

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HANWHA SOLUTIONS CORP.,
Petitioner,

v.

MAXEON SOLAR PTE. LTD.,
Patent Owner

IPR2024-01199 (Patent 8,878,053 B2)
IPR2024-01203 (Patent 8,222,516)

Record of Oral Hearing
Held: December 3, 2025

Before JO-ANNE M. KOKOSKI, KRISTINA M. KALAN, and AVELYN
M. ROSS, *Administrative Patent Judges*.

IPR2024-01199 (Patent 8,878,053 B2)

IPR2024-01203 (Patent 8,222,516)

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P R O C E E D I N G S

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JUDGE ROSS: So good afternoon, everyone, and welcome back.

We're here for the final hearing in IPR2024-01199 and -01203 concerning U.S. Patent Numbers 8,878,053 and Patent Number 8,222,516. I'm Judge Ross. Joining me today are Judges Kokoski and Kalan.

We're conducting this hearing remotely like we did earlier today. So just please be aware there may be a lag in either the audio or the video. And also, take caution not to talk over each other, we want the record to be clear. Make sure you're speaking into your microphone. And during your presentation, please try to reference your slide numbers that you're referring to, that'll help the record be clear.

We do have access to the entire case file, so if you refer to papers or exhibits that aren't part of your presentation, we can look those up. And hearing no objection, we did authorize a public line for today's hearing, so be aware that members of the public may be joining us.

As we mentioned in our October 29th hearing order, each side will have 60 minutes for their arguments. Because Petitioner bears the burden of persuasion, Petitioner will go first. Patent Owner will then have a chance to respond. And each side may reserve time for rebuttal.

There is no official clock, so I will try to do my best to keep track of time. But you should pay attention to your own clock and keep your own time. I will try to give you a warning at the five-minute mark, but I may overlook that.

Before you begin your argument, please remember to introduce

1 yourselves and those in your party and let us know how much time you'd
2 like to reserve for rebuttal or surrebuttal. And so with that, counsel for
3 Petitioner, please proceed when you're ready.

4 MR. CAVANAUGH: Okay. Thank you, Your Honor. Good
5 afternoon. My name is Dave Cavanaugh. And together with my colleague
6 Gilbert Smolenski, I represent Hanwha Solutions Corporation. With me
7 today also is Mark Selwyn and John Hobgood and we have clients on the
8 line as well.

9 Mr. Smolenski and I will divide today's argument, and I'll identify
10 who will address which issues when I cover them in a moment. But let me
11 begin by briefly summarizing a few important items that are not in dispute
12 between the parties. First, there's no dispute that the elements of the vast
13 majority of the challenged claims were known in the prior art, including in
14 the references relied on by Hanwha in the grounds. There's only one
15 element, and one element challenged as not being prior art in a single
16 limitation of a single dependent claim of the '516 Patent.

17 Second, there's no dispute that a person of ordinary skill would
18 have been motivated to make design changes in order to improve solar cell
19 efficiency and decrease manufacturing costs. Maxeon's own expert, Dr.
20 Ruby, agrees that efficiency improvement as small as one-tenth of 1 percent
21 is worthwhile. He also agrees that solar cell designs are geared toward
22 increasing efficiency and reducing cost.

23 Third, there's no dispute among the party's experts that a person of
24 ordinary skill would have known how to successfully implement oxide
25 layers in solar cells. Dr. Ruby, the Patent Owner's expert, acknowledged
26 that a person of ordinary skill would have known how to add an oxide layer

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1 to solar cells before the priority date of the challenged patents. So the issues
2 are narrow and we have a slide deck to help us go through the issues in an
3 orderly manner.

4 Turning now to Slide 2, I provide a brief agenda. And I'll first
5 provide an overview of the grounds and the challenged claims. I'll then turn
6 to the disputed issues. Of course, if you have any questions, at any time,
7 please ask them. And if we don't address something in the oral argument
8 today, we'll rest on the papers as the information is fully briefed for this
9 case.

10 I'll address issues one and two; and my colleague, Mr. Smolenski
11 will address issues three through five. I'll start --

12 JUDGE ROSS: Mr. Cavanaugh, did you let me know how much
13 time you want for rebuttal?

14 MR. CAVANAUGH: I apologize, Your Honor, I haven't yet and I
15 meant to do that.

16 JUDGE ROSS: Okay.

17 MR. CAVANAUGH: 15 minutes.

18 JUDGE ROSS: Okay. Thank you so much.

19 MR. CAVANAUGH: Okay. So on Slide 4, we present the
20 overview of the grounds. As your honors have seen from the various papers,
21 there are five grounds in the '516 IPR and three grounds in the '053 IPR.
22 Collectively, the grounds challenge each of the claims of the '516 and the
23 '053.

24 And, you know, on Slide 5, just to kind of walk through -- and Mr.
25 Selwyn did this for the '315 Patent's IPR -- we recognize that there is a
26 Canadian Solar IPR on each of these patents. The Hanwha IPRs are

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1 different; they're independent. And Hanwha petitions challenge all the
2 claims, Your Honor, where the CSI or the Canadian Solar IPRs don't
3 challenge all the claims. The references that Hanwha petitions rely on are
4 different. And of course, there's different expert testimony on behalf of the
5 Petitioners. And also, as the record amply shows, that there are different
6 supporting references provided in each of the Hanwha IPRs.

7 Turning now to Slide 6. Your Honor, what we've done is to -- and
8 I won't go through all the slides but to orient everybody to the '516 Patent
9 and kind of correspondingly to the '053 technology. Claim 9 is a
10 representative claim from the '516 patent. We've identified on this claim on
11 the right-hand side and colorized various limitations and where they're
12 presented in Figure 1 of the '516 Patent so that there's some correspondence.
13 And we'll be talking about these limitations throughout this presentation.

14 Turning now to the first ground of each of the patents. And this is
15 in Slide 12. This is the Froitzheim and Gan Ground. And you know, the
16 next slide identifies Froitzheim. And we used a similar color coding for the
17 Froitzheim illustration. And, you know, again, there's largely undisputed
18 solar cell structure here. I'm not going to go into detail because we'll go
19 through some detail for the obviousness combination. But there is a PN
20 junction, there's front rear contacts, and there's a textured front surface; all of
21 these things are part of the various claims.

22 And, you know, I'd like to then go to Slide 15, which is the Gan
23 reference. And we'll be talking about the Gan Thesis in a moment. But I'd
24 like to pause for a moment on what the actual grounds are for the
25 Froitzheim-Gan combination. And, you know, with the Gan reference, I
26 think it's important to recognize that it is teaching a thermally grown

1 interfacial oxide with a polysilicon emitter, which is what the limitation of
2 the claim is. And it's also identifying what it is that makes that feature or
3 that characteristic or that structure desirable because it has -- we'll talk about
4 it in a moment.

5 We'll go to Slide 16. We can talk through the -- kind of the
6 increasing efficiency that comes from the use of the polysilicon emitters as
7 well as the oxide layer. And the next slide is -- or I'm sorry, this slide, I
8 want to introduce two terms because I think it's important to recognize the
9 -- you know, what are called J-naught, and naught is N-A-U-G-H-T, it's a
10 zero in the papers; and also, rho-c, which is both features -- rho is R-H-O,
11 small c.

12 And so the J-naught is the current -- the saturation current density
13 of the solar emitter. And, you know, I think the parties agree and the experts
14 agree that a low J-naught is beneficial for solar cell design as well as a lower
15 contact resistance, which is what rho-c is, is also beneficial. And I think the
16 parties agree on that. And then finally, to just kind of introduce the actual
17 combination that we're using on Slide 17, you know, there is various
18 efficiencies that are created, a lower rho, a -- rho-c and a lower J-naught
19 with the use of the polysilicon emitter and the oxide layer of Gan.

20 And, you know, I'd like to now go to the actual disputes between
21 the parties and that's on Slide 18, if you will. And so one of the things and
22 -- you know, the Patent Owner has introduced Gan thesis, and we want to
23 address that. We'd also like to kind of address the reasonable expectation of
24 success, aspects of the combination. And then there are two other issues that
25 are applicable to the '053 IPR, which I'll address in due turn.

26 And so turning now, I think the helpful for the context of how to

1 look at the dispute between the parties is to look at what's not in dispute.
2 And so if we go to Slide 19, the experts agree that a person of ordinary skill
3 would be motivated to improve solar cell efficiency. And as I said at the
4 introduction, the Patent Owner expert, on the bottom of Slide 19, saying
5 generally speaking, an improvement in the one-tenth of 1 percent in
6 efficiency is worthwhile. So that's clear that the parties or the experts agree
7 on that.

8 And then next slide, the experts also agree, as I alluded to a
9 moment ago, that J-naught and rho-c, if they are reduced, it improves solar
10 cell efficiency. And I won't go through the testimony; it's there, Your
11 Honor. But I think the parties agree on that.

12 And then the next slide, 21, goes through the kind of how to
13 implement the oxide layers. And the parties agree -- or the experts agree
14 that someone skilled in the art would know how to implement oxide layers.
15 And I'll touch on this, you know, in a couple of times in my presentation in
16 the next moments.

17 I think that it's, you know -- and so with all of this as what the
18 parties agree that the Patent Owner has identified the Gan Thesis as a reason
19 why someone wouldn't be motivated to or would not have a reasonable
20 expectation of success for the combination. And that's on Slide 23 where we
21 start the presentation.

22 And I want to start where Your Honors identified during the
23 decision on -- or in the decision on institution, three observations of the use
24 of the Gan Thesis. When you observe that the Patent Owner is using the
25 thesis and not the reference itself, which is different than what is the ground.
26 Second, Your Honors recognized that the Gan Thesis recognized that the

1 process could be improved; that it wasn't just simply -- although it was
2 difficult control, it was -- it could be improved. And then we'll talk about
3 that more.

4 And third, and importantly, Your Honors suggested that the Patent
5 Owner may be advocating for a heightened standard of success. And, you
6 know, each of these items have been further explored during the kind of post
7 institution part of this proceeding. And that's what I'll be talking about in
8 my -- in the next few minutes.

9 So turning to Slide 24, I think it's important to recognize that the
10 Gan Thesis is really supporting and it's not really different than the Gan
11 reference itself. And I think that it's, you know -- and I want to kind of
12 focus on two things. First, that the Patent Owner's expert in developing the
13 opinion for the POR really hadn't looked at the entire reference itself and
14 just kind of looked at various sites that the Patent Owner evidently had
15 shown them -- had shown him. And when you look at the entire reference,
16 one of the things that you find is that there is a lot of optimism and there's a
17 lot of indications that kind of -- that the application of the oxide layer and
18 the polysilicon emitter was kind of important and good.

19 And I want to just identify two things, and it's on the slide here.
20 But if you look at Chapter 4, Your Honors, I'm sure will -- after the hearing
21 -- you know, Gan is describing a theoretical model for the use of an oxide
22 layer in a polysilicon emitter. And that's at the thesis on page 69. We
23 addressed this in our reply declaration, which is Exhibit 1077 in the reply
24 declaration at paragraph 28.

25 And then in Chapter 5, the Gan Thesis discussed the testing that
26 the author performed on the polysilicon emitters and the oxide layers and

1 confirmed that the combination of the features would have low J-naught and
2 rho-c. And that's a -- the Gan Thesis at 10, and I'm going to quote it for
3 Your Honors. "The results shown in this chapter are very much like what
4 was predicted in Chapter 4" and on page 70. From the discussion in the
5 previous chapter, there was great chance of -- to make a "polysilicon SIS
6 emitter with low J-naught and rho-c by breaking a small fraction of the
7 interfacial oxide."

8 In this chapter, we shall show experimentally that that was indeed
9 the case. So far from being a failed experiment or some kind of flawed kind
10 of thesis, really, what -- if you read the entire reference, it shows exactly
11 what, you know, the reference itself, the Gan reference kind of provides. It
12 goes into more detail. I think there were some failings of the machinery or
13 some of the equipment. That was identified also that I think contextualizes
14 some of the kind of -- you know, the way that the thesis talked about some
15 of the results. But overall, it was successful.

16 And, you know, Chapter 5 is addressed in paragraph 28 -- or 29 of
17 the Holman declaration. And so going to Slide 25. It's clear that, you know,
18 the reference recognized that low J-naught and low rho-c were very doable,
19 if I could just use informal language. And it was improving the
20 performance, so all the reasons why we say that the references can be
21 combined.

22 And you don't need to just look at Holman's testimony or the Gan
23 Thesis or the Gan reference itself. If you go to Slide 26, oxide layers had
24 been used for a long time in transistors. And Dr. Ruby, the Patent Owner's
25 expert agrees with that. And in his declaration with the POR, he identified a
26 reference, Foglietti, which is identified that Foglietti, we -- it's our Exhibit

1 1042.

2 And he identifies, as we say in this Slide 26, that Foglietti relates
3 to transistors, but the tunneling mechanism described also applies to solar
4 cells. And this is in paragraph 81 and 82 of his declaration, which is Exhibit
5 2027. And I think that it's helpful to recognize that also 82, 83, and 84 also
6 address the Foglietti reference and very much is a part of recognizing that
7 someone was recognizing that solar cells could be used with
8 -- advantageously with an oxide layer.

9 And also, you know, I think that there's -- if we go to Slide 28, the
10 -- you know, there's a reference that we identified in 1015, a patent to
11 Swanson. And Swanson -- and we'll put there on the left-hand side of Slide
12 28, there's a tunnel oxide layer and it's formed right on the back side of the
13 wafer -- between the wafer and the polysilicon layer. So as much as the
14 Patent Owner wants to say, no one had ever done it before, there is clear
15 teaching in the references, not only Gan but also the supporting references of
16 Foglietti and Swanson, that it had been done before and that people would
17 have a reasonable expectation of success.

18 And if we go to Slide 29, you know. I think that I want to touch on
19 some parts of the Patent Owner's POR, which is on page 34 and 35. And to
20 the extent that the Patent Owner is saying that there's no single reference that
21 successfully implemented it, you know, I don't think that corresponds with
22 their evidence I just identified.

23 But even more so I think it's an incorrect articulation of
24 obviousness if they're saying that well there's no single reference, but
25 multiple references might have done it. And then second, also on page 35 I
26 think, they talk about something not being commercially introduced. And

1 that, of course, is not the requirement for obviousness.

2 And the last thing I'd like to talk about with the Gan Thesis, unless
3 Your Honors have any question, is the final point that you -- that Your
4 Honors raised in the decision on institution. You wondered whether or not
5 -- or you observed maybe the Patent Owner was applying too high of a
6 standard for reasonable expectation of success.

7 And we had an opportunity to ask the Patent Owner's expert about,
8 well, what is your understanding of reasonable expectation of success? And,
9 you know, in plain English he said, well, the probability is close to 100
10 percent. And then we asked about the legal standard, and he said, well, he's
11 not familiar with the legal standard.

12 So however that informs Your Honors about where the expert is, I
13 think it does suggest that the Patent Owner's expert was applying too high of
14 a standard as to the reasonable expectation of success. And, you know,
15 whether it's the plain English version or if he's not familiar with the legal
16 standard -- I'm not quite sure how the Patent Owner can base an opinion if a
17 Patent Owner isn't -- if a Patent Owner's expert isn't familiar with the legal
18 standard.

19 So if there are no questions, I'm going to go to a couple of specific
20 issues for the '053 Patent and that's on -- and I'll start on 31. And here, you
21 know, the Patent Owner seems to rely on the Wands factors. And this is on
22 page 36 -- 33 to 36 of the POR for the '053 Patent. And, you know, the
23 Wands factors are -- as Your Honors likely know is related to the standard of
24 enablement, not necessarily -- not obviousness.

25 In fact, you know, the Patent Owner supplies no case where the
26 Wands factors were identified or used on or relied on for the -- for an

1 obviousness determination. And we have not found one either. So to the
2 extent that the Patent Owners are asking you to rely on the Wands factors to
3 support a finding of nonobviousness, they're asking you to kind of break out
4 of a pretty well kind of settled area of law and not really providing a great
5 deal of guidance. So in our view, they'd be inviting you to error.

6 And the other issue is, regarding Claim 9 of the '053 IPR -- and,
7 you know, I just want to touch on this for a moment. And it is, you know,
8 whether or not the -- kind of the information of the Gan Thesis which has a
9 polysilicon layer as well as an oxide layer, whether that teaching would also
10 render Claim 9 and the dependent claims obvious. And in our view, you
11 know, the Claim 9 is brought -- it -- Claim 9 is clearly -- has fewer
12 limitations and it doesn't have an oxide layer.

13 The Patent Owner seems to say that somehow not having an oxide
14 layer -- where the prior art does have an oxide layer is somehow an
15 indication that the claim is not rendered obvious and so that we believe is an
16 error. So it seems -- and I'll probably address this on rebuttal if the Patent
17 Owner brings it up, but it seems that the Patent Owner is seeking to construe
18 the transitional phrase comprising as consisting of.

19 So comprising, as Your Honors know is an open-ended language,
20 it admits all of these and there could be other limitations, other features, and
21 not -- and it's not close ended, which is consisting of would be closed ended
22 language which would require those things but nothing else. And so to the
23 extent that the Patent Owner is interpreting the claim that way, that's
24 incorrect. And we believe that -- as we said in the papers that Claim 9 is
25 obvious and the dependent claims are obvious in view of Gan and
26 Froitzheim.

1 And I'd like to then turn to Slide 35. And this is Ground 2 of the
2 '053 Patent. We include another reference, Smith. And, you know, on Slide
3 2, we have the various claims that are related to the Ground 2 and that
4 combination. And, you know, turning to Slide 36, we have the various claim
5 -- Claim 9 is a method claim as Your Honors have seen as well as some
6 dependent claims.

7 And, you know, the Smith teaching is -- I can go to the next Slide,
8 on 37, we see kind of the manufacturing techniques for solar cells, which is
9 what Smith is teaching. And we'll return to that in a moment.

10 Let's go to Slide 43 to address the various disputes that the Patent
11 Owner has identified with regard to the combination of Froitzheim, Gan, and
12 Smith. And the first one is whether or not this -- Smith's teachings are
13 limited to back contact solar cells. And, you know, in our view or the
14 answer to the first question is no, they're not. And so we'll tell you why in a
15 moment. And then second, whether or not a person of ordinary skill would
16 apply Smith's in-situ teaching to the combination. And the answer to that in
17 our view is yes. And we'll address that briefly also.

18 So in Smith's teaching, you know, one of the issues is whether or
19 not Smith is only limited to back contact cells or it could be applied to both
20 sides. And so, you know, as we put on the reference on Slide 44 here, the
21 Smith reference is really generally related to solar cells and it's not front side
22 or back side as kind of a limiter. And, you know, how do we know that?
23 We know that because Dr. Ruby had an article that said, you know, when
24 you're using the atmospheric pressure chemical vapor deposition, you can do
25 it on a solar cell with both front and rear contacts.

26 And, you know, that itself is I think an indication that there's a kind

1 of a discontinuity between how the Patent Owner is articulating their
2 challenge to the ground and kind of what the Petitioner -- or what the Patent
3 Owner's expert is looking at. In 1993, there was an article that Dr. Ruby
4 published that basically said it could be on both sides.

5 And, you know, going to Slide 46. Yeah, I think, you know, it's a
6 kind of a matter of law that a reference has to be considered for everything
7 that it teaches and not simply the described invention or their preferred
8 embodiment. And as Dr. Holman, the Petitioner's expert has identified both
9 in his reply declaration as well as the Petitioner's declaration filed with the
10 petition that, you know, Smith does in fact have that dual side of using
11 chemical -- atmospheric pressure chemical paper deposition on front and
12 rear contacts.

13 Now, there's a kind of a -- I want to turn to Slide 47 with regard to
14 the kind of -- the motivation, you know, as we said in our petition, a person
15 would have understand -- would have understood that APCVD and institute
16 diffusion processes and could be desirable because of both front and back
17 side wafers could be doped at the same time. So, like, we have that clearly
18 in the petition and we put that also in the reply declaration.

19 And Your Honors, you probably are aware that the Patent Owner
20 didn't depose our expert for the reply -- on the reply declaration. So that
21 stands itself as testimony which is -- it's not been -- has not kind of provided
22 any contrary kind of opportunity because the Patent Owner didn't avail
23 themselves the opportunity to depose the expert declarant.

24 And I think that I'd like to move, if Your Honors have no
25 questions, to the -- or to Slide 51 and that is Claim 12 on this --

26 JUDGE KALAN: Also, I did have a question about the Wands

1 factors and Patent Owner's use of the Wands factors to undergird its
2 reasonable expectation of success showing. Are we prohibited from looking
3 at their showing and analysis of the Wands factors when we're looking at
4 their reasonable expectation of success arguments, or do you have any
5 authority to that effect?

6 MR. CAVANAUGH: I would not say that you're prohibited from
7 looking at the underlying facts of the Wands factors. Applying them in the
8 context of enablement is different than applying kind of the reasonable
9 expectation of success or a motivation to combine. So, you know, I think
10 that while you can -- certainly, there's no prohibition that we have found
11 from looking at them but simply relying on the Wands factors or kind of
12 aligning the evidence consistent with the Wands factors doesn't get to a
13 nonobviousness case or position.

14 JUDGE KALAN: So your position is, regardless of whether it's
15 proper or not to invoke the Wands factors, they have not made the requisite
16 showing of reasonable expectation of success; not that we can't look at that,
17 not that the Wands factors analysis is disqualified for some reason.

18 MR. CAVANAUGH: That's correct. I may have misheard you,
19 but, like, they have to say that there's no reasonable expectation of success.
20 And we believe they have not shown that, or our burden is to show a
21 reasonable expectation of success. I'm going to be particular, our burden is
22 to show that there's a reasonable expectation of success. We believe we've
23 discharged that. And regardless of what you consider with regard to the
24 Wands factors, that doesn't disturb that of what we said.

25 JUDGE KALAN: All right. So thank you.

26 MR. CAVANAUGH: Okay. So briefly, with regard to Claim 12

1 and this is back to the '516 IPR. And so I just want to -- and this is on Slide
2 52, kind of the issue is whether or not Froitzheim discloses, you know, the
3 limitation wherein the second metal contact comprises silver formed over a
4 layer of silicon dioxide. And I want to kind of start with kind of the
5 -- what's in the specification.

6 And so the specification -- the limitation, if we go to the next slide,
7 53, you know, the -- it appears that the 110 is encapsulating, if you will, the
8 oxide -- silicon dioxide layer. And, you know, to the extent that the Patent
9 Owner is trying to read a limitation into the claim as in that embodiment, it
10 has not sought a construction or sought a reason why a particular
11 embodiment should be kind of read into the claim limitation.

12 If we go to the next slide -- you know, if we take a step back and
13 look at how each reference -- each -- the '516 Patent and the Froitzheim
14 reference disclose the formation of the silver layer over the silicon dioxide.
15 The '516 Patent uses a printing process and that -- it's very common as we've
16 put in our declarations. And Froitzheim also uses a printing process.

17 And part of that, like identification of the limitation of the claim,
18 we believe it deserves plain meaning. And, you know, to the extent that
19 there's any question whether or not Froitzheim teaches it, you know, it's the
20 same process that's being used. And this is a method limitation. So the -- or
21 actually, no, I'm sorry, this is a structural limitation. It's not the '053 Patent,
22 it is the '516 Patent. And then if -- so I'll pause there and invite any
23 questions you might have, Your Honors, about the sufficiency of the ground.

24 And then one other thing before I give it over to Mr. Smolenski, if
25 you have no more questions, because I want to address what the Patent
26 Owner has argued and, you know, that itself would not -- it would still, even

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1 with the Patent Owner's argument, have some -- it would -- the limitations
2 would be met by the claims.

3 And so maybe we go to Slide 54 and -- oh, I'm sorry, Slide 55.

4 And so, you know, to the extent that the Patent Owner is saying there needs
5 to be some kind of over, as in the Figure 4L, three slides ago. Because to the
6 extent that the Patent Owner is arguing that there needs to be some silicon
7 dioxide there and, you know, there is in kind of the process some silicon
8 dioxide still there.

9 And we had a reference, that is Exhibit 1081. And so the -- that
10 demonstrates that there is some silicon dioxide. And I'm going to going to
11 address - and that I think addresses what the Patent Owner has alleged.

12 And with that, unless Your Honors have any questions, I'm going
13 to turn it over to Mr. Smolenski.

14 JUDGE ROSS: I don't have any questions.

15 MR. SMOLENSKI: Great. Thanks, Dave. Thank you, Your
16 Honors. May it please the Board. Gilbert Smolenski from WilmerHale. I
17 will address the remaining disputed issues across the two IPRs. And we'll
18 start with the third ground in the '516 petition.

19 So if we could turn to Slide 57. For Ground 3 in the '516 IPR,
20 Petitioner relies on Borden-575, which I'll refer to as Borden instead of Gan
21 for the teachings of a polysilicon emitter and oxide layer. As shown on the
22 slide, Borden teaches a polysilicon emitter that is highlighted here in blue.
23 Borden also teaches two types of oxide layers, the first is a buried oxide
24 layer that's shown in yellow, and the second oxide layer is a tunnel oxide
25 layer that's highlighted in orange.

26 Paragraph 22 of Borden explains the purpose of the tunnel oxide to

1 provide passivation between the substrate and polysilicon emitter. In other
2 words, to reduce recombination losses and allow tunnel current flow
3 between the substrate and polysilicon emitter.

4 Turning to Slide 59. I'd like to address the combination of
5 Froitzheim and Borden that is set forth in the petition. As Mr. Cavanaugh
6 explained, the challenged claims recite an oxide layer. The claims do not
7 specify a specific type of oxide layer, and Patent Owner does not argue
8 otherwise. In the petition and as shown here on the slide, Hanwha relied on
9 Borden's tunnel oxide layer.

10 For example, in pages 65 and 66 of the '516 petition, Hanwha
11 specifically relied on Borden's tunnel oxide to establish motivation to
12 combine and reasonable expectation of success. When explaining that
13 Borden taught the recited oxide layer, Hanwha used the term oxide layer to
14 explain that Borden taught the limitation. The use of oxide on its own was
15 solely meant to establish that Borden disclosed the claim limitation and any
16 reference to the buried oxide layer in the specific claim elements did not
17 change the fact that the petition was relying on the tunnel oxide for the
18 overall combination.

19 So turning to Slide 60. The disputed issues for this ground are
20 narrow, first, whether Borden's prior art; second, Petitioner's reliance on the
21 tunnel oxide; and third, whether a POSITA would have been motivated to
22 combine these references with a reasonable expectation of success. Each
23 should be decided in Petitioner's favor.

24 Turning to Slide 61 and starting with the first issue. The petition
25 established that Borden is entitled to claim priority to its Provisional
26 application. To claim priority to Provisional, two requirements must be

1 satisfied, and this is in the petition as well as on this slide. And as
2 established in Hanwha's papers, for example, at pages 21 to 24 of the
3 petition and pages 17 to 19 and 23 to 24 of the Petitioner's reply, each
4 requirement is met here.

5 And if we turn to Slide 62, I'd like to specifically address Patent
6 Owner's dispute about paragraph 22 of Borden. And this dispute is centered
7 on six words at the end of the last sentence of paragraph 22, "while allowing
8 for tunnel current flow." Patent Owner's argument ignores the plain
9 language of the Borden Provisional. The Provisional, like Borden, as shown
10 here on the slide, teaches a tunnel oxide and states that the tunnel oxide
11 provides passivation between the substrate and polysilicon.

12 In response to the POR, Dr. Holman explained in his reply
13 declaration, which as Mr. Cavanaugh noted, was not challenged by the
14 Patent Owner that this phrase demonstrates the oxide layer allows tunnel
15 current flow. This description does not stand alone. As Your Honors can
16 see in paragraph 18 of the Provisional, the Provisional also references the
17 prior art more generally.

18 And as we know from Dr. Ruby, it was known that tunnel oxides
19 allow tunnel current to flow through the oxide layer. This, for example, is in
20 paragraph 77 to 83 of his declaration, which is Exhibit 2027. And there's
21 other testimony and evidence in the record that also demonstrates that oxide
22 layers allow for tunnel current flow. So as a result, Petitioner has
23 established that Borden is prior art.

24 JUDGE ROSS: Mr. Smolenski, it looks like you have about five
25 minutes left.

26 MR. SMOLENSKI: That's perfect. Thank you.

1 So turning to Slide 63, with respect to the second disputed issue, as
2 I noted, Hanwha relied on the tunnel oxide for Ground 3. In the Patent
3 Owner response, Patent Owner argued that Petitioner was improperly
4 relying on Borden's tunnel oxide. This argument did not accurately
5 characterize the petition, which as noted, relied on the tunnel oxide. In any
6 event, in response to the POR, the Petitioner's reply and Dr. Holman's reply
7 declaration explained why Patent Owner's arguments with respect to the
8 buried oxide were incorrect.

9 For example, as shown here from paragraph 53 of Dr. Holman's
10 reply declaration, he explained that the tunnel oxide must always be present
11 for current to flow. He also explained that a POSITA would have
12 understood how to omit the buried oxide layer and only implement the
13 tunnel oxide layer. And again, Patent Owner did not depose Dr. Holman, so
14 this testimony stands unrebutted.

15 With respect to the third disputed issue, I don't intend to go into it
16 in great detail, but just like the Froitzheim and Gan combination, Dr. Ruby's
17 testimony demonstrates this combination would have been straightforward.
18 This issue is fully briefed in Hanwa's papers, including pages 22 to 24 of the
19 reply, in paragraphs 54 to 61 of Dr. Holman's reply declaration.

20 So unless Your Honors have any specific questions, I'll now turn to
21 Slide 67, which is the Li ground. So I'd now like to briefly address the
22 combinations involving Li, which is Ground 5 of the '516 IPR and Ground 3
23 of the '053 IPR. Li's teachings are similar to Froitzheim's with one
24 important difference. Like Froitzheim, Li teaches a silicon substrate which
25 is shown here on the slide in green. However, unlike Froitzheim, Li teaches
26 creating a new layer on the rear side of the cell for the emitter; this is shown

1 here in blue.

2 And if we turn to Slide 69. For these grounds, there's no dispute
3 that the elements of the challenged claims were in the prior art. And as a
4 result, the sole issue for this ground is narrow, whether Li teaches away from
5 Gan.

6 And if we turn to Slide 70. Maxeon's arguments are primarily
7 based on one portion of Li that's shown here on the slide. Li states on page
8 four of the reference that the PN junction is prepared by a low-temperature
9 deposition method which avoids diffusion at 800 to 1000 degree Celsius.
10 It's well established that a statement that a particular combination is not a
11 preferred embodiment does not teach away absent clear discouragement of
12 that combination.

13 Here, Li's statements and teachings do not rise to a teaching away.
14 While Li acknowledges that high-temperature deposition may potentially
15 cause defects in silicon materials, Li never states that high-temperature
16 diffusion should always be avoided or that high-temperature diffusion will
17 prevent a solar cell from operating. It also never suggests that a solar cell
18 cannot be manufactured at higher temperatures.

19 And if we turn to Slide 71. In fact, Li specifically teaches high
20 temperature steps that overlap with the temperature ranges in Gan and as
21 well as Smith, which is in the '053 IPR. Li specifically teaches phosphorous
22 diffusion for the front surface field layer. And as explained by Dr. Holman
23 in his reply declaration, for example, at paragraph 66 in the '516 IPR, in
24 paragraph 61 of the '053 IPR, phosphorus diffusion takes place above 800
25 degree Celsius. This is the same temperature ranges that Gan and Smith
26 teach.

1 Patent Owner attempts to cast these teachings to the side by
2 arguing they're irrelevant to the PN junction. But Patent Owner's arguments
3 fail to consider Li for all that it teaches and ignores that a POSITA would
4 have understood how to successfully implement a polysilicon emitter in
5 oxide layer without introducing any unnecessary defects.

6 So for the Sheat's Ground, as Your Honors know and Mr.
7 Cavanaugh indicated earlier in the argument, this is fully addressed in the
8 papers, for example at pages 26 to 28 of the Petitioner's reply and paragraphs
9 68 to 73 of Dr. Holman's reply declaration, both in the '516 IPR.

10 So unless Your Honors have any specific questions with respect to
11 Sheats, we'll save the remainder of our time for rebuttal.

12 JUDGE ROSS: Thank you. I have you guys at 15 minutes for
13 your rebuttal.

14 MR. SMOLENSKI: Great. Thank you.

15 JUDGE ROSS: Patent Owner, whenever you're ready, you may
16 begin.

17 MS. ZHAO: I'm sharing -- excuse me, I'm sharing my screen. So
18 good afternoon, Your Honors. My name is Jing Zhao. And with me is Lead
19 Counsel Jeremy Peterson. We represent Patent Owner Maxeon. And I'd
20 like to reserve 15 minutes for rebuttal.

21 Skipping to Slide 3. We introduce our arguments against
22 implementing the oxide layer of the Gan reference on Froitzheim's cell. And
23 by the way, this is the only Froitzheim-Gan combination that Petitioner
24 proposes. They mentioned Claim 9 of the '053 Patent earlier, it doesn't have
25 an oxide layer. But the problems associated with the oxide layer in the
26 proposed combination still applies.

1 And mainly, the problem is that a POSITA would not have had a
2 reasonable expectation of success because the Gan reference -- I'm sorry, the
3 Gan Thesis failed to reliably implement this oxide layer. And the Gan
4 Thesis is relevant here because the Gan reference and the Gan Thesis talk
5 about the same experiment.

6 Slide 4 shows that the two references illustrate the same test
7 device. And Slide 5 shows that the two references disclose the same steps
8 for making that test device. On the left are the 12 steps of the Gan reference,
9 with the first-step anneal being repeated in steps 4 and 5. In the top right
10 corner are the same steps in the Gan Thesis, except the first anneal step is
11 only listed once, so we have 11 steps.

12 And because in those 11 steps, the oxide growth isn't specified to
13 be at 800 degrees. We included, at bottom right, another excerpt from the
14 Gan Thesis that discusses oxide growth with more details, including
15 specifying a temperature of 800 degrees.

16 And this is an example of why the Gan Thesis is relevant. Both
17 talk about the same experiment. Petitioner said earlier that the Gan Thesis is
18 supporting and not different from the Gan reference itself, except the Gan
19 Thesis actually adds context and details.

20 Those details include, on Slide 6, a problem in the experiment, the
21 control of oxide breakup. If the oxide does not break up sufficiently, then
22 according to the Gan reference, current flow would be hindered and contact
23 resistivity or rho-c would be high. And incredibly, the Gan Thesis states
24 here, top left, that solar cells that were made in this study all suffered high
25 contact resistance due to insufficient oxide breakup.

26 Slide 7 shows another problem with the experiment. The oxide

1 growth recipe is unreliable. It has poor control over the oxide thickness; this
2 is highlighted in yellow. An oxide thickness causes fluctuation in rho-c
3 values; this is highlighted in orange. This leads the author to conclude that a
4 more reliable way of growing the thin oxide is needed.

5 So in summary, because the two references discuss the same
6 experiment, the Gan Thesis would have discouraged a POSITA from
7 implementing the oxide layer of the Gan reference which is formed using the
8 same recipe and thus comes with the same problems. A POSITA would
9 have understood that the Gan Thesis concluded that a more reliable recipe
10 was needed. And the Gan Thesis doesn't offer any solutions to this problem.

11 If you look at Petitioner's Slide 25, the Gan Thesis only speculates
12 that the variation of the oxide thickness results mainly from the oxide
13 growth step and then said that if the first speculation is true, then it is
14 possible, speculation number two, that the thin oxide growth can be
15 improved by lowering temperature.

16 This is at best an unproven hypothesis, not a solution. And in fact,
17 as we saw in the Gan reference and the Gan Thesis, the author did try to
18 adjust temperatures. And the Gan Thesis still documented problems and still
19 concluded that a more reliable way of oxide growth was needed.

20 And at this point, let me go off topic for a moment and talk about
21 Petitioner's allegation that Dr. Ruby applied the wrong legal standard
22 because he was looking for 100 percent success. His testimony is that 100
23 percent is his understanding of what the term means in plain English. It's
24 not his understanding of the legal standard of that term. The legal standard
25 he applied is stated in his declaration. And Petitioner does not argue that
26 that standard was improper.

1 More importantly, this case does not require Dr. Ruby or Your
2 Honors to locate some fine line for reasonable expectation of success
3 because Gan's oxide is nowhere near that line. The Gan Thesis shows that
4 the author ran into problems after problems, couldn't solve those problems,
5 and concludes that a more reliable way of growing the oxide is needed. This
6 is much closer to reasonable expectation of failure than success.

7 JUDGE ROSS: Ms. Zhao, let me interrupt you for just a second,
8 please. You're not suggesting, are you, that we treat the Gan reference and
9 the Gan Thesis as kind of a single unified body of teaching, for lack of a
10 better word, are you? Or are you saying instead that, you know, the Gan
11 reference is the reference that Petitioner relies upon and maybe a person of
12 ordinary skill in the art at the time would also understand what is happening
13 in the Gan Thesis?

14 MS. ZHAO: I think both. I think certainly the Gan reference is
15 what Petitioner relies upon. But a POSITA would need to consider both
16 references because they speak about the same experiment. So if you're using
17 Gan's oxide layer -- the oxide layer from the Gan reference, you would have
18 to consider that oxide layer in the Gan Thesis because it's the same oxide
19 layer. It's grown on the same test device. It's made with the same steps.
20 And thus, it has the same problems.

21 JUDGE KALAN: Is there any authority for the proposition that
22 we should reach back or reach into a different reference, absent perhaps an
23 ambiguity with the primary reference? Because we are instructed to
24 consider the Gan reference for all that it teaches. But what within that
25 requires us or compels us to move beyond that and look at the Gan Thesis as
26 well? Or is there any authority that stands for that?

1 MS. ZHAO: A POSITA is expected to know all the references
2 about the art. If a POSITA is to consider the Gan reference, then a POSITA
3 is presumed to also know about the Gan Thesis. Does that answer your
4 question, Your Honor?

5 JUDGE KALAN: I understand. And thank you. But it still seems
6 as though we're being asked as a Board to evaluate something that's beyond
7 the scope of what Petitioner is relying on in the Gan reference. And I'm
8 wondering what the hook is for that other than a general knowledge imputed
9 to a POSITA.

10 MS. ZHAO: Your Honor, I think the general knowledge of a
11 POSITA is the hook here. Because a POSITA is asked to use the oxide
12 layer from the Gan reference. And the Gan reference should be considered
13 in the context of the Gan Thesis, which provides, in Petitioner's own words,
14 support for the Gan reference. And it's the same.

15 JUDGE KALAN: Thank you.

16 MS. ZHAO: Slide 8 addresses Petitioner's argument that the oxide
17 layer and the polysilicon emitter were known. The problem is there's no
18 evidence that a POSITA could have combined these two elements in a solar
19 cell with a reasonable expectation of success. Under KSR, shown on the
20 left, you can't overcome obviousness merely by demonstrating that each
21 element was independently known.

22 And the Federal Circuit also held, on the right, that prior art is
23 insufficient if it merely instructs a POSITA to vary all parameters. That's
24 exactly what happened in the Gan Thesis. The author repeatedly tweaked
25 the anneal temperature and anneal duration and still could not achieve a
26 consistently successful outcome. In other words, there is no expectation of

1 success in implementing Gan's oxide layer.

2 Petitioner mentioned the Swanson reference on their Slide 28.

3 Swanson doesn't help Petitioner because Swanson's tunnel oxide is formed
4 using an ozone oxidation process, which involves dipping the wafer in an
5 ozone bath. That is different from Gan's thermally grown oxide. And we
6 know from Gan that you -- we know from the Gan reference that you need to
7 break up the oxide layer. That's not done in Swanson. And it's unclear
8 whether Swanson's oxide can be broken up.

9 And this is again our point, it's not enough to just say someone else
10 knew about an oxide layer or a polysilicon emitter. The real question is
11 would a POSITA have had reasonable expectation of success putting Gan's
12 oxide and Gan's polysilicon emitter on Froitzheim's cell? And according to
13 the Gan Thesis, the answer is no.

14 On Slide 9, we move on to arguments against the Smith reference.
15 Petitioner wants to apply three processes from Smith to their proposed
16 combinations. The three processes are APCVD, diffusion barrier, and in-
17 situ diffusion.

18 Slide 10 shows why a POSITA would not have applied Smith's
19 APCVD. According to the petition, the motivation to combine is based on
20 Smith's teaching that APCVD advantageously allows for one-sided
21 deposition, which is particularly useful in the manufacture of back side
22 contact solar cells. According to Smith, shown top right, a back side contact
23 solar cell is a cell where the metal contacts are all on the back side.

24 And for this type of cell, APCVD makes sense because when your
25 contacts are on the back side, you want your emitters to be on the back side.
26 And that's what Figure 7 of Smith shows, bottom right.

1 But the proposed Froitzheim-Gan combination uses Froitzheim
2 solar cells which has contacts on both sides. So it's not a back side contact
3 cell and does not involve one-sided deposition. Thus a POSITA would not
4 have had any motivation to apply Smith's APCVD on the Froitzheim-Gan
5 combination.

6 Petitioner argued that APCVD is not limited to back side contact
7 cells. But this is not relevant. Petitioner isn't applying a generic APCVD
8 technique. They are applying Smith's APCVD. And Smith limited the
9 benefit of its APCVD to back side contact cells. Petitioner's motivation to
10 employ Smith's APCVD rests on this benefit. Thus, Smith only motivates a
11 POSITA to use its APCVD on back side contact cells.

12 Petitioner should also be held to what their petition says about in-
13 situ, shown on Slide 11. On the left is the extent of the petition's explanation
14 on how in-situ should be implemented. That is to say, there is no
15 explanation. Which steps of Froitzheim and which steps of Gan are
16 involved? We don't know. Which steps are to occur in-situ? We also don't
17 know. The citations in this excerpt, which involves Smith and Petitioner's
18 expert declaration do not fill the gap. So it's unclear how a POSITA is
19 supposed to implement Smith's in-situ.

20 All the information Petitioner provided today comes from
21 Petitioner's reply brief. But the limited information in the petition would not
22 have taught a POSITA how to apply Smith's in-situ to the proposed
23 combinations and is thus insufficient.

24 Earlier, on Slide 9, we showed the three processes of Smith that
25 Petitioner wants to apply: APCVD, diffusion barrier, and in-situ. But Slide
26 12 shows additional Smith elements that Petitioner tries to rely on to satisfy

1 claim elements without establishing motivation to combine. Petitioner
2 shows this in their Slides 48 to 50 as well.

3 For example, on the left of our slide, Petitioner references Smith's
4 first doped oxide layer, alleging that this element satisfies the limitation of
5 Claim 11. On the right, Petitioner references Smith's front side diffusion to
6 satisfy Claim 12. And although not shown on this slide, in the POR, on
7 pages 49 to 50, we also pointed out that the petition references Smith's
8 texturing technique to texture the front side of the cell to satisfy the
9 limitation of Claim 14.

10 These assertions are not consistent with what Petitioner proposes.
11 Petitioner proposes applying Smith's teachings to Froitzheim and Gan's own
12 manufacturing processes. Petitioner has not proposed that Smith would
13 replace any of Froitzheim and Gan's components. This distinction is
14 important because in the Froitzheim-Gan combination, Petitioner wants to
15 use Gan's dopant source on the back side, Froitzheim's dopant source and
16 diffusion steps on the front side, and Froitzheim's texturing technique to
17 texture the cell.

18 If Petitioner is now using Smith as dopant source, Smith's diffusion
19 steps for the front side and Smith's texturing, then Petitioner should explain
20 why a POSITA would have been motivated to replace these components
21 from Froitzheim and Gan with Smith. But they have not done so. So they
22 shouldn't get to argue that those components meet claim limitations.

23 Slide 13 shows that in its reply on the left, Petitioner raises for the
24 first time the new argument that the limitations we just discussed are routine
25 manufacturing steps. This is also on Petitioner Slide 36. This argument did
26 not exist in the petition.

1 On the right side, Slide 13 shows that the only time the petition
2 mentions routine steps was in the context of Smith's APCVD, diffusion
3 barrier, and in-situ and in a sentence about Froitzheim, Gan, and Smith being
4 analogous and that they all teach routine steps. But routine steps was never
5 mentioned in the context of the other Smith components or in the context of
6 claim limitations.

7 On Slide 14, we introduce arguments against the proposed Li-Gan-
8 Smith combination in the IPR for the '053 Patent and against the proposed
9 Li-Gan combination in the IPR for the '516 Patent. We incorporate our
10 arguments against implementing Gan's oxide layer, from Slides 3 to 8. And
11 for the Li-Gan-Smith combination, we also incorporate our arguments
12 against applying Smith's processes, from Slides 9 to 13.

13 We also have an argument unique to Li. The argument is that Li
14 teaches away from high-temperature diffusion while Gan and Smith use
15 high-temperature diffusion. Thus, a POSITA would not have combined Li
16 with Gan or Smith.

17 On Slide 15, we show the party's case law on the standard for
18 teaching away. Patent Owner's case is more recent, but the outcome is the
19 same under either case. Teaching away happens when a POSITA is
20 discouraged from the proposed combination.

21 On Slide 16, we show that Li indeed discourages high-temperature
22 diffusion. In its Background Art section, Li discusses conventional solar
23 cells that form an emitter on the crystalline silicon substrate using high-
24 temperature diffusion. And Li states that this method may cause pollution
25 -- this is pollution in the cell -- and greatly reduces cell efficiency.

26 Li then examines HIT cells which use an amorphous silicon as an

1 emitter. This amorphous silicon emitter has two advantages over diffused
2 emitters: one is that it has good surface passivation, that's not the focus of
3 the party's dispute; the other advantage is that it only requires a low-
4 temperature deposition, 200 degrees according to Li. So by using this
5 amorphous silicon emitter, Li points out that you can avoid the high-
6 temperature diffusion process.

7 On Slide 17, we show that Li adopts this amorphous silicon
8 emitter, although it can also be microcrystalline or nanocrystalline silicon.
9 This will be the layer illustrated in blue and labeled as 2 in the illustration on
10 Slide 17. This forms a PN junction with Li's N-type wafer in green. And Li
11 specifies that this PN junction is prepared by a low-temperature deposition
12 method which Li mentions, again, avoids conventional diffusion at 800 to
13 1000 degrees. So Li, once again, discourages the use of high temperatures.

14 Slide 18 shows that Gan diffuses at temperatures that Li expressly
15 discourages. On the left, Gan discloses a step 10, a drive-in, a.k.a. diffusion,
16 temperature at 900 to 1000 degrees. And on the right, you have Petitioner's
17 expert's testimony, that's step 10, would be implemented in the proposed Li-
18 Gan-Smith combination.

19 And if the Board were to find that a POSITA would have applied
20 Smith's in-situ, then Slide 19 shows that that also involves high-temperature
21 diffusion, heating the wafer to 1000 degrees in the first step and changing
22 the furnace condition to 750 then to 975 degrees in the second in-situ step.
23 So to recap, Li discourages the use of high-temperature diffusion. But Gan
24 and Smith both use high-temperature diffusion, so a POSITA would not
25 have combined Li with Gan or Smith.

26 Petitioner argued that Li teaches a high-temperature diffusion

1 based on its phosphorus diffusion step on the front surface field layer. As
2 Petitioner has summarized to you, that is associated with the N-type doping
3 and not relevant to Patent Owner's argument that Li teaches away from high-
4 temperature diffusion at its PN junction.

5 Petitioner also attempted to reduce Li's teaching to a mere
6 preference that is not consistent with the clear discouragement that Li
7 repeatedly expressed. And in Patent Owner sur-reply we provided case law
8 holding that even if a reference is not found to teach away, a statement
9 regarding preferences would still be relevant to a finding a motivation to
10 combine. You can find these cases, for example, on pages 20 to 21 of the
11 sur-reply on the '053 Patent.

12 In this case, even if you were to reduce Li's teaching to a
13 preference, it's a strong preference and strong criticism against using high-
14 temperature diffusion. That would still have negated a POSITA's motivation
15 to combine.

16 On Slide 20, we introduce our arguments against combining
17 Froitzheim with Borden-575. The illustration of this proposed combination
18 features an orange layer labeled as the oxide layer. So we begin our
19 arguments with the question, what is this orange layer supposed to be?
20 Because as Petitioner told you earlier, Borden teaches two types of oxide
21 layer, a tunnel oxide and a buried oxide. And the record is unclear as to
22 which one this orange layer represents.

23 Slide 21 summarizes this confusion in Petitioner's own words. On
24 one hand, the reply admits that the motivation to combine analysis focuses
25 on the tunnel oxide; this is highlighted in yellow. And Petitioner confirmed
26 this earlier, they told you, quote, "Hanwha specifically relied on Borden's

1 tunnel oxide to establish motivation of success -- or motivation to combine."

2 And in fact, Petitioner's motivation to combine analysis, if you
3 look at the petition, it only mentions Borden's tunnel oxide. It never once
4 mentions Borden's buried oxide.

5 On the other hand, the reply argues that Borden's buried oxide and
6 tunnel oxide each meet challenged claim limitations; this is highlighted in
7 orange. So it's unclear whether Borden's buried oxide is part of the proposed
8 Froitzheim-Borden combination.

9 Slide 22 shows that the reality is Petitioner's arguments fail either
10 way. Going down the green branch, if the buried oxide is included, then
11 Petitioner has fail to establish a motivation to combine. So Petitioner should
12 not be permitted to argue that Borden's buried oxide satisfies any of the
13 claim limitations.

14 Going down the red branch, if the buried oxide is not included,
15 then we run into operability problems because Borden's buried oxide goes
16 hand in hand with Borden's polysilicon emitter, which is definitely in the
17 proposed combination. So let me expand on that. Slide 23 shows that
18 Borden's buried oxide comes with a polysilicon layer -- polysilicon emitter.

19 Borden's goal is to improve what was previously a complicated
20 structure that provides contact passivation. That complicated structure is
21 called a selective emitter, shown top left. It has deep diffusion areas under
22 the metal contacts and shallow diffusion areas elsewhere. Borden replaces
23 these deep and shallow diffusion areas with a thin layer of emitter
24 -- polysilicon emitter; this is shown bottom left in blue. And Borden uses a
25 buried oxide to separate this emitter from the metal contacts.

26 Paragraph 19 of Borden explains that the buried oxide is an

1 insulating layer. It isolates the contacts from the substrate. And paragraph
2 24 explains that the presence of the buried oxide enables contacting to the
3 thin emitter without the use of a sophisticated contact process. In other
4 words, without the buried oxide, Borden's polysilicon emitter would need a
5 sophisticated contact process, such as having deep and shallow diffusion
6 areas.

7 There is no sophisticated contact process in the proposed
8 combination. Thus, a POSITA would not have had a reasonable expectation
9 of success in implementing Borden's polysilicon emitter without also
10 including Borden's buried oxide.

11 Now, taking a step back. Even if Petitioner is allowed to include
12 Borden's buried oxide without establishing motivation to combine, there
13 would still be a problem. Petitioner's proposed combination doesn't have
14 contact holes. This is an issue because remember paragraph 19 tells us that
15 the buried oxide is an insulating layer. In other words, it cuts off current
16 flow. But you need current to flow to the metal contacts. So Borden has
17 contact holes, which are holes in the buried oxide that permits the current to
18 flow through.

19 Slide 24 provides support for what I just said. The quote on top is
20 Froitzheim stating that the function of the contacts is to draw current. And
21 below, Borden says that the contact holes on the insulating layer, that's the
22 buried oxide, allow current flow. Thus, to the extent Petitioner proposes
23 implementing Borden's buried oxide, Petitioner's failure to include contact
24 holes is fatal.

25 On Slide 25, we turn our attention to Borden's tunnel oxide. If the
26 Board accepts that the tunnel oxide could somehow replace Borden's buried

1 oxide and contact holes, even though that was never clearly proposed and
2 there was never an explanation for why a POSITA would further modify
3 Borden structure this way, then a POSITA would still not have had a
4 reasonable expectation of success.

5 The Gan Thesis presented the POSITA with a problem; the
6 thickness of the tunnel oxide could not be controlled with Gan's methods.
7 And Borden didn't solve this problem. In its opening paragraphs, Borden
8 clearly reiterates that reliably forming a thin tunnel oxide was still difficult
9 at the time. This is perhaps why Borden's tunnel oxide only covers the
10 contact holes. And even then Borden emphasizes, over and over again, that
11 the tunnel oxide is optional.

12 Slide 26 shows another problem. Borden's polysilicon emitter
13 needs to be annealed at 1050 degrees. Gan teaches that the higher the
14 temperatures for the second-step anneal, the worse J-naught would be. This
15 is what Table 1 of Gan shows.

16 Although Borden discloses a shorter anneal time than Gan, Gan's
17 Figure 6 shows that the second-step anneal at 1000 degrees were worse than
18 900 degrees, even though the time used for 1000 degrees were much, much
19 shorter. Thus, a POSITA would have expected Borden's anneal temperature
20 to lead to a bad J-naught. And knowing this, a POSITA would not have
21 combined Borden's polysilicon emitter and tunnel oxide with Froitzheim's
22 cell.

23 Petitioner in their papers argued that Gan also teaches anneal
24 temperature at 1050 degrees. But that's not at the equivalent step as
25 Borden's 1050 degrees, which comes after deposition to activate the dopants.
26 The equivalent step in Gan is step 10, the dopant drive-in step at 900 to 1000

1 degrees. Gan's first-step anneal at 1050 occurs before dopant deposition.

2 And that step is for breaking up the oxide. And Gan teaches that the oxide
3 layer must be broken up, otherwise you have all sorts of problems.

4 And also, if we're going that way, a POSITA would not have been
5 motivated to combine the two anneal steps. Because Gan states, on page
6 245, that it used two anneal steps to avoid any possible interference from the
7 dopant diffusion because it had been reported that interfacial oxide tends to
8 break up more rapidly with the existence of dopants. So all that to say,
9 Gan's first-step anneal at 1050 is not the equivalent to Borden's drive-in step
10 and is therefore not relevant.

11 Slide 27 introduces our arguments against implementing Sheats'
12 trench cutting to the combination of Froitzheim-Gan and Froitzheim-Borden.
13 Slide 28 shows, on the left, that Sheats' trench according to Petitioner
14 addresses short circuits in solar cells. On the right, Petitioner's expert
15 expands on this and states that the trench creates edge isolation which in turn
16 prevents short circuits. So this leads into our first argument that Sheats'
17 trench is superfluous in Froitzheim.

18 This is because, as shown on top of Slide 29, edge isolation is
19 optional in Froitzheim, which means Froitzheim is probably not that
20 concerned with short circuits. More importantly, Froitzheim has its own
21 edge isolation if one is needed. In paragraph 47, Froitzheim calls it a
22 separation at the edge of the wafer, e.g., in a plasma.

23 Petitioner's expert confirmed, as shown at the bottom, that
24 paragraph 47 describes edge isolation. In other words, adding Sheats' edge
25 isolation to Froitzheim is superfluous. And Petitioner has not explained in
26 any of its papers why a POSITA would have been motivated to do so.

1 Slide 30, at the top left, shows Petitioner's expert further
2 confirming that the plasma in paragraph 47 is plasma etching. The two
3 excerpts at the bottom are from Petitioner's own references confirming that
4 plasma etching is a common technique for edge isolation. Again, Petitioner
5 has not explained why a POSITA would need another edge isolation
6 technique when Froitzheim already has plasma etching.

7 Slide 30, at the top left, shows Petitioner's expert further
8 confirming that the plasma in paragraph 47 is plasma etching. The two
9 excerpts at the bottom are from Petitioner's own references. Oh, I'm sorry, I
10 thought I skipped. Okay. Even if Petitioner could justify using another edge
11 isolation technique, Slide 31 shows that technique would still not have been
12 from Sheats. Petitioner's proposed combinations involve a single solar cell,
13 so edge isolation is to prevent short circuit within that single cell.

14 In contrast, Sheats' trench cutting is for preventing short circuit
15 between multiple cells. On the left side is Sheats' Figure 5D which is used
16 in the petition. And on the right, we show Petitioner's expert confirming that
17 5D illustrates three individual cells.

18 On Slide 32, an annotated Figure 5D shows that the function of the
19 isolation trench component 516 is to prevent short circuit between two cells.
20 Component 516 is the isolation trench Petitioner wants to use in Froitzheim.
21 And the figure is a bit confusing because it illustrates two isolation trenches
22 516 and 514. So Sheats says on the right that the other trench 514 may
23 cause electrical short circuits. And those short circuits are labeled 511 and
24 517.

25 Petitioner's trench 516 electrically isolates short circuit 511 from
26 the rest of the structure 500. Figure 5A, on the top right, shows that 500

1 represents the entire structure. It's a rectangular block that is later cut into
2 the three individual cells.

3 So again, Sheats is dealing with several cells here. And Sheats
4 expressly teaches that the function of trench 516 is related to all these cells
5 to solve a problem caused by another trench 514. None of these problems
6 exist in Froitzheim. So a POSITA would not have been motivated to use
7 trench 516 on Froitzheim's cell.

8 On Slide 33, we introduce our arguments against Froitzheim
9 meeting the limitation of Claim 12 of the '516 Patent, specifically meeting
10 the limitation of the plain and ordinary meaning of the term "formed over."
11 Petitioner argues that Froitzheim's screen printing satisfies the limitation of
12 this term. Patent Owner disagrees.

13 And Slide 34 shows what Froitzheim says about its screen-printed
14 metal contacts. We're looking at Figure 3 of Froitzheim because that's what
15 the petition uses for Claim 12. And describing Figure 3 is paragraph 33 of
16 Froitzheim that says that its rear contacts are arranged in a finger structure
17 and then says that between the fingers, a passivation layer 34 is arranged.

18 The passivation layer, according to Petitioner, satisfies the silicon
19 dioxide element of Claim 12. So we're looking for any part of the metal
20 contacts formed over the passivation layer in Froitzheim. That doesn't exist,
21 not in the descriptions and not in Figure 3. This is consistent with Patent
22 Owner's expert testimony about screen printing that after firing through, the
23 metal completely etches through the passivation layer.

24 Slide 35 addresses Petitioner's expert's opposite opinion, shown top
25 left, that after screen printing, most of the metal paste remains on top of the
26 anti-reflection coating, a.k.a. the passivation layer. This opposite opinion

1 makes no sense, given Froitzheim's use of front side metal contacts, which
2 are also screen printed; we show that in the bottom excerpt.

3 A screen printing on the front side leaves behind a bunch of metal
4 residue that stays on top of the cell, then the cell's ability to absorb light
5 would be greatly compromised. We know that the metal contact itself
6 already provides shading to the cell, which reduces the cell's ability to
7 capture light. This is covered in Patent Owner's expert declaration, shown
8 top right. So it's not plausible that the screen-printing process would add
9 even more shading to the cell.

10 And on a side note, Petitioner's references supporting their expert
11 opinion, for example, the reference cite on Petitioner's Slide 55, they all
12 disclose contact formation on a silicon nitride layer, not silicon dioxide, as
13 recited in Claim 12. So they are not relevant.

14 And finally, Slide 36 addresses Petitioner's arguments in the papers
15 that Claim 12 is satisfied if the metal contact is initially formed over the
16 passivation layer before it is fired through. In other words, before the
17 screen-printing process is complete, at some point in time, there is metal
18 paste sitting on top of the passivation layer. But that does not meet the
19 limitation of Claim 12's term "formed over." Because Claim 12 is a product
20 claim, it recites structural limitations.

21 In the case *Hazani* supports this read, as shown top left. It states
22 that pure product claims are claims that describe the product more by its
23 structure than by its process. That's Claim 12 reciting a second metal
24 contact comprising silver formed over a layer of silicon dioxide. And even
25 if the Board reads "formed over" to imply some sort of process, that would
26 not convert Claim 12 into a process claim. That's what the *Vanguard* case

1 says, bottom left.

2 And in addition, the *3M* case, in the middle, also holds that even if
3 claim limitations convey with equal force, a structural characteristic or a
4 process, those limitations are commonly and by default interpreted in their
5 structural sense, unless the Patentee has demonstrated otherwise. And here,
6 the Patentee has not demonstrated otherwise.

7 And because Claim 12 is a product claim and recites structural
8 limitations, it will be improper to read process limitations into the claim.
9 That is what the *Continental Circuit* case says on the right. But that is what
10 Petitioner has attempted to do here by arguing that an initial process in
11 screen printing would somehow satisfy the structural limitation of Claim 12.
12 So that argument would be improper.

13 And that concludes Patent Owner's arguments. I'd like to thank
14 Your Honors for your attention and reserve the rest of my time.

15 JUDGE ROSS: Thank you. I have that you used 35 minutes. So
16 that would mean you have extra time in rebuttal if you need it.

17 MS. ZHAO: Thank you.

18 JUDGE ROSS: Okay. Mr. Cavanaugh, I guess we'll hear from
19 you now.

20 MR. SMOLENSKI: And Mr. Cavanaugh, I think you're on mute.

21 MR. CAVANAUGH: Thank you. Sorry. Thank you, Your
22 Honors. I want to start with the -- I'll take a few minutes -- a couple points
23 on rebuttal. The first thing with regard to the Froitzheim-Gan reference
24 combination -- and you correctly identify that the Gan Thesis is not part of
25 the combination. I want to reiterate a couple of points.

26 I think, Your Honors, as we said in the introduction, there's little

1 dispute about what's in the references. And the question is for Your Honors
2 is whether or not someone skilled in the art would have combined the
3 teachings of the reference. Again, not the structure of the references and,
4 you know, we're relying on someone of ordinary skill in the art to look at the
5 references as we put in the declaration what a reference -- what a person of
6 ordinary skill would glean from a reference and how it would be combined.

7 And that's what we did with the Froitzheim-Gan references and the
8 other combinations and the other grounds. But I think it's important to
9 recognize with regard to the thesis, the Gan Thesis now, that the -- you
10 know, that Dr. Ruby didn't address or didn't read the entire thesis when he
11 rendered his opinion in the POR declaration; but Dr. Holman did.

12 And, you know, as I identified in my opening statement, Chapter 4
13 is describing theoretical models. And Chapter 5 is talking about the testing
14 that the Gan Thesis identified. And the results were very much like what
15 was predicted. And so, you know, what the Patent Owner seems to be
16 doing, especially with the thesis -- now, again, it's different than the
17 combination.

18 But even looking at the thesis, they're in some ways cherry-picking
19 things that suggest that things may happen or they can happen. But I think
20 the totality of the reference supports the combination or supports the ability
21 to kind of find that the thesis itself is actually confirming what the Gan
22 reference is saying.

23 And two other points on this, Your Honors, the first one is that,
24 you know, the -- Dr. Gan, you know, was explaining, he's a graduate student
25 doing a thesis. And at his university, the furnace that he had been provided
26 to had insufficient control of the gases. And that's at the Gan Thesis at 112

1 where he noted that the oxide growth, despite the furnace being filled with
2 pure argon, that -- you know, they noted that there may have been something
3 to do with oxygen residue in the furnace.

4 And so, you know, Dr. Holman's identification of, like, that
5 -- those kinds of things indicate to him and fairly to someone skilled in the
6 art that it is the kind of -- some of the equipment that led to some of the poor
7 results that were reported and not impossible results.

8 I think you don't need to go much further than the Patent Owner's
9 declarant, Dr. Ruby, to identify a reference that does suggest that the use of
10 oxide layers with - in the context of kind of a tunneling mechanism. And,
11 you know, the Foglietti reference that we identified, it's Exhibit 1042, Dr.
12 Ruby addressed it in his declaration at paragraphs 80, 81, 82, and 83.

13 And basically, like, he's saying that that teaching is providing and
14 equally applicable to solar cells and that is I think relevant to whether or not
15 someone skilled in the art, at the time of the purported invention, would have
16 found a reasonable expectation success.

17 The Patent Owner also tries to distinguish Swanson, which we put
18 in our presentation. And, you know, we aren't relying on Swanson for the
19 particular kind of teaching of a method. We are saying -- and as we said in
20 the declaration, it is Swanson's use of an oxide layer for the same purpose
21 that is -- that would lead someone to an understanding and a motivation and
22 a reasonable expectation of success at the time of the invention.

23 And I think I'd like to go to Froitzheim and Smith, and this is really
24 generally addressing Slides 9 to 13 of the Patent Owner's presentation. The
25 experts agree that the atmospheric pressure, chemical vapor deposition, and
26 in-situ diffusion were known in the art. I mean, I think that that's clear. We

1 put that in the reply, pages 9, 22, and 24 for the '053 Patent.

2 And yeah, I think it's important to recognize that to the extent that
3 there's any question at all whether or not the petition was sufficiently
4 presenting the teachings of Smith on page 50 of the petition of -- this is the
5 '053 Patent petition, page 50. Ground 2 challenges every claim of the '053
6 Patent and, quote, "Smith discloses additional teachings of the routine
7 fabrication steps." And so, like, that's clearly an indication that Smith is
8 being relied on for routine steps. But, you know, Smith teaches its -- what is
9 in Smith. And, you know, we think Smith itself is sufficient.

10 And the other thing that I'd note for Your Honors, you know, that it
11 seems that the standard of detail that the Patent Owner is identifying for the
12 various pieces of prior art are higher than even the level of detail that's
13 provided in the '516 and the '053 Patents. And this is more of a general
14 comment, maybe specifically applied to the Smith Grounds.

15 But the Patent Owner -- you know, it seems to be by looking at the
16 particular things of -- the particular isolated teachings without looking at the
17 overall teaching are barely focusing on individual aspects, which as we said
18 in our declarations that someone skilled in the art would be able to combine
19 the features. And, you know, to the extent that the Patent Owner is saying
20 that somehow the teaching isn't sufficient, like, we've addressed it in the
21 reply declaration and that reply declaration is un rebutted.

22 To the extent that the Patent Owner says that we're raising new
23 arguments, that itself is incorrect. As I said, like, earlier, you know, the
24 replies are responding to what the Patent Owner has identified in the POR in
25 a perfectly appropriate way and further exemplify how the petition itself
26 with the challenge of the POR does in fact teach the issues.

1 And then the third point is moving on to the Froitzheim-Borden-
2 575 combination, I think that it's important to recognize that the claim
3 limitation -- and Mr. Smolenski said this -- but I think it bears repeating
4 -- that the claim limitation is an oxide layer. So the fact that we say that, you
5 know, the tunnel oxide, the buried oxide, meet that limitation, it's a kind of a
6 linguistic thing that both are there.

7 When we combine the reference and did the motivation to
8 combine, the tunnel oxide is clearly what we identified, and that is fine.
9 There's no testimony that the buried oxide layer is somehow required either
10 by the claim or by Borden. I think a person of ordinary skill in the art
11 looking at Borden would recognize that there are a variety of ways of doing
12 that. And certainly, having that additional element in Borden doesn't
13 necessarily suggest that the references couldn't be combined.

14 JUDGE KALAN: If you have access to Patent Owner's Slide 22
15 where the alleged failures are broken down into boxes, would you mind
16 walking us through that and identifying briefly why these boxes do not
17 represent any sort of failure in the petition?

18 MR. CAVANAUGH: So Slide 20 -- yes --

19 JUDGE KALAN: Twenty-two.

20 MR. CAVANAUGH: Yes, Your Honor. So the combination, you
21 know, is -- well, in our view, not impermissibly vague. It is a buried oxide
22 -- the buried oxide is there in the grounds for kind of what is that limitation.
23 And to the extent that there's a motivation to combine, it is the tunnel oxide.
24 So they kind of failed to show why it would have used the Borden buried
25 oxide -- the buried oxide, once you get to -- and this is on the left-hand side
26 of the screen, the buried oxide -- the claim doesn't require a buried oxide.

1 It requires an oxide layer and that is supplied by the tunnel oxide.
2 And that's clear from the petition. And so the claim itself is satisfied by the
3 tunnel oxide. And, you know, that is not a particular issue with regard to the
4 Borden buried oxide. I think that the kind of -- we are relying on the tunnel
5 oxide. And, you know, we don't have -- because the buried oxide isn't a part
6 of the claim, we don't -- it is not needed to say that how someone of a skill
7 would use Borden's buried oxide, first point.

8 Second point, on the right-hand side, if we look at the polysilicon
9 emitter with or without the buried oxide, it seems to be there's a third path
10 here that -- you know, the Patent Owner really addressing is that, you know,
11 the limitations of the claim are in the prior art. Everyone agrees to that. The
12 question is whether or not the person skilled in the art, person of ordinary
13 skill, would be taking Borden's 575, you know, tunnel oxide and bringing it
14 into Froitzheim.

15 And, you know, the Patent Owner, in looking at this, it seems to
16 kind of want to -- kind of take details and take, you know, like, actual kind
17 of physical figures and say, oh, well, you know, that's -- like, you would
18 need to bring in that layer, you need to bring in that. A person of ordinary
19 skill wouldn't necessarily have to do that. And that's what Dr. Holman said
20 in our reply declaration. And so that -- I hope Your Honor clarifies, like,
21 why -- I think this Slide 22 is just not -- is not sufficiently characterizing
22 what the state of play is.

23 JUDGE KALAN: Thank you for walking through that.

24 MR. CAVANAUGH: Okay.

25 JUDGE KALAN: I do want to clarify that just really quickly.

26 MR. CAVANAUGH: Okay.

1 JUDGE KALAN: So my question to you, Mr. Cavanaugh, is: you
2 are not relying on the buried oxide layer alone as a basis for the Froitzheim-
3 Borden-575 combination, correct?

4 MR. CAVANAUGH: Correct.

5 JUDGE KALAN: Okay. And so there is no reason to combine
6 that because you're not relying on it.

7 MR. CAVANAUGH: Correct, that's our position.

8 JUDGE KALAN: So I can just ignore everything to the left-hand
9 side of this slide?

10 MR. CAVANAUGH: Yes. That's a succinct way of articulating
11 what I was trying to use more words to articulate. And I think that that is
12 -- like, in the interest of time, I'll move on. But, you know, I think looking at
13 kind of the particular position grounds is really important and the particular
14 combination. And to the extent that the Patent Owner considers it
15 impermissibly vague, in our view and the view of Dr. Holman as he testified
16 in the reply declaration, that's not so.

17 I would like to just mention two things, one, regarding the
18 Froitzheim -- or I'm sorry, the Claim 12 kind of the Patent Owner, again, is
19 looking at a particular implementation, a specific implementation, without
20 necessarily considering kind of the level of detail in the '516 Patent and,
21 really, they're holding the references for the combination at a higher standard
22 than they themselves can satisfy in their own patent. And that I think is
23 relevant.

24 The second thing that I think is a problem with -- and this is Slides
25 30 to 36 of their presentation, is that there is no claim construction that
26 they're looking at. It's, you know, a plain meaning. And, you know, I think

1 it is very relevant that the very processes that are described in the '516 Patent
2 are also used in the Froitzheim. And that is I think very relevant. And, you
3 know, it's -- there's --

4 JUDGE ROSS: It looks like you're at 15 minutes. I'm going to let
5 you go ahead and finish your thought. And then I actually have a question
6 about the last combination, which I believe Mr. Smolenski was taking
7 responsibility for. So I want to get that in there at some point.

8 MR. CAVANAUGH: Okay. I have finished my thought and if
9 you have a question for either me or Mr. Smolenski, please ask.

10 JUDGE ROSS: Okay. My question has to do with -- oh, where
11 did it go? Sorry, I've got to use my glasses. About the edge isolation layer
12 being superfluous. Could somebody talk about that a little bit for me,
13 please?

14 MR. CAVANAUGH: Sure. Mr. Smolenski, would you like to
15 address that?

16 MR. SMOLENSKI: Yes, that'd be great. And what I will do is if
17 you give me one moment, I'm going to pull up Slide 77 of Petitioner's
18 demonstratives. So with respect to Slide 77, as Your Honor was noting,
19 paragraph 47 of Froitzheim, which is shown here on the slide, does indicate
20 that a separation at the edge of the wafer may be implemented. And this is
21 specifically referring to edge isolation to prevent shorts.

22 As you can see here, however, Froitzheim uses the term "e.g." to
23 present one way of doing so, which is using plasma. But Froitzheim doesn't
24 state plasma as the only edge isolation technique that could be used. And
25 different techniques were known in the art, this is acknowledged by Dr.
26 Ruby, for example, in his deposition at 191, 6 through 9. He acknowledges

1 it's a known technique. Dr. Ruby also acknowledges that it was a technique
2 that could be implemented amongst different solar cells that are in a solar
3 array.

4 So again, edge trenches are a technique that are known; they could
5 be used in solar cells. And as a result, a POSITA would have been
6 motivated to use the well-known edge isolation technique of a trench and
7 Sheats to prevent short circuits. Does that answer your question, Judge
8 Ross?

9 JUDGE ROSS: It does. It's very helpful. And then I also would
10 like for you to address the Patent Owner's argument that we need to look at
11 the -- why Sheats is using the trench as opposed to edge isolation, since the
12 Petitioner argues that these aren't multiple cells that need to be isolated?
13 Does that make any sense at all?

14 MR. SMOLENSKI: Yes, Your Honor. And I'm going to attempt
15 to address your question in two parts but correct me if I'm going astray. So
16 I'm going to start with Sheats itself, so this is going to be Slide 74. So
17 Figure 5D of Sheats, which is shown here on the slide. The feature that is
18 labeled 516 is a trench. And as you can see here, this trench is in an
19 individual solar cell. And if we look at paragraph 59 of Sheats itself, it
20 explains why a trench is beneficial, doing so prevents short circuits.

21 And if I could now jump ahead to Slide 78, the experts agree that
22 short circuits are an issue not just for solar arrays but also for solar cells. As
23 you can see here on this slide, both Dr. Holman and Dr. Ruby both agree
24 that short circuits are problems for solar cells.

25 As a result, in view of Sheats' teachings with respect to a trench
26 and what it could be used to solve, which was well-known in the art,

1 consistent with the knowledge of a POSITA, a skilled artisan would have
2 also recognized this could be implemented in individual solar cells to solve
3 this problem. And as a result, as Hanwha explains in the papers, it would
4 have been obvious to implement this in Froitzheim's solar cell to solve the
5 problem of short circuits.

6 JUDGE ROSS: Okay. Thank you very much. Does anybody
7 have any other questions? Judge Kalan? Judge Kokoski? Okay. I guess
8 no.

9 All right. Ms. Zhao, it looks like you get an extra four minutes, but
10 I don't think you're going to need it because you already have 25 minutes for
11 rebuttal. But we'll just see what you need to do. You can proceed when
12 you're ready.

13 MS. ZHAO: Thank you, Your Honor. First, responding to
14 Petitioner's argument on reading the Gan Thesis in its entirety. The Gan
15 Thesis is a graduate student thesis. It provides a lot of background
16 information, much of it is not relevant to the party's dispute in this case.
17 And the Gan Thesis hypothesizes that polysilicon emitter and interfacial
18 oxide is a promising improvement and sets out to show that.

19 And it's true that they have found some success, but they have also
20 found problems. And these problems lead them to conclude that their
21 method of growing dioxide was no good; a more reliable recipe was needed.
22 And that's the recipe Petitioner wants a POSITA to work with.

23 Regarding Petitioner's argument that Dr. Gan's poor equipment led
24 to his poor results, a POSITA -- and that POSITA could somehow do better.
25 I'll note that the coauthor of the Gan reference, Dr. Swanson, who is also the
26 thesis advisor to the Gan Thesis, is a -- was a pioneer in the field. And

1 together, using the resources of the Stanford University, they were still not
2 able to get the oxide layer to work.

3 And to our knowledge, no one was able to get a tunnel oxide with
4 low J-naught to work in a solar cell at the time. And also -- because I have a
5 little extra time to further respond to Judge Kalan's earlier question
6 regarding whether the Board needs to look at the Gan Thesis. The case, *in*
7 *re Eli Lilly & Co.*, 902 F.2d 943, this is a 1990 Federal Circuit case, holds
8 that the Board must evaluate rebuttal evidence, such as the Gan Thesis, not
9 just the prior art submitted by the petition.

10 Petitioner also clarified today that the oxide layer drawn in their
11 proposed Froitzheim-Borden combination is the tunnel oxide. But that was
12 not clear in the petition given the confusion of the references to Borden's
13 buried oxide. So our original argument in the POR stands that the proposed
14 combination is impermissibly vague.

15 The fact that Patent Owner spent part of its word limit and time
16 limit today to address a possibility that the buried oxide is part of the
17 combination and the fact that Your Honors had to ask questions about it is
18 evidence of that.

19 And also, Borden teaches a buried oxide layer. So why would a
20 POSITA have used the tunnel oxide but not the buried oxide layer? That's
21 not explained in the petition. We don't even know if Borden's structure with
22 the buried oxide removed would even work or whether it would work better
23 than Froitzheim itself. And Petitioner has not shown that.

24 And also, confirming that buried oxide is not part of the proposed
25 combination, our argument that a buried oxide should accompany the
26 polysilicon emitter still stands. On the trench issue, Petitioner was silent on

1 it in their initial presentation. And I don't think Petitioner answer the real
2 question here, which is that Froitzheim suggests a perfectly fine edge
3 isolation technique. Why does the POSITA need to add another component
4 to it? There's no motivation to do so.

5 For all the other components, adding Gan's polysilicon emitter,
6 Gan's oxide layer, Petitioner has had to provide a reason. And they need one
7 for Sheats' trench too. Because I have a bit more time, let me also say that
8 today, Petitioner stated that they agree with us that Your Honor is not
9 prohibited to examine the Wands factor. And we use the Wands factor to
10 simply further demonstrate how the facts of this case undermines Petitioner's
11 assertion of a reasonable expectation of success by showing that others have
12 failed in growing an oxide layer.

13 That's the entirety of my rebuttal. Thank you, Your Honors.

14 JUDGE ROSS: Thank you both very much. Before we adjourn, I
15 just want to say that I think both sides did an excellent job presenting the
16 issues to us, fielding our questions. I think you all had an excellent
17 command of the evidence. And we really appreciate your preparedness.

18 Once we adjourn, I'm going to ask the parties to kind of stick
19 around, talk to the court reporter, see if she needs any help with anything,
20 please. And with that, the case is under submission. We're adjourned. And
21 we'll go off the record.

22 (Whereupon, the above-entitled matter went off the record at 4:57
23 p.m.)

IPR2024-01199 (Patent 8,878,053 B2)

IPR2024-01203 (Patent 8,222,516)

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