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THE ALBERTA ENERGY REGULATOR
PROCEEDING ID NO. 436

IN THE MATTER OF the Regulatory Appeal by
Obsidian Energy Ltd. of the
Alberta Energy Regulator's decision to
issue an Environmental Protection Order to
Obsidian Energy Ltd.,
pursuant to Sections 113 and 24 of the
Environmental Protection and Enhancement Act
On March 23, 2023
(Regulatory Appeal 1943624)

AER PROCEEDING
VOLUME 13

Calgary, Alberta
December 6, 2024

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B. Kapel Holden	AER Counsel
O. Chijioke	AER Counsel
A. Huxley	AER Counsel
(Via Videocast)	
A. Lung	AER Staff
A. Stanislavski	AER Staff
F. Hamdan	AER Staff
P. Fitzpatrick	For Regulatory Compliance Branch
J. Allison	For Regulatory Compliance Branch
A. Hall	For Regulatory Compliance Branch
D.P. Langen	For Obsidian Energy Ltd.
A. Barrington	For Obsidian Energy Ltd.

A. Porco, CSR(A) Official Court Reporter
K. Di Rocco, CSR(A) Official Court Reporter

(PROCEEDINGS COMMENCED AT 9:01 AM)
Discussion

THE CHAIR: Morning. Please be seated.

Good morning, everyone. Before we get to final argument, just a little bit of unfinished business from earlier.

Mr. Fitzpatrick, can you just give us an update on the undertakings.

P. FITZPATRICK: Yes, sir. The undertaking responses have been submitted for filing, and perhaps they should be given an exhibit number.

THE CHAIR: Okay.

B. KAPEL HOLDEN: Good morning, Mr. Chair.

The next exhibit number is 107.0, and so we'll mark the CLM responses to CLM Undertakings 1 and 2 as 107.0.

THE CHAIR: Thank you.

EXHIBIT 107.0 - CLM Responses to CLM's Undertakings 1 and 2

THE CHAIR: And, Mr. Langen, I

just wanted to confirm with you whether you had a desire to do any cross on those -- those undertakings.

D.P. LANGEN: Thank you, Mr. Chair.

We filed a letter yesterday morning confirming we had no cross.

THE CHAIR: Okay. Thank you.

Okay. I think, with that, that concludes the evidentiary portion of the hearing. I see nodding, so that's a good sign. So we'll close the evidentiary portion of the hearing, and we will now move to final argument.

Just a couple of matters. I fear I've caused some confusion about the references and -- and how they're to be handled, so we'll maybe deal with that as a preliminary motion.

When I spoke about not needing -- needing to read in all of the references, I was thinking more about kind of case-law-type references, and you have both provided books of authority, so I think that matter is resolved.

I think the -- sorry. I think the question was now around reference to specific parts of the record, exhibits and that, and whether there was a need to -- to read all that in.

I guess what I would suggest is, as you're doing your oral argument, if there are very specific pieces of the -- of the record that you want us to refer to, if you can be as specific as you can about where they are. The Panel has read, obviously, all the evidence, so I think we'll be able to find it.

We had talked about maybe providing a hard copy -- and I was originally thinking perhaps to the court reporters for insertion of the references, but that's not a service that they provide. And so it seems like just having you read it into the record might be the best option.

The other option would be to provide a copy on the record and mark it as an exhibit, only for the purposes of the references. Obviously, your oral argument that's in the transcript is what the Panel will rely on, not the -- not the written words.

So having said all that -- this is kind of a late development, so I just wanted to kind of hear from either of you whether that poses any problems for you or what your preference is in terms of how to proceed.

D.P. LANGEN: Thank you,

Mr. Chair.

Appreciate the clarification. We're -- we were prepared not to read in references. In some instances, they're -- they're lengthy; and, obviously, as you kind of alluded to on Wednesday, it breaks up the flow.

So I think what we will do is we will provide a copy of the speaking notes filed for -- for identification -- perhaps is maybe the best way of framing it, from my perspective. But that won't come until Monday or Tuesday because the notes themselves have notes to me as I am speaking, and I don't -- I don't ideally want that on the public record, so we'll have to kind of hack that stuff out.

THE CHAIR: Okay. Thank you, Mr. Langen. I think that would be okay for us.

Mr. Fitzpatrick.

P. FITZPATRICK: And my understanding was that -- that we were to submit the speaking notes, which is fine, and what Mr. Langen is suggesting is fine as well in terms of submitting them afterwards. And I can do the same thing also, rather than -- than be reading out by rotes the, like, exhibit numbers and page numbers and PDFs and so forth, if that's

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acceptable.
THE CHAIR: Okay. Yeah, I think that would be probably the most efficient way to go about it, if you're both in agreement. Okay. Let's proceed on that basis, then.
Okay. Are there any other matters you want to deal with before we hear oral argument?
Seeing none, Mr. Langen.
Final Submissions by D.P. Langen
D.P. LANGEN: Good morning, Mr. Chair, Commissioners Zaitlin and Stock.
As I mentioned on Wednesday, I estimate that I will be -- I estimated, at that point in time, I would be approximately 1.5 to 2 hours. We're still in that range, likely closer to the two hours.
I will be relying on some jurisprudence in our submissions, and we kind of touched on that this morning, and we have books of authority that we filed -- or provided electronically, and we have some paper ones here today. If anyone wants them in hard copy, we can pass them forward. However, I don't intend to put you in those authorities as I go through the argument. Instead, you have them available for your consideration as you deliberate.

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And, finally, Mr. Chair and Commissioners, I want to highlight the contributions of my colleague, Ms. Barrington, who contributed greatly -- and various Obsidian team members -- to what I'm about to present. It was and remains very much a team effort, notwithstanding I'm the only one appearing here today.
So, with that, Mr. Chair and Commissioners, I'm pleased to present the final argument of Obsidian Energy, or "Obsidian", in respect of this regulatory appeal of the March 23rd, 2023, environmental protection order, or "EPO", issued against Obsidian by the Alberta Energy Regulator's Regulatory Compliance Branch, formerly Compliance and Liability Management, which I will refer to as "CLM" for consistency with the record.
At a very high level, in presenting Obsidian's submissions, I will first touch very briefly on facts leading up to the issuance of the EPO and then move on to legal -- the legal framework within which it was issued.
Following that, I will address the weight to be given to certain of the CLM evidence.
Next, I intend to address two discrete

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points that should garner some attention but do not otherwise materially inform the remainder of Obsidian's submissions. These are CLM's failure to use data available to it or to seek out and obtain additional data and information in the public interest and the late-breaking and evolving position of CLM, delivered by Dr. Canales in CLM's opening statement, that induced seismicity causation frameworks are only used by CLM for guidelines of rapid assessment of seismicity events.
Following -- following on this, I will move to the merits. And in doing so, at a high level, I will first discuss the facts surrounding CLM's analysis underpinning the EPO and that analysis itself. In doing so, I will not be materially addressing the de novo evidence but, instead, the record of the decision-maker and CLM's supplemental information.
Then I will move on to the consideration of the de novo evidence in the context of the 14-18 Obsidian well.
Following that, I will move on to the de novo evidence as it relates to how the high-volume Leduc injectors to the north of the

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Reno cluster as well as to how the 6-14 Belloy well are much more likely to have caused the Reno seismicity than the 14-18 Obsidian well.
In doing so, I will address Commissioner Zaitlin's pressure questions relating to how hydrodynamic pressure moves to the area of the Reno cluster and then how the hydrodynamic pressure likely moved to the basement to trigger the mainshock along a fault in the basement.
It is here where I intend to take a few minutes in camera to address confidential information as required; notably, in relation to the 6-14 well.
Next I will address the two questions that this Panel set out for this proceeding, being, first, whether the seismic events specified in the EPO were induced by human activity; and, second, whether Obsidian's disposal operation was responsible for those seismic events.
Finally, as I indicated to hearing Commissioner Stock, I will address the issue of the relief Obsidian is seeking in the context of the AER's jurisdiction under the Responsible Energy Development Act, or "REDA".
Now, it goes without saying, Mr. Chair and

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Commissioners, Obsidian's position is that the EPO should be revoked and, in the alternative, varied.

So first up are the facts that got us here. Now, suffice it to say, they are extensive. I will attempt to be brief in addressing the well-known facts and assist in providing -- that assist in providing context.

Obsidian holds Well Licence W0 -- 0443668 in respect of a water disposal well with a surface location of 14-18-82-17 W5M, which we have been referring to as "the 14-18 well". The 14-18 well is situated approximately 40 kilometres southeast of Peace River and is authorized for disposal of water into the Leduc Formation at approximately 1,920 metres and has been in operation since December 2012.

There are two other water disposal wells within 18.5 kilometres of the 14-18 well. The first is at the surface location of 13-11-84-17 W5M and is authorized for disposal into the Leduc Formation at approximately 1,828 metres, "the 13-11 well".

A second well is located a 6-14-82-18 W5M and is authorized to dispose into the Belloy Formation at approximately 790 metres, "the

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6-14 well".

Finally, there's a group of water disposal wells that inject into the Leduc Formation and that are, together, approximately 20 kilometres north of the 14-18 well, and I will refer to that group of wells as the "the high-volume Leduc injectors".

As is well-known, on November 29th, 2022, the Alberta Geological Survey, or "AGS", a branch of the AER, reported seismic events occurring approximately 40 kilometres northeast of Peace River. I will refer to this as "the November 2022 event".

This precipitated an announcement from the AER on November 30th in which it indicated that its initial conclusion was that the November 2022 event was natural and not induced seismicity.

After the November 2022 event, the AER concluded that there was not sufficient evidence to identify either the 14-18 well or the 6-14 well as seismogenic. It also noted that the 13-11 well was previously associated with induced seismicity events.

On February 13th, 2023, the AER retained Nanometrics to conduct an analysis of the data

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associated with the November 2022 -- sorry -- November 2022 event, which ultimately was not provided to the AER until March 17th, 2023.

On March 10th, 2023, prior to Nanometrics providing that analysis to the AER, Dr. Canales was of the view that, if the seismicity associated with the November 2022 event, and I quote: (as read)

> ... persists resembling more of a swarm sequence rather than an exponential decay, then it is fair to start suspecting in something else than natural [end quote] seismicity.

On March 16th, 2023, the AGS reported seismic events occurring approximately 40 to 42 kilometres southeast of Peace River, which I will refer to as "the March 2023 event".

I will refer to both the November 2022 and March 2023 events together as "the seismic events".

Now, I want to pause here. Not surprisingly, between the November 2022 and the March 2023 events, AGS and the AER undertook assessment work in relation to the cause of the November 2022 event. On the occurrence of the

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March 2023 event, that work appears to have accelerated, as AGS and CLM were now of the view that the seismic events were induced.

Indeed, in a presentation created March 20th, 2023, just three days before the EPO, AGS indicated that it was possible to infer a link between the water injections in the 14-18 well and the November 2022 event; and it was possible, to a lesser extent, to infer a link between injections in the 6-14 well and the same event.

In doing so, the AER confirmed that, since 2019, past seismic events have been identified as induced and correlated or linked to the 13-11 well. Thus, the influence of the 13-11 well cannot be disregarded in respect to the November 2022 seismic event.

And we know, on or about the time CLM met with Obsidian following the March 2023 event, the AER also met with the operator of the 13-11 well, and that operator agreed to put in place a voluntary mitigation plan.

On March 21st, 2023, in the course of assessing the March 2023 event, CLM questioned whether or not the 13-11 well may have contributed to the event and suggested that

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perhaps the 13-11 well should be included in the EPO. And I'll have more on that later.

On March 22nd, 2023, and again on March 23rd, 2023, Obsidian met with CLM, at CLM's request, for a courtesy meeting and then a due process meeting respectively. Shortly following the March 23rd due process meeting, CLM issued the EPO against Obsidian, naming no other operators.

In issuing the EPO, CLM acknowledged it was not aware of any adverse effects resulting from the seismic events. Further, the EPO directed Obsidian to undertake certain actions.

On July 18th, 2023, the right for Obsidian to appeal the EPO was granted by the AER, and this proceeding, AER 436, was initiated.

Now, at this point, and before I move on, I want to stress that, although this proceeding has a significant amount of de novo technical evidence, the factual and technical evidence contained in the record of the decision-maker, Exhibit 06.01, and the supplemental information of CLM in Exhibit 06.02 -- which was not directly before the decision-maker at the time the EPO was issued -- is surprisingly light given the time that passed between

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November 2022 and the March 2023 events.

In this regard, we note that the record of the decision-maker contains materials that are almost exclusively related to the March 2023 event, whereas the supplemental information of CLM contains materials solely related to the November 2022 event.

Further, a careful review of the facts in both as well as a comparative review of the technical evidence used by the decision-maker to issue the EPO relative to the de novo technical evidence of CLM in this appeal is, in Obsidian's submission, telling. And I will address this later in Obsidian's submissions.

Now, Mr. Chair and Commissioners, very quickly, the legal framework for the EPO that was issued pursuant to Section 113 and 241 of the Environmental Protection Act, "EPEA", and CLM's September 2024 hearing submissions, it confirmed that in issuing the EPO, the decision-maker was of the opinion that the seismic events may cause adverse effect. Notwithstanding this, the EPO states that both no adverse effects occurred as a result of the effects -- events and that the events have caused adverse effects.

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This internal inconsistency is erroneous, and regardless of the findings of fact you conclude in this proceeding, the Panel should -- should, indeed, amend the EPO. So if you decide to uphold the -- the EPO, then we submit that that should be changed.

Now, Obsidian sought a regulatory appeal of the EPO pursuant to Section 91(h) of EPEA and Section 38(1) of the REDA. On November 9th, 2023, the AER Panel, as it then was, confirmed that the issuance of the EPO and its entire content form the appealable decision, and on the same date, the AER Panel set the issue of the hearing -- the hearing of the issue as, and I quote: (as read)

> Whether the order, including all of its content, should be confirmed, varied, suspended, or revoked.

And to assist in determining that issue, the AER Panel invited the parties to address two questions: First, were the seismic events specified in the order induced by human activity; and, second, is Obsidian's disposal operation responsible for the seismic events?

Now, I've discussed the matter of any applicable standard of review with my friend,

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Mr. Fitzpatrick, and I can confirm that we are both of the view that this is largely a hearing de novo; and, therefore, no standard of review ought to be applied to the decision under appeal, the EPO.

This approach is in line with recent AER jurisprudence on this point wherein the AER has described regulatory appeals before it has hybrid de novo hearings that do not necessarily require the application of a particular standard or review. Those review -- those authorities -- which I believe, Mr. Chair and Commissioner Stock, at a minimum, you'll be aware of -- are at Tabs 1 through 3 of our book of authorities.

So at this point, Mr. Chair, I don't intend to make any submissions on standard of review; however, if -- if the Panel chooses that it wants submissions, then we'd like the right to be able to do so. So, in other words, if you're going to apply standard of review, we'd like to make submissions.

Now, Mr. Chair and Commissioners, I'm going to move to the issue of weight.

In exercising your discretion not to qualify witnesses tendering opinion evidence in

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this proceeding, you suggested that the issue of the amount of weight that should be given to such evidence would be considered.

To that end, Obsidian submits that, to the extent the Panel seeks to rely on the opinion evidence, either technical or scientific, of Drs. Canales and Shipman, that evidence should be afforded materially less weight due, in our submission, to their impartiality.

In the court context, if a witness is tendered as an expert and is not qualified as one, then that witness and their evidence is not admissible.

To be clear, that is not what Obsidian seeks. Obsidian simply submits that, because Drs. Canales and Shipman are not impartial, they would not have properly qualified as expert witnesses. In the absence of the Panel qualifying any expert witnesses, the opinion evidence of Drs. Canales and Shipman should garner materially less weight than any competing evidence.

In the 2015 case of White Burgess Langille Inman v. Abbott and Haliburton -- that's at Tab 4 of the book of authorities -- the Supreme Court held that expert witnesses who are not

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independent can nonetheless provide independent testimony. The decision-maker must determine, according to the Court, whether the expert is capable and willing to carry out their duty to the Court, having regard to both the particular circumstances of the proposed -- proposed expert and the substance of the proposed evidence.

And I'll pause here, Mr. Chair and Commissioners, and note that it's the former, the factual circumstances surrounding each of Drs. Canales's and Shipman's involvement in the work and recommendations leading to the issuance of the EPO impugned in this proceeding, that is in play. That is, we submit it is evident that they are not impartial, given their extensive involvement up to the issuance of the EPO, and it's those circumstances that we will be focusing on in a few minutes.

The instance circumstances are on all fours with those from a 2015 Tax Court of Canada decision, HLP Solution Inc. v. Canada. That's at Tab 5 of the authorities. That case deals with independent expert evidence tendered by a government agency, like CLM.

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In HLP, prior to hearing viva voce expert evidence, the Court held a voir dire to determine whether a witness of the Minister of National Revenue could be qualified as an expert.

In that case, a corporate taxpayer claimed investment tax credits for scientific research in experimental development, which the Minister disallowed in large part. After filing a notice of objection and receiving no response from the Canada Revenue Agency, or "CRA", the taxpayer appealed the Minister's decision to the Tax Court.

In opposition to the appeal, the Minister tendered an expert who had been employed by the CRA as a research and technology advisor.

Now, at the outset, the Court stated that an expert witness's main role is to, and I quote: (as read)

> Assist the Court in assessing evidence on scientific or technical matters.

As you are aware, Mr. Chair and Commissioners, in this case, you are very much tasked with assessing evidence on scientific and technical matters.

The Court went on to state in HLP that in

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weighing the probative value of the testimony of an impugned expert, the cost of that testimony in terms of impact on the trial process needs to be considered. The Court did so and disqualified the witness.

In HLP, the Court concluded that the impugned expert should not be qualified because she was not impartial since the impugned expert was involved at every stage of the Minister's file under appeal. The impugned expert delivered the opinion -- the technical review report -- that served as the basis for the tax assessment that was under appeal.

Following the appellant's representations, which was a reply to the impugned expert's technical review report, the impugned expert also wrote an addendum to her technical review report in which she still upheld the same position, and the impugned expert also participated in every meeting with the appellant as the CRA's representative.

At paragraph 32 of the HLP case, the Court found that, due to her involvement at every stage of the file, it would be very difficult for the impugned witness to have the necessary detachment to give a new opinion that will

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disregard her previous opinions.
Particularly, the Court found that there was a blurring of the distinction between her role as an expert witness and her role as a research and technology advisor because she described in detail the work that she did on this file as an advisor; she reproduced word-for-word paragraphs from her technical report, and she used the pronoun "we" when referring to the CRA.
Consequently, the Court disqualified her as an expert witness, not because she was employed by the CRA but because she could not be impartial, in the Court's view.
So, Mr. Chair, and Commissioners, that's the jurisprudence upon which we rely. Now we move on to applying the facts to the law.
Obsidian submits that the facts in the incident case are on all fours with the facts in HLP where the Tax Court did not qualify the Minister's witness as an expert due to the lack of impartiality.
As in HLP, where the Court found the impugned expert was involved at every stage of the Minister's file under appeal, Drs. Canales and Shipman are both employees of the AER, and

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both have been involved in this matter since its inception. As confirmed in cross-examination, both immediately became involved in assessing the first seismic event, being the November 2022 event, and in the second seismic event, being the March 2023 event.
Indeed, the evidence disclosed by CLM is clear that both Dr. Shipman and Dr. Canales were immediately involved in assessing the data surrounding the November 2022 event. There's an entire email thread that they are included on dated November 30th. In that email thread, Dr. Shipman made an inquiry as to the depth of the seismic event, and that inquiry precipitated an email discussion amongst AER personnel. In the months following the November 2022 event, Dr. Canales --
THE CHAIR: Sorry, Mr. Langen.
D.P. LANGEN: Yeah.
THE CHAIR: Court reporter in distress. We'll just take a minute.
THE CHAIR: Madam Court Reporter, when you're ready, maybe you can just read back to where you got to, and then Mr. Langen can pick it up from there.

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THE COURT REPORTER: Can you pick up from: (by reading)
There's an entire email thread that they are included on dated November 30th.
D.P. LANGEN: Thank you, Madam Court Reporter and Mr. Chair.
There is an entire email thread that they, being Drs. Canales and Shipman, are included on dated November 30th. In that email thread, Dr. Shipman made an inquiry as to the depth of the seismic event, and that inquiry participated -- sorry -- precipitated an email discussion amongst AER personnel.
In the months following the November 2022 event, Dr. Canales appears, from the evidence, to have been the primary analyst assessing whether that event was seismogenic, which he initially concluded it was not.
In this regard, in cross-examination, Dr. Canales confirmed that the initial published analysis, a PowerPoint slide deck dated January 16th, 2023, relating to the November 2022 event, was prepared by him. That slide deck and all related emails included Dr. Shipman.

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Dr. Canales indicated that the seismic hazard in the region had increased and recommended action to prevent it. You'll recollect I cross-examined Dr. Canales on this point on Monday, and he confirmed he made that recommendation.
CLM itself has confirmed in an information request response that Dr. -- Drs. Canales and Dr. Shipman advised the decision-maker in respect of the seismic events in advance of the issuance of the EPO, which is clear from the evidence CLM has filed.
Further, in CLM's direct evidence, the decision-maker confirmed that Drs. Canales and Dr. Shipman continued to advise him and that Dr. Canales and Dr. Shipman were involved in the assessment of the March 2022 event and its cause.
Plainly put, there is extensive evidence in Exhibit 06.01 and 06.02 and in the testimony provided before you that demonstrates that both witnesses were substantively involved in Dr. Canales's ultimate recommendation to the decision-maker that the EPO be issued. As in HLP, when the Court found that the impugned expert delivered the opinion, being the

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technical review report that served as the basis for the tax assessment that was under appeal, on March 21st, 2023, Dr. Canales met with the decision-maker, provided analysis of the two seismic events, and during that meeting, he indicated that the analysis pointed to one operation: Obsidian's. He was further asked to make a recommendation, and his response was action should be taken to prevent further seismic events from occurring.

As you know, Drs. Canales and Shipman then met with Obsidian the following day. In that meeting, Dr. Canales confirmed that CLM was of the view Obsidian's operations caused the two events.

In that same meeting, Dr. Shipman indicated to Obsidian that the meeting was a courtesy and that the formal action -- that formal action was forthcoming. Dr. Canales's technical analysis and his view and recommendation was the sole basis for the decision-maker to issue the EPO.

In this proceeding, as in the HLP Solutions case, Dr. Canales contributed additional evidence, an addendum if you will, beyond what was contained in the record of the

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decision-maker, Exhibit 06.01, and the AER's supplemental information, Exhibit 06.02, which evidence in this proceeding is in Exhibit 57.01.

The first report is a reprisal of his earlier analysis using the same data that was available to him before the issuance of the EPO. The second is a reprisal of his earlier analysis using data available up to July 2024.

Both addenda support and uphold his original analysis and views; that is, in all instances, the evidence compiled by CLM and authored by Dr. Canales in the context of this proceeding supports Dr. Canales's earlier work advising the decision-maker in relation to issuing the EPO against Obsidian.

And as an aside, in the HLP case where the Court found that the impugned expert's use of the pronoun "we" when referring to the CRA was an indicia of a lack -- of a lack of impartiality.

And here, Mr. Chair and Commissioners, Dr. Canales did exactly that in the addenda filed as written evidence. He also uses the pronoun "we".

Now, as in HLP where the impugned expert

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also participated in every meeting with the appellant as the CRA's representative, one or both of Drs. Canales and Shipman participated in all the meetings with Obsidian as AER representatives.

First being when Dr. Canales presented the analysis on -- on March 22nd, 2023, in informing Obsidian that CLM had concluded it was Obsidian's operation that caused the two events and with Dr. Shipman informing Obsidian that a higher level response was forthcoming from the AER.

Second being when Dr. Shipman was present in the due process meeting with the decision-maker on March 23rd, 2023, when a formal draft of the EPO was read out to Obsidian.

Due to their involvement since the day following the November 29th, 2022, event and their involvement in every stage of the file since then, as in HLP, the preponderance of evidence demonstrates it would be very difficult for each of Drs. Canales and Shipman to have the necessary detachment to give a new opinion that would disregard their previous views and opinions established leading up to

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the issuance of the EPO.

With respect, Obsidian submits this is clearly evident in the fact that Dr. Canales would need to be -- to fully reverse his earlier opinion and recommendation made on March 21st, 2023, to the decision-maker to take action against Obsidian.

Obsidian, therefore, respectfully submits that Drs. Canales and Shipman are unable to meet the duty of expert witnesses to give fair, objective, and nonpartisan opinion evidence; that is, based on the factors outlined in HLP, each of Drs. Canales and Shipman should not be considered impartial witnesses. Accordingly, Mr. Chair and Commissioners, Obsidian submits that their evidence should be viewed through a lens of lack of impartiality and given substantially less weight.

Now, as promised, Mr. Chair, I will address two discrete points that should garner some attention but do not otherwise materially inform the remainder of Obsidian's submissions.

The first relates to CLM's exercise of discretion to issue an EPO and the public interest. The decision-maker confirmed through its testimony that in exercising its public

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interest mandate to issue an EPO, CLM should do -- do so using all available information at its disposal, yet, notwithstanding it has 2-dimensional seismic data for the Reno cluster area approximately one month before issuing the EPO, it did not use that data nor disclose that data until preparing evidence for this proceeding.

Additionally, you'll recollect that during cross-examination, Mr. Fitzpatrick appeared to take issue with Obsidian for not disclosing its evidence to CLM in advance of the oral hearing so as to try to persuade CLM that their conclusions were incorrect.

In a similar vein and with respect, if CLM is truly of the view that in exercising its public interest mandate, it should do so using all available information, it failed to do so on two occasions at least.

The first occurred when Obsidian requested and CLM declined AER commissioner-led alternative dispute resolution, and the second is when CLM failed to ask a single information request of Obsidian in respect of its suite of independent evidence filed in this proceeding.

The second discrete point is the

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late-breaking, evolving position of CLM, delivered by Dr. Canales in CLM's opening statement, that CLM considers induced seismicity causation frameworks only as guidelines for rapid assessment of seismicity events.

And I want to be clear on this point. If you look at the transcripts, Commissioners and Mr. Chair, Dr. Canales, the third time he makes reference, actually says, That's it. I've said it three times. It's a bit odd.

Let's be clear, Mr. Chair and Commissioners; this is completely contrary to CLM's evidence to that point in time in this proceeding. In its evidence-in-chief, it stated it applied widely accepted seismic causation analysis methods. And when asked what those were, it cited Verdon et al., Foulger et al., and Davis and Frohlich frameworks. It did it on two separate occasions in response to two distinct information requests.

It also filed a July 2024 reprisal of its -- of its EPO, and in doing so, it applied the Verdon and Foulger frameworks. Mr. Chair and Commissioners, that entire report is based

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on those frameworks, and it was not rapid, as it was completed some 15 months following the EPO. Finally, the Verdon et al. framework can be applied both rapidly and then revisited as new information becomes available.

I'm now going to move into the merits, Mr. Chair and Commissioners. In doing so, I'm going to be a bit of a contrarian in my submissions. I'm going to spend an awful lot of time speaking about CLM's materials and actions leading to the issuance of the EPO. They teach you in law school to put the decision-maker in your brief, and I'm going to put you in theirs.

The general thrust of our submission is that CLM, in issuing the EPO, relied on erroneous data, used a simplistic and outdated framework to assess seismicity causation, was inconsistent in applying that framework, and, finally, attempted revisionist history when reprising that work. That is simply not credible.

To start, we need only consider the materials in the record of the decision-maker, Exhibit 06.01, and the materials in the supplemental information, Exhibit 06.02.

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Important to this discussion is that the decision-maker only relied on and -- and, indeed, only had access to the record of decision-maker prior to issuing the EPO. In this regard, the decision-maker was express in the hearing that he was advised throughout by Dr. Canales and Shipman.

It is clear that in reviewing those two exhibits, 06.1, 06.2, that immediately following the November 2022 seismic event, CLM was of the view that the 16-14 [sic] well was more likely the cause of that event relative to the -- each of the other two wells being considered. This is evident in the very first presentation that Dr. Canales prepared in January 2023 when the 16-14 well is assigned the label "WD1" and appears first in order in the discussion in that presentation.

Indeed, that presentation -- in that presentation, Dr. Canales first identifies and points to two primary, if not exclusive, indicia that he ultimately relies on in his recommendation to the decision-maker: spatial proximity and temporal correlation of water-injection activities.

And in the January presentation, when

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assessing the WD1, or the 6-14 well, he notes the following, and I quote: (as read)

> Positive spatial temporal correlation with seismicity.

Going on to state: (as read)

> November 2022 events occurred close to the well. Mainshock located 2 kilometres.

And finally: (as read)

> Drastic increase in injecting volumes.

This latter indicia for the 6-14 well is later ignored, and continues to be, by CLM. And I'll have -- I'll touch on that later.

For the 14-18 well, he identifies positive spatial temporal correlation with the mainshock being 4.8 kilometres away and injection occurring at the Leduc. What is missing and what remains missing is any changes to the injection rate of the 14-18 well leading up to either of the seismic events.

Indeed, in the words of Dr. Canales in January 2023: (as read)

> The well with the strongest spatial temporal correlation and relatively good match with the volumetric data is the well WD1.

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Which is the 6-14 well.

He notes it is a relatively shallow well and that it lacks a convincing link with the basement. For the 14-18 well, Dr. Canales notes that its spatial temporal correlation is not as close as the 6-14 well.

Now, you fast-forward to March twenty -- 20th, 2023, four days after the March 2023 event. Dr. Canales has additional information in hand: The Nanometrics processing of the first round of the nodal array data. This data provides hypocentres for events recorded in the Reno cluster. As evidenced in Dr. Canales's presentation of that same date, CLM's focus has changed. The well labelled "WD1" is the 14-18 well, and "WD2" is the 6-14 well.

That presentation forms a large part of the record of the decision-maker and was the focal point in the March 21st, 2023, meeting with the decision-maker and Dr. Canales in which Dr. Canales recommended that action be taken.

Now, it's here, Mr. Chair, I want to stress two things. A review of Exhibit 06.01 and 06.02 makes it very clear that the decision to issue the EPO was premised on only two indicia: spatial proximity and temporal correlation of

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injection activities. And although CLM's de novo evidence in this proceeding is flush with references to induced seismicity frameworks, Exhibit 06.01, which contains the materials relied on by the decision-maker, are devoid of reference to such frameworks.

Further, Exhibit 06.02, the CLM supplemental information, refers only once to such frameworks: the Davis and Frohlich framework. And I'm going to get to that later.

Moving to that March 20th, 2023, presentation, it, again, focuses on spatial proximity of the seismic events and temporal correlation. However, as I said, Dr. Canales has nodal array data processed by Nanometrics at this point, which provides the hypocentres -- hypocentres, the longitude, the latitude, the depth; effectively, the location of the events. In the result, this view -- in -- in the result, his view has changed. And fair; more data's better. You can make a decision, change your decision, off you go.

With the Nanometrics data, the 14-18 well is now the focus. And in this regard, the presentation states, and I quote: (as read)

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> From the nodal array data, it is possible to infer a link between the injections into the Leduc, Well 1, and the events in Cluster 3. The link between the injections into the Belloy, Well 2, and the cluster is less clear.

Two points on this quote. First, inference was used to link the 14-18 well to the event and issue the EPO and nothing more; and, second, there is a heavy reliance on nodal array data processed by Nanometrics, which provides the hypocentres or locations of the seismic events in that nodal array data.

I cannot stress enough the importance of CLM's and the decision-maker's reliance on that hypocentre data in issuing the EPO. The reason is that that hypocentre data was erroneous. Further, that data was, and I quote -- and this is a quote -- "key evidence", according to the decision-maker. In the decision-maker's notes from the March 20th, 2023, meeting where Dr. Canales recommended action be taken, the decision-maker's notes in this regard state: (as read)

> Nodal data showed two structures:

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Depth, basement-rooted faults going to formation that has the injection.
Quote: (as read)
Nodal array, key evidence locations and depth aligned with the Leduc Formation well at 18-082-17 W5.
Quote: (as read)
Points to one licencee's operation: Obsidian.
Indeed, Dr. Canales is also of the view that this hypocentre data was "key evidence", stating: (as read)
The presence of earthquakes reaching the depths of the Leduc Formation was the key evidence to point to the Obsidian well.
But, Mr. Chair and Commissioners, those locations were wrong.
Dr. Canales, in oral evidence, stated that Nanometrics processed the nodal data as fast as they could, and, in doing so, he indicated that AGS was aware at the time of the EPO of artifacts in the hypocentre data.
Let's be clear. The evidence shows there are two problems with the Nanometrics data. The first problem was waveform and amplitude

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issues known and reported by Nanometrics when it delivered the data on March 17th, 2023, to CLM.
However, at the time, Nanometrics was express that those issues would not affect event location, longitude, latitude, depth, and origin times; that is, Nanometrics was -- expressed that there were no errors in the hypocentres relied on by CLM to establish the indicia of spatial proximity for the 14-18 well. The decision-maker confirmed in cross-examination that he was not aware of those or did not recall being told of these amplitude issues by Dr. Canales.
The second problem was, notwithstanding what -- what Nanometrics said on March 17th, 2023, there was a serious problem with the hypocentre locations from Nanometrics, making the key evidence -- again, the decision-maker's term -- that the -- the key evidence the decision-maker relied on to tie the seismic events to the toe of the 14 well and to infer a link to that well and issue the EPO. Simply, it is unrefuted that those hypocentre locations were erroneous.
Dr. Verdon discovered this error and

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addressed it in his evidence. CLM subsequently responded in its evidence-in-chief, but in doing so, it did not indicate when the error was discovered. The reprocessing by CLM was not completed until July 2024.
Now, at this point, Mr. Chair and Commissioners, you'll recollect that I cross-examined Dr. Canales on whether he was aware of the artifacts that resulted in erroneous hypocentres, and he presented to the -- that he presented to the decision-maker as key evidence, and he said he was. However, the decision-maker confirmed in cross-examination that he was not informed of the erroneous hypocentres by Dr. Canales before making his decision to issue the EPO and that had he been informed, he would have asked further questions before proceeding.
Now, Mr. Chair and Commissioners, I'm going to ask that the key evidence, which was the erroneous spatial proximity of the seismic events to the toe of the 14-18 well relied on by CLM to infer the 14-18 well caused the seismic events be pulled up.
And if so, if we can -- I would ask if we can have Exhibit 06.01 pulled up at PDF 29,

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please. Thank you.
This is the page in the slide deck that Dr. Canales presented to the decision-maker on March 21st in the meeting where Dr. Canales recommended action be taken. Now, as you can see -- see in the two cross sections in the centre and on the right-hand side of the slide, there's a solid line of hypocentres at the toe of the 14-18 well. The depth of the toe of the well and the hypocentres as shown there is approximately 2,000 metres.
Now, as I said, CLM confirmed that the reprocessing of the nodal data to eliminate the errors in the hypocentres relied on was completed some 16 -- 16 months later in July 2024, and CLM reprocessed -- the CLM reprocessed hypocentres are presented in Exhibit 57.01 at PDF 158.
And if we can have that pulled up, please. Thank you.
We can see the depth view on the bottom right clearly shows that upon reprocessing, the key evidence relied on by CLM in March 2023 to issue the EPO has substantially changed. The depth of the hypocentres, as determined by CLM, was revised and is now centred around

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approximately 4,000 metres, a difference of 2,000 metres or a hundred percent increase in depth from March 2023.

And it may be worthwhile pulling up one other image of these revised CLM hypocentres. If we can please pull up opening statement slide deck, Exhibit 98, Slide 21, please.

Now, this shows, Mr. Chair and Commissioners, the very same reprocessed hypocentre locations as in the earlier exhibit I was just discussing with you. I note, however, it's looking from the other side. It's 180 degrees.

So the cluster in question is on the left in this figure. The reason I highlight this figure is because during his direct oral evidence, Mr. Galloway spoke to this slide, and he indicated that this is the best version of CLM's earthquake locations.

Now, Mr. Chair, if you'll bear with me a little bit more with the pulling up of the exhibit front. If we could pull up Dr. Verdon's evidence at Exhibit 50.06, at PDF 19, please. Thank you.

If we look at the east-west section shown in Figure 2-8, Dr. Verdon relocated the CLM

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erroneous hypocentres as well, although his locations, as you know, are deeper than CLM's relocation that we were just discussing. In Dr. Verdon's case, we can see that the hypocentres under the Obsidian well are centred at approximately 2,800 to 3,000 metres below the toe of the 14-18 well. Note that the dimensions on the figure are shown relative to sea level.

The import of the difference between Dr. Verdon's hypocentre locations relative to CLM's July 2024 hypocentres will be discussed later in our submissions.

So, Mr. Chair and Commissioners, I'm going to pause here to sum up. In March 2023, the decision-maker was told and relied on solely the indicia of spatial proximity of the hypocentres we've been discussing and the temporal correlation with the operations at the 14-18 well. The key evidence, to use the decision-maker's term, was the spatial proximity. It was erroneous. How erroneous? CLM's July 2024 hypocentre locations changed by approximately 2,000 metres in depth or a hundred percent.

CLM's reliance on temporal correlation is,

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with respect, also wrong. That evidence is clear that unlike the 6-14 well, there was no drastic increase in injecting volumes, to use CLM's words, at the 14-18 well concurrent with the seismic events. Indeed, the injection volumes in the 14-18 well had been, on average, relatively steady since 2019 up to March twenty -- up to the March 2023 event.

On this point, the injection volumes in the 14-18 well peaked in 2017 and were approximately 50 percent of that peak during the temporal period in question, October 2023 -- 2022 through March 2023.

This is clearly distinguishable from the 16-14 well, which did have a drastic increase in injection volumes concurrent with the seismic events.

Now, you'll recollect in this regard that Dr. Verdon completed a statistical analysis to determine if there was correlation in injection volumes and seismic events. His conclusion is that there is no correlation between the 14-18 well injection volumes and the seismic events, but there is a correlation between the 16-14 well injection volumes and the seismic events.

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To close this out, in March 2023, CLM could only rely on the indicia of spatial proximity to assign causation of the seismic events to the 14-18 well, which is what it did. And the hypocentres it relied on to do this were later proven to be erroneous.

Notwithstanding that, in March 2023, CLM relied solely on that spatial proximity to issue the EPO. Dr. Canales, in his 2024 reprisal, was critical of anyone who would do so, stating, and I quote -- this is de novo evidence July 2024: (as read)

> We appreciate the incorporation of such proximity parameters to understand the spatial correlation between seismicity and industrial activity; however, solely using parameters without having clear evidence of the connection between seismicity and industrial activity can be deceiving.

He then goes on to state: (as read)

> Proximity of disposal activity to seismicity and subsequent proximity parameter is insufficient to consider that disposal activity as seismogenic.

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Moving on, Mr. Chair and Commissioners, but still in the context of CLM's materials and actions leading up to the issuance of the EPO, I want to discuss with you the framework used by CLM to assess causation up to March 2023.

Now, earlier, I touched on the late-breaking, evolving evidence of CLM on this point, and I won't revisit that. Instead, I will start with two responses to information requests that I discussed with you earlier, IRs 1.8 and 1.11.

In those IRs, CLM was asked effectively the same question: What are the widely accepted seismic event causation analysis methods? And those were the words used by CLM in its evidence parroted back to it in the IR questions.

The response was the same in both instances: Verdon et al. 2019, Foulger et al. 2023, and Davis and Frohlich 1993.

Now, the comment on that list, as I presented it, one of these is not like the others. This is something you were alive to, Mr. Chair, when you questioned Dr. Canales about why he used Davis and Frohlich and not the new frameworks on the list.

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Davis and Frohlich, or simply "Davis" for ease, is three decades old. Some people in this hearing room had not been born yet when that framework was published, but age -- as some of the others in this room, including myself, would argue -- does not make a framework obsolete. However, the Davis framework has certainly been criticized as outdated and simplistic.

Notably, in March -- in a March 2023 Salvage et al. published paper, one that is cited by CLM in its de novo evidence, that paper notes that the Davis framework is qualitative and not quantitative and that it invokes temporal and spatial characteristics -- does that sound familiar -- and that it -- as well as the ability to characterize known geological structures to determine whether a seismic sequence is likely induced based on, and I quote: (as read)

> Simple yes or no binary qualitative assessment scheme.

Salvage et al. go on to state that because of the simplistic binary nature of the questions: (as read)

> In many cases, such questions are sufficient to answer the natural versus induced question; however, the binary nature of the scheme means that complex scenarios are difficult to consider, and, thus, output can be ambiguous.

Salvage et al. also go on to recognize that more recent frameworks, like Verdon and Foulger, have been proposed that are not binary, like Davis -- like the Davis framework, and, as such, allow the expert a greater degree in answering.

So why do I raise this? First, because in January through March 2023, when AGS was re-evaluating its earlier determination, that the November 2022 event was natural, the Verdon framework had been published for over four years and the Foulger paper for at least two months. It was published in January 2023.

Now, here you will remember that in cross-examination, Dr. Canales said he was aware of the Foulger framework as soon as it got published, early 2023, and he did not recall when he became aware of the 2019 Verdon framework. Notwithstanding he was aware of the Foulger framework in January 2023, and the Verdon framework had been published for approximately four years, it was the Davis framework that was applied by Dr. Canales to assess the causation of the November 2022 event.

Importantly, that assessment is referenced only once in a single slide of a slide deck in the CLM supplemental information. The record of decision-maker has no reference to the Davis framework or any framework.

Now, all of this is to say that notwithstanding that CLM advocates for the use of, and I quote: (as read)

> Three widely accepted seismic event causation analysis methods --

Again, those -- there -- those are their words -- CLM used only one up to the issuance of the EPO. They used the oldest; they used the one that has been criticized as being simplistic and leading to ambiguous outputs in complex scenarios.

Now, Mr. Chair and Commissioners, I don't need to tell you that we are dealing with a complex scenario. Three operations are being considered as the potential cause of the seismic events that are listed in the EPO, all

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three of which had been identified by CLM in January 2023 when applying the Davis framework. With respect, CLM simply was not in the game in March 2023 when using the Davis framework to assess the causation of the seismic events.

Nothing establishes this more than the fact that CLM stated in its own evidence that since the Davis framework was published in 1993, additional frameworks had been developed to better discern the nature of earthquake sequences, addressing ambiguous and uncertain data. Such frameworks, according to CLM, are the Verdon and Foulger frameworks since they account for incomplete or ambiguous datasets, which are pertinent for emerging and evolving sequences. And that's at Exhibit 57.01, at PDF 64. That's de novo evidence. Those are the words of CLM.

Now, I cross-examined Dr. Canales on this statement, and he confirmed that in November 2022, the Reno cluster was emerging, and in March 2023 when the second event occurred, the Reno cluster was evolving. So notwithstanding Dr. Canales's view that the Verdon and Foulger frameworks are better suited to emerging and evolving seismic sequences

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relative to the Davis framework, when the Reno cluster was, by his own admission, emerging and then later evolving, he applied the Davis framework.

Simply put, in March 2023, at the time it issued the EPO, CLM did not meet its own standards, which it articulated in its subsequent de novo evidence. This is a harbinger of the revisionist history I earlier referenced.

This revisionist history is the second reason I raise this issue, the issue of CLM's application of the Davis framework, and it's to that that I turn now.

Now, Mr. Chair and Commissioners, CLM's application of the Davis framework for the November 2022 event differs from what is presented in the de novo evidence of CLM when it reprised its work up to March 2023, as presented by Dr. Canales in CLM's opening statement.

In this regard, I want to pause and stress that during CLM's oral opening statement, when Dr. Canales provided evidence of the application of the Davis framework, he indicated that the original assessment occurred

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in November and that this assessment was in evidence. He said it was in evidence. As indicated to you before, there's only one reference to the Davis Frohlich assessment on the record, and so it -- that has to be the one he's talking about that's in evidence.

And this is, in our submission, the one aspect of an inferred revisionist history that permeates the March 2023 report purporting to apprise CLM's work leading up to the issuance of the EPO.

And, in this regard, if we can please bring up Exhibit 06.02. That's CLM's supplement -- supplementary information. And we're interested in PDF page 12, please.

So now, Mr. Chair and Commissioners, as Dr. Canales indicated in cross-examination at Volume 7, page 507, he performed an assessment using the Davis framework in November 2022. Key to this is that it's post the November 2022 event and predates the CLM's receipt of the erroneous Nanometrics nodal data, which -- which it received on March 17th. This slide is titled "Determining the Cause of the Seismicity (Cluster 3)". Cluster 3 is the Reno cluster.

We can see the slide speaks to application

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of the 1939 Davis framework, and the questions -- and -- and the Questions 1 through 4 are answered "yes" or affirmative. The final question, Number 5, is answered as "undetermined". If you're following the binary nature of the Davis framework, this "undetermined" would be an implied no.

So let's tally and remember our four -- remember that we have four affirmatives and one negative. Obviously, in November 2022 when Dr. Canales said that this application of the Davis framework was done, CLM did not conclude that the November 2022 event was induced, so it determined that the application of the Davis framework was not sufficient to come to the conclusion that we had induced seismicity.

Now, let's turn to the de novo evidence of CL -- CLM, specifically the reprisal of its work to March 2023 contained in Exhibit 57.01 as well as Dr. Canales's summary of that work in the CLM opening statement.

And to do that, I'm going to ask to have Exhibit 104 pulled up, please.

You'll recollect, Mr. Chair and Commissioners, this is an aid to cross-examination that I discussed with Mr. --

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Mr. Canales on Monday this week at transcript Volume 7. He agreed with the information presented on PDF 2, which is a copy of Slide 5 of Exhibit 98, CLM's opening statement slide deck. What we did is we added references to the record where he provided answers to the Davis framework.

This PDF page 2 shows Dr. Canales's answers as he indicated orally using the information he had available in November 2022. And now you'll see that we have two "maybes" or implied noes, two "yeses", and a "don't know", again, an implied no. So the tally is two affirmatives and three noes.

This is different. It is different than the November 2022 application of the Davis framework we were just looking at and as presented in the CLM supplemental information at Exhibit 06.02, which Dr. Canales confirmed was completed in November 2022.

So with respect to CLM, all of this suggests that we have some revisionist history occurring. In this regard, we note that in directing IRs to CLM, Obsidian asked on a total of at least five occasions for CLM to disclose any analysis that was not already on the record

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of this proceeding.

And I can't stress this enough, sir: Our information requests, there were five that were specific to that, but there were others where we asked, wherever they made reference to analysis or assessment, Is that on the record? Please tell us where it is. And if it isn't, please provide it.

In each instance, CLM did not disclose any analysis. Instead, it always pointed to the material already on the record, often pointing to Exhibits 06.1 and 06.2, the record of the decision-maker and the CLM supplemental information.

So let's turn to the March 2023 reprisal report, Exhibit 57.01. You can pull that exhibit down. Thank you.

At PDF pages 29 through 48 -- we don't need to pull that up, but in that exhibit, in addition to the application of the Davis framework I just discussed with you, it has one other aspect of revisionist history. Specifically Section III titled "Discussion" contains three figures: Figures 6, 7, and 8, all of which CLM has confirmed in response to IR 1.3 did not exist prior to July 2024.

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So in conducting the reprisal of its work in March 2023, CLM created new figures. Those new figures speak largely to justifying its attribution of the seismic events to the 14-18 well based on the proximity of the Leduc Formation to the basement.

In this regard, in the text under Figure 8, CLM states, and I quote: (as read)

> Notice that the Leduc Formation either directly or indirectly overlies the Precambrian basement or is separated by a thin granite sandstone, thus postulating connections with the basement-rooted faults are justifiable.

"Justifiable."

So this is a figure that didn't exist in March. They're reprising the work. And now they're justifying that work, but they didn't do it before, because we asked for all that analysis, and we never got it.

Further, in that same report, CLM theorizes how the apparent lack of correlation between injection rates in the 14-18 well can be explained in light of the EPO, none of which arises in either the record of the

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decision-maker or the CLM supplemental information.

All of this is to say, Mr. Chair and Commissioners, the March 2023 reprisal report filed by CLM is, to some extent, revisionary history. If you're seeking to understand what, in fact, occurred leading up to the issuance of the EPO, the more credible evidence is that contained in Exhibits 06.1 and 06.2.

In this regard and before I leave this portion of argument, I want to provide you with three examples of the credibility of that evidence relative to the de novo March 2023 reprisal report and, to some extent, the credibility of the de novo July 2024 report upon which CLM relies.

First is that on March 20th, 2023, just three days before the EPO was issued, Dr. Canales was attributed as confirming that the 13-11 well was causing seismicity and that this should be addressed to prevent large events from happening.

Similarly, on that same date, a number of -- another member of AGS, Tyler Hauck, was attributed the view that the 13-11 well should be included in the EPO. You'll recollect I

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cross-examined the CLM panel on this very point, and I'll let you read that cross-examination.

Second is that CLM itself indicated that the 6-14 well was to be considered the cause of the November 2022 event if a link between the shallow injection depths and the basement, including faults, to -- to -- in order to attribute it, you need to find a link, and that link could include a fault.

Third is that CLM stated that the -- to link the 14-18 well to the November 2022 event, what was needed -- and I'll quote this, as it is telling. This is just three days before they issued the EPO: (as read)

> To find indications of increasing pressure -- bottomhole pressure, some reservoir modelling may be required to infer a possible pressure increment at the fault location, and it should be backed up with robust geological and seismological data.

In cross-examination, CLM confirmed this is indicative that CLM thought measuring the pressure associations between the Leduc Formation wells, the 13-11 and the 14-18, may be helpful. And we know, Mr. Chair and

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Commissioners, none of that was done by CLM either before it issued the EPO or after when it produced its de novo evidence. Instead, all that was done by the -- all of that -- all that work was done by the independent experts hired by Obsidian to submit exactly the type of technical analysis in this proceeding, the same technical analysis that CLM identified three days before it issued the EPO.

So it's to that de novo evidence I'm going to now turn. As you're aware, Mr. Chair and Commissioners, this proceeding involves a simple question: What was the cause of the seismic events? The answer, unfortunately, is not near as simple. As I just discussed, in first instance, CLM relied solely on two indicia, spatial proximity and temporal correlation, to issue the EPO against Obsidian's 14-18 well. Nothing more. In doing so, CL -- CLM relied on hypocentre data that was erroneous and temporal injection data that Dr. Verdon has proven has no statistical correlation.

Now, unfortunately, notwithstanding CLM is now in possession of additional nodal data post-March 2023 and has acquired and

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interpreted some 2-dimensional reflection seismic, in Obsidian's submission, CLM has failed to establish that the 14-18 well was the cause of the seismic events. This is, in part, because, in Obsidian's submission, CLM has failed to conduct a comprehensive assessment, something that Mr. Galloway for CLM is a proponent of.

Conversely, the independent experts who filed evidence on behalf of -- of Obsidian have. That evidence includes analysis of both 2- and 3-dimensional reflection seismic, geological interpretation, static geological modelling, dynamic reservoir modelling, geomechanical analysis, and induced seismicity analysis.

The contention arising from that suite of independent expert evidence is that the Reno cluster is likely but not definitively induced and that the more likely cause of the seismic -- seismic events is the northern Leduc injectors and the 6-14 well, and, as a result, the Obsidian 14-18 well is substantially less likely to have caused the Reno cluster seismicity than the other disposal wells discussed in this evidence.

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Now, I -- I intend to address that contention by first contrasting the de novo evidence of CLM with the independent evidence of the experts for Obsidian in respect of each of the three possible causes in issue. First up is Obsidian's 14-18 well; second is the high-volume Leduc injectors; and, finally, I will address the 6-14 well.

Finally, I will address why CLM's singular focus on the 14-18 well cannot lead you to the result that the 14-18 well is the cause of the seismic events or, in the alternative, is the singular cause.

Now, to set the stage, there are a number of facts that don't appear to be in dispute. There is generally no dispute that the fault upon which the mainshock creating the seismic events occurred lies in the basement.

Similarly, there does not appear to be any dispute that there are faults at the top of the basement that can be assumed to extend into the Leduc Formation.

There does not appear to be any dispute that the stress in the Leduc Formation is strike-slip, and, with that, that stress regime is inconsistent with the reverse fault

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seismicity of the Reno cluster.
There is no dispute as to the existence of faulting in the Belloy, although there is a dispute as to the characteristics of that faulting.
There is no dispute that the mechanism that can cause induced seismicity in the basement is the propagation of pore pressure, either through faults or through -- through a permeable formation.
So first up Obsidian's 14-18 well. And, again, I'm going to be a bit of a contrarian. I'm going to start with CLM's de novo evidence, the July 2024 reprisal authored by Dr. Canales, and what he relies on to reach the same conclusion CLM reached in March 2023.
Now, in this regard, you'll recollect Dr. Canales, in response to a question by you, Mr. Chair, indicated that he looks for, and I quote, "compelling evidence" to attribute causation of induced seismicity.
With respect, if you ignore the errors in the Nanometrics process which resulted in the locations of the hypocentres of the seismic events used by CML [sic] to conclude the indicia of spatial proximity had been met at

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the time, CLM had better evidence in March 2023 to tie the 14-18 well to the seismic events than it has now. It had better evidence then.
What that means, Mr. Chair and Commissioners, is that if CLM did not have compelling evidence in March 2023 when it issued the EPO, which Obsidian submits is, indeed, the case because it had no temporal correlation, it certainly does not have compelling evidence now.
First, CLM's July 2024 reprisal outlines that the only additional data CM -- CLM had in July 2024 that it did not have in March 2023 is two additional rounds of nodal array data, making the total number of rounds three, and 2-dimensional reflection seismic data interpretation. I say "interpretation" because, as I discussed with you earlier, in February 2023, it had 2D seismic data, but it did not rely on that data or any related interpretation in its analysis underpinning the EPO.
Second, the July 2024 CLM reprisal is exactly that: A reprisal of its previous assessment of the indicia of spatial proximity and temporal correlation, using the data that

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existed in March 2023 and the new data I just discussed with you.
Indeed, in the July 2024 reprisal, Dr. Canales states that the -- and I quote: (as read)
> Earthquakes are reaching depths proximal to the disposal targets being the 14-18 well,

confirming the attribution of this activity as seismogenic.
This position by CLM is simply not tenable. As I discussed earlier, the hypocentres, including the one sourced from the original erroneous Nanometrics data, were corrected by CLM, and the result in July 2024 was that those hypocentres had moved from the toe of the 14-18 well, as I -- as we pulled up those exhibits, to at least 2,000 metres depth -- from -- from 2,000 metres to approximately 4,000 metres, a difference of 2,000 metres, and increased a hundred percent in depth.
Third, the data used to assess the indicia of temporal correlation has not changed since March 2023. Now, notwithstanding this, Dr. Canales attempts in the 2024 reprisal to resurrect this indicia by reaching back in time

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some six years to 2017 when the 14-18 well was injecting at higher volumes.
Mr. Chair and Commissioners, this simply isn't credible. Frankly, by this point, Dr. Canales is grasping. Given the injection data has not changed since March 2023 -- since the March 2020 reprisal, I simply -- I will simply direct you to my earlier submissions on this point.
Fourth, CLM's 2-dimensional reflection seismic interpretation concludes there are potentially basement-rooted faults. As I noted at the outset of this portion of -- of Obsidian's argument, there is no dispute. It can be assumed there are faults at the top of the basement that extend into the Leduc Formation.
What is in dispute is the exact locations of those faults and whether they are positioned under the 14-18 well alone, as CLM's reflection seismic interpretation purports to establish.
Now, on this point, Mr. Boeckx' evidence is that there are serious concerns with the quality and accuracy of CLM's interpretation of the 2-dimensional reflection seismic and related conclusions, all respect to

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Mr. Galloway. I will not repeat that evidence here but refer you to Exhibit 81.5 where these concerns are outlined.

And, indeed, Commissioner Zaitlin, you questioned Mr. Galloway on that very evidence relative to CLM's interpretation in an in-camera session in Volume 8 of the transcript, and that evidence speaks for itself.

So I return to where I started in respect of the de novo evidence of CLM, that being CLM's 2024 reprisal authored by Dr. Canales. There is even less evidence in that reprisal that supports the 14-18 well being the cause of the seismic events than CML -- CLM had, again, ignoring the erroneous Nanometrics data and associated erroneous hypocentres at the time it issued the EPO.

Simply, there was no compelling evidence in March 2023, and there is even less evidence now to conclude that Obsidian's 14-18 well was the cause of the seismic events.

On that point, the uncompelling nature of CLM's 2024 reprisal in its effort to attribute causation to the 14-18 well becomes even more uncompelling when you consider Dr. Verdon's

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evidence. Specifically, as I discussed with you earlier, Dr. Verdon's hypocentres under the Obsidian well are centred approximately 2,800 to 3,000 metres below the toe of the 14-18 well, and its statistical analysis determined that there is no correlation between the 14-18 injections and the seismic events.

All of that is to say, Mr. Chair and Commissioners, that Obsidian's 14-18 well is substantially less likely to have caused the seismic events making up the Reno cluster, and, instead, the high-volume Leduc injectors and the 6-14 Belloy well are more likely to have caused those events.

Now, Mr. Chair, I note the time. Now would be a convenient time to take a break, if -- if you would like.

THE CHAIR: Thank you, Mr. Langen. You read my mind.

So let's take a 15-minute break, and we will resume at 10:40. Thank you.

(ADJOURNMENT)

THE CHAIR: Thank you. Please be seated.

Please continue, Mr. Langen, whenever you're ready.

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D.P. LANGEN: Thank you, Mr. Chair. At the break, I was informed that, on occasion, when I'm referring to "the 6-14 well", I sometimes say "16-14". My apologies.

If I say it again, I'm referring to the 6-14 well.

It's to the high-volume Leduc that I now turn. And in this regard, Obsidian's contention is that those injectors caused the seismic events, and it's supported by the observation of a pressure increase at large distances from the high-volume Leduc injectors and the dynamic reservoir model prepared by Dr. Pooladi-Darvish.

As you know, notwithstanding that in January 2022 CLM was initially of the view that a reservoir model would assist in assessing the causation of the November 2022 event, it did not complete one, nor did it seek to inquire through any information requests about the one upon which Dr. Pooladi-Darvish's evidence is based.

Instead, CLM chose to file a nine-page bulleted document that comments on Dr. Pooladi-Darvish's evidence. This critique, for lack of a better word, was authored by

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Mr. Virues. And I apologize, Mr. Virues. I'm not pronouncing your name correctly.

Now, Mr. Chair and Commissioners, I'm only going to speak to this critique once in this argument, and it's here.

First, Dr. Pooladi-Darvish addressed certain of the assertions in Mr. Virues' evidence, and he did so thoroughly, and the entirety of his evidence is not, in any way, challenged or diminished by that critique, nor was it challenged by the oral evidence he provided in this proceeding.

Second, I do not like what I'm about to say, but it needs to be said. Mr. Virues' evidence is nothing more than 49 unsupported bald assertions. As demonstrated in cross-examination of Mr. Virues on a singular point in that report, the use of DSTs to determine pressure, it is apparent that Mr. Virues did not do any work beyond finding authorities for the singular statement that DST data interpretation is an art rather than a science. He used a sound bite from one authority, which he only skimmed, and then sought to support that sound bite with another authority that he found by Googling.

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He did so notwithstanding that the AER itself allows the use of DST data to determine initial pressure of reservoir as stated in Directive 40, a regulation, and notwithstanding that various scientists at AGS publish maps using DST data to determine reservoir pressures and publish papers outlining how DST pressures can be used to determine reservoir pressure.

Mr. Chair and Commissioners, you are all technically trained. The critique of Dr. Pooladi-Darvish's pressure analysis and reservoir model filed in this proceeding would not meet the expectations that are placed on first- or second-year university students in any science or applied science program. For that reason, it should be given no weight. Not nice to say, not nice to hear, but it had to be said.

Now I'm going to discuss Dr. Pooladi-Darvish's evidence. In doing so, I will reference generally some portions of his evidence that are confidential and provide a citation to the record so that you may refer to that confidential evidence later in your deliberations.

So Dr. Pooladi-Darvish's evidence

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establishes that the high-volume Leduc injectors are responsible for increasing pressure in the area of the Reno cluster. His evidence shows, first, that those high-volume Leduc injectors increased the pressure in the Leduc Formation in the area surrounding the Reno cluster before the 14-18 well was placed in disposal service. The quantitative amount of that increase is shown in Exhibit 50.03, at PDF 4.

His evidence shows that since the 14-18 well was placed into disposal service in 2012, and up to and including to November 2022, when the first event occurred in the Reno cluster, the same high-volume Leduc injectors continue to contribute to the pressure increase in the Leduc Formation in the area surrounding the Reno cluster. That is in Exhibit 50.03 at PDF 5.

Finally, his evidence shows that the contributions of the high-volume Leduc disposal wells to the pressure increase between the 2012 -- between 2012 and November 2022 was more than 90 percent, whereas the contributions to the pressure rise by the 14-18 well was less than 10 percent, and that's in Exhibit 50.03 at

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PDF 5.

Dr. Pooladi-Darvish summed up the results from his reservoir model as follows, and I quote: (as read)

> There has been significant flow of water from the northern wells since 1986 towards the south, including the area around the 14-18 well. The communication from the northern wells led to a measurable increase in pressure in the area around the 14-18 well before this well was put in disposal service in 2012, and it's represented as a constant pressure boundary condition in the pressure transient response of the falloff test of the 14-18 well in October 2023.
>
> The contribution of the 14-18 well in increasing the pressure at an observation point that is 2.3 kilometres west of the 14-18 well is far less than the pressure increase caused by the other disposal wells.

Notwithstanding the detailed and comprehensive work by Dr. Pooladi-Darvish, CLM's position is that the high-volume Leduc injectors do not

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contribute to the pressure increase in the area of the Reno cluster.

With respect, CLM's basis for this is rather simplistic. It's really dismissive since, in CLM's view, the high-volume Leduc injectors are too far away, there's a lack of a breadcrumb trail, and the assumption that any pressure perturbation from those injectors is minimal compared to those from the 14-18 well. The totality of the evidence on this point is five sentences in Exhibit 57.01, at PDF pages 5, 18, and 40.

The latter point is completely disproven by Dr. Pooladi-Darvish's evidence, which I just discussed with you. That is, the contributions of the high-volume Leduc injectors to the pressure in the area of the Reno cluster far exceeds, indeed is a vastly higher, than the contribution of the 14-18 well.

Now, Commissioner Stock, you'll recollect your discussion with Dr. Pooladi-Darvish on this point. The first two CLM points are disproven by the existence of the Northern Peace River seismic cluster. As Dr. Verdon outlines in his reply evidence, the nearest industrial activities to the North Peace River

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cluster are the same high-volume Leduc injectors, and they are approximately 20 kilometres away from that cluster.

Indeed, since 2016, academic publications have concluded that the North Peace River cluster is induced by water disposal, Anderson and Eaton; and more recently, in 2023, in the very same paper that CLM cites in support of its conclusion that the 14-18 well is the cause of the Reno cluster, Schultz et al. expressed the view that the North Peace River cluster is induced by water disposal.

In this regard, you'll recollect that CLM confirmed in cross-examination that it is now analyzing the North Peace River cluster to determine if it is induced. And, again, I stress, they're analyzing it, but the nearest industrial activity is water disposal, and it's 20 kilometres away.

Further, the first two points are also completely contrary to CLM views expressed in an email from just three days before the EPO being issued. And, again, you'll recollect my discussion with the CLM witnesses about this March 20th, 2023, email in cross-examination.

In that email, CLM acknowledges both that

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there is a potential -- potentially communication between the 13-11 well, 20 kilometres north of the Reno cluster, and the 14-18 well and that fluids can flow throughout the Leduc Formation and can do so without a breadcrumb trail, as admitted by CLM in cross-examination.

Now, Mr. Chair, with respect, this CLM evidence is telling. First, as you noted -- as I noted to you earlier, CLM is dismissive in the de novo evidence of the high-volume Leduc injectors. And, second, notwithstanding it acknowledged that fluid could flow through the Leduc Formation and had earlier -- had early in January 2023 itself concluded a reservoir model would assist in determining causation, it did not take the opportunity -- and I keep coming back to this point, but I have to stress it. It did not take the opportunity in information requests to seek a copy of Dr. Pooladi-Darvish's model to even test it.

Finally, the AER itself is of the view that a 20-kilometre or more distance between injections well -- injection wells is not alone enough to dismiss them as a possible cause of induced seismicity.

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In that very same email I discussed with the CLM witnesses, CLM identifies two additional Leduc Formation wells that were not the 13-11 or the 14-18 wells as potentially requiring investigation.

So they stand here today and tell you it's too far away, yet all the evidence indicates that they were of the view that there is at least the potential that wells 20 kilometres away could have caused the seismicity.

Additionally, it's worth noting that there are -- that the new Directive 65 requires that if a disposal well is determined to be seismogenic, a seismic hazard assessment must be conducted within 10 kilometres or, to quote directives -- the directive, a wider radius, if directed by the AER.

So under the new Directive 65, the AER retains discretion to direct a seismic hazard be conducted in excess of 10 kilometres from a seismogenic well.

I'm going to pause here, sir, and stress the fact that CLM did not in its de novo evidence substantively address in any way the possibility that the high-volume Leduc injectors were the cause of the seismic events.

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And this, I submit to you, brings into serious question the credibility of that de novo evidence.

The independent experts retained by Obsidian presented a comprehensive suite of evidence focused on this possibility, amongst other things -- on that possibility, amongst other things. And CLM first chose not to seek to understand that evidence through information requests and then effectively chose to ignore it, which, again, I stress is completely contrary to their evidence at the start of my cross-examination, that as critical thinkers and scientists, more data is better than less.

This gets me to my last point on -- on this issue. Mr. Chair, you asked Dr. Canales if there is a broader, more systematic issue with induced seismicity arising from fluid disposal in the Peace River Arch where the Reno, North Heart, and North Peace River clusters are located. And his response was, and I quote: (as read)

> Yes. What we have found so far is that the water disposal into the Leduc Formation has been associated with clusters of seismicity in the

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Peace River Arch.
Moving along.
It's here, Mr. Chair and Commissioners, I want to turn briefly to the two questions Commissioner Zaitlin posed to the Obsidian witness panel. The first question was how does the pressure from the high-volume Leduc disposal wells get to the Reno cluster? As discussed by Mr. Watson with you, Commissioner Zaitlin, Enlighten assessed the core data, porosity, and permeability for wells drilled in the Leduc Formation that was available in the study area.
And Enlighten's conclusions are that the Leduc Formation is essentially homogenous -- an essentially homogenous reservoir in relation to the parameters of porosity and permeability, and notwithstanding some depositional facies existing in the formation, it's still essentially homogeneous.
Indeed, those facies do not overall impede the ability to communicate pressure through the formation, particularly at the reef margin, where injection takes place.
In this regard, Mr. Watson concluded that because of its reservoir characteristics,

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including its permeability, the Leduc Formation is an excellent candidate for water injection and that because of the pervasive faulting through the Leduc to the Wabamun interval, it behaves like a single hydrostratigraphic unit and that because of this and the differences in density between the injected fluids and the formation water, there's a substantial ability to disburse fluids injected into the Leduc away from the injecting wellbore.
So this, Commissioner Zaitlin, is the geological evidence that, in Obsidian's view, outlines how the injection volumes from the high-volume Leduc injectors influence the pressures in the area of the Reno cluster, as borne out by the static and dynamic models of Ms. Marshal and Dr. Pooladi-Darvish respectively.
The second question you raised, Commissioner Zaitlin, was how do we get the pressure increase attributed to high-volume Leduc injectors to the basement to trigger the critically stressed fault causing induced seismicity?
Dr. Verdon has identified that mechanism as an -- and -- and it is the same mechanism that

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CLM has relied on to attribute causation of seismic events at the 14-18 well. A reasonable assumption that faults extend from the Leduc into the basement allowing pressure perturbations from the Leduc Formation to be transferred to depth -- to the depth of the earthquakes in the basement.
In this regard, CLM has provided no evidence to rebut this assumption as it relates to the high-volume Leduc injectors. And the reason for this is clear: To do so would run contrary to the very same assumptions CLM relies on to attempt to tie causation to the 14-18 well.
Before moving on, I want to highlight a point regarding CLM's evidence relating to the assumption of pressure perturbation from the Leduc Formation to the basement.
CLM states it is possible to infer the interpretation -- interpolation of basement-rooted faults towards the Leduc Formation, and this relates to a double standard that I'll address later in the confidential section of Obsidian's argument.
Now, Mr. Chair and Commissioners, I'm going to turn to the 6-14 Belloy well. I intend to

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speak briefly on this now and then move to an in-camera session to address the remainder of -- of Obsidian's submissions in respect of this well, since I'll be referring to confidential evidence.
The hypocentres calculated by Dr. Verdon from the nodal array data place the majority of the recorded seismic events closer to the 6-14 well than the 14-18 well. This can clearly be seen in Figure 2-5 of Exhibit 50.06 and, again, in Figure 6-1 of Exhibit 81.9.
Importantly, despite the difference in depth between Dr. Verdon's hypocentres and CLM's July 2024 relocated hypocentres, CLM's hypocentres are now closer to the 16-14 well than they are to the 14-18 well. This can be seen in Figure 2-9 of Exhibit 50.06.
Notwithstanding Dr. Verdon's hypocentres are lower than CLM's hypocentres, or deeper, in respect of spatial proximity, the recorded seismic events are closest to the 16-14 well than the 14-18 well. This is regardless of whether you accept Dr. Verdon's evidence or the relocated July 2024 hypocentres of CLM. CLM does not dispute this, so Obsidian submits that there is implicit agreement on this point.

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Similarly, each of Dr. Verdon and CLM have presented the same volumetric injection data for the 6-14 well, and it's apparent on the face of that data that in the first quarter of 2022, the injection volumes in the 6-14 well significantly increased, approximately doubling.

In this regard, it's worth again pointing out that in January 2023, following the November 2022 event, Dr. Canales was of the view the 6-14 well saw a, and I quote: (as read)

> ... drastic increase in injecting volumes during 2022.

So given all this, Obsidian submits that there is a strong temporal correlation between the operations of the 16-14 well leading up to the seismic events, making up the subject matter of the EPO that CLM cannot deny.

Now, I'm going to pause here, and I'm going to address some evidence that didn't get a whole lot of airtime in the hearing. It is Mr. Watson's evidence about the nature of the Belloy Formation in and around the 16-14 well.

Notably, Mr. Watson found that that Belloy Formation in the immediate vicinity of that

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well has a limited ability to disperse pressure increases since it's near the formation subcrop, and other formations are missing due to erosion. Further, anecdotal evidence supporting these conclusions includes two acid squeezes being performed on the 16-14 well. The first occurred shortly following the November 2022 event and the second shortly before the March 2023 event.

It's at this point, Mr. Chair and Commissioners, I'm about to move on to what Obsidian submits is the real dispute between the independent experts of Obsidian and CLM, and it relates to assessing the causation of the seismic events at the 6-14 well, and that being the characteristics of the fault that's been identified in the Belloy, and, for that reason, we need to move into the confidential portion.

THE CHAIR: Okay. Thank you, Mr. Langen.

We'll go in camera. We'll turn off the video feed, and anyone in the gallery who has not signed an undertaking should exit for the moment.

If staff can confirm when the video feed

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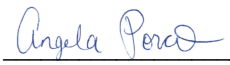
has been discontinued.

(PUBLIC PROCEEDINGS ADJOURNED)

Certificate of Transcript:

We, A. Porco and K. Di Rocco, certify that the foregoing pages are a complete and accurate transcript of the proceedings taken down by us in shorthand and transcribed from our shorthand notes to the best of our skill and ability.

Dated at the City of Calgary, Province of Alberta, this 6th day of December 2024.



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