying to be difficult. I'm just trying to understand --

A. Sure.

Q. -- how the array actually works.

But what is a ring terminal?

A. A ring terminal is an electrical device that you would crimp on the end of a wire so as to connect it to a busbar with a screw through the center of the ring.

Q. Okay. So if you're installing a string of PV modules and you go to connect it to a string

combiner, you would have the end of a wire. And then you take that end of the wire and crimp on a ring terminal to the end of that string?

A. That's one way. Yes.

Q. What's another way?

A. Oftentimes there are built-in connectors at the ends of individual wires used in solar panels, solar arrays, solar strings. "Plugs" is a common term. Plug and receptacle.

Q. Do they come from the wire manufacturer with the plug already built onto the end of the wire?

A. Yeah. Yes.

Q. And what is a common busbar?

A. Usually a piece of copper, rectangular shaped.

Q. Would you plug one of the plugs on the end of a string into the piece of copper?

A. No. The manufacturer of the string combiner, if that's what we're talking about still, would probably use a ring terminal and a conductor leading out to a connector. And you

would simply connect plug and receptacle.

Q. And in Paragraph 38 on page 19 of Exhibit 2038, you mention output feeder cables.

A. Uh-hmm. Yeah.

MR. MELMAN: Wait, wait. Let Mr. Dixon ask a question.

Q. Let me rephrase my question.

In Paragraph 38 on page 19 of Exhibit 2038, you state that string combiners output feeder cables to inverters. Is that accurate?

A. Yes.

Q. Are there any other ways to connect strings of modules to feeder cables other than string combiners?

MR. MELMAN: Objection, form.

A. No.

Q. Are you aware of any PV arrays that connect string modules -- strings of modules directly to an inverter?

A. Yes.

Q. What types of PV arrays connect string

modules directly to an inverter?

A. A PV array as a single string.

Q. Is it fair to say that most utility-scale solar doesn't have a single string?

A. That's a -- utility-scale solar has many, many strings. So yes.

Q. So utility-scale solar plants will always have some form of string combiners?

MR. MELMAN: Objection, form.

A. Yes.

Q. Have you heard of the term "home run cable"?

A. Yes.

Q. Where does a home run cable fit into the PV system that we were just discussing?

A. "Home run" is an ill-defined term. But in my mind, it is associated with a cable run starting at the end of a collection of solar panels that are wired together as a string and running to the next point -- either an inverter or a string combiner, the next point in the flow of the power from the array toward the point of

interconnection with a utility.

Q. Can a home run cable be a feeder cable?

A. In a situation where there's only one string, yes.

Q. Are there situations where feeder cables are aggregated into a string combiner?

A. "Feeder cable" is also ill-defined. In the National Electrical Code, Article 690, there are PV source circuits and there are PV output circuits.

The correct terminology is that a PV source circuit is fed into a combiner where the current is aggregated with other source circuits and the output of a combiner is a PV output circuit.

Now, when you say "feeder circuit," it's ambiguous depending on the context of how many source circuits there are in a system.

Q. How is "feeder cable" ambiguous depending upon the context of how many source circuits there are in a system?

A. If there is only one source circuit, then

the concept of a feeder is usually meaningless.

Q. Would an example of only one source circuit be a PV system that only has one string of modules?

A. Only has one? I missed one word.

Q. String of modules.

A. Yes.

Q. How do feeder cables -- strike that.

How do inverters convert DC current from feeder cables to AC current?

A. With power electronic switches.

Q. How do the power electronic switches work?

MR. MELMAN: Objection, beyond the scope.

A. Like switches.

Q. As in on/off switches?

A. Yes.

Q. So in operating as on/off switches, how do they convert DC current from feeder cables to AC current?

MR. MELMAN: Objection, beyond the scope.

A. Induction.

Q. How does induction convert DC current to

AC current?

MR. MELMAN: Same objection.

A. Induction is what's used in transformers.

Q. Is an inverter a transformer?

MR. MELMAN: Objection. And, Mr. Dixon, if you'll give me a running objection to this line of questioning, I won't have to keep interrupting you.

MR. DIXON: Agreed.

MR. MELMAN: You can answer.

THE WITNESS: Do I answer the question?

MR. MELMAN: Yes. You can answer if you can.

A. What was your question again?

Q. Is an inverter a transformer?

A. No, not in the usual sense of the word.

Q. So how does an inverter transform -- sorry. Let me rephrase that question.

How does an inverter convert DC current from feeder cables to AC current via induction?

A. By high-frequency power electronic switches, transformers, inductors, and capacitors

wired appropriately together as any inverter manufacturer does.

Q. Where are inverters located in a solar array?

MR. MELMAN: Objection, form.

A. Inverters are not located in photovoltaic arrays. They're located in photovoltaic power systems.

Photovoltaic arrays are solar panels.

Q. Where are inverters located in photovoltaic power systems?

A. At convenient locations where DC can be aggregated.

Q. But those convenient locations where DC can be aggregated are not within the solar array itself?

A. They may be within the same land area. Yes.

Q. But the inverters aren't located in and amongst the strings of modules?

MR. MELMAN: Objection, form.

A. Well, I could tell you that I have built

inverters that are on the module. It's called an AC module.

I can tell you that there are string inverters that have been made for each string of modules and distributed through array fields. But these are not common in -- these are not common at all in utility-scale systems.

So yes, but not in utility-scale systems.

Q. In what types of systems would there be an AC module?

A. Typically small rooftop systems.

Q. After the inverter outputs an AC current-carrying cable, are those AC current-carrying cables typically in close proximity to any DC current-carrying cables?

MR. MELMAN: Objection.

A. No.

Q. On page 20 of Exhibit 2038, in Paragraph 41, do you see the sentence that says, "Higher module efficiencies for these modules reduce land costs, structural support costs in favor of simple single-axis tracking to improve

electricity production by 20 to 25 percent"?

A. Yes.

Q. In the 2010 to 2015 period, did the PV industry still favor simple single-access tracking?

A. During the -- could you restate, please? I just want to make sure I heard you right.

Q. In the 2010 to the 2015 period, did the PV industry still favor simple single-access tracking?

MR. MELMAN: Objection, form.

A. Yes.

Q. In the 2010 to 2015 period, did the preponderance of utility-scale solar systems use simple single-access tracking?

A. I believe so. It was evolving.

Q. What do you mean by "it was evolving"?

A. It wasn't constant through the entire period from 2015 to -- 2010 to 2015.

Q. How did it change from 2010 to 2015?

MR. MELMAN: Objection, form.

A. It probably became more common.

Q. In Paragraph 41 you say, "As time went on, however, it also complicated array field wiring by introducing the requirement for control cabling." Is that accurate?

A. That's as stated. Yes.

Q. Where is the control cabling located in array field wiring?

MR. MELMAN: Objection, form.

A. The control cable would have to be led to the actuator device for tracking arrays.

Q. Where is the actuator device located for single-access tracking devices?

MR. MELMAN: Objection, form and foundation.

A. The tracking -- the actuator device is in a tracker on each row at some location.

Q. So the data cable -- sorry. Strike that.

The control cabling comes from a different location to the actuator device on each row?

A. No. Each row would have an actuator device.

When you say "control cabling," are you

talking about signal?

Q. So in Paragraph 41 you reference control cabling. What do you mean by "control cabling" in Paragraph 41?

A. Signal and power.

Q. How are signal cables wired in a PV array?

A. I don't see control cabling in Paragraph 41.

Q. The very last line, do you see "control cabling"?

A. I do. Thank you. Control cabling.

Q. How are signal cables wired in a PV array field?

MR. MELMAN: Objection, form.

A. They're wired from -- you said signal wires?

Q. Correct. Signal wires.

A. They're wired from a controller, which is probably centralized, to individual actuators.

Q. When you say the controller is centralized, centralized where?

A. Adjacent to or within the array field.

Q. Would there be one controller for the entire array field?

MR. MELMAN: Objection, form.

A. At least one. The array field may be subdivided.

Q. So for its local strings of modules, it would have wires going out to each one of those module strings and attaching to an actuator?

MR. MELMAN: Objection to form.

A. No.

Q. So how does the centralized controller use signal wires?

A. They extend it through the centralized controller to an actuator on each -- typically on each row of modules or panels of modules.

Q. So the centralized controller has signal wires extending from the centralized controller to an actuator on each row of the modules or panels of modules?

MR. MELMAN: Objection.

Q. Is that accurate?

MR. MELMAN: Objection to form.

A. That is one way. There are instances where one actuator controls multiple rows of panels.

Q. But that actuator is still ultimately controlled by the centralized controller?

A. By a -- yes.

Q. In Paragraph 43, which is page 21 of your declaration, you state that solar PV arrays became commercially viable in the mid to late 2000 time frame. Is that correct?

A. That's -- yes. That's stated.

Q. What do you mean by "mid to late 2000 time frame"?

A. I mean somewhere between 2000 and 2010.

Q. On the next page, in Paragraph 47, in the third line up from the bottom of the page, do you see where it says, "A number of DC power strings source circuits are then extended to a string combiner and wired in parallel to aggregate their current"?

A. Yes.

Q. Is a DC power string the same thing as the

strings of modules?

A. Yes. We were discussing.

Q. And then in the next paragraph on page 23, about halfway down, do you see, "Typically 4/0, which is about three-quarter inch diameter"? Do you see that?

A. Yes, I do.

Q. What is 4/0?

A. That's 4-aught cable, American wire gauge.

Q. What is the relevance of wire gauge?

A. It's a standard for the size of wires.

Q. Is a 4-aught cable a large cable?

A. You would think so. Yes.

Q. You don't think so?

A. I've seen a lot bigger.

Q. In what context were those bigger cables -- sorry. Let me strike that.

In what context did you see those bigger cables?

A. Electric power systems.

Q. PV electric power systems?

A. No. Utility electric power systems.

Cable system sizes, American wire gauge. It's easy to look up.

Q. What's the largest cable you've seen in a PV electric power system?

A. Probably 4 aught.

Q. So later in this paragraph you say, "At this stage, wire runs would likely be routed 90 degrees from the direction of the rows of PV panels and would typically be placed in trenches with risers to the string combiners." Do you see that?

A. Uh-hmm.

Q. When you say "at this stage," what stage are you referring to?

A. The stage after the combiner, the flow of current starting with the panels into source circuits to a combiner box and then the next stage, the PV output circuits.

Q. Is the combiner box the location where the wire runs would likely be routed 90 degrees?

MR. MELMAN: Objection.

A. No.

MR. MELMAN: Form.

Q. At what point in the system would the wire runs likely be routed 90 degrees?

A. At the ends of rows of panels.

Q. When you say they would typically be placed in trenches with risers to the string combiners, are you referring to output wires that would be trenched?

A. It could be both the output wires, the PV output wires per NEC jargon, or PV source circuits. But definitely the PV output wires.

Q. In Paragraph 48, are you talking about any specific time period when there would be trenched wires?

A. During the 2000-2010 time frame, perhaps a little bit longer.

Q. In Paragraph 48 when you're referring to trenching, would that statement be accurate as of 2014?

A. Yes.

Q. Is your statement in Paragraph 48 regarding trenching accurate as of today?

A. Less so.
Q. How do you know that it's less accurate today?
A. Because of things I've learned in the past five years and currently. This is an evolving industry and awareness of evolution changes in the industry.
Q. How have you come to learn of the evolution changes in the industry?
A. Changes in electrical code, seeing array fields, seeing industry information.
Q. When have you seen array fields?
MR. MELMAN: Objection to form.
A. Large-scale array fields. Every time I have a chance. It's one of those things that catches my attention when I see them.
Q. When was the last time you saw a large-scale array field?
A. Well, there's a few of them in Colorado where I spend my winters that are fairly big, 5 megawatts. I will often if driving by something like that out of curiosity stop and go in and look

at them.

I'm trying to think in the last five days whether I've driven by something and just ignored it. They're becoming more and more common.

Q. So when you stop by and go in and look at them, are you actually entering the facility or are you just looking from behind a fence or something?

A. No. I'm an outsider.

Q. So you haven't been able to actually go in and see the details of how the --

A. You can see the details from the outside.

MR. MELMAN: Let Mr. Dixon finish his question.

THE WITNESS: Okay.

Q. What details can you see from the outside?

MR. MELMAN: Objection, form.

A. Configuration of the panels, structure.

Q. Would you be able to know if there is trenching by looking at it from the outside?

A. You could infer.

Q. How would you infer that there's trenching

in the PV array field by looking at it from the outside?

A. You would not be able to see -- well, you would see conduits running down into the earth, and you would not see wires supported by other methods above ground.

Q. What are some of the other methods of supporting wires above ground?

MR. MELMAN: Objection, form.

A. There are a number. They're enumerated in Article 690.

Q. When was Article 690 -- actually, let me back up.

When you refer to Article 690, you're referring to Article 690 of the NEC. Correct?

A. Yes, in its multiple editions.

Q. When was the first edition of Article 690 created?

A. That's a good one. In the late 1970s or early 1980s. I believe the late 1970s.

Q. Do you know if the first edition of Article 690 enumerated methods of supporting wires

above the ground?

A. No, I don't. I would need to go back and read it.

Q. Do you know when Article 690 first enumerated methods of supporting wires above the ground?

MR. MELMAN: Objection.

A. No.

MR. MELMAN: Foundation.

MR. DIXON: Now might be a good time for lunch. We've been going for about an hour and a half.

(Lunch recess, 12:16 p.m. to 1:02 p.m.)

A F T E R N O O N S E S S I O N

BY MR. DIXON:

Q. Good afternoon, Dr. Kern. You had a good lunch?

A. Indeed, Mr. Dixon. Thank you.

Q. Could you please turn to page 26 of your -- 27 -- sorry -- of Exhibit 2038. And look at Paragraph 60.

This paragraph talks about an expectation within the industry from 2000 to 2014 that wire management for solar installations would simply involve selection and application of existing methods and equipment. Is that right?

A. Yes.

Q. What were some of those existing methods and equipment that you reference in Paragraph 60?

A. The ones that are enumerated in Article 690: conduit, cable trays, direct burial in conduit, direct burial without conduit, wire ties.

When this industry started, whatever seemed easy. Also, whatever was going to get you

past the local building inspector.

Q. At that time, did Article 690 reference hangers?

MR. MELMAN: Objection, form.

A. Short answer, no.

Q. Is there a long answer?

A. It still doesn't.

Q. Does it use the word "hanger" in Article 690 of the NEC?

A. Which year?

Q. At any time between 2000 to 2014.

A. I don't believe so.

Q. Does Article 690 of the NEC use the word "hanger" today?

A. I don't believe so. I'm not sure. I'm not positive.

Q. Between 2000 and 2014, did any article of the NEC use the word "hanger"?

MR. MELMAN: Objection, form.

A. I don't know. The NEC is hundreds and hundreds of pages. If I do a search for the word "hanger" and I -- 50 percent odds I find it

somewhere. But in this context, no.

Q. So between 2000 and 2014, did Article 690 of the NEC reference aboveground cable management systems?

A. Literally reference those words "aboveground cable management systems"? Is that what you're asking?

Q. Yes.

A. I don't know. It certainly enumerates a number of aboveground cable management approaches. I wouldn't say systems.

Q. What are the aboveground cable management approaches that Article 690 enumerated between 2000 and 2014?

A. Was there a question there?

Q. Yeah. The question was, what are the aboveground cable management approaches that Article 690 enumerated between 2000 and 2014?

A. I know that in 2011 it enumerated a number of them. I don't know if I can relate them exactly, but it's in article -- Paragraph 30B, I believe, Article 690.

Do you have a copy of that to look at?
Q. Let me check.
A. It's not important to me. It does list --
MR. MELMAN: Wait, wait, wait. Mr. Dixon is looking for a copy of Article 690.
THE WITNESS: Okay.
MR. MELMAN: Let's give him a chance to do that and then ask any additional questions he has.
Q. I don't think I have it on me.
Can you recall just from memory the aboveground cable management approaches that Article 690 enumerated in 2011?
MR. MELMAN: Objection, form.
A. I believe it enumerates cable trays, conduit, and several other methods, but I don't explicitly remember. And it had a catchall "and similar," I think was the word, or whatever.
Q. What is a cable tray?
A. A cable tray is a tray that extends horizontally with elevated sides in which you can lay cable, cables.
Q. And a cable tray is an aboveground cable

management approach?

A. Yes.

Q. Can there be an aboveground conduit to manage cables?

A. Yes.

Q. What is an example of an aboveground conduit that is used to manage cables?

A. Electrical conduit, either EMT, metal; or PVC conduit, tubular.

Q. Were cable trays used in solar between 2000 and 2014?

A. Yes.

Q. How were cable trays used in solar applications between 2000 and 2014 suspended above the ground?

MR. MELMAN: Objection, form.

A. They were attached to the array structure, and wires leading from the solar panels could be laid into the trays and extended distances toward combiner boxes or inverters.

Q. What were cable trays attached to within the array structure?

A. Typically the posts supporting the array itself, the panels.

Q. Were electrical conduits used in solar applications between 2000 and 2014?

A. Yes.

Q. How were the electrical conduits used in solar applications between 2000 and 2014 suspended above the ground?

MR. MELMAN: Objection, form.

A. This is attached to structural members of the ground support of the array itself.

Q. When you reference structural members of the ground support of the array, are you talking about the posts supporting the array itself?

A. Yes.

Q. Were any other structures used to support either electrical conduits or cable trays in a solar array between 2000 and 2014?

A. Other than the column supports, there may be additional support from torque tubes between columns, and there may be additional support above the ground in wire runs needed to connect rows of

panels. But by and large, most of the interconnections would be to the structure supporting the panels, the array.

Q. You mentioned there may be additional support above the ground in wire runs needed to connect rows of panels.

What additional support would there be in that scenario?

A. Footings on the ground, concrete or steel, upon which the cable tray or conduit could be attached and supported.

Q. Between 2000 and 2014, were cable ties used to manage cables in PV arrays?

A. Probably in certain instances cable ties could be used to attach jumper cables between modules to the module frames, but they would be discouraged for so-called home runs or so-called home run wiring.

Q. What are jumper cables between modules?

A. Most module manufacturers will provide pigtails for each module so that they can be quickly connected to form a series string.

Q. What's the difference between a cable tie and a cable hanger?

A. A cable tie is a -- typically plastic but possibly metal device that you can use to cinch a cable to an existing structure to support it.

A cable hanger would rely on gravity to capture the cable.

Q. So jumping ahead a little bit to Paragraph 82, which is on page 36 of Exhibit 2038, do you recognize this section of your report or your declaration?

A. Oh, let me go back to see what the heading is. Overview of the '291 patent. That's the section, apparently.

Q. So in Paragraph 82, the last sentence, you discuss dependent Claims 2 through 4 of the '291 patent. Right?

A. It mentions dependent Claims 2, 3, and 4 of the '291 patent.

Q. And dependent Claims 2, 3, and 4 of the '291 patent claim cable hangers with at least three, four, and five cable-carrying surfaces. Is

that right?

MR. MELMAN: Objection to form.

A. I believe that's correct.

Q. How would you modify the hanger shown in Figure 2 at the top of page 36 here to have three cable-carrying surfaces?

MR. MELMAN: Objection, form.

A. Well, I think actually the Figure 2 shows three cable-carrying surfaces.

Q. And which surfaces are the three cable-carrying surfaces?

A. One is listed as 10. Immediately to the right of 10 there is a cable-carrying surface that is not numbered. And directly above 10 there is a cable-carrying surface with -- shown with a cable in it.

Q. How would you modify the cable hanger disclosed in Figure 2 to have five cable-carrying surfaces?

MR. MELMAN: Objection, form.

A. I think you would repeat the up and down undulation of 10 leading to the unnumbered

cable-carrying surface to its right and just repeat that up and down.

Q. Would you have any concerns about whether the cable would still be -- the cable manager would still be able to function and support cables used in PV arrays?

A. Going to three?

Q. Going to five cable-carrying surfaces.

A. No. I have no problem with that.

Q. So it would be a relatively simple modification to make to the hanger in Figure 2?

MR. MELMAN: Objection, form.

A. Provided -- yes, provided the materials and the strength of the materials were properly adjusted to reflect the intended weight-loading capacity that you'd put onto it.

Q. How would you go about adjusting the strength of the materials to reflect the intended weight-loading capacity?

MR. MELMAN: Objection, form and beyond the scope.

A. Make it thicker, use stronger material.

Two basic approaches.

Q. So if you'd go to page 44 -- actually, sorry. Page 37 of Exhibit 2038. There's a heading here that says, "Claim Interpretation." Is that right?

A. Yes.

Q. What is your understanding of how claim interpretation factors into this proceeding?

MR. MELMAN: Objection to form. It calls for a legal conclusion.

A. Claim interpretation. I'm trying to think of the legal word for -- the meaning of the word -- construction.

Claim interpretation, I'm not sure. It's a legal process of interpreting what is in a claim and what is not in a claim.

Q. Do you know what materials you consider when interpreting a claim?

MR. MELMAN: Objection, form.

A. I'm not a lawyer, but I understand that the body of the claim and the preamble of the claim may or may not be limiting, is the

terminology I understood.

Q. So when you're understanding the meaning of a claim, do you consult anything other than the body of the claim and the preamble of the claim?

MR. MELMAN: Objection, form.

A. If needed to understand the claim, the body of the claim, or to find the definition of what is meant by wording in the body of the claim, you can go back to the preamble of the claim to look for that definition or look for that meaning. And from the preamble of the claim, you can go back to the specification, I believe it's called, to further understand the meaning and interpretation of the claim.

Q. So in Paragraph 6 of Exhibit -- sorry. Strike that.

In Section 6, titled "Claim Interpretation" of Exhibit 2038, do you express an opinion regarding the proper interpretation of the term "electrical cables"?

A. Yes. I believe so.

Could you show me where I refer to

electrical cable in that, point it out?

Yeah.

Q. So just looking at the subsection headings in Section 6 of Exhibit 2038, do you identify electrical cables as a term in meeting claim interpretation?

MR. MELMAN: Objection to form.

A. Yes, I believe the word "electrical cables" or . . .

Do you have a copy of the '291 patent, please? I'd like to look at the exact wording.

Q. This is Exhibit 1001.

(Exhibit 1001, previously marked, is not attached to the transcript.)

A. So we are talking about Claim 1. And in Claim 1, Column 10 -- I forget the legal term, but the body claims, the second one refers to at least one electrical cable of the plurality of electrical cables.

And the plurality has no antecedent unless you go back to the preamble or precedent. I'm not sure which is the right word. So the plurality of

electrical cables is ambiguous until you look up to the preamble and you see "a plurality of electrical cables."

Q. I'm handing you what's previously been marked as Exhibit 2001.

(Exhibit 2001, previously marked, is not attached to the transcript.)

Q. So if you go to page 44 of Exhibit 2001 -- let's back up.

Do you recognize Exhibit 2001?

A. Yes. I'll look for the signature page just to be sure. Yup.

Q. What is Exhibit 2001?

A. It is the declaration of Edward Kern, Edward C. Kern, Jr., Ph.D., in support of the patent owner's preliminary response.

Q. Is this the declaration you submitted in the spring of 2024?

A. Yes.

Q. So if you go to page 44 of Exhibit 2001 and go specifically to Paragraph 107, first sentence.

A. Getting there.
Q. The first paragraph of -- sorry -- the first sentence of Paragraph 107 states, "In the context of the '291 patent, a POSITA would understand that electrical cables are DC and AC current-carrying cables that provide power, i.e., power cables." Did I read that correctly?
A. Yes.
Q. Do you agree with that statement today?
A. Can you explain to me, before I answer, in the context of the '291 patent, the '291 patent is about solar power systems. So in the context of solar power systems? How limiting are you asking that question? How limiting is the context of the '291 patent?
Q. This is your statement.
A. Okay. Broadly --
Q. I'm deferring to your interpretation.
A. Broadly, I would say that the POSITA understands electrical cables to mean power cables, which can be either AC or DC.
Q. Did you review the Patent Trial and Appeal

Board's institution decision before authoring your July 2024 declaration in this matter?

A. The institution of the review, inter partes review?

Q. Correct.

A. Yes. But not committed to memory, by a long shot.

Q. Okay. So this first statement in Paragraph 107, do you know if you made a similar statement in Exhibit 2038, your July 2024 declaration?

A. I don't recall. I don't recall.

Q. Would you be surprised if you did not make the same statement in Exhibit 2038?

A. No.

Q. I'll represent that you didn't make the same statement in Exhibit 2038 --

A. Would I be surprised, you said, if I didn't? And I said no.

Q. I'm saying, I've looked at Exhibit 2038. And after my review, I haven't been able to identify a statement that electrical cables in the

context of the '291 patent are DC and AC current-carrying cables that provide power, i.e., power cables.

A. Yeah.

MR. MELMAN: Wait. Mr. Dixon is just making a representation. He hasn't asked a question yet.

So let him ask his question.

Q. Does that sound correct to you? Did you make that statement in Exhibit 2038?

A. I don't recall. I could read it and look for it.

Q. I'm handing you a document that's been marked Paper 17.

MR. DIXON: I want to go off the record really briefly to discuss how we want to mark this.

(Off the record, 1:37 p.m. to 1:37 p.m.)

BY MR. DIXON:

Q. I'm handing you a document that's marked Paper 17.

(Paper 17, previously marked, is not

attached to the transcript.)

Q. Have you seen this document before?

A. Yes. I believe so.

Q. Do you recognize this document as the decision granting institution of inter partes review by the Patent Trial and Appeal Board?

A. Yes.

Q. Can you please go to page 8 of Paper 17. And there is a heading that says "Claim Interpretation." Do you see that?

A. Yup. I do.

Q. And four lines from the bottom of this page, the Paper 17 says, "Patent owner argues that electrical cables are power cables such as DC and AC current-carrying cables that provide power and they are not Category 5 cabling for high-performance communications and aerial cables that do not carry current." Do you see that?

A. Uh-hmm. Yes.

Q. And then if you go to the next page, page 9 of Paper 17, do you see that it says, "On the current record, we preliminarily interpret

electrical cables as wiring that conducts current or signals. The parties are encouraged to present relevant intrinsic and extrinsic evidence regarding the meaning of this term and whether the preamble should be construed as limiting." Did I read that right?

A. Yes.

Q. Did you present any opinions in Exhibit 2038 regarding the meaning of "electrical cables" outside of your discussion of whether the preamble is limiting?

MR. MELMAN: Object to the form.

A. Could you restate? Not restate but repeat.

Q. Did you present any opinions in Exhibit 2038 regarding the meaning of the term "electrical cables" outside of your discussion regarding whether the preamble is limiting?

MR. MELMAN: Objection, form.

A. I don't recall.

Q. You don't have a section -- sorry.

You don't have a subsection of Section 6

claim interpretation that is titled "The Meaning of Electrical Cables," do you?

A. I don't see one. Can you point it out if it exists?

Q. I don't see one either.

In Section 6, claim interpretation, do you say anywhere that electrical cables are power cables such as DC and AC current-carrying cables?

A. I don't believe so.

Q. So in Paragraph 88 of Exhibit 2038, you provide the meaning of organizing a plurality of electrical cables extending from a plurality of solar panels. Is that an accurate statement?

A. In Paragraph 88 -- yes.

Q. And you say that organizing a plurality of electrical cables extending from a plurality of solar panels is properly construed as organizing -- sorry. Let me strike that.

In Paragraph 88, you define organizing a plurality of electrical cables extending from a plurality of solar panels as having its ordinary and customary meaning specifically separating the

electrical cables extending from the solar panels.

Is that an accurate statement of your definition?

A. Yes.

Q. Is it fair to say that your construction replaces "organizing" with "separating"?

MR. MELMAN: Objection, form.

A. Replaces? I'm not sure your meaning.

Q. Is it fair to say that instead of saying "organizing a plurality of electrical cables," your construction says "separating the electrical cables"?

MR. MELMAN: Objection, form.

A. I believe that in the context of extending from a plurality of solar panels pretty much defines the cables as being the DC power cables.

And when you're dealing with DC power cables, as I said earlier, good practice is to organize. And one way to organize is to separate.

So "organizing" and "separating" in this context to me have an equivalency.

Q. In this context, is organizing and

separating -- in this context, do organizing and separating have a one-to-one equivalency?

MR. MELMAN: Objection, form.

A. Not necessarily.

Q. Is that because one way to organize is to separate?

MR. MELMAN: Objection, form.

A. I think the preferred way would be to separate. Again, this is all coming from the National Electrical Code requirements.

Q. What is another way to organize cables? Sorry. Strike that.

What is another way to organize electrical cables extending from solar panels?

MR. MELMAN: Objection, form.

A. I'm not sure I know of any. Organizing and separating happen together, happen when one does something sometimes.

Q. Would you say that cable bundling is a form of cable organizing?

MR. MELMAN: Objection, form.

A. If the cables are of the same nature, then

bundling them would be organizing them. The same type, nature.

Q. Couldn't you bundle cables of a different nature and still have them be organized?

A. They'd be commingled. I wouldn't call that organized.

Q. If they were different colors, could they be organized within a bundle?

MR. MELMAN: Objection, form.

A. I'd say it more they wouldn't be so much as organized but identifiable.

Q. Would you say that a set of cables of a different nature that are in the same bundle is more organized than a set of cables of a different nature laying on the ground?

MR. MELMAN: Objection, form.

A. More organized than lying on the ground in random spaghetti-like nature, sure. More organized in a useful way? Not sure.

Q. But bundling them would still be organizing them in that instance, wouldn't it?

MR. MELMAN: Objection, form.

A. I suppose so. I don't have -- you're in a hypothetical situation that brings in more than is within the scope of this. The notion of cables strewn on the ground are less organized than cables bundled? Sure.

Q. Were cables previously organized when they were trenched in a solar array?

MR. MELMAN: Objection, form.

A. Trenched. I would say no.

Q. So cables in a bundle are more organized than cables in a trench in a solar array?

MR. MELMAN: Objection, form.

A. The organization of the cable is in the eyes of the perceiver. You can't perceive cables in a trench.

So what is the usefulness of being organized if you can't see them? This is all about orderliness of an electrical installation. And things are organized for the benefit of safety and future maintenance and operation of the system.

Q. So wouldn't you be able to have a set of

black cables on one side of the bundle and a set of red cables on another side of a bundle and that would serve the purpose of being orderly in an electrical installation?

MR. MELMAN: Objection, form and beyond the scope.

A. More orderly but not necessary. If you're referring to cables being of different polarities, for example.

Q. So if you had a bundle of cable that was black on one side and red on the other regardless of polarities, isn't that organizing those cables?

MR. MELMAN: Objection to form and beyond the scope.

A. Cables are black on one side and red on the other?

Q. Yes. Just the color of the shielding.

A. The jacket will be two colors?

Q. So let's say you have six cables in a cable bundle. Three of their jackets are red. Three of their jackets are black. They're split right down the Equator of the bundle between red

and black.

Do you understand the hypothetical?

A. Yeah.

Q. Would you say that those cables are organized?

MR. MELMAN: Objection to form and beyond the scope.

A. In reflecting on this conversation, I would say that they are not more organized, that organization means if you start with an entire population of anything, of things, and you keep them in one bowl, whatever, they are not organized.

Organization begins when you separate things into groups.

Q. In the hypothetical that we're discussing, wouldn't they be identified as being in a red group or a black group?

MR. MELMAN: Same objections.

A. No. They would be identified as being red or black because they would not be grouped.

Q. Why wouldn't they be grouped if they were

all the same color?

A. They aren't all the same color in your hypothetical.

Q. The three black cables are all the same color in my hypothetical. Correct?

A. Yes.

Q. The three red cables are all the same color in my hypothetical. Correct?

A. Correct.

Q. So those are grouped into black cables and red cables. Right?

A. No. They're identified as black cables or red cables. Grouping would be separating them into separate bundles.

Q. Is "grouping" a technical term of art?

MR. MELMAN: Objection to form and beyond the scope and relevance.

A. Grouping is not, in my experience -- what did you say, a technical form of art?

Q. Term of art.

A. Term of art. No. I don't know. It's beyond my use of the English language.

Q. Do you know if the patent, Exhibit 1001, uses the term "organizing" in the specification?

A. In the specification?

Q. So if I point you to Column 4, line 60. It should be in the objectives of the invention.

A. Further objectives of the present invention. Yup. Okay.

Q. So one objective is to -- one object of the invention is to provide a more organized system to support cables in the solar, mining, and electrical industries. Correct?

A. That's exactly what it says.

Q. And then if you look at the next further objective, it says, "It is a further object of the present invention to provide a cable support system that provides a safer, secure, strong, and effective separation of cables and wires as to protect the electrical performance of cables in solar, mining and electrical applications."

Is that accurate?

MR. MELMAN: Objection to form.

A. That's what it says.

Going back to your prior, however, "It is a further object of the present invention to provide a more organized system to support cables," blah, blah, blah.

"Organized" there refers to system, a system to organize -- I'm wondering which -- in the context of this claim, whether it's -- not this claim. This paragraph. It's an organized system or is it a system to organize? Is there a difference in meaning there?

Q. Is there a difference in meaning to you?

A. I'd have to think about it. Usually you can take a sentence and strike the prepositional phrase at the end and then the meaning would be to provide a more organized system.

I think it's ambiguous.

MR. MELMAN: We've been going for about an hour. Maybe it's time for a short break.

MR. DIXON: I'm just about to wrap up this line.

MR. MELMAN: Okay.

Q. So is there a difference in meaning to you

for -- sorry.

Is there a difference in meaning to you between "a more organized system" and "a system to organize"?

A. Yes.

Q. What is that difference?

A. One is an organized system. The system is organized. The other is a system to organize something else such as support cables, cables.

Q. How would a system be organized?

MR. MELMAN: Objection to form, beyond the scope.

A. It would be managed well if it were organized, is one way I think of it.

Q. Would a system to organize be an organized system?

A. Would a system to organize be a more organized system?

This is getting so convoluted. I'm not sure I can answer that.

Q. And is "organizing" a technical term of art in the solar industry?

A. No.
Q. Is it a technical term of art in the NEC?
A. I am not sure. And actually, I do not know what would make something a technical term of art in the solar industry, what authority has jurisdiction over that kind of definition.
Q. Your experience.
A. What?
Q. If you were the authority?
A. God help me if I were the authority.
MR. DIXON: Okay. We can take a break right now.
(Recess, 2:04 p.m. to 2:19 p.m.)
BY MR. DIXON:
Q. Dr. Kern, before the break we were talking about the meaning of organizing a plurality of electrical cables extending from a plurality of solar panels. Do you recall that?
A. Yes.
Q. And your construction is "ordinary and customary" meaning specifically separating the electrical cables extending from the solar panel.

That's right?

A. Yes.

Q. Does separating -- sorry. I didn't mean to --

A. I'm just trying to find the right page. Got it.

Q. It should be page 39, I think, of your declaration.

Does separating the electrical cables extending from the solar panels require separation of different types of electrical cables?

A. Different types of electrical cables. When you say "type of cable," what do you mean? The color? The purpose?

Q. So for example, does it require separating AC current-carrying cables from DC current-carrying cables?

A. The code has a requirement for that. Yes.

Q. Does your articulation of the ordinary and customary meaning specifically separating the electrical cables extending from the solar panels, does separating the electrical cables mean

separating AC current-carrying cables from DC current-carrying cables?

A. It means separating AC from DC current-carrying cables. But ordinarily AC current-carrying cables don't extend from solar panels, so it would be a little bit of a nuance there. That's all.

Q. Ordinarily where do AC current-carrying cables extend from?

A. A typical utility source of AC electricity.

Q. In what instances would AC current-carrying cables extend from solar panels?

A. Only in the instance where the inverter was built into the solar panel and it created AC electric power at the solar panel.

Q. Does your ordinary and customary meaning specifically separating the electrical cables extending from the solar panels require separation of data cables from AC current-carrying cables and DC current-carrying cables?

A. Could you rephrase, explaining whether all

of these are extending from the solar panels? Because the way you said it, they're not all extending from the solar panels.

Q. So I guess the --

A. Or likely to extend from solar panels.

Q. So are data cables likely to extend from solar panels?

A. No.

Q. And I think we spoke earlier about this, but data cables are likely to extend from a centralized command --

A. Controller.

Q. Controller. That's right. Thank you.

Would you ever have a scenario where AC and DC current-carrying cables are extending from a solar panel at the same time?

MR. MELMAN: Objection, form.

A. No.

Q. Would a solar array ever have a scenario where one module string is outputting AC current and another module string within the array is outputting DC current?

A. That's a hypothetical which in some remote -- the short answer, no.

The long answer, someone could do it if they wanted to, but I've never heard of it.

Q. If you could turn to page 40 of Exhibit 2038. In Paragraph 97, you discuss Caveney's disclosure of cable supports that are secured directly to any fastener or structure. Is that accurate?

A. Yes.

Q. It's your opinion that all of the structures specifically disclosed in Caveney are preexisting building structures. Right?

MR. MELMAN: Objection, form.

A. That's what I say here. Yes. Preexisting building structures.

Q. Is a ladder rack a structure?

MR. MELMAN: Objection, form.

A. No. A structure -- it's a structure but not in the structure of the building.

Q. So the structures specifically disclosed in Caveney are not all preexisting building

structures because a ladder rack is not a structure in the building -- sorry. Strike that.

MR. MELMAN: Wait, wait. Mr. Dixon is asking a question.

Q. The structures specifically disclosed in Caveney are not all preexisting building structures because, as you just testified, a ladder rack is not a structure in the structure of the building. Is that right?

MR. MELMAN: Objection to form.

A. A ladder rack is a structure to support cables. It is not a structure to support the building itself.

Q. What do you mean by "preexisting building structures" in Paragraph 97?

A. Caveney lists I beams, ladder racks, which -- I believe he lists ladder racks. I'm not positive. If he does, they would be installed prior to the installation of any kind of cable support system hung from those ladder racks.

Q. So when you use the term "preexisting," you mean prior to the installation of any kind of

cable support system?

A. The ladder rack is a cable support system.

Q. So Caveney is not a preexisting building structure, then. Right?

MR. MELMAN: Objection, form.

Q. Sorry. That was a terrible question.

A. Mr. Caveney is certainly not a preexisting building structure.

Q. The patent can't support any part of a building.

So a ladder rack is not a preexisting building structure. Right?

MR. MELMAN: Objection, form.

A. Semantics. A ladder rack could have been installed before a Caveney hanger was installed. So it could be preexisting, but it is not part of the building structure, which I mean to support the floors and the roof and the walls of a building.

Q. So in Paragraph 97 when you say "preexisting building structure," are you referring to parts of the building structure that

support the floors and the roof and the walls of a building?

A. Yes. I think a ladder rack in that situation is borderline between the building structure. An I beam is certainly part of the building structure. A joist is certainly part of a building structure. A ceiling or a wall is part of the building structure or envelope.

A ladder rack might be included as something that a contractor would build in a data room or, you know, in a location in the building before the data contractor, whatever, wiring contractor came in. So it's borderline. But the others are all part of the building structure.

Q. Is it fair to say that a ladder rack is a different type of structure than the rest of the structures specifically identified in Caveney?

A. As shown in Paragraph 97, I'd say yes. In the context of Paragraph 97.

Q. And the ladder rack is a structure that is a cable support system?

MR. MELMAN: Objection, form.

A. Yes. Similar to a cable tray. And as a matter of fact, I'm not sure I can distinguish between ladder rack and cable tray. I mean, there must be, but it's beyond my knowledge of that detail.

Q. Does Caveney say that its structures must be indoor?

MR. MELMAN: Objection, form.

A. I don't believe so. It might.

Q. Would you like to review Caveney?

A. The Panduit product literature or the Caveney patent?

Q. The Caveney patent, Exhibit 1003.

A. Could you point out where in Caveney it says it, that it's limited or not limited to indoors?

(Exhibit 1003, previously marked, is not attached to the transcript.)

Q. My question is, does Caveney anywhere say that it is limited to being indoor?

MR. MELMAN: And before Dr. Kern answers, I'm going to object to that question based on

form.

A. Very quick read, very quick read, it does not identify anyplace where it says it is limited to indoors.

Q. Is there any reason the hangers disclosed in Caveney couldn't be used outdoors?

MR. MELMAN: Objection, form.

A. The hangers disclosed in Caveney within the context of the specification suggest very strongly to me that these are for indoor locations that are not subject to high winds, rain, rodents, high temperatures.

The cables that are suggested for use in Caveney don't suggest outdoor-rated cables. Nothing in it suggests outdoor applications. It all appears to me to be focused on data centers, office complexes with Internet -- Ethernet wiring, that sort of thing.

Further, the hangers in Caveney do not seem to have provisions to keep cables from escaping from them. They're open hangers facing upward. They don't have enclosures holding them

down, with the exception perhaps of cable ties, which are not a good thing to use outside, outdoors.

Q. Is it your opinion that open hangers facing upward would not teach the -- bear with me one moment -- the cable-carrying surface limitation -- limitations, plural, of the '291 patent?

MR. MELMAN: Objection, form.

A. Can you point me to exactly where you are referring to there.

Q. So for Claim 1 of the '291 patent, for example, it teaches "a plurality of cable hangers structured to be disposed along, and suspended from, the messenger wire, each cable hanger having a plurality of cable-carrying surfaces, each cable-carrying surface being structured to support at least one electrical cable of the plurality of electrical cables."

My question is, does Caveney's open hangers facing upward teach the plurality of cable-carrying surfaces, each cable-carrying

surface being structured to support at least one electrical cable of the plurality of electrical cables?

MR. MELMAN: Objection, form, and beyond the scope.

A. Does Caveney teach. Caveney does show cable-carrying surfaces capable of supporting at least one electrical cable -- with a broad definition of "cable," because Caveney's are not very strong -- of a plurality of electrical cables.

In a limited way, yes, that captures it. Leave it at yes.

Q. What do you mean "in a limited way"?

A. Well --

MR. MELMAN: Wait, wait, wait. Let Mr. -- I don't know if Mr. Dixon is finished with asking his question, but let him finish.

Q. I'm finished now.

MR. MELMAN: Objection, form, and beyond the scope.

Q. So you said that "In a limited way, yes,"

Caveney captures the plurality of cable hangers limitation of Claim 1 of the '291 patent. Right?

A. Right.

Q. What do you mean by "in a limited way" it captures that limitation of Claim 1 of the '291 patent?

MR. MELMAN: Same objections.

A. I was thinking that the descriptions and the drawings in Caveney show U-shaped surfaces, cable-carrying surfaces, but they're very shallow whereas in the '291 patent they are shown as significantly deeper such that cables would not escape from them upward.

And in addition, in '291 -- I'm not sure if it's claimed, but it's shown that the cable hangers enclose the cables so that they cannot jump out of the hanger as they might in Caveney, if Caveney is exposed to any kind of atmosphere, any environmental conditions.

Again, that's my looking at the specifications, not at the claims.

Q. Do you think that claims require that the

cable hangers enclose the cables so that they can't jump out of the hanger, as they might in Caveney?

MR. MELMAN: Objection, form, and beyond the scope.

A. I'm not a lawyer.

Q. You're a person of ordinary skill in the art, though. Right?

A. More so, I think.

Q. And so if you look at Claim 1 of the '291 patent, Exhibit 1001, in reading that claim does it require that the cable hangers enclose the cables so that they can't jump out of the hanger?

MR. MELMAN: Objection to form and beyond the scope.

A. It doesn't appear to state it.

Q. So it's fair to say that Caveney discloses the plurality of cable hangers limitation of Claim 1 of the '291 patent?

MR. MELMAN: Objection, form.

A. Caveney discloses -- just repeat one time.

Q. The limitation -- let me restart the

question so it's clear.

So it's fair to say that Caveney discloses the limitation in Claim 1 of the '291 patent, beginning with the phrase "a plurality of cable hangers." Correct?

MR. MELMAN: Objection, form.

A. Certainly not.

Q. Why not?

A. Because Caveney, if you continue to read on in that claim, talks about suspended from a messenger wire. And Caveney in no way is structured to be supported from a messenger wire.

The only similarity is a cable-carrying surface.

Q. So is it fair to say that Caveney discloses the limitations in Claim 1 of the '291 patent that cover the cable-carrying surfaces of the hanger?

MR. MELMAN: Objection, form.

A. I don't know. I don't think those are separable. Are they? This one body claim can have multiple, multiple parts. I don't know. I'm

not a lawyer.

Q. Well, one limitation is being suspended from and disposed along a messenger wire. Right?

MR. MELMAN: Objection, form, and calls for a legal conclusion.

A. You just read something to me. Yeah. Thank you. What was the question?

Q. Claim 1 says "a plurality of cable hangers structured to be disposed along, and suspended from, a messenger wire." Right?

MR. MELMAN: Objection, form.

Q. And then it goes on to disclose how those cable-carrying surfaces of the hanger are arranged. Is that fair?

MR. MELMAN: Objection to form.

A. How they're arranged? No, it doesn't say anything about how they're arranged.

Q. Claim 1 goes on to disclose how the cable-carrying surfaces are structured. Right?

MR. MELMAN: Objection, form.

A. Being structured. Yes.

Q. What does "being structured" mean?

MR. MELMAN: Objection, form, and calls for a legal conclusion.

A. Designed.

Q. So doesn't Caveney disclose a cable hanger having a plurality of cable-carrying surfaces, each cable-carrying surface being structured to support at least one electrical cable of the plurality of electrical cables?

MR. MELMAN: Objection to form and beyond the scope.

A. I think it's limited by the preamble to that, not to that claim but the preamble to that body claim.

Q. Setting aside the preamble, does Caveney disclose a cable hanger having a plurality of cable-carrying surfaces, each cable-carrying surface being structured to support at least one electrical cable of a plurality of electrical cables?

MR. MELMAN: Objection to form.

A. You said excluding -- you're saying take that body claim and exclude the first two

sentences, two lines?

Q. Yes.

MR. MELMAN: Do you have the question? Do you still have the question from Mr. Dixon?

THE WITNESS: Yeah.

A. If it were written that way, perhaps. It's not written that way.

Q. So now I'm just asking, does Caveney disclose a cable hanger having a plurality of cable-carrying surfaces, each cable-carrying surface being structured to support at least one electrical cable of a plurality of electrical cables?

MR. MELMAN: Objection, asked and answered multiple times.

A. I think Caveney discloses exactly what's written in a plurality of electrical -- electric -- excuse me -- a plurality of cable hangers structured to be disposed along, and suspended from, the messenger wire, each cable hanger having a plurality of cable-carrying surfaces, each cable-carrying surface being

structured to support at least one electric cable of the plurality of electric cables.

That's what is disclosed in this, and I don't see that in Caveney at all.

Q. Turning to page 43, there's a subheading titled "Almy." Right?

A. Uh-hmm.

(Exhibit 1004, previously marked, is not attached to the transcript.)

Q. I'm handing you Exhibit 1004.

A. Thank you.

Q. Do you recognize Exhibit 1004?

A. Yes.

Q. This is the Almy reference. Correct?

A. Yes.

Q. Who is the inventor of Almy?

MR. MELMAN: Objection, form, calls for a legal conclusion, beyond the scope.

A. Objection. I didn't hear you clearly.

Q. Who does Almy identify as the inventor on page 1 of Exhibit 1004?

MR. MELMAN: Same objections.

A. Charles Almy, number line 76 or something 76.
Q. Are you familiar with Charles Almy?
A. I have not met him personally. No.
Q. Have you heard of Charles Almy?
A. Only through the work I've done on this case.
Q. Do you see under "Correspondence Address" it says SunPower/BSTZ?
A. Yes.
Q. Are you familiar with SunPower?
A. Yes.
Q. What is SunPower?
A. SunPower was a corporation founded by a colleague of mine named Dick Swanson to manufacture solar cells, solar modules, and ultimately in 2007 they acquired another company that I'm familiar with and went into the photovoltaic systems business, PV systems business.
I don't know who BSTZ is. Oh, wait a minute. That's the name of the law firm right

afterwards. Sorry.

Q. Do you know if Charles Almy worked for SunPower?

A. I don't. I think he worked independently, however.

Q. Does Almy disclose a messenger wire?

A. Almy discloses in the specification 202A, 202B in the drawings Figure 2A, which I associate with being a messenger wire or equate to being a messenger wire.

Q. Does Almy disclose hangers suspended from either 202A or 202B in Figures 2A and 2B?

MR. MELMAN: Objection, form.

A. Almy discloses -- uses a different term, wire loops, which have somewhat of an equivalency to a hanger but not entirely.

Q. What's the difference between a wire loop and a hanger?

A. A wire loop being a loop is a singular -- encloses a singular area surface. A wire loop would serve to bundle but not to separate.

Q. Do all hangers separate?

MR. MELMAN: Objection, form.
A. No.
Q. So some bundles could -- sorry. Strike that.
Some hangers could serve to bundle but not separate?
MR. MELMAN: Objection, form.
A. Yes.
Q. So how would those hangers be different than a wire loop?
MR. MELMAN: Objection, form.
A. "Those hangers" being?
Q. How would hangers that serve to bundle but not separate differ from the wire loop disclosed in Almy?
MR. MELMAN: Objection, form.
A. They -- I've been thinking too hard.
Please restate the question. How do they -- did you say how do they differ?
Q. How would hangers that serve to bundle but not separate differ from the wire loop disclosed in Almy?

MR. MELMAN: Objection, form.

A. Geometrically they would be equivalent. The wire loops in Almy are formed by the same material as the apparent messenger wire. And in the case of 202A, it is a continuous wire, so the hanger could not be separated from the messenger.

202B, the wire loop is perhaps closer to a single cable-carrying surface hanger. But again, it appears that its manufacture -- manufacturing process, by looking at it, would not have a separate item of as a -- what much of the '291 patent deals with in terms of its -- the hanger aspect of the '291 patent.

Q. How can you tell by looking at Figure 2B that the manufacturing process of 204B wire loop, it would not be a separate item?

MR. MELMAN: I'm not sure if Mr. Dixon is finished articulating his question.

Q. How can you tell by looking at Figure 2B that the manufacturing process for wire loop 204B would result in the wire loop not being a separate item?

MR. MELMAN: Objection to form.

A. Let me restate the question. How do I look at 204B and realize that it's manufactured separately than 202B?

Q. I think -- and please correct me if I'm understanding your testimony wrong.

You said that by looking at the Figure 2B, "it appears that its manufacturing process, by looking at it, would not have a separate item of as a -- what much of the '291 patent deals with in terms of the hanger aspect of the '291 patent."

I'm trying to understand what you meant by that statement.

A. I'm not sure I understand what you just said that I apparently said.

Let me just reiterate what I see in Figure 2B. I see a wire 202B running from the left to the right. I see a wire loop 204B that shows one open end that doesn't even appear to be secured to 202B where that one open end is.

And then the other end of 204B appears to go under 202B and then back down, but you cannot

see in this illustration the -- what I assume is the other end of 204B.

MR. MELMAN: Can we take a short break?

MR. DIXON: Yeah.

(Recess, 3:06 p.m. to 3:21 p.m.)

BY MR. DIXON:

Q. Can you please go to page 45 of your declaration, Exhibit 2038. In Subsection C on page 45, you discuss the Carr reference. Is that right?

A. Correct.

Q. In your opinion, does Carr disclose a messenger wire?

A. Yes. He calls it a strand.

Q. Carr calls it a messenger strand. Correct?

A. Supporting strand.

Q. I'm handing you Exhibit 1005.

(Exhibit 1005, previously marked, is not attached to the transcript.)

Q. This is the Carr reference.

So if you go on page 2 of Carr, page 2 of

3 for Exhibit 1005.

A. Page 2 of the exhibit?

Q. Yeah.

A. Page 2 of Carr.

Q. So in the column on the left, if you go to approximately line 47 or 48, the first line of the paragraph there starting with "according to this invention," doesn't that sentence call it a messenger strand?

A. A messenger strand. Yes, indeed.

Q. So you understand Carr to disclose a messenger wire?

MR. MELMAN: Objection to form.

Q. So do you understand Carr to disclose a messenger wire?

MR. MELMAN: Objection to form.

A. Carr refers to a supporting strand, a single supporting strand, a so-called messenger strand, and a supporting strand, all in Column 1. He seems to have many different terms for the same thing.

Q. In your opinion, does Carr disclose a

messenger wire when it's discussing the supporting strand and messenger strand?

MR. MELMAN: Objection, form.

A. Is "disclose" and "claim" the same thing? As a term, I just want to be sure I understand.

Q. So all I'm asking is, when you read Carr do you understand it to be using a messenger wire?

A. I understand it to be using a wire -- we are now calling a messenger wire, under the '291 patent, a catenary wire. A catenary supporting something else.

Q. Does Almy disclose hangers suspended from that wire?

MR. MELMAN: Objection to form.

A. I believe --

Q. I misspoke. Does Carr disclose hangers suspended from that wire we were just discussing?

MR. MELMAN: Objection, form.

A. I heard the same thing. How did they differ?

Q. I accidentally said "Almy" when I asked the question the first time. I'll ask it again

just to make it clear.

Does Carr disclose hangers suspended from the supporting strand, messenger strand, messenger wire, catenary wire, however you want to characterize it?

MR. MELMAN: Objection to form.

A. Figure 1 certainly shows Carr's hanger suspended from a messenger wire.

Q. So in Paragraph 110 on page 46 of Exhibit 2038, your declaration --

A. I'm sorry. Paragraph?

Q. 110.

You say, "Carr only discloses aerial conducting cables or carrier transmission." Is that right?

A. That's what Carr discloses. Yes.

Q. Does Carr say that it discloses, quote, aerial cable -- aerial conducting cables for carrier transmission?

A. Yes.

Q. Where does Carr say, quote, aerial conducting cables for carrier transmission?

MR. MELMAN: Objection to form.

A. Those are two quotes. The aerial conducting cables is in line 3 of Column 1 in Carr. Aerial conducting cables is also in line 5 of Carr that are used for carrier transmission.

I believe that -- and in the context of what Carr is dealing with, I understood that to mean aerial conducting cables for carrier transmission.

Q. Are all aerial conducting cables for carrier transmission?

A. No.

Q. Does Carr in any other portion of Exhibit 1005 refer to aerial conducting cables as for carrier transmission?

A. A quick look doesn't express it. No. It doesn't.

Q. But Carr does discuss aerial cables repeatedly. Right?

A. Aerial cables for?

Q. Carr does discuss aerial cables repeatedly. Right?

MR. MELMAN: Objection to form.

A. Yes, Carr -- I understood Carr to work for Bell Labs. Bell Labs was an R&D facility for American Telephone and Telegraph.

Q. What I'm saying is, in Exhibit 1005 when Carr is describing his hanger, he refers to aerial cables. Right?

A. Yes.

Q. Carr does not describe the aerial cables as carrier transmission cables in any other place than line 5. Right?

MR. MELMAN: Objection, form.

A. It appears that way.

Q. And if you go to Carr's claim at the bottom of the second column, line 55, it claims a hanger device for suspending a pair of cables. Is that right?

A. That's correct.

Q. And nowhere in the claim does it specify that they are carrier transmission cables. Right?

A. So in the claims, a device for suspending a pair of cables. That's correct.

Q. On page 47 of your declaration, Exhibit 2038, you set forth exemplary independent claims. Is that right?
A. I'm sorry. Page?
Q. 47?
A. 47. Paragraph?
Q. Paragraph 111.
A. 111. Okay.
Q. You set forth exemplary independent claims. Correct?
A. Yeah.
Q. How did you determine which exemplary independent claims to choose?
A. These were the two -- in my view, the two primary claims in this patent.
Q. Are there other independent claims in this patent?
MR. MELMAN: Objection, form, calls for a legal conclusion.
A. I believe there are. 19, 24, 14.
Q. Is 14 a primary claim in this patent?
MR. MELMAN: Objection, form.

A. I don't know.
Q. Do you know if AWM is challenging Claim 14?
MR. MELMAN: Objection, form, beyond the scope, and calls for a legal opinion.
A. I don't know.
Q. If you'd turn to page 54 of your declaration and look at Subheading B, does that let you know whether or not AWM is challenging the validity of Claim 14 in this proceeding?
A. It appears.
Q. Is it your opinion that Claims 1 and 6 are the same as Claim 14?
MR. MELMAN: Objection to form, calls for a legal opinion.
A. Clearly not. They have different numbers.
Q. You just didn't think it was necessary to independently list it along with Claims 1 and 6?
MR. MELMAN: Objection, form.
A. No.
Q. Why did you think it was not necessary to independently list Claim 14 with exemplary

Claims 1 and 6?

MR. MELMAN: Objection, form. And objection, relevance.

A. My experience with patents is limited. But what I've observed is that the subsequent claims sometimes expand upon the initial, the ones presented first. And it's a . . .

I guess I understand it as a way to claim the invention being used in the field as opposed to the invention standing by itself.

Q. So are you saying for Claims 1 and 6 it's not claiming the invention being -- as being used in the field?

A. No.

MR. MELMAN: Objection to form.

Q. What do you mean by that?

A. My understanding is a claim like 14 would allow you to sue an owner of a system as opposed to the manufacturer of the components in a system for infringement. I may be wrong, but that's my understanding why this type of claim is put in.

Q. In your opinion, does Claim 1 require the

system to actually be in use with the plurality of solar panels and the plurality of electrical cables?

MR. MELMAN: Objection, form, calls for legal opinion and relevance.

A. Restate. I think the answer is no, but I'd like to hear you ask it again.

Q. In your opinion, does Claim 1 require that the system actually be in use with the plurality of solar panels and the plurality of electrical cables?

MR. MELMAN: Same objections.

A. No.

Q. Why is that?

MR. MELMAN: Same objections, and beyond the scope.

A. The way I understood patent law is that -- and you can fill in the blanks here. But you can make, sell, or use something. And if you make it and infringe, that's not a good thing. If you sell it and infringe, that's not a good thing.

If you buy it from someone who made it and

sold it to you, that's still not a good thing.

So if a solar power plant is owned by somebody that bought infringing technology, those people are not above the law. An engineer's view of the law. Probably not quite right.

Q. So in your opinion, to meet the limitations of Claim 1 could you just have the components of the system so the messenger wire, the plurality of cable hangers, and the -- with the required structure for the cable hangers, could they infringe just by sitting on the property without having any cables in them?

MR. MELMAN: Objection, form, relevance, beyond the scope, calls for legal opinion.

A. And weird.

So if you bought a whole pile of these locking cable hangers and method of using '291 and put it in the field but didn't use it, would that infringe?

Q. Yes.

A. If they're made by someone other than the patent owner, yes. Or a licensee, I suppose.

Q. Can you please turn to page 54 of your declaration.

A. I'm already there.

Q. Did I already say that? I apologize if so.

Paragraph 130, you state, "For all these reasons, it is my opinion that Caveney does not disclose or render obvious independent Claim 1 and therefore does not disclose or render obvious dependent Claims 2 through 5 and Claim 9 that depend from Claim 1 or dependent Claim 10 that depends from Claim 9." Is that accurate?

A. Yes.

Q. In your declaration, have you expressed any other opinions regarding the obviousness of Claims 2 through 5, 9, and 10?

MR. MELMAN: Objection, form.

A. I don't believe so.

Q. Can you go back to the paper -- exhibit marked Paper 17. Can you please turn to page 22. So you understand Paper 17 to be the board's decision instituting inter partes review. Right?

A. Yes, yes.

Q. So towards the middle of the first paragraph, do you see the sentence beginning, "In contrast"? Can you read that sentence and the following sentence for me, please?

A. "In contrast, the claimed cable hangers are structured with a spiral gripper 24 and locking loop 26 to lock onto messenger wire 12 with abutment surfaces 34, 36, 38 that retain the hangers in place." That's the sentence.

Q. And the next sentence says, "Prior art hangers fall off or slide out of their spacing, but the locking arm of a claimed cable hanger securely retains the hangers in place even when bumped or knocked during cable installation." Is that right?

MR. MELMAN: Objection, form.

A. That's what it says.

Q. Do you agree that the claimed cable hangers are structured with a spiral gripper?

MR. MELMAN: Objection, form, beyond the scope and relevance.

A. The claimed cable hangers are structured with a spiral gripper. I believe that's true. Yes.

Q. Do you agree that the claimed cable hangers are structured with a locking loop?

MR. MELMAN: Objection, form, beyond the scope, relevance.

A. Claimed -- we're talking about the '291 patent. Is that correct?

Q. Yes. That's correct.

A. Not Mr. Caveney's patent?

Q. No.

A. I certainly recall that they are structured to -- I mean, where are we? Structured to not slip.

Q. And they don't slip because of the locking arm of the claimed cable hangers?

MR. MELMAN: Same objections.

A. That's the alleged purpose of the locking spiral gripper.

Q. If we can go back to your declaration, and now page 57, Paragraph 145.

You state, "Dependent Claims 15 through 18, 21, and 22 all depend directly or indirectly from Claim 14. Dr. Beik and petitioner rely solely on Caveney for disclosing or rendering these claims obvious."

You have some citations.

And then you say, "For the reasons stated above relating to independent Claim 14, it is my opinion that Dr. Beik and petitioner have not shown that Caveney discloses or renders obvious the limitations of these dependent claims."

Is that accurate?

A. What you have read is accurate. Yes.

Q. Other than the statements I just read, does your declaration contain any other opinions regarding the obviousness of Claims 15 through 18, 21, and 22?

MR. MELMAN: Objection, form.

A. I don't recall. The context of where I am in this right now is not entirely clear to me.

Q. So if you go to page 54, do you see that this section relates to Ground 2?

A. Uh-hmm.

Q. So if I modify my question a little bit and say other than the statements I just read, does your declaration contain any other opinions for Ground 2 regarding the obviousness of Claims 15 through 18, 21, and 22, can you provide an answer to that question?

MR. MELMAN: Objection, form.

A. I can if I take the time to read through, if you'd like me to.

Q. Do you recall if you have any Ground 2 opinions regarding the obviousness of the dependent claims?

A. I do not recall.

Q. Is your declaration complete and accurate as of today?

A. I believe so.

Q. If we could move on to Ground 3 and go to page -- Paragraph 160, page 62.

A. Page 62?

Q. Yup.

A. Which?

Q. Paragraph 160.
A. 160. So we're in --
Q. Ground 3.
A. We're in Ground 3. Okay. 160. Okay.
Q. In Paragraph 160, you say that Almy discloses a grid bar drive strut. What is a -- sorry. I misquoted your declaration there. I'm going to preemptively correct myself.
In Paragraph 160, you say that Almy discloses a rigid-bar drive strut. What is a rigid-bar drive strut?
A. A rigid-bar drive strut is a device for rotating and tracking multiple rows of solar panels.
Q. Where would the rigid-bar drive strut be located in a PV array?
A. It would be located under the solar panels and running perpendicular to rows of solar panels.
Q. Where would the motor that controls the rigid-bar drive strut be located within the PV array?
MR. MELMAN: Objection, form, foundation.

A. Typically around the periphery of the array, the array field.

Q. Would there be a single motor powering the rigid-bar drive strut?

MR. MELMAN: Same objections.

A. Yes.

Q. As of 2014, approximately what percentage of utility-scale solar installations used rigid-bar drive struts?

MR. MELMAN: Objection, form.

A. First, there would be the fact that rigid-bar drive struts are not used in fixed arrays, which constitute a large fraction of solar power systems.

Second, the rigid-bar drive strut type of system has evolved for a number of years going back to the 1990s, and putting a number on what the fraction is, is a little bit pie in the sky for me.

But by the late 2000 to 2010 time frame, trackers were becoming common, so the percentage of systems that were trackers versus fixed was

increasing.

And also, during the time frame 2010 and following, it's my understanding that the -- and my observation that the actuators for single-axis tracking systems were -- the single drive strut design was gradually being superseded by the actuators distributed through an array field. But the numbers, I don't have in my head. It was changing over time.

Q. Were trackers consisting of actuators distributed throughout the array field available as of March 2nd, 2009?

MR. MELMAN: Objection, form.

A. Available? You mean did it exist somewhere? I'm sure.

Q. Were trackers consisting of actuators distributed throughout the array field in use in utility-scale solar farms -- sorry -- plants as of March 2nd, 2009?

MR. MELMAN: Objection, form.

A. I don't know, actually. And I believe you're referring only to single-axis trackers.

Two-axis trackers, that kind of stuff was around in the 1990s.

Q. Did two-axis trackers have data cables?

MR. MELMAN: Objection, form.

A. Highly likely. These were experimental, instrumented. These were not cost-effective.

Q. So two-axis trackers weren't used in utility-scale solar?

MR. MELMAN: Objection, form.

A. They were used, yes, before utility-scale solar in experimental demonstration projects before solar was cost-effective. Never commercially.

Q. Can you explain your statement in Paragraph 161 about why it's not surprising, in your opinion, that Almy doesn't disclose or suggest the use of data carrier cables?

A. Yeah. Because Almy's patent was for a tilted single-axis tracking system that was driven by a shaft, a pushrod -- we had a name for it a while ago -- that was located at the periphery of the array field. And so there would be no need or

no motion or no purpose in having data cables strung alongside the DC cables, DC power cables in Almy.

Q. How does the application date of 2009 factor into that conclusion?

MR. MELMAN: Objection to form.

A. The conclusion that it did not? No. The application date of the patent and the issue of the application and the issue -- I'm not sure if the wording in the application is the same as the wording in the final patent. It might not be: It just happens to be that that's what SunPower did and that's what Almy discloses.

Q. I'm just trying to understand your statement in 161 that says, "This is not surprising, given the date of Almy's application in 2009."

A. Yes. Because in 2009, the common use of pushrod-type systems was predominant or I believe it was predominant.

Q. But by 2014 the industry was moving away from the pushrod-type system. Is that right?

MR. MELMAN: Objection, form.

A. The pushrod -- other type systems were -- that was the direction the industry was headed at that time frame. How far it had gotten . . .

Q. Did those other tracker systems have data carrier cables?

A. The ones that now have actuators distributed through them.

Q. So as of 2014, were the tracker systems that were replacing the pushrod-type systems -- sorry. Let me restart that question.

So as of 2014, did the tracker systems that were replacing the pushrod-type systems use data carrier cables?

MR. MELMAN: Objection, form.

A. Yes. They would have to in a limited way, to the limited places that actuators were situated.

Q. Would a PV engineer in the 2013 to 2014 time frame consult the NEC to determine how to manage these data cables?

MR. MELMAN: Objection, form and

relevance.

A. I don't believe the NEC deals with data cables. I could be wrong. But predominantly the NEC deals with power cables, AC and DC. There are rules about isolating the AC and DC cables from other things for safety considerations. It's not, to my knowledge, in Article 690.

Q. Would a PV engineer in the 2013 to 2014 time frame know that AC and DC cables could interfere with data cables?

MR. MELMAN: Objection to form and relevance.

A. They would understand that AC cables could interfere with data cables. I'm not sure if that is from the NEC, but they would understand that, yes.

Q. Can DC cables interfere with data cables?

MR. MELMAN: Objection, form.

A. No. It's something that if you really tried hard you could make it happen. But no right-minded engineer would fret about that.

Q. So can we turn to page 68 of Exhibit 2038.

A. Did you say 68?
Q. 68.
A. 68. Thank you.
Q. Specifically, Section 9, secondary considerations of nonobviousness. Do you see that?
A. Sure. Uh-hmm.
Q. In Paragraph 180 on the following page you mention the word "nexus." Is that right?
A. Yes.
Q. In your opinion, what does it mean for there to be a nexus between the claimed invention and the evidence of secondary considerations?
MR. MELMAN: Objection to the extent it calls for a legal opinion.
A. Yeah. Nexus is a relationship. Is that a fair term? Cause-and-effect type of thing.
I'm not sure that was your question. I just answered another question.
Q. And still staying in Paragraph 180, but on the next page, you use the word "coextensive."
A. Yes.

Q. What does it mean to be coextensive in the context of secondary considerations?

MR. MELMAN: Objection, form.

A. I have learned that the word "coextensive" means that the physical product or embodiment, or whatever, of something described in a patent is equivalent. They have the same boundaries. They relate to the same thing. They are the same thing.

Q. So the physical product needs to be the same as the claims. Is that what you're saying?

A. As the specification. And I suppose with the limitations of the claims. But I'm an engineer.

Q. Do you know whether or not a product can be coextensive if it includes features that are not disclosed by the patent?

MR. MELMAN: Objection to form.

A. A product that contains features that are not covered by the patent?

MR. MELMAN: And objection also to the extent it calls for a legal opinion.

A. I'm thinking about a situation where something is clearly coextensive and then you put lipstick on one of them. Does that change it significantly enough to make it no longer coextensive?

I'm not sure where the -- you could tweak something a little bit. You could add a minor feature. You could add -- I don't know. You could add something to it that made it a tiny bit easier to use or you could add something to an invention that would make it a little bit easier for someone in the field to install it or you could add to an invention something that you found that your customers were having to go out and get separately.

I don't think something like that would -- I hope something like that would not upset the determination of coextensive because then you'd have no way to protect anything. Just add this to it and it's no longer . . .

Q. Can we go to Paragraph 182 on page 70 of Exhibit 2038. You say you've prepared an

Appendix A which is a claim chart mapping the limitations of independent Claims 1 and 6 to CAB standard system.

A. Yup.

Q. What is CAB standard system?

A. As I understand it, CAB standard system is their initial design. It's covered by the '291 patent that they have subsequently added additional functionality to the system above and beyond their standard system.

Q. What additional functionality did they add to the system above and beyond their standard system?

A. This is where --

MR. MELMAN: Objection, form, and beyond the scope, relevance.

A. I understand they've added some capabilities for grounding.

Q. Is grounding a cable management system in a PV array important?

MR. MELMAN: Objection. Same objections.

A. Grounding is important in a PV array, not

necessarily in a PV array wiring system or wiring, whatever, system.

Q. In a messenger-supported aboveground cable management system, does the NEC require grounding?

MR. MELMAN: Objection, form, beyond the scope, relevance.

A. NEC requires grounding in all systems. And so yes, it requires grounding, period, irrespective of the wiring system.

Q. So grounding is important to a cable management system in PV arrays?

MR. MELMAN: Same objections.

A. No. Grounding is essential to the PV array itself in its entirety, the PV system in itself in its entirety.

Q. And a cable management system is part of a PV system. Right?

A. An element.

Q. So the cable management system needs to be grounded?

MR. MELMAN: Objection, beyond the scope, relevance.

A. To the extent that anything within the PV system needs to be grounded, components of a cable management system would need to follow the rules too.

MR. MELMAN: I think it's time for a short break.

MR. DIXON: Okay.

(Recess, 4:22 p.m. to 4:34 p.m.)

BY MR. DIXON:

Q. So, Dr. Kern, when we left off we were discussing the standard system.

A. Yes.

Q. Do you recall?

A. Uh-hmm.

Q. And you mentioned another CAB system that added grounding. Is that right?

A. I have heard about another CAB system that has grounding.

Q. Have you heard the --

A. The standard system clearly does not have grounding. I mention that only as something that one might add as a convenience.

But in hindsight, from just thinking about what I said, it's probably much more of an addition than what I was imagining that would relate to whether something was coextensive or not with the '291 patent.

Q. So the addition of grounding is a substantial addition. Is that what you're saying? To the invention disclosed in the '291 patent?

MR. MELMAN: Objection, form, relevance, beyond the scope.

A. Yeah. I mean, I guess what I'm thinking is that we are talking about the coextensiveness of '291 and the standard CAB system.

As I think I pointed out in here, the grounding aspects -- I got led down the wrong way here somewhat. The grounding aspects shown here say that they are not part of the standard system, but other smaller things could be not part of the standard system. Leave it at that.

Q. Have you heard of CAB's integrated grounding system?

MR. MELMAN: Objection, form, relevance

and beyond the scope.

A. Yes.

Q. In what context have you heard of CAB's integrated grounding system?

MR. MELMAN: Same objections.

A. What context? I've heard of it in the sense that there is something other than the standard system.

Q. Did you perform an analysis to determine whether the integrated grounding system practices the '291 patent?

MR. MELMAN: Objection, beyond the scope, relevance.

A. No, I didn't do any investigation of grounding.

Q. How did you define what comprised the standard system?

MR. MELMAN: Objection, form.

A. How did I?

Q. So maybe I -- it would be helpful --

A. This is the mapping.

Q. Maybe it would be helpful to point to your

declaration. So in Paragraph 181 you state, "I understand that for solar power plant installations, CAB sells its standard system for solar cable management which includes mid pier kits, end pier kits, galvanized steel messenger wire, and cable hangers of various configurations for supporting and separating various electrical cables within a PV array."

Is that an accurate reading of Paragraph 181?

A. Yes.

Q. How did you determine that these components were included in the standard system?

A. I was shown their product literature.

Q. Do you cite any product literature in Paragraph 181?

A. No.

Q. Do you know if CAB in fact sells a single product called the standard system?

A. I don't know if they call it the standard system. I know they sell components. I mean, whether they sell, I've been shown orders for

components used in systems. I don't recall whether it's packaged, marketed as a, quote, standard system. That may be a -- I just don't know.

Q. I'm handing you a document that is marked Exhibit 2056.

(Exhibit 2056, previously marked, is not attached to the transcript.)

A. Whoa.

Q. Have you seen Exhibit 2056 before?

A. No.

Q. I'll represent to you that this was a document produced by CAB in this proceeding reflecting sales of components for the year 2018.

A. Could you repeat that? A document? What is this again?

Q. This is a document produced by CAB in this IPR, and it shows sales of components --

A. Got it.

Q. -- and a by-item-number for the year 2018.

MR. MELMAN: Mr. Dixon, given this document was produced and marked confidential

under the protective order in this IPR, I'm going to designate the transcript confidential. We'll go back and then identify specific portions. Okay?

MR. DIXON: That sounds good.

A. So this is a list of their sales?

Q. If you see the second column, it says "Name."

A. "Project name." Oh, second column. "Name."

Q. So do you see that it lists customer names there?

A. Sure. Yeah. This is privileged information, isn't it?

Q. That's why it's marked confidential.

And then do you see in the sixth column over under the header "Description"?

A. Yup.

Q. And you see a reference in the third line, "[redacted]"?

A. Sure.

Q. And then it also lists an invoice number?

A. Yup. Quantity.
Q. Material number in between?
A. It's a spreadsheet of sales organized by, it would appear, customer.
Q. So if you go about a third of the way down, do you see [redacted]?
A. A third of the way down? [redacted].
Q. [redacted]?
A. [redacted]. There you go.
Q. So do you see that there are three entries there for Invoice Number 109159?
A. Yup.
Q. And the description of those materials are [redacted]? Is that accurate?
A. Sure.
MR. MELMAN: Objection, form.
Q. Do you see the listing of material [redacted]?
A. Is that in the material column?
Q. Yes.

A. Yeah. [redacted]

Q. I think you're in a different purchase order there. It's the column above it.

A. Yeah.

Q. So do you see one of the descriptions is [redacted]?

A. [redacted]?

MR. MELMAN: Objection, form, beyond the scope, and relevance.

A. I see the letters that you're describing. Yeah.

Q. Do you know what type of product [redacted]?

MR. MELMAN: Objection, beyond the scope.

A. No, I do not. What kind of material?

Q. What kind of component.

MR. MELMAN: Objection, beyond the scope.

A. No, but I -- no, I don't. I could speculate, but I won't.

Q. If I represent to you that it's a [redacted] would you believe that?

MR. MELMAN: Objection, beyond the scope.

Objection to form.

A. I would ask you what a [redacted] is.

Q. In preparing your opinions in this IPR, did you ever see a CAB product called a [redacted]?

A. No. If I saw it, I did not take notice of it.

Q. Do you think a [redacted] is a hanger?

MR. MELMAN: Objection, form.

A. I have no idea.

MR. MELMAN: And beyond the scope.

A. I have no idea.

Q. So for this Purchase Order 109159, do you know if the system [redacted], purchased practices the '291 patent?

MR. MELMAN: Objection, beyond the scope, relevance.

A. It doesn't tell me exactly what it is. No.

Q. So you don't know whether Purchase Order 109159 practices the '291 patent?

MR. MELMAN: Same objections.

A. No, I don't.
Q. On page A6 of Appendix A to your declaration, Exhibit 2038.
A. Page 86?
Q. A6.
A. Thank you. Okay. I'm on A6.
Q. You say that [redacted] and [redacted] are representative of the cable hangers in CAB's standard system. Is that right?
A. Yeah.
Q. Do you know if [redacted] are representative of [redacted]?
MR. MELMAN: Objection, beyond the scope.
A. Did you say [redacted]
Q. Yes. That's the [redacted] were just discussing in the previous exhibit.
A. Oh, okay. I have never seen the actual part numbers of the elements enumerated, listed, disclosed in the patent, however.
Q. How did you determine that [redacted] are representative of the cable hangers in CAB's standard system?

A. Some of the detail in this figure on these pages, I relied on assistance for this level of detail, part numbers, listing numbers, things that I did not believe were crucial, essential to the issues in this case.

Q. In the figures on page A5, did these represent [redacted]?

MR. MELMAN: Objection, form.

A. I don't know. They do not appear to have part numbers printed on them in these photographs.

The internal part number listings as opposed to the common names given to these parts in this proceeding, I relied on the common names, not the bill of materials names on various purchase orders in the accounting system of CAB.

Q. So looking at the pictures that you created on page A5 of your declaration, you don't know if the hangers depicted in these pictures are either [redacted]?

MR. MELMAN: Objection, form.

A. I do not.

Q. Do you know approximately how many hangers

CAB sells?

A. I do not.

Q. Do you know if all of the hangers CAB sells are identical to one another?

A. I assume they are not.

Q. Why do you assume that they are not?

A. Because different hangers have different numbers of cable-carrying surfaces, so that would make them different.

Q. But you've concluded that CAB's products are coextensive with the claims of the -- Claims 1 and 6 of the '291 patent. Is that right?

A. Yes.

Q. And that's even though you haven't reviewed every single product CAB sells that you are claiming is coextensive with the '291 patent?

MR. MELMAN: Objection to form.

A. I have reviewed what has been presented as the common names for these devices, not the bill of materials part numbers as expressed in a spreadsheet tied to an accounting system that is probably part numbers that customers might be

aware of in preparing purchase orders and part of their design guide.

But for these proceedings, I use the common names of the parts.

Q. Does a hanger used with the integrated grounding system practice the '291 patent?

MR. MELMAN: Objection, form, beyond the scope, relevance.

A. I don't know. I haven't reviewed the other patents.

Q. Do you know if CAB sells hangers for use in solar that do not separate cables?

A. I missed one word. Hangers used in?

Q. Solar.

A. Solar. That do not separate cables.

MR. MELMAN: Objection, form.

A. Do I know --

MR. MELMAN: And beyond the scope.

A. Could you say that again, please?

Q. Do you know if CAB sells hangers for use in solar that support cables but don't separate them?

MR. MELMAN: Objection, form, beyond the scope.

A. By "hangers" are you referring to hangers that are supported by a messenger strand only or hangers in general?

Q. Hangers supported by a messenger strand only.

MR. MELMAN: Same objections.

A. I am not aware of such hangers.

Q. Would [redacted] be representative of [redacted]?

MR. MELMAN: Objection to form, relevance and foundation.

A. I don't know.

Q. So you don't know what universe of CAB products [redacted] are representative of?

MR. MELMAN: Objection to form.

A. Well, I've stated here that they are representative of cable hangers and CAB's standard system, but I have relied on others in drafting

this detail.

As I said, I have not used the specific part numbers in thinking about what is a hanger and what is not a hanger. It's the language of the patent and the number of surfaces, whatever they are, wire-carrying surfaces that distinguish generically the different types of hangers.

But again, I have not personally gone into the parts numbers detail, the evolution of those parts numbers over time in preparing for this discussion.

Q. Who did you rely on in drafting this detail regarding [redacted] being representative of [redacted]?

MR. MELMAN: Objection, lacks foundation.

A. I relied on the firm that is representing CAB to provide this kind of lower-level detail and a lot more lower-level detail in terms of references, for example, throughout this document.

I have not checked every reference in this document to make sure that it's referring to the

right specific source, line, and paragraph.

Q. And I don't want to know anything about communications you had with counsel when I'm asking this.

Are you saying that the firm representing CAB drafted the section of this claim chart stating that [redacted] are representative of the [redacted] [redacted]?

MR. MELMAN: Objection, form.

A. It was a collaborative process and they drafted it. And I did not check the detail.

Q. You don't think that determining whether two specific products are representative of a large number of hanger products is an important detail?

MR. MELMAN: Objection, argumentative.

A. I believe the answer to that is no, but I'd like you to restate the question for me, repeat the question for me.

Q. You don't think that determining whether two specific products are representative of a

large number of hanger products is an important detail?

MR. MELMAN: Objection, form.

A. No, I do not.

Q. On page A3, do you see that you make a similar statement regarding [redacted] being representative of [redacted] [redacted]?

A. I do.

Q. Did you perform any analysis to determine whether [redacted] is representative to the [redacted]?

MR. MELMAN: Objection, form.

A. No.

Q. At any point when you make a statement that a product is representative in Appendix A to Exhibit 2038, did you personally determine whether that product is representative?

A. Appendix A, Exhibit -- where?

Q. Appendix A being your entire claim mapping. You make a statement that parts are representative on a number of occasions. Is that

accurate?

MR. MELMAN: Objection, form.

A. Could you point out to me exactly where that line is?

Q. I pointed you to two for the hangers and the messenger wire. I believe you on page A4 say that [redacted].

A. You're saying that the captions under these photographs?

Q. Correct.

Did you perform any of these analyses determining that specific part numbers are representative of groups of parts?

MR. MELMAN: Objection, form.

A. I never dealt in the detail of what the actual part number in the CAB accounting system relates to the common name given to the parts shown and discussed in this patent, in this proceeding, the patent.

Q. On page A2, do you see that you point to components in the second figure and label them

"Pile mid pier attachment L bracket"?

A. Yup.

Q. "Messenger wire"?

A. Yup.

Q. Why did you identify the pile and the mid pier attachment L bracket?

A. Why did I identify them? I identified them as the means for the messenger wires to be supported -- one means for a messenger wire to be supported a distance above the ground. Presumably the pile goes to the ground and the mid pier attachment L bracket is above the ground and supporting a messenger wire.

Common, easy to understand, pertinent language, clear.

Q. Does Limitation 1.A recite a pile?

A. Replace a pile?

Q. Recite.

A. Recite. Recite a pile, no.

Q. Does Limitation 1.A recite a mid pier attachment L bracket?

A. No.

Q. Does Limitation 1.A recite a means for structuring a messenger wire above the ground?

A. Yes.

Q. Does Limitation 1.A use the word "means"?

A. Use the word?

Q. Means.

A. Mean?

Q. Means, M-E-A-N-S.

A. Oh, means. Is it a means.

I think the point here is that the messenger wire needs to be supported above the ground by some means.

A messenger wire's structured to be supported a distance above the ground. And as a convenience, this mid pier attachment L bracket is offered to provide that means and showing the pile -- again, this is in their installation guide, I believe.

The pile associated with the mid pier attachment L bracket, again, is a convenience, a means. There could be other means to do it, but this is a convenience, a means to support the

messenger wire a distance above the ground.

Q. Could a tracker pile be a means to support the messenger wire a distance above the ground?

MR. MELMAN: Objection, form, beyond the scope, and relevance.

A. Could a what pile?

Q. A tracker pile.

A. Who is to say this is not a tracker pile?

Q. So a tracker pile could be a means to support the messenger wire a distance above the ground?

MR. MELMAN: Same objections.

A. Any pile could be a means to support the messenger wire above the ground.

Q. So if you look at the image just above this on page A2, you point to organizing a plurality of electrical cables extending from a plurality of solar panels. Do you see that?

A. I do.

Q. What type of electrical cables are these in this first picture on page A2?

A. What type? I can see cables that appear

to be multiple colors. That's the jackets. The type of cable would be either aluminum or copper.

The size of the cable, again, there's no scale on this, but the size of the cables suggests to me they are -- and the scale of things suggests to me they are larger than string cables, but they don't seem to be so large as to be photovoltaic output circuit cables.

I'm totally speculating trying to answer your question, what types of cables.

In the context of the picture, I would say they are cables extending from the solar panels, the plurality of solar panels. But it's difficult to pin it down beyond that.

Q. Do you know if the cables shown in the first image on page A2 are DC current-carrying cables?

A. I don't know for a fact. But since they are extending from a plurality of solar panels, then they are very likely to be DC. As a matter of fact -- I'll stay with that. Extremely likely to be DC.

Q. But you don't know for sure whether they're DC cables?

A. No. They are cables. What current runs through them is just likely to be DC because of where they are shown in this photograph. And we are dealing with photovoltaic power systems, which are DC arrays by and large.

Q. Are there any data cables in this image?

A. I do not see any data cables in this image.

Q. Do you see any AC current-carrying cables in this image?

A. No, I do not see any AC current-carrying cables in this image. In the foreground, at least. I mean, as you go into the background, you can't infer what's in the background.

Q. And so in this image the hangers are organizing cables that are all carrying the same type of current?

MR. MELMAN: Objection, form.

A. Yes. DC current.

Q. Actually, one more question on this one.

How can you tell that the cables shown in this image at the top of page A2 are extending from a plurality of solar panels?

A. The presentation of the picture suggests that it is extending from the solar panels in the background.

Q. But you can't see the cables in this picture at the top of page A2 actually extending from the solar panels. Right?

MR. MELMAN: Objection, form.

A. In order to confirm that they extend from solar panels, one would need to see more clearly where the terminations of these cables heading toward the solar panels in fact connect to the solar panels. Presumably they are extending -- presumably they are extending from a plurality of solar panels.

The, again, likelihood in this photograph if it hasn't been manipulated is that these are extending from combiner boxes, judged on the size of the conductors. So they would be extending from solar panels but not directly.

They'd be extending from solar panels. In a more general sense, they are coming from solar panels but not extending from solar panels such as a PV source circuit. In a broad sense, they're extending from solar panels toward an inverter.

Q. Because the cables that literally extend from solar panels are the string modules. Right?

MR. MELMAN: Objection to form.

A. The ones that directly extend from solar panels are the string. Yes.

Q. Going to page A1, the second image, does this show organizing a plurality of electrical cables?

MR. MELMAN: Objection, form.

A. Yes. I would love it if the picture were taken at a little bit different angle so I could actually count the number of cables.

But I see more than one, one white and one black, maybe two black, maybe another white one hidden.

But it would appear that there are four DC electrical cables in the left-hand side of that

hanger, the hanger shown, whose part number I do not know.

Q. And going to page A6 -- and I apologize for making you jump around.

A. Jumping around is no problem.

Q. Do you see the image of a cable carrier -- sorry -- a cable hanger with cable carrier identifiers identified?

A. I do.

Q. Is this cable hanger organizing a plurality of electrical cables?

MR. MELMAN: Objection, form.

A. It's supporting a plurality of electrical cables. The cable hanger has a divider. In this particular case it is not separating cables, but it's certainly capable of separating cables with the cable carrier divider, should they need to separate cables. It would appear to be an underutilized cable carrier.

Q. Do you know if CAB's cable hangers have a coating on them?

MR. MELMAN: Objection, form, beyond the

scope.

A. Yes.

Q. What type of coating do CAB's cable hangers have on them?

MR. MELMAN: Objection to form, beyond the scope.

A. CAB cable hangers have a coating that prevents corrosion. I don't know the specific chemistry of the coating, but its functionality is to prevent corrosion, resist UV degradation, support and augment the ability of the carrier to grip the messenger wire, and to -- how do you say this?

Inside the cable -- inside the hanger material it would be typically metal, conductive. And the coating serves as a dielectric to isolate that metal from anything that potentially could have a hazardous voltage on it.

Q. Is the chemistry of the coating on CAB's cable hangers important to conferring those properties?

MR. MELMAN: Objection to form and beyond

the scope and relevance.

A. Yes. The chemistry involves its abilities to resist ultraviolet radiation, to be a dielectric, to prevent corrosion.

Q. Does the --

A. I'm not a chemist.

Q. Does the '291 patent claim the chemistry of the coating on CAB's cable hangers?

MR. MELMAN: Objection, form, beyond the scope.

A. I believe I did see in the -- but I didn't pay a great deal of attention to, a reference to the coatings on the CAB cable hangers.

Q. That reference just mentions the existence and type of material. Right?

MR. MELMAN: Objection, form, and beyond the scope.

A. I believe it's Claim 23 is one place I see it. Makes sense.

Q. Does Claim 23 or any other claim of the '291 patent claim the thickness of the coating on CAB's hangers?

MR. MELMAN: Objection to form and beyond the scope.

A. I don't recall. The coating on the CAB hangers did not seem to be a major consideration in this issue, in this.

Q. But it is important to better grip the messenger wire and be UV resistant. Right?

MR. MELMAN: Objection, form, beyond the scope, relevance.

A. I said that. It says it in the patent. I have not investigated the details of it.

Q. Do you know if any other patents other than the '291 patent cover CAB's cable hangers?

MR. MELMAN: Objection to form, beyond the scope and relevance.

A. I believe in the patent identified as paren 63 it says it's a continuation of prior patents.

MR. MELMAN: Can I ask the reporter how long we've been on the record?

(Recess, 5:34 p.m. to 5:48 p.m.)

BY MR. DIXON:

Q. Can you please turn to page -- or actually Paragraph 172 of your declaration.

So about halfway down in Paragraph 172, do you see the statement that, "Further, Carr's hanger device is made of a simple and cheap construction which is capable of supporting two aerial cables"?

A. Yes, I see that.

Q. Does "simple and cheap construction" mean weak construction?

A. It means simple and cheap. It doesn't say anything about its strength.

Q. Could a hanger of simple and cheap construction be strong?

MR. MELMAN: Objection to form.

A. I suppose it could be. "Simple" could mean strong. "Cheap" generally tends to imply maybe not so.

Q. Do you think a hanger of simple and cheap construction could support a 4-aught power cable?

MR. MELMAN: Objection to form. And beyond the scope.

A. A single 4-aught power cable?
Q. Yes.
A. Conceivably.
Q. Do you know what material the Carr hanger is made out of?
A. If I recall, it was made out of steel. I recall it was made out of steel.
Q. I think it might be in that first column, line 49 or 50 depending --
A. Metallic -- I'm sorry.
Q. In Carr Exhibit 1005, in the first column right around line 50, I think it states, "Constructed of a laminated steel strip." So I think your statement is accurate if you agree with what Carr says.
MR. MELMAN: Objection, form.
A. I think maybe Carr is talking about prior art there.
Q. If you look at the first sentence of that paragraph, it says, "According to this invention." Right?
A. Oh, wait.

Q. Column 1. This paragraph starts right around line 46.

A. Oh, line 46. I'm sorry. Yes, yes. I'm sorry. I was looking at the upper part of the line -- around line 5.

Q. So Carr's hanger is constructed of a laminated steel strip Y shown in Figure 4 of rectangular cross-section having considerable hardness and resiliency. The right?

A. Right.

Q. Are CAB's hangers made out of steel?

MR. MELMAN: Objection, beyond the scope.

A. I believe so.

Q. Are CAB's hangers cheap to make?

MR. MELMAN: Objection, beyond the scope, relevance.

A. I assume so.

Q. Are CAB's hangers of simple construction?

MR. MELMAN: Objection, form, beyond the scope, relevance.

A. Yes.

Q. Earlier you testified that Almy's wire

loops were made out of the same material as the messenger wire disclosed by Almy. Is that accurate?

MR. MELMAN: Objection, form.

A. That is what appears in Almy, in their drawings, their specification.

Q. Do you think the wire loops in Almy are stronger than a steel cable hanger?

MR. MELMAN: Objection, calls for speculation, beyond the scope.

A. None of these patents show any dimensions to the materials used. The strength depends on the dimensions.

Q. So you could adjust the dimensions to create stronger, weaker hangers?

MR. MELMAN: Objection, form, calls for speculation, and beyond the scope.

A. An engineer would change the dimensions to change the strength.

Q. Would that be within the scope of an engineer in the solar industry having ordinary skill in the art?

MR. MELMAN: Same objections. And objection, relevancy.

A. Yes.

Q. Sorry. I realize my question was unclear.

Would changing the dimensions to change the strength be within the skill set of an engineer in the solar industry having ordinary skill in the art?

MR. MELMAN: Objection to form, calls for speculation, beyond the scope and relevancy.

A. Yes.

MR. DIXON: Okay. I have no further questions.

MR. MELMAN: Why don't we just take a couple-minute break, let me just review my notes, caucus, and then we'll come back.

(Recess, 5:56 p.m. to 6:03 p.m.)

MR. MELMAN: We have no redirect. No further questions.

Thank you, Dr. Kern.

MR. DIXON: Thank you for your time today.

(Off the record at 6:03 p.m.)

CERTIFICATE OF SHORTHAND REPORTER - NOTARY PUBLIC

I, Michelle Keegan, Registered Merit Reporter and Notary Public within and for the Commonwealth of Massachusetts, do hereby certify:

That EDWARD C. KERN, JR., PH.D., the witness whose deposition is hereinbefore set forth, was duly sworn by me before the commencement of such deposition and that such deposition was taken before me and is a true record of the testimony given by such witness.

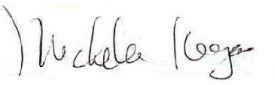
I further certify that the adverse party was represented by counsel at the deposition.

I further certify that the deposition of EDWARD C. KERN, JR., PH.D. occurred at the offices of Mintz, Levin, Cohn, Ferris, Glovsky and Popeo, P.C., One Financial Center, Boston, Massachusetts 02111, on Tuesday, October 1, 2024, commencing at 9:38 a.m. to 6:03 p.m.

I further certify the inspection, reading, and signing of said deposition was waived on the record by agreement of all parties.

I further certify that I am not related to any of the parties to this action by blood or marriage, I am not employed by or an attorney to any of the parties in this action, and that I am in no way interested, financially or otherwise, in the outcome of this matter.
IN WITNESS WHEREOF, I have hereunto set my hand this 1st day of October, 2024.

My commission expires May 15, 2026.



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