THE ALBERTA ENERGY REGULATOR

IN THE MATTER OF
Regulatory Appeal 1927181
to the Alberta Energy Regulator

AER PROCEEDING
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(PROCEEDINGS COMMENCED AT 8:59 AM)

THE CHAIR: Good morning. With only the -- with only active participants on screen, it seems it's a startlingly small number of frames to look at this morning. I sort of want to wait for my screen to fill up.

So good morning, and welcome to the last day of our electronic hearing. In terms of housekeeping or preliminary matters, I just wanted to say that we have received the paper version of the revised Tab 15B for Exhibit 48.02.

Ms. Berg, I assumed that you would've received that as well?

MS. BERG: Yes. Yes.

THE CHAIR: And you're fine? Yeah. Okay. Excellent.

That's all for me. Unless either one of you has a housekeeping or preliminary matter, we can start in with final argument, then.

Ms. Berg.

Closing Remarks by ISH Energy Ltd.

MS. BERG: All right. Thank you, Madam Chair.

Good morning. And -- yes. Good morning, Madam Chair and Members of the Panel.

The approval under appeal in this proceeding, Approval 11475EE, was the latest approval issued under what I will refer to as "Umbrella Approval 11475."

While this proceeding raises many issues, one of the central issues that it raises is this: At what point does an umbrella approval require a fundamental re-examination?

We believe that with Approval 11475EE we've reached that point where a fundamental re-examination is required. The KN06 box is not like the many other boxes that CNRL has produced in the Kirby zone. In and around the KN06 box, there is clear evidence of issues with the overlying barrier or seal. There's evidence of fractures and faulting. And because of that, there is a need for stronger mitigations, including an observation well.

In this argument, I will briefly go through some of the evidence that is before you in this proceeding.

There is a very clear divergence in the views of many of the witnesses, including independent experts before you, in particular, on issues of geology and seismic.

You are a specialized tribunal with the expertise to assess that conflicting evidence and determine whose

opinions are more technically sound. It is my submission that the evidence on geology and seismic from the independent experts acting on behalf of ISH is the strongest and most reliable evidence before you.

What I will also highlight, as I go through this evidence, is what CNRL chose not to put before you. In particular, that relates to the ISH of seismic data.

CNRL was asked to provide seismic data in IRs that were issued by ISH and failed to provide data that would allow for the identification of anything but very large-scale faults. It provided a single semblance slice where it could've easily provided multiple semblance slices to provide a clearer picture across zones.

Because it did not provide that requested data, there are only two conclusions that can be drawn: Either CNRL did not do the level of seismic work necessary to identify smaller scale faults in the KN06 area, or it did do that work and deliberately chose not to disclose that data.

In this argument, I will address the issues set out by the Panel. I will also address some of the mitigations that ISH believes would address the risks that it has identified with the CNRL approval under appeal. I will also briefly cover issues regarding the 10-01 well.

And, finally, I will address issues relating to the Panel's questions in IRs regarding the value of resources and whether that ought to determine in any way the type of mitigations that the Regulator might consider in this proceeding.

So starting with Issue Number 1, as set by the AER, which is the presence or absence of an effective barrier or top seal overlying the bitumen-bearing McMurray formation and, if present, its relevant characteristics, in the area of the CNRL KN06 box.

Now, both CNRL and ISH recognize that the regionally extensive silty mudstones of the B1 and A2 intervals can be effective barriers to steam, provided they are continuous and of sufficient thickness. But there is significant disagreement regarding what is occurring in the KN06 box and, in particular, with the B1 mudstone.

So beginning with the A2 mudstone, the evidence in this proceeding demonstrates that the A2 is thin in the KN06 box, varying from about .8 metres thick to a zero edge along the northwest margin of the pool. It, therefore, cannot be considered an effective seal throughout the KN06 box. Both ISH and CNRL are in agreement on this point. The truncation of the A2 mudstone along the northwest western margin of the KN06 SAGD area, as illustrated in ISH's A2 mudstone isopach,

was set out in Exhibit 63.01 at PDF page 14.

Mr. Mathison discussed the thin A2 mudstone in the core at the 1AA/11-01 well in his evidence. He also explained how the differences between the ISH and CNRL isopach maps for the A2 mudstone can be explained by decisions made regarding contouring. What the evidence makes clear is that the A2 mudstone cannot be considered a barrier for the KN06 box.

So moving to the middle B1 mudstone. There are very significant differences in how Mr. Mathison and CNRL view the B1 mudstone. ISH's interpretation can be found in -- well, Mr. Mathison's interpretation can be found in the isopach map of Exhibit 63.01 at PDF 12. And Mr. Mathison is of the view that over the KN06 thermal project area, the middle B1 mudstone has been eroded in portions of LSD6, 7, and 10. Mr. Mathison is also of the view that the maximum thickness of the mudstone in the KN06 box is .7 metres.

Since the middle B1 mudstone is absent or extremely thin throughout the KN06 SAGD project area, it too cannot be considered an effective seal. To illustrate this, Mr. Mathison discussed core from the AA/07-01 well, which is about 15 centimetres thick and appeared to be fractured. He also discussed core from the AB/09-01 well which, again, was about 15 centimetres thick.

Other core, including that from the 1AA/11-01 well, were described as thin interbedded mudstone silt stone sandstones that would be highly unlikely to act as a barrier. The evidence from the core in this proceeding demonstrates that the middle B1 mudstone also does not provide a barrier over the KN06 box.

Now, just briefly with regard to the McMurray B1, ISH's evidence has outlined that the McMurray B1 is a highly variable unit ranging from dominantly sandstone to dominantly mudstone. B1 strata, that is sand-dominated forms. A northwesterly trend through the southwest corner of the KN06 wells, and I won't read out those wells 'cause they're in our -- our evidence, but the B1 strata performs a fining up trend, as well in -- in the KN06 box.

With regard to the McMurray B2 regional, that unit varies from 4 to 1 metre throughout the KN06 area. In core, the zone consists of thinly 2, as in centimetres, to thickly, as in decimetres, interbedded sandstones and thin mudstones. ISH interprets the McMurray B2 as tidal flat assemblage that grades from dominantly bitumen saturated sandstone to dominantly mudstone.

ISH does not consider the McMurray B1 and the McMurray B2 regional to be barriers because they are dominantly sandy over the KN06 area and, therefore, would be spill points for steam.

Now, Mr. Mathison also provided evidence on the presence of inclined heterolithic stratification sedimentary fill, or ISH, at the top of the post B2 reservoir.

This interbedded assemblage of sands and mudstones can vary from predominantly sand to mudstones. IHS, as the term implies, is inclined typically at an angle of approximately 8 degrees. What Mr. Mathison calls the "upper portion of the B2 valley fill reservoir" is comprised of IHS. The muddy, silty IHS passed laterally to sand IHS both along the strike of the reservoir and down dip. Where this occurs, the reservoir is almost entirely made up of sandy strata up to the base of the regional B2 layer.

Again, there are significant differences in interpretations between Mr. Mathison's view and the view of CNRL. In his evidence, Mr. Mathison outlined a number of core photos, including photos from the 1AB/05-01 well, where he noted that CNRL calls the post B2 non-reservoir -- that what CNRL calls the "post B2 non-reservoir" Mr. Mathison would interpret as IHS.

ISH argues that CNRL has been inconsistent in their pick of their top of post B2 reservoir, post B2 non-reservoir boundary. This has resulted in inclusion of sandy IHS above the top of the post B2 reservoir.

In the CNRL cross-examination, CNRL admitted that

it includes sandy IHS as part of its reservoir. The difficulty of picking a precise top of reservoir, particularly where sandy IHS occurs, was also illustrated in CNRL's original application at Exhibit 2.01, PDF 29, where the sandy IHS, according to their modelling inputs, clearly goes up to just below the lower B1 boundary. This is also evidence in core interpreted by CNRL in this proceeding.

CNRL also admitted in cross that they use a shale percentage to pick the top of the reservoir, and this is despite a statement in Fustic, et al., 2011, where they state, and I quote: (as read)

> The use of specific cutoff values for the thickness of silt stone beds, IHS packages, or shale volume to define barriers to fluid flow should be used with caution.

Using a shale volume cutoff to demarcate the top of reservoir ignores thick, sandy IHS that lies above the shaley intervals that meets the cutoffs. Using a shale volume cutoff assumes that the steam chamber will grow only vertically, yet IHS are by their very nature inclined.

It follows that the limited view given by core does allow full evaluation of the extent of the beds. Using shale volume cutoff to demarcate the top of the reservoir ignores thick, sandy IHS that lie above the

shaley intervals that meets the cutoff.

Using a shale volume cutoff -- I'm sorry. I was cutting and pasting this morning, and I think that I have duplicated what I am saying, so if you could just give me a moment. The hazards of being up too late.

IHS, at their very nature, are inclined, whereas sandy IHS overlying muddy IHS -- the sandy IHS can be accessed by steam where they intersect thick reservoir sand along their own dip edge. It follows that the limited view given by core and well logs does not allow a full evaluation of the lateral extent of both sandy and muddy IHS where these terminations will create spill points. Mr. Mathison concluded that the IHS presence would not form a barrier in and around the KN06 box.

Now, with regard to GC-MS, CNRL interpreted the GC-MS in a manner consistent with Adams 2008 and did not take into account revisions made by Fustic, et al., in 2011. In rebuttal, Mr. Mathison submitted that the most likely interpretation of the bitumen compositional gradient is that within the B2 valley fill the IHS do not form barriers in the 1AA/11-01 well but rather they are most likely baffles.

In summary, the core data on the record of this proceeding from in and around the KN06 box indicates that a barrier or seal is thin or absent in significant portions of the KN06 box.

So moving to the next issue set by the Panel, which is the risk of fractures or other breach of the barrier top seal, if it is present, resulting from CNRL operations in the KN06 box.

So in response to this issue, ISH presented a substantial amount of evidence regarding fractures and faulting in and around the KN06 box. This evidence consisted of an analysis of core, well log data, oil water contact, and seismic.

So beginning with the core. Mr. Mathison found that the evidence clearly indicated that fractures were prevalent throughout the vicinity of the KN06 box. He also saw evidence of faults in the core photographs. I'm not going to walk you through the many core photographs that Mr. Mathison presented in his evidence in this proceeding, including in his opening statement, but before I leave the issue of core data, I have to address the very significant differences between the way Mr. Mathison and Mr. Lavigne view the core evidence.

Now, obviously, I am not an expert in geology, but I know that there is significant expertise in geology both on the Panel and in the staff at the AER. You will need to look at these core photos and look at what Mr. Mathison and Mr. Lavigne had to say about these

photos, and you will need to make an assessment regarding whose interpretation you believe.

There is considerable evidence on the record regarding the differing views of Mr. Mathison and Mr. Lavigne on these core photos. You will see this in the parties' submissions, in their opening statements, and as well in the extraordinarily painful cross-examination that I did of Mr. Lavigne. Please examine those core photos. Examine the testimony of Mr. Mathison and Mr. Lavigne regarding all of those core photos.

Look at the evidence, for example, on well AA/02-01. It has not only a vertical fracture that has undergone some displacement in the Beaver Hills lakes formation but also an intensely fractured interval in the lower McMurray.

Look at the well illustrated in the CNRL opening statement that includes a zone that Mr. Lavigne has interpreted as drilling mud, although it is almost certainly a sand with mudstone clasts.

Please look at all of that evidence and make an assessment of whose opinion you're going to accept.

Now, core was not the only evidence of significant structuring in the area of the KN06 box. The strongest piece of evidence to prove that there has been significant structuring in the KN06 area, including the

KN06 steam project area, is the dislocation of stratigraphic marker Cross Sections W to W prime and V to V prime at Exhibit 29.03 that is coincident with a flexure on seismic lines, and you will find that flexure at Exhibit 30.02, pages 123 and 124.

These are expressed as northeast and southwest contours on CNRL's Paleozoic time structure map, and that can be found at Exhibit 30.02, PDF page 116.

Although these flexures are interpreted by CNRL as due to differential compaction, this explanation is not plausible because it does not account for the structuring for the Paleozoic on Section V to V prime and the thicker sands in Section W to W prime.

The drop in structure of the Paleozoic is a 6.6-metre drop -- excuse me -- and coincides with the oil water contact between wells AA/06-01 and AC-07-01 found at Exhibit 29.03. This is also evidence in the oil water contact stratigraphic cross sections K to K prime between Wells AA/06-01 and AA/07-01. You can also see this between wells on stratigraphic Cross Section FF prime at 29.02 -- Exhibit 29.02.

Similar displacement of the oil water contact also occurs on Structural Cross Section D to D prime, and that is, I believe, at Exhibit 29.01, Appendix L, although that's an unrelated structure.

We submit that this is the most plausible

explanation for the structure trending northeast and southwest through the east half of the KN06 and identified as AA prime in Figure 18 in Exhibit 29.01, page 32, the timing of which would be post oil migration and degradation.

Given the magnitude of the structure, there would've been a halo of fractures surrounding the fault and in all likelihood subsidiary faults of smaller magnitude with each of these surrounded by a halo of fractured rock. Due to the vertical nature of these faults, they would be exceedingly difficult to detect on seismic and sporadically encountered in coring.

So moving to the seismic. ISH's stance on CNRL's seismic evidence is that CNRL did not go far enough to definitively include that faulting is absent in the confining strata. ISH believes the detailed analysis of how seismic amplitude phase and frequency change spatially in a seismic volume is the only way seismic can support these small-scale faulting and fracture interpretation.

CNRL claimed it performed a detailed seismic review of its high-quality 2008 Kirby 3D data set within the vicinity of KN06. From this review, CNRL concluded there was no evidence for salt disillusion or faulting. ISH concluded that CNRL's structural seismic interpretation, which includes time and depth structure maps, isochrons, and isopachs, and a visual inspection of seismic cross sections, demonstrates that CNRL's seismic review only investigated the presence of very large-scale faulting or collapse due to salt disillusion.

Core and log evidence within Kirby North show that the scale of faulting and fracturing are expressed at a much smaller scale. The observed small-scale faults and fractures would require CNRL to support its hypothesis with advanced seismic analysis.

Now, advanced seismic analysis includes horizon amplitudes, horizon attributes, zone attributes, coherency slices, frequency decomposition, and pre-stack gather analysis. CNRL did not provide any advanced seismic interpretation analysis in their evidence apart from a single coherency slice.

The one piece of CNRL's seismic evidence that was able to detect subtle spatial changes in seismic wave forms was their time domain semblance slice at the approximate mid-B1 mudstone level. The semblance slice had several dissimilarity anomalies present in and around the KN06 drainage box.

A further examination of how and if these anomalies propagated above and below the B1 mudstone level is the first step to determine if small-scale faults and fractures are present.

Instead CNRL chose to provide a second and very different semblance slice approximated at the same mid-B1 mudstone level. ISH demonstrated that this semblance slice was not a direct comparison to the first slice. It was derived from a different seismic volume which contained a significant acquisition footprint that was not removed in processing, and the seismic traces had been stretched to depth. CNRL's attempt to compare these two semblance slices only provided confusion and did not further strengthen their argument that there is no faulting or fractures within the confining strata in KN06.

CNRL stated that they would easily recognize a 7-metre displacement on seismic markers at the Wabiskaw B, Paleozoic, or within the reservoir itself. ISH demonstrated in its rebuttal to CNRL that the offset calculated from a fault of this size would be less than 3 milliseconds on the 2008 3D. 3 milliseconds of offset between adjacent traces can be seen on reflections events within the Wabiskaw, McMurray, and Paleozoic.

ISH is not suggesting that these are all faults but only emphasizing that the geophysicists would need to carefully investigate the spatial changes in seismic amplitude, phase, and frequency to confirm or refute an interpretation of small-scale faults and fractures.

In summary, as you consider CNRL's seismic evidence, we ask that you consider not only what CNRL did provide but what they did not provide. Why were basic seismic tools capable of detecting smaller scale faults not used? Why was a single semblance slice from the B1 provided? If CNRL wanted to demonstrate that there was no evidence of faults, it could have provided semblance slices from the other strata.

So, finally, with regard to a potential breach of the barrier, you heard a great deal about the 10-01 well in this proceeding. The evidence in this proceeding has made it clear that the GOB zone was compromised. I think it's fair to say that the parties agree that the pressure data indicates that the GOB has been leaking with a hard shutdown on January 7th, 2020, of this year.

CNRL submitted evidence earlier in this proceeding alleging that ISH had been producing GOB gas from the 10-34 well, a very serious allegation that is currently under investigation by the AER. When ISH produced a report by David Leech in this proceeding that provided clear evidence that the 10-01 well had been flowing and that the hard stop on January 7th, 2020, had to have occurred within very close proximity of the 10-01 well, CNRL changed its story, but not by very much.

Now CNRL is alleging that ISH was producing GOB

gas from the 10-01 well before the hard shutdown on January 7th.

Please keep in mind that this 10-01 well that ISH is allegedly producing GOB gas from during much of 2019 is about 700 metres from the CNRL Kirby North central processing plant. It has CNRL equipment installed within it and produces monitoring data, which is produced by CNRL, and was manually checked by CNRL staff in 2019 on a regular basis.

Now, this proceeding is obviously not about what happened in the GOB zone, but the 10-01 well is very central because CNRL wants to use it as a gas monitoring well while ISH believes the well is compromised and may be a conduit for steam into overlying gas zones.

The evidence in this proceeding makes it very clear that the well was flowing in 2019. ISH believes that the most reasonable conclusion that can be drawn is that the 10-01 is compromised and the gas was flowing behind casing until January 7th when hydrates formed and shut down the leak.

Now, obviously, we are not going to resolve the issue of exactly what is happening within the 10-01 in this proceeding. But the fact that evidence reveals that here is an issue with that well is something that I submit you need to take into account in your -- you need to take it into -- you need to take account of in your deliberations.

So moving on to Issue Number 3, which is the need for an observation well in the KN06 box. ISH submits at the outset that monitoring should be focused on data acquisition that will inform risks. We submit that CNRL has not done a full risk assessment of the SAGD operations in the KN06 box, and, as Ms. Giry noted in her evidence, a risk not identified is a risk not managed.

ISH submits that there are -- that there are a variety of risk-mitigation measures that could be used. So with regard to identification of risks, one risk that ISH has identified is that the MOP is too high at start-up and creates hydraulic fractures.

Now, Dr. Boone's expert report solely focused on the risk and impact of hydraulic fractures during the first hours of a well start-up. While he explained that the risk is very limited that it's likely to have an impact, he did not consider the presence of faults, fractures, and a compromised well.

CNRL has explained that it needs a 7 MPa at start-up circulation to maintain operational flexibility in their central processing facility. They explained they'd prefer to take the risk of hydraulically fracturing a well during start-up instead

of adapting their operations to their facility's constraints.

The evidence reveals that CNRL's new standard operating procedures would still not have prevented hydraulic fracturing at KN06 O4-I. It would only have resulted in a faster reaction time from their operating staff to limit the impact. CNRL opts not to incorporate any safety factor to the MOP and maintains an MOP of 7 MPa during start-up for operational convenience and flexibility, namely, to limit the number of slugs creating offsets in the process at the central processing plant.

ISH submits that a true mitigation to limit the risk relating to hydraulic fracturing during start-up would be to reduce the MOP to 6 MPa. Loss of operational flexibility when a well is brought into circulation would only be temporary.

Now, a second risk that ISH has identified is the potential for steam and sour gas to contaminate the GOB zone due to insufficient confining strata. Now, again, we submit ISH has demonstrated that there are no continuous and competent sealing barrier -- sealing layers that will form a competent barrier between the steam chamber and the GOB zone for the duration of the SAGD project. We submit there's also evidence of faults in the core and well log data with insufficient

seismic to demonstrate that faults are not present in the KN06 area.

The risks associated to the vertical steam-chamber growth is related to steam breaking through the incompetent confining strata and to contamination of the GOB zone by steam and sour gas produced by the super-heated bitumen by aquathermolysis -- I -- I didn't write that sentence -- aquathermolysis. And I will be sure to send that word to our court reporter.

CNRL did not share their plans to understand or monitor steam-chamber growth at KN06 and the impact on the GOB zone. They chose instead to refer to similarities with regional geology when KN06 is actually showing very specific geological features.

CNRL monitors steam placement based on steam oil ratio evolution and water material balance. As can be seen in CNRL Directive 54 presentation submitted in this proceeding as evidence, this monitoring technique does not provide any information on vertical steam-chamber growth and horizontal steam conformance.

In other assets with not as much geological complexity, CNRL has opted for drilling observation wells and running RST tools to monitor steam-chamber growth. CNRL briefly suggested that an observation well could be drilled at a later date to track steam-chamber containment, though they would not drill

in an active chamber. This monitoring strategy was not properly developed or explained during the course of the proceeding, and CNRL has not mentioned any intention of acquiring regular 4D.

Monitoring must also be in place when SAGD operations create conductive heating which increases pore pressures and temperatures above the steam chamber. The effect of this thermal expansion could be to create additional fractures in the thin mudstones -- in the -- in the -- sorry. I need to have a drink.

The effect of this thermal expansion could be to create additional fractures in the thin mudstones in the B1 and A2 layers when present. CNRL briefly mentioned that the 10-01 gauge data would be analyzed on a very regular basis to look for inflections in the pressure and temperature range and temperature trends. CNRL cannot rely on 10-01 gauge data that may be impacted by failed wellbore integrity.

It is clear that CNRL is not willing to implement a functioning monitoring system dedicated to the GOB zone. ISH notes that any such monitoring would also inform CNRL on the performance of their SAGD operations, conformance of their steam chamber, and location of the thief zones.

If monitoring was in place, an effective mitigation to protect the GOB would, then, be to reduce steam injection pressure. This would eliminate risks of steam and sour gas breakthrough in the GOB zone and loss of steam for CNRL SAGD operations.

CNRL stated that monitoring GOB is not required if controls are in place. ISH notes that the objective of a monitoring plant is to check the efficiency of the preventive and reactive controls.

In summary, with regard to monitoring, ISH submits that CNRL should rework the seismic to properly identify the magnitude of -- of fractures and faults and confining strata vulnerability and drill an observation well or observation wells located at vulnerable containment locations in the KN06 box, as well as any other relevant steam-chamber monitoring techniques.

Now, back to, again, briefly the 10-01 well. ISH believes that the 10-01 well, a thermally compatible but non-compliant well that was worked over by CNRL in January 2015 to make it thermally compatible, is now compromised. In March 2019, CNRL equipped the 10-01 well with a pressure temperature gauge for the dual objective of cement integrity and GOB zone monitoring.

CNRL conducts monthly interpretations but failed to communicate any anomalous observations to the AER, including large pressure drops representative of gas depletion arguably because they could not connect the

major pressure and temperature anomalies with their SAGD operations.

ISH got access to this data through this proceeding on August 13, 2019, and -- sorry, in 2020 and conducted a well test analysis of temperature -- of pressure temperature data that appears to demonstrate that there has been GOB gassing -- GOB gas channelling behind casing.

Now, the well, as we've already said, stopped leaking on January 7th, 2020, with a hard shutdown, and since then, both parties have noted that the pressure in the GOB zone is now higher than it was when monitoring first was initiated in March 2019 possibly indicating some pressure support from a lower zone.

We submit that the cement logs run in January 2015 are not reliable evidence to prove isolation between the McMurray formation bitumen zone, the GOB zone, and Upper Mannville HH zone. Both parties agreed that wells with good cement logs can experience well integrity issues, such as surface casing vent flows.

A well demonstrating serious cement bond failures tends to have a low chance of success of being remediated. Again, we submit the 10-01 remains the most likely leakage pathway for steam and sour gas to break through the GOB zone. This breakthrough event would happen before steam -- the steam chamber matures.

At minimum, if the approval under appeal is not rescinded, we would request as -- as per Condition 7 of the approval under appeal that prior to drilling wells in the KN06 box, CNRL must complete or abandon the 10-01 well in a manner that is compatible with thermal operations and, as per Condition 8 of the approval under appeal, that CNRL must conduct an assessment of the impact thermal operations may have on this well and any plans required to mitigate risk of reservoir fluid containment.

And so, finally, a question that was raised by the AER through its IRs to the parties, and that is: Should the value of the resource dictate in any way the mitigations put in place?

So the AER has asked whether it should consider value of ISH's resources in assessing whether or not to order certain mitigations. CNRL has submitted that certain mitigations ought not to be considered because they may exceed CNRL's assessed values of the gas resources.

The purposes of the Oil and Gas Conservation Act include effecting the conservation of and preventing the waste of oil and gas resources in Alberta, as well as affording each owner the opportunity of obtaining the owner's share of production of the oil and gas -- or gas from any pool. These are purposes which support

the view that ISH's resources should be protected no matter what the cost.

But, of course, the Oil and Gas Conservation Act is not that simple, because it also provides for the economic orderly efficient and responsible development in the public interest of the oil and gas resources of Alberta. CNRL will, of course, argue that it would not be economic or efficient to require that it spend as much or more on mitigations than its estimate of the value of the GOB gas.

We anticipate it will also argue that ruling which requires that it spend more on mitigations than its estimate of the GOB gas is contrary to the public interest because it may mean that the more valuable bitumen resources are not developed.

So as is the case often with contested regulatory applications, you will have to do a difficult weighing exercise as you determine how to fulfill the seemingly contradictory or conflicting purposes of the OGCA in this case.

So how to approach this weighing exercise. At the outset, it must be noted that oil and gas operators in this province, including SAGD operators, are expected to bear the responsibility for fulfilling regulatory requirements. This includes environmental requirements; indigenous and stakeholder consultation requirements; safety requirements; many, many other requirements.

And, in this case, those other requirements, include those set out in Directive 23, which provides that in situ operators -- in situ operations be conducted in a manner that ensures reservoir fluid containment. I respectfully submit that this is the starting point. If CNRL wants to build and operate a SAGD project, it needs to do so in accordance with regulatory requirements.

In this case, we believe that fulfilling those requirements means that CNRL must do much more to identify and mitigate the risks of producing bitumen from the KN06 box. There is significant evidence of faulting and fracturing in and around the KN06 box, coupled with an incomplete barrier or top seal and the presence of a potentially compromised well. As previously outlined, some of those mitigations could include the lowering of the start-up pressure, the installation of a monitoring well, and/or 4D seismic. The AER should review this and should order what it deems appropriate in this case that would bring CNRL within the regulatory requirements for this project. Now, that may mean a 6 MPa start-up. That may mean a monitoring well. That may mean 4D seismic. Or it might be a suite of other mitigations. It should not

allow CNRL to avoid meeting the regulatory requirements for the building and operation of its SAGD project and then impose all of the losses associated with CNRL's failure to meet the regulatory requirements on ISH, including the loss of ISH's future opportunity to produce GOB gas.

Now, I note that CNRL has provided an estimate of GOB gas reserves that is so low -- that is so low that it would, frankly, be impossible to imagine any mitigations at all making sense if they were to be dependent on not exceeding those values. CNRL has valued ISH's NPV10 share of the reserves between minus 7,000 on the low side to plus -- or, sorry, minus 7,000 on the low side to plus 208 on the upside, with a note that the high side is potentially inflated. ISH takes a different view, with an estimate of its share of NPV5 at 1,751,000.

Except for the reduction of the start-up maximum operating pressure to 6 MPa, which is at no cost, the mitigations proposed by ISH in this case, according to CNRL's evidence, can range anywhere from 100,000 to 1 million, a range so wide as to be somewhat unhelpful in assessing what might be appropriate should the AER determine that it does wish to propose -- to assess proposed mitigation -- proposed mitigations against the value of underlying resources.

The AER needs to assess the facts of each case in fulfilling the purpose -- purposes of the OGCA. And I respectfully submit that it should be cautious in taking the position that a party like CNRL need not fulfill its regulatory obligations. It should not allow a party like CNRL to lay waste to the resources of another party like ISH. Insofar as a decision like that is made, it should be one, I submit, that should be extremely rare. Those types of decisions by the Regulator where one resource is destroyed in favour of another can potentially lead to claims against the Province for losses, and taxpayers of this province should not be on the hook for the loss of, in this case, GO -- ISH GOB resources because CNRL would prefer not to pay the costs of basic regulatory obligations that other SAGD operators incur.

So, to conclude, ISH requests that the AER rescind CNRL's Approval 11475EE for the KN06 box, pending further review of risks and mitigative requirements.

Now, I want to note that ISH does accept that, at some point, the KN06 box will go forward, but what we submit is that it should go forward with a fully supported application, an application that reflects a thorough understanding of the geological issues in the KN06 box and that takes into account the risks that exist as a result of that geology. It is not enough

that an application of this nature go forward as a boilerplate. We can't have applications of this nature go forward on a, Well, we've just drilled another 96 wells; trust us, it's just going to be fine, approach. It can't be based on an application that doesn't contain basic seismic data. The issues of the KN06 box need to be understood and faced head-on by CNRL in any future application for this development.

In the alternative, ISH requests that the AER require that CNRL fully address the risks of steaming in the KN06 box, which will include an assessment of the 10-01 well prior to commencing steaming operations, that it reduce the maximum start-up operating pressure for KN06 to 6 MPa, and that it develop a monitoring strategy for start-up and continuous SAGD operations for operations in the vicinity of the KN06 box that will monitor the confining strata and may include an observation well or wells to replace the 10-01 well as well as 4D seismic.

And those are my submissions. I'm happy to take any questions that the Panel may have.

THE CHAIR: Thank you, Ms. Berg.

Commissioner McKinnon, any questions?

MS. MCKINNON: Yes, I have one, and I'm trying to figure out how to best frame it.

Alberta Energy Regulator Questions ISH Energy Ltd.

MS. MCKINNON: And, I think, Ms. Berg, you addressed some of -- some of these issues or this issue in your submissions but I'm going to frame it just a little bit differently and ask you to address it that way.

And it's a question on the onus and where the onus lies in this appeal that we're hearing. And I heard you say that CNRL -- or Canadian Natural has to produce better evidence. ISH is the applicant in this appeal, so could you just address again more, I guess, pointedly the onus question, where it lies and what we need to consider when we are weighing the submissions in this case.

MS. BERG: Well, I -- I think that we start with the -- with the technical questions, the key questions set out -- the two key questions set out by the AER with regard to -- to this matter, which is: Is there a competent seal, and is there evidence of fractures? And insofar as there is evidence of an incompetent seal or barrier or fractures, it's -- it's my submission that this -- this application should not proceed.

I guess in terms of the way to view it, if -- you have before you far more evidence than the regulatory applications group had before it prior to -- to approving this application. So if -- if you were in

the position of the regulatory applications group and had this evidence regarding fractures and potential faults and an incompetent seal and no mitigations, would you approve this application without additional evidence to -- to -- without additional evidence to take away those -- those concerns, and, in particular, basic seismic evidence that -- that should be available, some seismic slices -- some semblance slices in this proceeding? The absence of them is significant because they -- they should have been made available. And so the fact that they are not made available and the fact that there is so much evidence of fracturing and faulting in the core, I submit that -- that if you were in the regulatory applications group, you wouldn't approve this application. You would -- you would ask for further information and -- and would order certain mitigations.

And I -- I perhaps have not answered your question with regard to -- to onus, but I -- I would step back and -- and ask myself what -- what you would do if you -- if you were in the regulatory applications group and were determining whether or not you would be proceeding or -- or requesting more data or -- or requiring additional mitigations.

MS. MCKINNON: So if we were to put ourselves in that position, as you've just suggested, what I'm

hearing, I think, you're arguing is that -- and we don't have more evidence because the evidentiary record is closed. So you're arguing that we -- we should revoke because we can revoke or suspend or -- I'm missing one, but, anyway -- that those are the options that we have under an appeal, so you're suggesting we would revoke because we don't have enough evidence?

MS. BERG: You would revoke and let the -- the applications group gather the additional material that is needed and make an assessment of the -- the additional mitigations that would be appropriate in this case, yes.

MS. MCKINNON: Okay. And then your alternative argument, I think, if I'm framing this correctly, is that we would vary the decision by reducing the operating start-up pressure, requiring an observation well; is that correct?

MS. BERG: Yes. That you would put in mitigations that help address some of the issues with both the lack of a barrier and the evidence of fracturing and faulting in -- in the KN06 box area.

MS. MCKINNON: I think that's it. I have -- I had another one, but I think you addressed it. Just give me one sec.

So just to follow up, then, on the last question, the reduction of the MPa to 6 and the establishment of

an observation well would be acceptable to ISH as its alternative?

MS. BERG: Yes. And in addition, we -- we would want there to be an assessment and -- and to be clear, I mean, ISH has requested 4D seismic as -- as one of the options. I think it would be actually very nice to have a well-done 3D seismic. You know, that -- that could be a starting point. All of the semblance slices could be an additional starting point. So additional information gathered and -- and mitigations appropriate to -- to what is seen in that KN06 box.

MS. MCKINNON: Okay. Just to circle it back to your economics argument, what is -- what, in your opinion, is the Panel's role in considering the relative economics? For example, 4D seismic, I understand, is very expensive, and so you did address the -- the question of the OGCA and the wastage and the relative economics.

Is there a point where the Panel should say, Wait a minute. This is just too much to ask an operator to provide? Or are you arguing that the OGCA requires us to ensure all of the other fractures, including wastage, would, I guess, be -- would take the economic consideration to a different thing than just the weighing the costs and the benefits?

MS. BERG: So I think that in making any

decision you always have to carefully consider all of the different requirements of the OGCA and balance them, and it's a difficult exercise. If it was a simple, you know, check off the boxes easily, I mean, we wouldn't all be, you know, struggling with -- with, you know, lengthy applications like -- like this one.

With regard -- so, I mean, in answer to your question, let's take a very extreme case. Let's say there -- there's a $100 million mitigation required and, you know, a million-dollar resource that's being protected. Obviously, you know, in that -- in that extreme kind of case, the Regulator would never order such a mitigation, but I argue as well that such a case would never come before the Regulator because -- because these are always commercial parties that make commercial decisions.

And so to some degree, I think the Regulator also just has to let commercial negotiations happen. If -- if one party, you know, is tired of -- of dealing with another one -- and, frankly, I think it's fair to say that -- that both ISH and CNRL are somewhat annoyed at each other over -- over recent -- recent years.

So in this case -- but I -- but I think that that is -- should be the rare case, Number 1, because I think it's rare that anything extreme would ever show up before you, and -- and I'd also say that I don't

think that's this case. I don't accept -- I submit that you should not accept the minus 7,000 and the plus -- I don't know -- 208,000 inflated estimate that CNRL put forward as the value of ISH -- ISH GOB resources.

And, you know, CNRL was asked about the cost of mitigations. They know what 4D seismic costs. They know what GOB wells -- or not GOB wells but monitoring wells costs. Yet in -- in their -- in their response to the AER IRs, put in, you know, a very unhelpful range of, you know, 100,000 to a million. I mean, what -- what does that tell you?

So -- so I think that -- while I think -- and sorry for the lengthy answer. While I think that there are obviously cases where the AER would need to -- to say, No, this -- this level of mitigation is not appropriate because of the relative value of the resource, I don't think that's this case.

And I -- I want to say again that -- that another reason that the AER -- why such a decision should be the very rare case is because a decision that strands or -- or destroys -- allows for the destruction of another entity's resources does, I think, create a possibility for liability of the province, and -- and again, parties should -- parties like CNRL, like ISH when it -- it's pursuing a project, they need to bear

the economic consequences of -- and -- and regulatory costs of their own projects. That's not something that should be pushed on the taxpayers of this province unless it's a truly, truly exceptional situation as was the case, for example, in the gas over bitumen decisions.

So, again, I've gone on quite a long time, and I'm not sure I entirely answered your question.

MS. MCKINNON: That was helpful. Thanks. Those are my questions for you.

THE CHAIR: Commissioner McKinnon -- or Zaitlin. Sorry.

DR. ZAITLIN: Thank you.

ISH provided and you provided a list of the additional data required -- that you believe is required for a full risk assessment, but you didn't mention what type of data -- or technique would be required, and you'd want to see it vary in the application of the evaluation of the 10-01 well. What additional work would need to be done, in ISH's opinion, to be able to determine the integrity of the 10-01 well?

MS. BERG: And, unfortunately, I am probably the person least capable of responding to that question, given my lack of technical expertise, but I do know that chat logs are definitely something that

ISH is interested in seeing pursued, and if you could give me one moment, I -- I do have someone beside me who would be able to provide a more sound and technical response. So are you able to give me just a moment, sir? Yeah? Okay. Thank you. Just a moment.

So, sir, I'm advised that in addition to the chat log ISH would want further -- further assessment of the cement and -- and, frankly, would just need to work with CNRL to understand, you know, for example, what CNRL encountered when -- when putting in that monitoring data in 2019. I mean, really, it is going to require that the -- that these parties work together to determine the best path forward for that well.

DR. ZAITLIN: Thank you.

That's it, Madam Chair.

THE CHAIR: Thank you.

Ms. Berg, I have a question that may in some way circle back a bit to the line of questions that Commissioner McKinnon started, and that's that: The fact that the 10-01 GOB well has been shut in by virtue of regulatory order, does that come into play at all in our decision-making or should it and, if so, to what extent?

And I'll have the same commission -- or question for Canadian Natural and Ms. Jamieson, so heads-up.

MS. BERG: The fact that it has been shut

in, should that affect your decision? I'm not sure that --
THE CHAIR: By virtue of an order, not by the choice of ISH.
MS. BERG: Well, I think that -- like, the key issue with the 10-01 well in this proceeding is -- it's not whether it's shut in due to order or for any other reason. It is that it may be compromised. And I -- I think that what is -- what is critical is -- is that there be some investigation -- further investigation to determine what is going on with that well.
There is something. I think the parties -- you know, there's very few things that people agree on in this proceeding, but I think that the parties can agree that there is -- there is something going on with that well. I don't see the fact that it is shut down by way of order to be -- to be of any -- of any impact in -- in this particular -- I may be misunderstanding your question.
THE CHAIR: I'll try one more time just to be --
MS. BERG: Okay.
THE CHAIR: -- sure that I'm clear.
So you had urged us to -- that we've got to carry out a weighing exercise, and in that weighing exercise,

we need to take into account the regulatory framework, including Directive 23, the purposes provisions in the Oil and Gas Conservation Act. Then we'd had a discussion about the differences in economic evaluation. But at the end of the day, we're going to have to take those things into account, weigh the different factors, and make our decision.
I guess my question put another way could be: Should the fact that the -- that ISH is not at this point able to produce the gas from the Wab B from the 10-01 well, if it wanted to, be a factor that -- because of the GOB order a --
MS. BERG: Okay.
THE CHAIR: -- factor that we should take into account in our weighing, in our balancing?
MS. BERG: So I guess that more goes to the fact that, I mean, GOB -- and perhaps I've got someone here who can help me better understand your question, if you can give me a moment.
THE CHAIR: So, Ms. Berg, sorry for interrupting. I see it more as a legal -- I'm thinking of it as a legal question, so ...
MS. BERG: Yeah. And so, I mean, obviously there are commercial issues that -- that come into -- to play with -- with the fact that it's -- that it's shut in. Yeah. I guess --

THE CHAIR: Okay. No.
MS. BERG: Yeah. I -- again, I think that the critical issue in this proceeding is -- is first and foremost determining what is going on with that well and -- and addressing it head on.
THE CHAIR: Okay.
MS. BERG: And as for, you know, I mean, orders as to what should -- it's the physical characteristics of what's going on at that well that I -- I think are critical to this proceeding. I mean, the GOB order is what it is right now, and I'm not sure how it -- it really affects what you are weighing in -- in this particular proceeding.
THE CHAIR: All right. Thank you.
So just looking for my clock. There we are. It's 10:21. If we take a break now and come back at 10:45, will that give you time to be ready to go, Ms. Jamieson?
MS. JAMIESON: Could we make it 10:50 so I can have -- we sort of budgeted 30 minutes to get back together on the break, and I might be mistaken about that, but that's what I had in my head.
THE CHAIR: Yeah. Okay. That's fine.
MS. JAMIESON: Okay. Thank you very much.
THE CHAIR: So we are adjourned until 10:50.
(ADJOURNMENT)

THE CHAIR: All right. Now that the host has unmuted everyone, Ms. Jamieson, whenever you're ready.
Closing Remarks by Canadian Natural Resources Limited
MS. JAMIESON: (AUDIO FEED LOST)
THE CHAIR: You're muted.
MS. JAMIESON: And it was such a great start. Let me hit rewind.
So good morning, Madam Chair and Panel Members. I'm pleased to make these closing remarks on behalf of Canadian Natural.
As the Panel's aware, this is a regulatory appeal of an amendment to the Kirby North scheme approval, Scheme Approval 11475EE, which allows Canadian Natural to drill and operate a sixth steam gravity -- sorry, steam-assisted gravity drainage box, KN06, for the recovery of crude bitumen from the McMurray formation within the Kirby North area.
Counsel this morning for ISH suggested that this scheme approval required a fundamental revisiting. I'm going to suggest to you that that's fundamentally not the case, that it is the KN06 amendment approval that is at issue in this proceeding and that for the Panel to consider revisiting or opening up the original scheme approval would not be appropriate.
On April 30 of this year, this Panel set out three

hearing issues, which I will address in detail in a few moments. In our view, the key decision that this Panel needs to make is whether Canadian Natural's SAGD operations at the KN06 box presents an unacceptable risk to ISH's interests in the Wabiskaw B pool.
THE CHAIR: Sorry. Ms. Jamieson, your screen has frozen. So we can hear you, but I think we've lost video.
MS. JAMIESON: We'll just check on that. We're not seeing anything on our end, so ...
UNIDENTIFIED SPEAKER: Oh, there you go. You got kicked out.
MS. JAMIESON: We're getting kicked out. I got kicked out today.
MS. TURNER: Madam Chair, we'll just wait, I believe, for Ms. Jamieson to reconnect?
THE CHAIR: Yes, we will.
MS. TURNER: Okay. It doesn't seem to be signal strength on our issue -- on our end, so perhaps they're having some issues on their end.
THE CHAIR: It appears as though she's calling in.
MS. JAMIESON: I am. I am on the phone, so we have audio. We just have to go right back to the Zoom invitation.
THE CHAIR: Ms. Turner, is there any point

to us all leaving and coming back? Would that make any difference? Or if the issue's on their end, we just have to wait?
MS. JAMIESON: Madam Chair, it does appear to be on my end, and we just have to disconnect from the internet and come back. So I'll just take a moment and see if this works.
THE CHAIR: Okay. Yeah. Go ahead.
MS. JAMIESON: Madam Chair (AUDIO FEED LOST) I think we're going to get me a new screen here. That might solve it.
THE CHAIR: Okay. Now we see you.
MS. JAMIESON: You can? Good. It appears I'm back. Just give me one more moment. I'll get physically set up. Okay. Let's try this.
All right. I'm just going to repeat my last paragraph.
On April 30th, 2020, this Panel set out three hearing issues which I will address in detail in a moment. In our view, the key decision that this Panel needs to make is whether Canadian Natural SAGD operations at the KN06 box presents an unacceptable risk to ISH's interest in the Wabiskaw B pool.
To this, we say there is an extremely low risk that Canadian Natural's operations will impact the Wabiskaw B gas. Canadian Natural respects that ISH is

concerned about the potential impact to the GOB zone. This concern is simply unfounded and does not warrant any change in Canadian Natural's proposed start-up for monitoring procedures.
With respect, Canadian Natural requests that this appeal be denied. Canadian Natural's also asking that the conditions outlined by ISH in its response to the Panel's information request, AER to ISH 007, which is Exhibit 66.01, pages 9 and 10, also be denied.
The framework for this regulatory appeal starts with Section 42(2) of the Responsible Energy Development Act, REDA. This Panel's task on this appeal is to determine whether Scheme Approval 11475EE should be confirmed, varied, suspended, or revoked for the KN06 box, to be clear.
In arriving at its decision, this Panel must consider certain factors in its governing legislations. Section 2 of the REDA states that the AER's mandate is in part to: (as read)

> Provide for the efficient, safe, orderly, and environmentally responsible development of energy resources in Alberta.

Given that this regulatory appeal relates to an application filed under the Oil Sands Conservation Act and the Oil Sands Conservation Rules, Section 15 of REDA and Section 3 of the responsible -- of REDA

General Regulations also apply.
Pursuant to Section 3 of these regulations, this Panel must also consider the social, economic, and environmental effects of the energy resource activity.
Canadian Natural applied for the KN06 box pursuant to Section 13 of the OSCA as well as the Alberta Energy Regulator's Directive 78 as an amendment application.
ISH's counsel this morning suggested that in some way the application was not compliant with Directive 23. The Directive 23 requirements contain -- first of all, Directive 23 is the directive that applied for the original scheme approval, if you will. It's been, I believe, in draft form since, but it does include a requirement to contain the steam and fluids.
And Canadian Natural is not taking issue with that. Canadian Natural acknowledges those regulatory requirements apply here and takes those requirements seriously. In our view, Canadian Natural is fully compliant with whatever regulations apply.
In considering whether to confirm, vary, suspend, or revoke the AER's decision to Approve Application Number 1909305, this Panel must also regard for the purposes of the OSCA, as set out in Section 3 of that Act, including: (as read)

> To effect conservation and prevent waste of the oil sands resources of Alberta; to ensure

orderly, efficient, and economic development in the public interest of the oil sands resources of Alberta; [and] (g) to ensure the observance, in the public interest, of safe and efficient practices in the exploration for and the recovery, storing, processing, and transporting of oil sands, discard, crude [that must be a typo] crude bitumen, derivative crude bitumen, and oil sands products.

Now, I want to acknowledge that Ms. Berg brought up the oil sands -- or, sorry, the Oil and Gas Conservation Act and those regulations in respect of the GOB zone, and I think that's probably the case. In this case, the AER's mandate would include consideration and conservation of the oil sands as well as consideration under the Oil and Gas Conservation Act, the GOB zone. However, I don't think that's going to be an issue. There's alignment in the priorities with respect to the development of both resources.

This Panel may also consider the broader context in which this regulatory appeal is being heard, and we believe it is important to do so here. In the recent decision, 2020 ABAER 005, the AER considered the broader context in which three disposable wells in a single pipeline application were made, i.e., to support

the previously approved Hangingstone waste management facility.

There is also a verbiage in that decision report about how the AER is to consider its legislative mandate and the regulatory requirements that apply in relation to the broader context, and I would encourage the Panel to take a look at that decision. I thought it was helpful.

Before -- oh, standard of review. I just want to touch on this briefly. In that same decision, the standard of review that should apply to a regulatory appeal received some discussion. And at the time, I considered the nature of regulatory appeals to consider both the filed record of the material that AER authorizations considered in making the original application. I think, Madam -- Panel, do you still have me on video? I'm seeing my name came up. Maybe it's just a different view.

THE CHAIR: Yes. We can still see you.

MS. JAMIESON: Okay. Thank you very much. All right.

In that decision -- yes. In that decision, the question was really about the hearing Panel's ability to receive new information in the context of a regulatory appeal.

It determined that, given the hybrid de novo

nature of the proceedings and its distinction from a typical appeal on the record, it was not necessary to apply a standard of review. Instead the decision on whether to confirm, vary, suspend, or revoke the earlier decision is to be based on the record before the Panel.

And I raise that partially because there's some question about whether or not perhaps -- one of the resolutions is -- coming from ISH is for Canadian Natural to be -- to be required to go back and sort of resubmit the application and provide additional information as if it was somehow deficient or lacking, and we would suggest that that's simply not the case. The Panel is positioned now with all the information on the record to consider the merits of the appeal and does not need to take further steps in regard to the -- the application.

Sorry. There's some type of -- I'm getting lots of IT challenges this morning. Oh, that's why. It's echoing or something.

So the other point we make is -- in terms of standard of review is it would be our submission that the hearing panel should be applying a reasonableness test to the issues before it. But since the GOB proceedings in 2004, 2005, there actually has been very little considerations to GOB issues by this regulator

or the Courts.

In terms of case law, we have only the one case that addresses bitumen directly, and that is "Alberta Energy Company Ltd. v. Goodwell Petroleum Corporation Ltd." and the cite for that, 2003, Alberta Court of Appeal 277, Goodwell.

And it suggests that bitumen mineral rights holders can extract the minerals pursuant to those rights even if so doing they interfere with and/or commit waste of another's minerals.

Now, in its decision letter -- yeah. So in its decision letter to grant this appeal dated February 11th, 2020, the AER noted that this case references several Alberta cases that deal with the incidental production that involved gas and initial gas-cap gas in the production of bitumen, and on the ownership of coal bed methane, and that the Goodwell case addresses the situation where interference with or wastage of another's minerals is reasonably necessary to win, work, recover, and remove one's own minerals.

We acknowledge that these cases have their genesis in an early decision of the Alberta Court of Appeal on a split-title dispute between holders of petroleum rights and natural gas rights where the Court held that -- and I quote: (as read)

The petroleum rights holders are entitled to

extract all the petroleum from the earth even
if there is interference with and a wastage
of the natural gas rights holders' gas so
long as in the operations modern methods are
adapted -- adopted and reasonably used.

The AER picked up on this test when it stated at the bottom of page 4 of that decision letter, February 11, 2020, in the statement in relation to this proceeding.

An essential question here, then, is whether the approved start-up injection pressure for KN06 is reasonable in the circumstances. Our view is that the Panel in this proceeding can apply similar tests to all three hearing issues in this proceeding. In other words, are Canadian Natural's plans to develop the KN06 reasonable in the circumstance?

This test is very similar to the one that the Alberta Environment -- or, sorry, the AER employs on a regular basis. And that is, is Canadian Natural acting in a prudent and responsible manner such that potential impacts from its operations can be avoided or mitigated?

Before I go on, I just want to make it clear because it did come up, I believe, in the discussion between Ms. Berg and, I believe, Ms. McKinnon, this concept of wastage. Canadian Natural has not applied and has no intention to waste the gas. That is not

what this proceeding is all about. And so the Panel doesn't need to think in terms of bitumen or the GOB. It's not one or the other, in this case.

The whole GOB proceedings were designed. They recognized the need for the gas to stay in place in order to keep the pressure on the bitumen resource in order for it to be optimized or the recovery to be optimized. So it's not a question of one or the other. Certainly not at this stage.

This is a matter of Canadian Natural gets to go first. The bitumen gets to be produced. And then in time, once the bitumen's recovered, then the GOB can be produced. So it's not a matter of wastage or -- I'm forgetting Ms. Berg's phrase -- destroying the GOB resources. That is not an issue in front of you on this appeal.

Now, with respect to evaluating the potential impacts that ISH alleges, this Panel will need to weigh the technical evidence. I think Ms. Berg stated that the AER is a specialized tribunal well-positioned to assess which opinion is technically sound and what evidence is the strongest and most reliable, and we agree with those statements.

I think she was relating it to the geology and the seismic evidence, and there is no question in our view that that is the significant technical evidence that

needs to be weighed, and we trust that the Panel will do so as it does in the normal course.

So this is a task well familiar to the AER and this Panel, and it's certainly applicable here. The first technical question is whether or not there's an effective confinement barrier between its SAGD operations -- between Canadian Natural's SAGD operations and the Wabiskaw B gas. In Canadian Natural's view, the technical evidence clearly demonstrates that there is an effective containment barrier.

This Panel must also weigh risk. First to determine whether there is -- in fact, there is a risk. A concern is not a risk. We ask that the Panel gives due consideration as to whether or not there is an actual risk in this circumstance or whether the concerns raised by ISH are actually perceived risks.

The next question is: If there is a potential risk, can it be or is it sufficiently mitigated? Risks should be managed to a point where they are low risks or acceptable risks. This Panel -- this Regulator deals with risk all of the time, I'm going to suggest, and it's rare that any energy activity comes with zero risk. So that can't be the expectation or the standard. This is about whether or not there is an acceptable risk in the circumstance.

This is a slightly different question than monitoring. I think on the monitoring options, the Panel should be asking itself whether it's reasonable in the circumstances given consideration of the effectiveness of the options measured against its cost and benefits, and I'll remind this Panel that, of course, the governing legislation does speak in terms of social, environmental, and economic benefits and impacts, and I think that economic consideration should certainly -- certainly be one of the considerations here.

Now, before I leave the -- the framework for this appeal, I do want to touch on the onus or the burden of proof on the appellant. So I don't have a citation for you, but it's typical in the general law that the burden of proof is on the appellant to actually demonstrate that their issue is -- can be substantiated.

And I would suggest -- and we'll come back to this in detail, but here ISH has failed to meet that burden test in a few ways, but, in particular, on the geological evidence its provided as well as its evidence on faults and fracturing, particularly, the evidence when the Panel goes looking for it, I think it'll find the evidence on those two topics wanting.

Okay. So now I'll turn to the three hearing issues, if I could. So the first issue, of course, was whether or not there's an effective containment barrier in the area of KN06, and in Canadian's view -- Canadian Natural's view, of course, the evidence clearly demonstrates that there is an effective barrier overlying the McMurray formation and consists of post B2 non-reservoir, the regional B1 sequence, and the A2 mudstone. All three of these units can be mapped with core and image logs and will contain steam to within the bitumen zone of the McMurray formation under the approved SAGD start-up and operation conditions.

I want to touch briefly on the 2003 regional geological study. That study established a framework for use in delineating various stratigraphic units throughout the oil sands areas. You heard Mr. Lavigne describe the regional stratigraphy in detail, and I'm not going to review that evidence in detail here except to make one salient point.

Back in 2003 and the time of the regional geological study, only discrete regional mudstones were recognized to provide steam-chamber containment. However, at the time, there was a very limited number of SAGD operations. After almost 20 years of expansive SAGD development, it is now well-established that the silty mudstones overlying the McMurray reservoir acts as an effective containment strata in addition to the

only regional extensive massive low-permeability barriers.

This is not just Canadian Natural's view, but it's well-established by the academic literature which was filed by Canadian Natural in this proceeding, and there I'll point you to Exhibit 30.02, which is Canadian Natural's hearing submission PDF page 76 of 2019 at Tab 15. That's where you'll find the Collins, et al. paper, 2011.

And then we did also file the abstract for the Jablonski 2014 paper that was referred to by ISH in their submission, and that's at Exhibit 63.02, paragraph 16, PDF 10 of 102. One more cite for that, when we brought in the abstract, it was one of our aids in cross-examination. So I'll get that number for you.

Turning now to the three individual stratum that Canadian Natural points to. We want to review the evidence that you have in relation to each one.

So Canadian Natural's evidence with respect to the post B2 non-reservoir. This would be the lowest of the three confinement strata. Canadian Natural's evidence is that the mudstone prone inclined heterolithic strata, or what's known as "IHS," capped those reservoir units within the post B2 incision at KN06. And there's a type log filed at Exhibit 30.02, PDF 69 of 209, Tab 8.

These non-reservoir facies form a wedge-shaped mudstone prone deposit ranging in thickness from 1.4 to 6.4 metres over the entire KN06 drainage box. At KN06, the top of the reservoir is determined to be the point where the vertical permeability is too low to allow steam to penetrate into overlying facies due to high mudstone content. This would be the base of the post B2 non-reservoir. Core photos at typical post B2 non-reservoir facies are shown in Exhibit 30.02 of page 70 of 209, Tab 9. The isopach map of the total non-reservoir post B2 sediment is shown in Canadian Natural's evidence as Exhibit 30.01, PDF 71 of 209, Tab 10.

The temperature data submitted by Canadian Natural clearly demonstrates that steam stops at the post B2 non-reservoir. The reservoir saturation tool, the RST data, is from Canadian Natural's Jackfish property, which is -- which after ten years of production is nearly depleted and confirms that the top of the steam chamber stops within the post B2 reservoir and does not penetrate even in the post B2 non-reservoir facie.

This is significant because what Canadian Natural's actually offering is a package of confinement strata of which the first is completely effective to contain (AUDIO FEED LOST). The additional layers are really redundant and provide extra insurance that the

steam will stay contained. That's how the Panel should be thinking of this. The first one demonstrates. So if you actually take a look -- a good look at Canadian Natural's evidence on the post B2 non-reservoir, it should take high confidence that there is an effective barrier there.

Now, just -- sorry. I lost my -- so did I cover the gas -- I just want to talk about gas chromatography-mass spectometry, the GC-MS evidence, which also suggests that the post B2 non-reservoir barrier is effective to contain steam. The GC-MS data at the 1AA/11-01 wells shows breaks in the hydrocarbon column that demonstrate compartmentalization.

Within the post B2 non-reservoir unit, two clear barriers occur, and for that, I would point you to Exhibit 30.02, PDF 109 of 209, Tab 19, as well as -- Mr. Lavigne covered it in his opening statement, Exhibit 88.02.

Now, there were several questions on cross where, I believe, Ms. Berg was trying to suggest that Canadian Natural had not applied the theoretical model or the pattern that comes with the GC-MS tool, that Canadian Natural was not applying it correctly. We would suggest that that was a complete misunderstanding on ISH's part and that the image shown in Mr. Lavigne's presentation actually demonstrates that there are six barriers throughout the confinement strata as opposed to sort of one linear -- or one connected barrier, as ISH was trying to (AUDIO FEED LOST).

So on behalf of ISH, Mr. Mathison criticized the effectiveness of ISH's confinement strata on the basis that mudstone beds and IHS are laterally discontinuous and sandy. Mr. Mathison seemed to ascribe to the now outdated view that only regionally extensive massive and low permeability formations can act as barriers. We would suggest to you that that was back in 2003, that that was the prevalent view and over the past 17 years has evolved considerably.

Canadian Natural, of course, disagrees with this assessment as the analytical evidence from the operational data from its Kirby South and Jackfish projects irrefutably concludes that the steam is, in fact, being contained by the much -- mud-rich IHS in the post B2 non-reservoir formation.

Turning now to the mid-B1 mudstone. Next, Canadian Natural relies on the B1 sequence that caps the fine-grained non-reservoir facies of the post B2 incision and consists of a heterolithic package of generally bioturbated sandstones and mudstones. In total, the B1 sequence ranges from 7.1 to 9.7 metres in thickness. Upper and the lower B1 units are separated by the mid-B1 mudstone, which is a clearly visible and

mappable mudstone unit discernible in core and on well logs. In the KN06 box, the mid-B1 mudstone is continuous. It's up to 1.4 metres thick. For that, the Panel can turn to Exhibit 30.02, PDF page 74 of 209, Tab 13.

Geomechanical evaluation also confirms that the stress contrast exists between the McMurray post B2 reservoir and the mid-B1 mudstone such that this fracture containment mechanism will work to effectively contain any potential hydraulic fractures during start-up.

Canadian Natural's modelling evidence further substantiates that the mid-B1 mudstone will work as an effective barrier. Rigorous geomechanical modelling of the potential fracture growth was used to demonstrate that the stress contrast in the mid-B1 mudstone is one of the three effective fracture containments. It would be Exhibit 88.02, Slides 50 to 52 of 73.

You heard Dr. Boone speak to a stress gradient contrast of 0.5 kPa per metre or greater being an effective fracture containment mechanism. For that, you can go to the hearing transcript, Volume 3, PDF page 406.

Canadian Natural's DFIT evidence clearly demonstrates that there's a high confidence of a stress gradient contrast greater than or equal to 1.0 kPa per

metre between the McMurray sand and the mid-B1 mudstone. And Mr. Lavigne -- oh, sorry. I'm not sure about the witness, but it was in our opening statement, Exhibit 88.02. This might've been -- yeah. It was Dr. Boone. Slide 44 of 73.

Geomechanical modelling evidence provides a confirmation that the mid-B1 mudstone is an effective barrier to vertical fracture growth. Exhibit 30.02, PDF page 158 to 178 of 209.

ISH agreed with Canadian Natural that the mid-B1 mudstone has the same sealing characteristics as the regional A2 mudstone. Exhibit 63.02, page 12, paragraph 20. Mr. Mathison seems to be arguing now or in the past two days that the mid-B1 mudstone is too thin and discontinuous to effectively act as barrier in the area of the KN06 box.

In ISH's reply submission, Figure 3, it shows a large cutout of the mid-B1 mudstone.

THE CHAIR: Sorry, Ms. Jamieson. Your audio has been cutting in and out. I think you're going to need to go back to Exhibit 63.02.

MS. JAMIESON: Okay. I will. Thank you.

Yeah. I'll go back to -- ISH agreed with Canadian Natural that the mid-B1 mudstone has the same sealing characteristics as the regional A2 mudstone, and that can be seen in Exhibit 63.02, page 12, paragraph 20.

Mr. Mathison now seems to be arguing that the mid-B1 mudstone is too thin and discontinuous to effectively act as a barrier in the area of the KN06 box. ISH's reply submission, Figure 3, ISH shows a large cutout of the mid-B1 mudstone over the KN06 box. Canadian Natural strongly disagrees with this interpretation.

While thin in places, the mid-B1 mudstone is present and can be mapped over the entire box. Further, it is of sufficiently low permeability to act as an effective barrier. The low permeability of the mid-B1 mudstone is supported by core analysis found at Exhibit 48.02, PDF 36, Canadian Natural to ISH IR Response 17.

In Canadian Natural's view, Mr. Mathison's poor choice of datum led to misinterpreting the presence and thickness of the mid-B1 mudstone at the KN06 box. When hung on a properly chosen datum such as the top of the Wabiskaw, the mid-B1 mudstone can be correlated consistently. Otherwise, picking errors occur and other B-1 mudstones are miscorrelated.

Turning to the third confinement stratum, the A2 mudstone. The A2 mudstone has been recognized as an effective seal that lies between the main post B2 reservoir sandstone bodies and the overlying Wabiskaw on a regional basis.

At KN06, the A2 regional sequence is the uppermost unit of the McMurray formation. The A2 mudstone is present over the entire KN06 drainage box with most thicknesses being greater than 0.5 metres with the exception of a small area at the 1AA/12-01 well in the northwest corner of the box where it's been eroded by the Wabiskaw D.

ISH agrees to the sealing ability of the A2 mudstone but appears to have taken issue with its absence in the 12-01 well alleging that that somehow discounts its effectiveness over the remainder of the KN06 box. Again, Canadian Natural disagrees.

Mr. Mathison alleged that the area where the A2 is missing "could be as big as an LSD." In Canadian Natural's view, well data limits -- well data limits the possible area of A2 removal. Mr. Mathison's allegation of an LSD is a gross exaggeration. Even if we were to accept ISH's pessimistic mapping, the A2 mudstone still covers approximately 95 percent of the KN06.

Furthermore, in the small area of the very northwest corner of the drainage box where the A2 mudstone is absent, the remaining confinement strata are still intact. So, in conclusion, on the first issue, I'd like to take you back to Canadian Natural's core evidence from the 1AA/11-01 well which was

explained in detail by Mr. Lavigne.

So that would be Exhibit 88.02, Ms. Turner, if I could have that brought up, and this is PDF page 18 of 73.

MS. TURNER: One moment.

MS. JAMIESON: It would just -- if there was any key evidence that we would like the Panel to go back to and review, it would be the evidence that has been summarized on this slide. And, of course, this is a compilation of Canadian Natural's earlier evidence submitted as part of its hearing submission, Exhibit 30.02, page 69 and 112 of 209, Tab 8 and 22. And it's Exhibit 53.02, which is Canadian Natural's annotated core photos, pages 133 to 139 of 420.

And what the bottom core log really demonstrates is that all three confinement strata are completely intact in this well, 11-01, which is located almost in the centre of the KN06 box. I'm not a geologist. However, I've been told that any reservoir engineer looking at this core data would conclude that there is effective confinement strata at this location.

All right. I'm going to leave that and press on, please.

So with respect -- so that can come down, Ms. Turner, if you're able.

So the other quite controversial issue in the

proceeding was the presence of faults and fractures in the area of the KN06 box. Just by way of background, I think it's important to take a step back. Canadian Natural has been drilling and operating SAGD wells in the Kirby area now for eight years. It has extensive knowledge of the stratographic layers as well as the lack of faults and fractures in this area. Canadian Natural has drilled, cored, logged, including image logs, and reviewed several hundred stratigraphic test wells at Kirby North, including 12 within the KN06 drainage box. It's conducted in-depth analysis of those 3D seismic.

Canadian Natural is intimately familiar with the stratographic framework in this area and can readily interpret the various structural and stratographic features that show up in both the core data and the seismic. Canadian Natural's clear interpretation of the relevant core, image logs, and 3D seismic in this area of the KN06 box is that there are no large faults in the area. Smaller scale faulting, in the order of 2 to 3 metres of offset, of course, is not resolvable -- resolvable on seismic, and Canadian Natural acknowledges that. Structural variations within the KN06 area are, however, clearly demonstrated by the seismic evidence to be a result of differential compaction of post B2 incision sediment combined with

drape effects over pre-existing Paleozoic high formation by erosion.

And, again, this is the second exhibit I'd like to have brought up. So Mr. Sverdahl spoke to this in Exhibit 88.02, the opening statement. I believe it's page 30 of 73.

MS. TURNER: One moment.

MS. JAMIESON: So with respect -- and, again, I just want to draw your attention to the key evidence that substantiates, in Canadian Natural's view, no large faults and very little fracturing in the area. And it would be this compilation of the seismic evidence. And, again, this was pulled forward from Canadian Natural's hearing submission, pages 119 and 123 of 209, as well as Tab 29 and 33.

So a couple of points on this: ISH has been quite critical of Canadian Natural's seismic methodology, alleging, you know, the -- the work wasn't done. That's clearly in direct contradiction to Canadian Natural's evidence, which you will find Canadian Natural is saying they did do a detailed evaluation. They acknowledge they did not show all the 3D data, and that's for good reason. It's confidential data. They showed what they believed demonstrated and supported their contention, and we would suggest it's sufficient.

Now, from this slide, what we want you to take away, just again, is that any structural variation at the KN06 box is really due to differential compaction of McMurray post B2 incision sediment. And that conclusion really hasn't been challenged by ISH. Mr. Vermeulen spoke in terms of not being able to make any conclusion. He was strong in his view that he did not receive enough information to draw those conclusions for himself. But I would suggest, Madam Chair, as well as Panel Members, that Canadian Natural's evidence on the record does demonstrate no large faults or any significant fracturing.

Now, in its reply submission, ISH agreed that no large faults were observed in Canadian Natural's seismic data. There's a statement at paragraph 50, Exhibit 63.02, PDF 28. During its opening statement earlier this week, ISH seemed to backtrack on this position and now appears to be arguing that there could be a fault with a throw of 7.5 metres in the vicinity of the KN06 box. This is based on a 7.5-metre offset in the oil water contact between the 06-01 and the 07-01 well, which they state -- which ISH states are 241 metres apart, indicating that the oil water contact is gently dipping at 1.8 degrees. This subtle structural change, confirmed by Canadian Natural's seismic data, is not consistent with faulting, and at the very low dip, even fracturing would be unlikely.

And to support that point, we ask you to look to Exhibit 86.02, PDF 12 of 23, paragraph 50 to 53.

This simply cannot be a large fault. Canadian Natural has acknowledged that any faults with under 2 to 3 metres of throw would not be detectible on seismic. However, a 7.5-metre fault would be clearly detectible in the seismic, including in the seismic semblance slices provided to ISH, and it's not.

With respect to smaller faults or fractures, ISH seems to be arguing that if there is a large 7-meter fault, then one would expect a multitude of fractures in and around it as well. Mr. Mathison pointed to numerous features in the core data that he identifies as faults or fractures. Again, Canadian Natural strongly disagrees. During its opening statement, Mr. Lavigne walked us all through the numerous features that ISH claims to be fractures and provided more plausible interpretation. Both of these are sedimentary features related to bioturbation that Mr. Mathison has misidentified. Characteristics of some of the alleged fracturing are consistent with it having been drilling-induced. None of the wells illustrated lie within the KN06 box, and, additionally, there are no demonstrable natural fractures in the confinement strata. This is confirmed from the analysis of the 20 image logs provided by Canadian

Natural.

Lastly, even if one were to accept that some of the observed features may be actual faults or fractures, in order for them to be effective conduits for or enablers of steam rise, the faults or tracts need to be demonstrated to be open and have significant hydraulic conduct -- conductivity such that both steam vapour can rise and condensed steam can drain. This was not demonstrated, nor would it be likely for any of the observed features. And, again, this is discussed in the paper Collins, et al., 2011.

And in terms of onus of proof, ISH, as the appellant, has clearly failed to demonstrate, you know, first of all, that faults and fractures exist. But they have to go further than that. They have to actually demonstrate a network of fractures with sufficiently open conduits, sand-filled, that would allow or create the steam to rise to the confinement strata. And there really is no evidence on the record that ISH can point to that gets them that far.

If I could just have one moment. I just want to check my notes on this first hearing issue if I could before I move on.

THE CHAIR: Sorry. Go ahead.

MS. JAMIESON: Thank you.

Thank you, Madam Chair.

So moving forward to Hearing Issue Number 2: risk of fracture. So the second hearing issue is whether the risk of fractures or other breach of the barrier or top seal, as is present, result from Canadian Natural's proposed operations in the KN06 box. Canadian Natural has conducted thorough geomechanic investigation of the risk of hydraulic fracturing at the KN06 box, including analysis of the Kirby North field data, in situ stresses, and geomechanic modelling. The results of these investigations clearly demonstrate that the confinement strata will contain steam and reservoir fluids in the McMurray formation.

Now, focused on the first potential risk, the risk of fracturing during start-up: First, Canadian Natural's evidence demonstrates that the risk of hydraulic fracturing within the post B2 reservoir -- so this is in the sand -- during start-up operations is extremely low. Analysis of the operational data for the prior 96 Kirby North start-ups confirms that fracturing from injection is a very rare event. Indeed, there was conclusive evidence that 95 of 96 wells were started up with no fracturing in the McMurray sands, and the last one was merely a possible fracture. For that, we point to Exhibit 30.02, paragraph 134 to 143, PDF pages 29 to 31.

There are a couple of other important conclusions that can be drawn from Canadian Natural's analysis of the field data. 41 of the 96 wells initiated circulation at bottomhole pressure, BHP, greater than 60.0 MPa. For a -- oh, sorry. This is -- I misspoke. This is a misprint. I think the first one, 41 of 96 wells, were less than 6 MPa. Where start-ups require BHP greater than 6 MPa, they were typically performed for one hour with and with very small injected volumes. That was analyzed in the data provided at Exhibit 30.02, paragraph 144, PDF page 31.

None of this is unusual or pushing the envelope for a SAGD circulation start-up. Same exhibit, paragraphs 171 to 173, PDF pages 38 to 39.

Similarly, the analysis of DFIT and fracture containment mechanisms demonstrate high confidence in the stress contrast between the McMurray post B2 reservoir sand and the mid-B1 mudstone to effectively contain any fractures. Exhibit 30.02, paragraph 144, PDF page 31.

This is one of the three fracture containment mechanisms present within the KN06 McMurray setting. Geomechanic modelling confirms the analysis of the field data and stress contrast -- and stress contrast fracture containment mechanisms.

Just give me a moment.

Mr. Walters, who is an industry-recognized expert

in geomechanics and modelling, demonstrated that the risk of start-ups with bottomhole pressures up to 7 MPa is extremely low, due to the three effective fracture containment mechanisms present at KN06, namely, leak-off, stress contrast, and poroelastic stress increases. Exhibit 30.02, Tab 42, PDF pages 158 to 178; I believe that's his report.

Turning now briefly to Dr. Boone's report. Dr. Boone, who is also an industry-recognized expert in geomechanics and thermal reservoir engineering, was retained to conduct an impartial, independent assessment of Canadian Natural's geomechanic evidence. Using the APEGA risk matrix, Dr. Boone formally assessed the risk of start-up-induced fracturing and concluded it to be low or white risk. And his report is found at Exhibit 30.02, Tab 45, PDF pages 184 to 204.

None of this geomechanic evidence was challenged by ISH during the hearing. I note that ISH did not file its own numerical or quantitative analysis of Canadian Natural's risk assessment, nor did they provide their own. We would ask the Panel to accept Canadian Natural's evidence and conclude that the risk of hydraulic fracturing is extremely low. The weight of that evidence in the face of ISH's perceived -- perceptions of risk as opposed to actual risk should be

conclusive for the Panel.

Now, in its reply submission, ISH presented an alternative, quantified risk, and this risk scenario was a wellbore channel at the 10-01 well, which would lead to souring of both the Upper Mannville II -- so that's the GOB to Wabiskaw B -- and Upper Mannville HH Grand Rapids gas zone. ISH assessed the consequence of this risk to be $2 million. You can find that at Exhibit 63.02, paragraphs 101 to 102, PDF pages 45 to 46.

Canadian Natural's position is that the evidence shows that there is no channel in the cement behind casing of the 10-01 well. The cement bond logs confirm that there is good bond above and below the Wabiskaw and that the Mannville II does remain isolated. The third-party independent reviews of bond logs concluded that, without a doubt, there was definite hydraulic isolation. Exhibit 81.01, PDF 35 of 36.

Now, the parties obviously disagree on this point, but rather -- first of all, what the Panel has in front of it is the evidence of the cement bond logs that do demonstrate integrity. There is also agreement that the 10-01 gas was flowing.

Madam Chair, I'm just being told that maybe I'm not speaking up enough.

So rather than to get into the points of

disagreement, we'd like to make that point that regardless -- regardless of the well-integrity issue, in the unlikely event that a wellbore cement channel does, in fact, exist, it would be repaired, and then the notional risk that ISH has evaluated would effectively be mitigated.

In his direct evidence, Dr. Boone noted that while ISH provided its own corporate risk assessment in its reply submission, ISH failed to consider this simple mitigation option. And to that, we would point to the hearing transcript, Volume 2, page 127 of 224.

There was a third potential risk described by ISH during this proceeding, and that is the long-term souring of the GOB. So when asked by the Panel, ISH described this third concern, possibly souring of the GOB from steam rise or leakage. Canadian Natural's evidence demonstrates that any risk of souring of the GOB is extremely low due to a number of factors, including the presence of the overlying strata barriers and the lack of faults and fractures.

Again, the confinement strata has been pressure-tested, so to speak, with a pressure difference greater than 1 MPa between the GOB and the McMurray bottom water. That's found at Exhibit 30.02, paragraph 131, page 29 of 209.

Since the GOB production was shut in in 2005, the pressure in the gas at the 10-01 well immediately above KN06 stayed constant for 13 years, as was noted in Mr. Leech's report in ISH's reply submission, Exhibit 63.01, PDF 54 of 102 -- correction, Exhibit 63.02.

This sustainment of this upper pressure difference for more than a decade is a demonstration of the long-term effectiveness of the confinement strata as a barrier in this area. This is inconsistent with the ISH claim of natural fracture and fault open conduit.

Additionally, in Table 1 of Exhibit 9.02, which is found at page 82 of 119, it is clear that the AER recognizes that the SAGD operating pressures other than during the start-up will remain between 2.5 and 4 MPa in order to stay balanced with the bottom water. This is a low pressure. These operating pressures are only 42 to 67 percent of the approved 6 MPa maximum operating pressure and so pose little risk to the integrity of the confinement strata over the length of the operation. Therefore, any potential natural fractures or faults will remain closed for the length of the operation.

Additionally, monitoring of the Jackfish project, the RST data that I spoke of earlier, which is a geological -- sorry, a geologic analogue with late-life SAGD operations, shows all steam chambers have been

contained by the first barrier, again, the post B2 non-reservoir, after more than a decade of SAGD operations at many of the wells. And the evidence supporting that statement can be found at Exhibit 30.02, paragraph 78 to 82, PDF 20.

It should also be noted -- and I'll come back to this, but -- that the present value of the Mannville gas is estimated to be 21 -- $21,000 to $620,000. That's Canadian Natural's evidence provided in its opening statement, Exhibit 88.02, PDF page 56 of 73.

Now, we appreciate that is Canadian Natural's valuation. However, it did provide its full methodology to ascertain those numbers, which is in stark contrast to ISH's numbers, which are provided and some assumptions made, but no methodology or description was provided in its evidence.

So -- but just assuming the full value of this gas is lost, which is, of course, highly unlikely, one can still not justify the cost of an observation well or 4D seismic as the cost is comparable to the risk being mitigated.

Finally, we note that Ms. Giry characterized the souring of the Mannville II pool as a "safety issue." And the reference for that is at Transcript Volume 2, page 169, PDF 28 of 224.

The souring of a gas pool is not a safety issue.

Any potential safety issue from H2S would only arise when or if the GOB was actually produced. And then, of course, there are numerous sour gas safety protocols that would be in place to prevent any safety issues. Sour solution gas is routinely produced and handled within both thermal and conventional operations. In fact, the sour gas generated in SAGD operations produced and commonly used as a fuel for steam generation.

I'll pause here and take a moment, if I could, again to check my notes, Madam Chair, please.

THE CHAIR: Sure. So I know you have had some technical issues. We are over an hour now, but, as I say, you've had technical issues. So how close to -- are you to the end of your argument?

MS. JAMIESON: Thank you.

I had lost track of the time. So I appreciate the reminder. I think I'm going to cover the third issue very quickly, and then I have some final comments.

THE CHAIR: Okay.

MS. JAMIESON: The third hearing issue presented by the Panel is whether or not there is a need for an observation well at KN06. Of course, in Canadian Natural's view, there is no need for this observation well. They certainly don't need an observation well. And so the only reason that one

potentially could be drilled would be for the purpose of monitoring the GOB. In Canadian Natural's view, an observation well is not suitable for this purpose or justified in the circumstance.

As just discussed, there is an extremely low likelihood of contamination of the GOB: First, because there will be an effective confinement barrier; and, second, the KN06 box is in a no-fault, low-fracturing environment such that there are no natural pathways or conduits up into the GOB.

Even if there are a few natural fractures, these fractures would need to be open and of a certain size to act as a conduit for steam, which I discussed earlier. The evidence suggests that none of these types of natural fractures exist. ISH is requesting an observation well because of a belief that they would act as early detection and possibly prevent contamination of the GOB.

Mr. Craig explained that observation wells provide monitoring, not prevention. Exhibit 88.02, Slide 56 -- PDF 56 of 73.

Further, while an observation well could be drilled and outfitted to monitor the GOB zone, from an economic perspective, again, this would exceed the value of the gas it is intended to monitor, 600K versus 21 to 620K. We think this is a relevant consideration and should be taken into account by the Panel. Again, back to your mandate, you are and should be taking -- you are -- sorry, you have the jurisdiction and should be taking into account economic effects.

More importantly, there is a more appropriate method of monitoring the GOB, and that is with a gas well. There are four gas wells in the Mannville II gas pool, one of which is the 10-01 well that has received so much discussion. In Canadian Natural's view, the 10-01 -- 10-01 well is the most appropriate because it's -- because it is located in the KN06 box and already has the downhole temperature and pressure gauges installed. Exhibit 30.02, paragraph 11, PDF of -- 5 of 209.

Further, and as stated earlier, the well-integrity issue being raised by ISH is a proverbial red herring and not plausible. As I indicated earlier, the evidence points to sound cement behind casing into the formation. This can easily be verified by a reservoir pressure test of the Upper Mannville HH pool, as described by Mr. Leech, which ISH has not yet performed. That's at Exhibit 63.02, page 53 of 102.

Regardless, even if there proves to be a problem, this well can be repaired and still be utilized as a GOB monitoring well, or, if for some reason it simply

cannot be, there are three other wells in this pool that could also be used to monitor the GOB.

Finally, I want to come pack to Canadian Natural's need for the 7 MPa start-up pressure. Mr. Craig described how Canadian Natural's aim is to circulate and unload the wells as quickly and efficiently as possible. Where conditions are right, they will be able to do that under 6 MPa. And based on the field data to date, this will be in 50 percent or more of cases. However, there will be times when certain wells simply won't unload at the lower pressures due to low reservoir permeability, and, in addition, the 7 MPa start-up pressure is needed to prevent process upsets in the central processing facility.

When asked about a lower start-up pressure, Mr. Craig described the issues faced when wells are not effectively unloaded. He discussed slugs of liquid that are intermittently unloaded from the well. These slugs of fluid cause pause pressure variation in the CPF and are likely to cause upsets at the plant, which, in turn, take time, costs, and often require a reduction in the production rate to deal with that can go on from days to weeks.

Accordingly, Canadian Natural needs the higher start-up pressure and would suggest that the economic impact of a lower, under 6 MPa start-up pressure should

be taken into (AUDIO FEED LOST).

I'll point you to the hearing transcript for Mr. Craig's explanation. Volume 3, pages 398 to 399, PDF 70 to 71 of 165.

On a number of occasions, ISH seems to suggest that this is -- that the 7 MPa start-up pressure will present some sort of undue risk and that a limit of 6 MPa somehow mitigates this risk. Again, all the evidence points to the fact that there is little to no risk of hydraulic fracture upon start-up. Accordingly, this is more of a perceived risk on ISH's part than an actual risk, and we ask the panel to see through this.

Finally, I want to finish off by coming back to the extensive controls and operating procedures that Canadian Natural has in place to prevent an issue. Mr. Craig described these at length as well as Canadian Natural's commitment to adopt enhanced start-up procedures that will reduce the time period for a well operating above 6 MPa, as recommended by Dr. Boone.

Canadian Natural is committed to a geomechanics workshop for operational staff to enhance understanding and awareness of start-up issues and an enhanced monitoring process that triggers expert geomechanical support for wells where pressures over 6 MPa are required during start-up. That's at Exhibit 65.01, AER to CNRL Information Response Number 8, PDF page 27 of

45.

And we would like the Panel to take these mitigation measures or enhancements into consideration when it's thinking in terms of mitigating the risk, if, in fact, there is a risk. These measures are clearly over and above what is needed, given the extremely low risk of fracture on start-up. However, Canadian Natural is prepared to implement them as a responsibility operator using modern methods and as part of their commitment to continuous improvement.

Madam Chair, I think I'm about ten minutes away from finishing up. Shall I proceed, or were you thinking we should take a break?

THE CHAIR: I was thinking more in terms of fairness to both parties in respecting the time limits, so unless --

So, Ms. Howden, do you need a break? I'm looking at our court reporter.

THE COURT REPORTER: No. I'm okay.

THE CHAIR: Okay. So if you can finish in ten, Ms. Jamieson, let's proceed. I'll note that you do -- you are still coming in and out a bit because I noticed Ms. Howden struggling sometimes when you seem to fade out or disappear.

THE COURT REPORTER: Yeah. It's just a word here and there that I can't hear. Like right now, I can't

hear anything. Oh, you're muted maybe.
MS. JAMIESON: I am going to speak right over the telephone in front of me, and let's see if that improves things. And if not, I will repeat anything that you need me to for the transcript (AUDIO FEED LOST).
THE CHAIR: No. We can't hear you at all now.
MS. JAMIESON: Madam Chair, can you hear me right now?
THE CHAIR: I -- yes.
MS. JAMIESON: Okay. I'm going to just try to finish up. We'll just have to make do here if we could.
Yeah. So I would like to encourage the Panel just to take a step back. As I mentioned in my instruction, the Panel certainly can take a broader view, take a look at its larger mandate as well as the broader conclusion. The first comment I would like to make is that SAGD operations have been occurring in the Fort McMurray area since 1996, 24 years ago. Since that time, Canadian Natural has been a significant contributor of SAGD development, having drilled and operated 300-plus wells, all without any known incidents of lost steam to other formations during circulation, start-ups, or continuous SAGD operations.

The GOB proceedings took place in 2004 and 2005 and led to the shut-in of certain gas pools in order to avoid further impairment of bitumen recovery, including the Kirby Upper Mannville 2 pool directly above the box -- KN06 box. Further, as a result of the GOB decision, gas producers were extended compensation for the shut-in gas through the Alberta Energy royalty adjustments, as outlined in the "Alberta Natural Gas Royalty Guidelines."
For the Kirby Upper Mannville II pool, Canadian Natural's accounting records indicate that compensation of approximately 5 million was provided in royalty adjustments to Canadian Natural and ISH relating to the shut-in -- shutting in of the pool.
Another consideration that I mentioned earlier is the value of the remaining reserves. Canadian Natural's -- in Canadian Natural's estimation, the value of the gas remaining in the pool is 21 to 620K. ISH provided evidence of the value of the gas remaining in the pool of $2 million. We are asking the Panel to keep these values in mind when it considers the monitoring options ISH has brought forward as very few of them can be justified in light of: One, the value of the remaining reserve, in particular, the value of the remaining gas reserve does not justify the approximate cost of 600,000 to drill and equip a SAGD

observation well; and, two, the efficacy of the additional monitoring with further risk reduction.
Finally, it is -- one other aspect that we ask the Panel to pay attention to is that the mineral rights in the gas pool, the Wab B, are jointly held, 53.75 percent by Canadian Natural and 46.25 percent by ISH. As a joint majority owner, Canadian Natural has a mutual interest in protecting the gas pool.
And, finally, while it's recognized -- it's critical to recognize that the KN06 box is part of a much larger scheme, the Kirby North project. The Kirby North project is well underway and ultimately will recover 377 million barrels of bitumen. And Mr. Iannattone, in his opening statement, highlighted the economic benefits of the Kirby North project to the citizens of Alberta, including 1.2 billion in net present value royalties to Alberta as well as 133 million a year in jobs and contracts for operations.
And, again, we're not suggesting that this excuse anything, but we're saying the Panel should be taking into account the economic benefits and costs of the KN06 box. To date, Canadian Natural has executed on 96 SAGD wells at the KNO2 to KNO5 boxes, all within the same confinement and without any instance of lost steam to other formations.

Mr. Iannattone also spoke of Canadian Natural's strong commitment to operational excellence, as well its -- as to its culture of continuous improvement.
So based on our written and oral submissions in this proceeding, the depth and technical expertise that Canadian Natural -- Canadian Natural brings to the table to these issues, in our view, is clear and extensive. Canadian Natural is highly invested in SAGD development and is engaged in developing these resources at a time when economic development is needed in this province.
I believe I'm done, Madam Chair. But if I could just take a moment and consult with my client to make sure.
THE CHAIR: Go ahead.
MS. JAMIESON: Just one last comment, Madam Chair.
Ms. Berg spoke in terms of -- I think it was in response to a question from Ms. McKinnon -- in terms of whether or not the Panel should be taking into account the economics. And at one point, she asked the question: Is there a point where too much -- there's too much economic burden or cost to the operator to provide and how that should be considered in the context of the AER's larger mandate? And in response, Ms. Berg started speaking about, you know, how

commercial parties make commercial decisions, that type of thing, and then spoke in terms of -- that -- in terms of any costs or burden on Canadian Natural from, say, monitoring should not be put -- not flow through or be put on Alberta taxpayers. And I just wanted to bring to the Panel's attention, when they're weighing these economic considerations, that every dollar Canadian Natural actually spends is deducted against the Crown royalty payments. So that does ultimately impact the Government of Alberta's intake, which goes to the public interest of Alberta, and we do think this is a consideration. If, in fact, the mitigation and monitoring measures that Canadian -- or, sorry, that ISH is requesting and proposing were appropriate or needed in any way, this would not be an issue. But, from Canadian Natural's perspective, there is an extremely low risk that anything is actually going to impact the GOB, and, therefore, expensive monitoring or mitigation measures just cannot be justified, in our view.

Thank you, Madam Chair and Panel Members, for your patience. And I -- that does conclude my closing remarks.

THE CHAIR: Thank you.

Commissioner McKinnon, any questions?

MS. MCKINNON: I have no questions. Thank

you.

THE CHAIR: It's hard to unmute myself when I jump around like that.

Commissioner Zaitlin, any questions?

DR. ZAITLIN: No. Thank you.

THE CHAIR: No. And I don't have any, either.

So, Ms. Berg, in terms of the reply, I think on the schedule that we had circulated, we had no break in between, but I'm going to propose just a short ten-minute break before we come back for your reply. I'm assuming you have a reply?

MS. BERG: I do have a brief reply, yes, and I would like to confer with my clients to ensure that I cover everything, so I would appreciate a ten-minute break.

THE CHAIR: Okay. So we'll take a ten-minute break and be back at 12:20.

(ADJOURNMENT)

THE CHAIR: We're back and live. Although I didn't expect it based on the forecast, the sun has broken through the clouds, and my blinds aren't able to totally keep it out. So I'm going to be basking in the glow one sided here.

Ms. Berg, whenever you're ready.

Closing Remarks by ISH Energy Ltd.

MS. BERG: Thank you, Madam Chair.

So at the outset, Ms. Jamieson began her remarks by indicating that it's her understanding that -- this morning when I referred to the umbrella application that I was suggesting that the entire 11475 scheme be set aside. That's not the case. Apologies if that was not clear.

When I referred to an umbrella application, essentially what I was referring to was getting an overall approval with the others going through on almost exactly the same basis. And what I am saying is that with regard to Approval 11475EE, we have considerations -- particular considerations on the geology here that mean that it just can't be easily tacked on to the other earlier approvals with no additional consideration. So just, again, to clarify, the only approval under appeal here and that we are addressing is the 11475EE approval.

So with regard to some of Ms. Jamieson's remarks regarding application de novo, insofar as it is an application de novo, it is still necessary for CNRL to demonstrate that it should get its approval on the same basis as -- as it was initially provided.

And it's our submission that -- that, one, the approval -- the information that's been provided is such that -- that the approval should not have been

granted, and it should be rescinded and -- and CNRL should take steps to reapply or alternatively -- and, absolutely, this -- this Panel has the ability to assess the evidence before it and determine whether additional mitigations should be put in -- in place with regard to this approval under appeal.

So with regard to Ms. Jamieson's submissions regarding the use of the reasonableness tests, we agree that the reasonableness test is the test that is applicable here. And I submit that having regard to the evidence before you in this proceeding, that -- that there is strong evidence that -- that this approval should either be modified significantly to increase the mitigations or alternatively, as we've already noted, rescinded.

With regard to -- and I don't have the decision in front of me, but Ms. -- I believe Ms. Jamieson referred to a decision that was cited in the -- in the -- in the AER decision that granted this appeal with regard to bitumen owners being allowed to interfere or waste gas, and -- and there is -- I thought that the decision-makers -- it's my recollection the decision-makers in that initial AER decision addressed the law on that properly and that parties need to take reasonable steps to ensure that -- that bitumen owners need to take reasonable steps to ensure that -- that gas is not wasted. There isn't some carte blanche ability to waste gas.

Now, Ms. Jamieson also made note of comments that I made regarding the waste and destruction of gas and advised that, you know, CNRL's operations will not ultimately waste or destroy any of these resources. But the bottom line is that the GOB won't -- won't be produced if there is a significant breach of the zone. That gas can be and in other projects, I understand, has been destroyed by significant breaches of the GOB zone.

With regard to the souring, there -- there is also a significant cost that goes into treating gas that is soured, and so I -- I think that -- that our earlier submissions on the point are relevant. We -- ISH -- ISH is engaged in this proceeding because it has real concern about its future ability to produce that resource. It is concerned about whether that resource will continue to exist in the same form when it is finally allowed to produce it.

And just -- if I may, I'd really like to -- Ms. Jamieson talked about the onus and -- and the burden of proof being on the appellant and -- and apologies to Ms. McKinnon because I think that that is obvious, and I -- I should have gone there at the outset with her question.

But there's an additional step when engaged in an appeal. Now, obviously the initial -- the initial onus is on the appellant. The appellant needs to substantiate what -- what it -- its concerns are. It needs to substantiate, in this case, that there is a problem, a significant issue with the -- with the issuance of this approval.

But there's a point that the onus shifts back, and I submit that we have reached that point in this appeal. We have used core. We have used the -- the substantial -- there's been substantial evidence provided on core that indicates a lack of a barrier and fractures and potential faults. There is oil water contact information, and there's limited seismic information that also suggests -- that's consistent with the -- the core data and the oil water contact data and some of the other well log data that is on the record.

So there -- there is significant evidence that there is a problem, and CNRL is the entity that has the seismic data that could put -- could have put that issue to rest. That onus, I submit, submitted back to CNRL, and CNRL by not providing information that was explicitly requested by ISH, I would submit, failed to -- to meet its -- its onus, which, again, I -- I would submit has shifted back to CNRL.

And then, finally, I -- I would like to go back, Madam Chair, to your question regarding the GOB order because I discussed it with my clients over the break, and I think I may have misunderstood your question. If you're referring to whether you -- whether the AER should consider the economic implications of the GOB order -- and is that fair? Is that -- was that what was underlying your question, or ...

THE CHAIR: No. What was underlying my question was whether there is any -- within the legal framework that we'll be using to make our decision, is there anything that we should be looking to or that suggests that we should be taking into account the fact that ISH is bound by the GOB order and, for the time being anyway, prevented from doing anything with that, from producing that gas?

MS. BERG: Well, I would simply note that -- that ISH wants the opportunity to produce that gas in the future. The gas over bitumen decision, I think it's fair to say, was -- was largely a win for the -- for the bitumen producers. ISH has provided evidence on the record, I believe, at IR Number 9 of the AER IRs indicating its past lost opportunity for four wells in the area of approximately 4.5 million, and there will be future lost opportunity as well.

And so I guess insofar as you are taking into

account economic considerations, I -- I would submit that -- that it would be fair to -- to have regard to that.

And I believe that those are my submissions. Yes.

THE CHAIR: Thank you, Ms. Berg.

So I'm going to suggest that anybody who is on our Zoom team on the Zoom call, if you want to turn your cameras on, one, we'll see how many people are on Zoom with us at the moment, and, two, then I'll give my closing remarks, although, of course, I'm not going to know when everybody's on. But yes -- and to be clear, I'm also -- there we go. I was going to say, to be clear, I'm including AER team as well. Is that it? Well, I'll go ahead, anyway. Everybody else may just be listening.

So I want to thank you all very much for your participation. I would like to convey the Panel's appreciation of your flexibility and your willingness to participate in this hearing by Zoom. As I say, it's the AER's full Zoom-based hearing. So I would invite and, in fact, encourage you to provide any feedback you have about the electronic format and how that worked. And, specifically, if you've got any suggestions for how it might work better to our hearing services department -- because we do have other electronic hearings coming up, and continuous improvement is certainly something that the AER pays attention to as well.

And no change is too small. So if the suggestion is, you know, people should get detailed instructions about how to get in and out of breakout rooms without being sent or pulled out, that's fair game.

So you've provided us with a great deal to think about over the last few days. The Panel will review and consider the evidence and submissions made, and we'll make our decision on this regulatory appeal.

We know Canadian Natural is anxious to have a decision before the end of the calendar year. The Panel has 90 days in which to issue its written decision. If we have a decision that is ready to go, in our view, before 90 days, we won't hang on to it. We will issue our decision when it is ready. Each of the parties who have participated in this hearing will receive a copy.

And now the hearing is closed. Thank you.

PROCEEDINGS CONCLUDED

CERTIFICATE OF TRANSCRIPT:

We, Sarah Howden and Andres Vidal, 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 16th day of October 2020.

Sarah Howden, CSR(A)
Official Court Reporter

Andres Vidal, CSR(A)
Official Court Reporter