



TRANSCRIPT OF PROCEEDINGS

East West Link Proposal

**HEARING at
HUNTERVILLE ROOM, ASCOT STAND,
ELLERSLIE EVENT CENTRE,
80 ASCOT AVENUE,
REMUERA,
AUCKLAND
on 9 August 2017**

BOARD OF INQUIRY:

Dr John Priestley (Chair) CNZM QC

Mr Alan Bickers (Deputy Chair) MNZM JP

Mr Michael Parsonson (Board Member)

Ms Sheena Tepania (Board Member)

Hearing Proceedings

Day 26 Wednesday 9 August 2017

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[9.02 am]

- 5 DR PRIESTLEY: Thank you. Now, counsel and members of the public, the programme for today is Mr Erskine being cross-examined in the main it would seem, by Ms Devine. He's your witness, isn't he, Mr Mulligan?
- MR MULLIGAN: Yes, sir.
- 10 DR PRIESTLEY: Then we've got the two Transpower witnesses. Who is representing Transpower today?
- MR GARDNER-HOPKINS: Mr Gardner-Hopkins.
- 15 DR PRIESTLEY: You have come back up from Wellington?
- MR GARDNER-HOPKINS: I have.
- 20 DR PRIESTLEY: We are greeting you with typical Auckland winter weather, I do apologise for that. You probably won't be on with your witnesses for a couple of hours I wouldn't imagine but we can see whether we can sort that out before lunch. Are they available?
- MR GARDNER-HOPKINS: Yes. Yes, they are. They are here and they are hopeful of getting through their evidence today.
- 25 DR PRIESTLEY: Have you settled your Court of Appeal case yet?
- MR GARDNER-HOPKINS: I haven't yet, we're still working on it.
- 30 DR PRIESTLEY: You are working on it?
- MR GARDNER-HOPKINS: Yes.
- 35 DR PRIESTLEY: Well, if there are any developments let us know because it could tweak slightly the substantive law and, as I said yesterday, the Board has to put much greater weight on Court of Appeal judgments than it would Environment Court judgments, even though that may be heresy to some in the room but that is the reality of a stare decisis system. Thank you very much.
- 40 Right, swear in Mr Erskine, please. Is it Erskine, is that how you pronounce your surname?
- 45 MR ERSKINE: Erskine, yes.
- Mr Erskine (sworn)
- DR PRIESTLEY: Mr Mulligan.

MR MULLIGAN: Yes, sir, and thank you for I suppose the allowance in terms of the intervention. This is perhaps the beginning of the evaluation of the Mercury issues which will be this week with Mr Erskine and then next week Mr Erskine has responsibilities in Australia so that is why he is today and has become a firm fixture in terms of today and the cross examination.

[9.05 am]

Mr Erskine, can you give your full name to the Board.

MR ERSKINE: Michael George Erskine.

MR MULLIGAN: Where do you work, Mr Erskine?

MR ERSKINE: I work in GHD's Melbourne office in Australia.

MR MULLIGAN: And what is GHD?

MR ERSKINE: GHD is a consulting engineering organisation that provides services to a wide range of clients.

MR MULLIGAN: In terms of the East West Link, what's been your role in relation to this particular project and your role in terms of the evidence that has been presented to the Board?

MR ERSKINE: Sure. My role here has been to provide the risk services and support for the team here.

MR MULLIGAN: And as part of that role did you prepare a statement of rebuttal evidence dated 28 July 2017 which addressed risk issues arising from the Southdown Power Station?

MR ERSKINE: Yes.

MR MULLIGAN: And attached to that was there are risk assessment of the Mercury Southdown site?

MR ERSKINE: Yes.

MR MULLIGAN: Do you confirm that evidence is true and correct to the best of your knowledge?

MR ERSKINE: Yes.

MR MULLIGAN: Did you prepare a summary of that evidence for today's proceedings?

MR ERSKINE: I have.

MR MULLIGAN: Can you read from that, please?

5 MR ERSKINE: Yes. Okay, so here is the summary.

10 "So my role in the project has been to provide the extra technical advice of the risks that are relevant to Mercury Energy's Southdown Power Station and the proposed location of the East West Link highway across that site. So I participated in the facilitated meeting of experts held on Thursday, 13 July this year in Auckland.

15 After that meeting I prepared a risk assessment of the nominated hazard scenarios identified in Mercury's evidence and during the conferencing. So in terms of corrections since preparing my evidence I have noted the following errors that I would like to correct.

20 (a) Page 8, section 4.2 of the risk assessment has a cross referencing error which can be deleted.

(b) Page 12, table 7 of the risk assessment, the gas hold up figure is identified as an assumption in that text but I would point out that it was based on information supplied by Mercury by email.

25 (c) In the evidence, page 17, 10.1(b) gas venting from the turbines, there is just a clarification that all three vents would need to be considered in the exercise going forward.

30 A summary of the risk assessment. A risk assessment has been undertaken on a conservative basis which will most probably elaborate should there be questions about that. When an updated study or examination is undertaken based on detailed design the risks are likely to be lower, ie we would be expecting bit less risk. The hazards identified by Mercury in its evidence ..."

35 DR PRIESTLEY: Just pause there for a minute, Mr Erskine. This is my ignorance but conservative is a term which largely reflects what one is trying to conserve, I suppose. But would I be right that a conservative basis is that you have done an assessment weighting the worst-case scenarios, is that right?

40 MR ERSKINE: Just as a pipe designer or a structural engineer would leave margin in their design so we would leave margin in our risk for the overall protection of everybody, yes. So it's in that sense we would consider worst case so that with the uncertainty of knowledge that we have we always try and target that region.

45 DR PRIESTLEY: I think I understand it but I will ask a supplementary. Does that mean that identified risks in the assessment of anything overweighted rather than underweighted?

MR ERSKINE: Correct.

DR PRIESTLEY: Right, thank you very much. You are starting on paragraph 5.

5

MR ERSKINE: Indeed.

[9.10 am]

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"So the hazards identified by Mercury in its evidence and then further raised at the conferencing are the catastrophic failure of a disc within the gas turbine generator, the generator retaining ring failure, natural gas released from the turbine gas valve train, natural gas release from First Gas assets comprising the pigging station, metering and supply and the pipework. CO₂ release due to the fire mitigation drenching system, fire or explosion at the Southdown site, ignition of electrical gear which would be a sub-component, transformer oil fire, ignition of flammable or combustible material, chemical energy release from proposed battery storage.

15

20

Another scenario is the falling debris, ie plastic bags, tarpaulins or other material from impacting on the Southdown site from the East West Link elevated road, vehicle incident collision impacts on the Southdown site from the elevated road.

25

The other scenarios are the frequent tripping of the turbine due to road vibration carrying through to the site, heat plume generation from the engines in the chimney stacks, compromised emergency response due to the location of the EWL road and/or support structure.

30

The methodology that we used is as follows. Risk is the possibility that harm might occur when someone or something is exposed to a hazard. Of course a hazard is a particular event or situation or even a procedure or chemical that could give risk to this potential. So it is the potential of offsite facility due to identified hazard scenarios such as a release of gas or the failure or release of turbine component and the potential for operational disruption to Mercury's site due to an event such as a vehicle going over the East West Link barrier and dropping on to the site. The consequence is an offsite fatality or an operational disruption.

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Risk is the probability of the event multiplied by that consequence. So the probability of so many fatalities. So fatality risk is expressed as a potential loss of life, which is the fatality rate per year. That is the benchmark that risk practitioners use, for example, one fatality every 100,000 years. That is an average frequency of return if we express it that way. We normally express it by its inverse.

45

To assess the acceptability and tolerability of the level of risk I have

5 used the Victorian Interim Risk Criteria Tolerability and Acceptability values for that offsite risk shown in table 1 below. Work Safe New Zealand guidance indicates that the Victorian Interim Risk Criteria Tolerability and Acceptability values can be used as a guide for indicating the level of acceptable societal risk."

That societal risk, by the way, is the effect of a facility on the surrounding society. Okay.

10 "My review of the New Zealand Acts and regulations with regard to safety indicated that whilst the facility itself is not a major hazard facility, the tolerability criteria that he used for such facilities can provide good indication as to the acceptability and tolerability of the risks of the co-location of the EWL within operational Southdown site.
15 The risk criteria I have used can be applied to an exposed offsite population to determine contour zones around a facility where a certain hazard may be present an acceptable, tolerable or unacceptable level of risk."

20 That is what we are out to look for.

"These contours are expressed as offsite values as outlined in the table below."

25 So in table 1 you can see the values and, as I alluded to earlier, they are expressed as an inverse of that one in 100,000 type value.

30 "In this case the risk is less than 1 by 10 to the minus 7. One by 10 to the minus 6, of course, is 1 in 1 million, so 1 by 10 to the minus 7, 1 in 10 million. Tolerable region: 1 by 10 to the minus 7 through to 1 by 10 to the minus 5. That is tolerable if all reasonably practicable steps to reduce the risks are undertaken, or unacceptable is when the risk is higher than 1 by 10 to the minus 5."

35 Okay.

DR PRIESTLEY: Would you just pause there for a moment? Well, finish your

explanation of the table and then I will ask you a question.

MR ERSKINE: Sorry?

5 DR PRIESTLEY: Finish your explanation of your table, if I have cut in --

MR ERSKINE: Yes.

10 DR PRIESTLEY: You have finished your explanation of table 1?

MR ERSKINE: Yes.

DR PRIESTLEY: Looking at paragraph 7 --

15 MR ERSKINE: Seven, yes.

DR PRIESTLEY: -- you say that you reviewed New Zealand's Acts and regulations with regard to safety.

20 MR ERSKINE: Indeed.

[9.15 am]

25 DR PRIESTLEY: New Zealand's health and safety legislation underwent considerable change with effect from about 18 months ago. Were you able to review that?

30 MR ERSKINE: To a certain extent, yes. We did a search on that and the information that we found, as of about a month and a half ago, was that that legislation still pointed towards the Victorian interim risk criteria and the guiding thinking. The broader Commonwealth understanding of risk is to get the risks down to a level of tolerability or acceptability through the technique of so far as is reasonably practicable. So, in other words, if the effort gets you good return on risk reduction it is worth to do. So the UK HSC guidance gives a disproportionality factor along that line of equation so, whilst those numbers get you in the range, the insofar as practicable approach says, "Go to the point where it's just beneficial to do but you need to get down to a reasonable level as an initial guidance".

40 DR PRIESTLEY: One of the big systemic changes was that identification and mitigation of health and safety risks in New Zealand now is no longer the sole preserve of management, but it is an issue to which boards have to turn their minds on a regular basis. It just can't be delegated to the CEO or GM. The result of that has been to sensitise, I suppose, boards to health and safety risks, which is doubtless something which is in the mind of the current board of Mercury Energy and also, of course, NZ Transport Agency. So it's an area where people are a little bit more sensitive and

alert than was the case two or three years ago. You appreciate that culture shift?

5 MR ERSKINE: Right. Yes. That is a culture that we have embraced in Australia and it's good to hear that. Certainly having read Mercury's risk framework I see that they embrace that and have done so for a while with their public information that I could read, yes. So the boards have their risk management framework and if they are updating that from your recent shift in legislation, hopefully they're reflecting the tolerability values that your society puts on the value of a life here in New Zealand, the value of statistical life, which the NZ Transport Agency has published.

10 DR PRIESTLEY: Right. My final question is relating to the table. Because I became mathematically challenged at about the age of 16 and abandoned that discipline, I do understand I think what the risk of 1 death in 100 years is in that table but can you just put into a nice numeral for me the unacceptable risk change at the bottom of the table, one death in what?

15 MR ERSKINE: One death in 1,000 years is 1 by 10 to the minus 5.

20 DR PRIESTLEY: Is that unacceptable then?

MR ERSKINE: Above that level of risk. That is the borderline.

25 DR PRIESTLEY: That is the cut off?

MR ERSKINE: That is the cut off, the threshold of the Victorian interim risk criteria. You will note in brackets in that table - and I should point everybody to that - that is location specific individual risk. Just to draw upon the mathematical position that you have outlined there, that is for a person to be standing at that perimeter 24 hours a day, 7 days a week, 365 days a year. They would have to stand there and that is the risk. What we then have to do is summate the number of people in a region around to find out what the actual fatality level would be.

30
35 **[9.20 am]**

40 So this is a risk-specific term. I don't want to bog you down in that too much but it is a specific term by which we generate contours. We use that as a stepping stone for final figures, take it as that. Sometimes we use it as a criterion. Sometimes it's a stepping stone to final fatality values that we might use in our calculations. Okay. I appreciate it is complex so feel free to keep asking a few times over.

45 MR BICKERS: I am going to accept that invitation. Mr Erskine, I just need to

understand this table a little bit more.

MR ERSKINE: Table 1?

5 MR BICKERS: Table 1. I guess my familiarity with risk management has been based on the New Zealand standards where you do look at probability, and consequence and an organisation conventionally calibrates different levels of probability and consequence. I think NZ Transport Agency has such a matrix. So when you determine probability and consequence, you then go into the matrix and it will identify the level of risk and that will lead to certain management. Now, as I read the technical report, I was keeping up with it to the figure 1 where there was an analysis of consequence and frequency. In paragraph 7 of your statement this morning you said that:

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15 "The risk is the probability of the event multiplied by the consequence."

20 I want to know whether you mean that in mathematical terms or whether you mean that in a general sense, because we have a dimensional issue here to think about and I am unclear about the dimensions. So that when we get to the offsite risk in the table, I am not clear how what dimension we are talking. You explained to us a little bit about that, but I am interested in how we go dimensionally and a dimensional analysis from probability and consequence and then arrive at this table.

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MR ERSKINE: Okay. Back in the good old engineering days we were taught that one must keep the units and dimensions consistent all the way through.

30 MR BICKERS: That is the way I remember it too, yes.

MR ERSKINE: That's good. Strangely enough in risk, many times in studies I have found people have made errors by multiplying frequencies by frequency, so a frequency might be probability of fatality per year and you can't multiply it by another one. You can only ever multiply a frequency by a probability, so that your end product is an ultimate frequency for the fatality potential. We have to look at the frequency of, say, a turbine throwing a disk. So that is the disk rate per year value, multiplied by the probabilities or the parameters around it getting through a shroud or a casing and making some sort of contact with the road, then with the probability of exposure of a person being on the road, finally with the fatality potential of that impact concluding the calculation.

40
45 We must always check that those units and dimensions, as you say, are consistent with the end product of fatality per year equivalent rate. Now to make it just a little bit clearer, as you mentioned with the NZ Transport Agency risk framework, and indeed with Mercury or other

frameworks, the management say, "Well, what is the equivalence of one fatality versus some number of injuries?" And it may be that ten major injuries for some organisations is equivalent to one fatality. So we summate the potential outcomes to give a fatality equivalent value as well.

Now, you ask many questions. Hopefully, the thread of keeping the units consistent, equivalencing the output to get an equal basis of values at the end is what we seek to achieve, so that you now are able to prepare and add the final figures so that you get a risk dose or aggregate value just like you would get a dosage of solar radiation that may give rise to cancerous cells in the skin.

[9.25 am]

MR BICKERS: So let me understand that. In terms of consequence, it can be fatality. It can be multiple serious injuries or even multiple minor injuries, and somehow you --

MR ERSKINE: Equivalence.

MR BICKERS: Yes. You create an equivalence which then aggregates to provide a consequence value.

MR ERSKINE: Correct.

MR BICKERS: Right. Where does that come from? Where does that equivalence calculation come from?

MR ERSKINE: That is an interesting one. Different societies equivalence in different ways, so we utilise whatever is the guiding document for us in our assessments. Some road authorities use the ten serious injuries and a serious injury can be quite a spectrum of things so, again, it is an approximate value to be considered of a major injury, could be loss of arm, or leg, or some impairment of many sorts, to give one fatality, it's how society ranks it, or the organisation views that.

MR BICKERS: I'm thinking, in terms of highway design traditionally, looking at benefit cost analysis, one would look at the accident record on a stretch of highway in terms of fatalities and injuries, and as you have already alluded to, the road controlling authority has a statistical value of life, which is always arguable - our Accident Compensation Corporation often disagrees with that figure - but those matters summate to statistical value of life that goes into a benefit cost analysis in a conventional way. Are you saying this is the same approach? Is that right? Or a similar approach?

MR ERSKINE: Similar in principle, let's say that, because the quantitative approach

may look in a little bit more detail.

MR BICKERS: Whose equivalence standards have been applied in this case?

5 MR ERSKINE: I shall just have to have a look at detail on that one. Just bear with me. I think we had stated, from memory, the ten major injuries to the fatality equivalent.

10 I haven't seen it explicitly here. I've taken note of it and if possible I could come back. There's quite a significant amount of numbers and material.

MR BICKERS: Is it NZ Transport Agency's or is it some other guidance document? So the dimensions of Table 1, in terms of the offsite risk, so the offsite risk we are talking about is the risk on the proposed East West Link and the dimensions of that are fatalities per year. Is that correct?

[9.30 am]

20 MR ERSKINE: Yes, that's right.

MR BICKERS: I am unclear where that derived, in terms of the green, orange and red - easiest way to describe it - did that fall out of the Victorian interim criteria?

25 MR ERSKINE: Yes.

MR BICKERS: Okay. All right.

30 MR ERSKINE: So it is directly out of the Victorian Interim Risk Criteria and their guidance note document to that effect, which I think we have a copy that could be made available.

MR BICKERS: You are saying that WorkSafe New Zealand has said that in the absence of any New Zealand-specific criteria, that it is acceptable to use the Victorian criteria.

MR ERSKINE: Yes, that's right.

40 MR BICKERS: Okay. That's very helpful. Thank you.

MR PARSONSON: Just building a little bit on the questions around equivalence standards, in this case we have a situation where, am I correct in understanding the equivalence standard in risk is based on the NZ Transport Agency as an organisation, it's determination of what those should

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appropriately be. Is that correct?

MR ERSKINE: Sorry?

5 MR PARSONSON: Is your assessment of risk and equivalence standards based on the NZ Transport Agency preference or criteria for those factors?

10 MR ERSKINE: We took the WorkSafe New Zealand guidance for major hazard facility for offsite risk, which pointed us towards the Victorian interim risk criteria. The NZ Transport Agency values - I'll just see if I can dig them up - they were very project oriented as distinct from operational, so we did find some limitations in that framework.

15 MR PARSONSON: I guess the background to my question is how does that take account of the equivalence standards in risk that may be determined as appropriate by Mercury Energy as the potential source of the risk, of the hazard, and potential liability that may fall upon that organisation.

20 MR ERSKINE: For very low probability and high consequence events such as this, the qualitative matrices do struggle a little bit so you have to go to the acceptability values for land use and planning. Australia had generated the Victorian criteria. There are some other values that are used. The UK also used similar. They are much more valid for the very high consequence/low probability values that are needed to make these sorts of assessments. The normal matrices might say 1 in 20 years, or 1 in 25 100 years and they might say it is a medium risk, but if it's 1 in 100,000 years, those matrices, the qualitative ones, struggle. Oil and gas companies, because they can have very major consequence ones, tend to put numeric values like 1×10^{-4} , etc, because if you have a deep-water horizon event, there can be major consequences that have to be 30 very strictly guarded for. So society has that potential; you really need to go to these deeper, more quantitative frameworks, if you like, the societal ones, which is a different value, by the way, sometimes, to 35 onsite values that organisations have. The more elegantly managed frameworks, with larger multinationals, tend to have very good articulation of the offsite values as well, that recognise the regulatory requirements that take precedence.

40 MR PARSONSON: Does your analysis reflect that approach?

MR ERSKINE: Yes.

MR PARSONSON: And recognition of the particular site that we are dealing with?

45 MR ERSKINE: Yes. So we are looking more at what the societal value is that you

place upon this.

DR PRIESTLEY: I think those questions from the Board took you into some of the substance of paragraph 9, but you may want to take it up there.

5

MR ERSKINE: It did.

10

"Risks in the broadly acceptable region are considered to be allowable by society or authorities and require not additional risk management controls.

15

Risks within the tolerable region are considered to be allowable by society or authorities provided reasonably practicable risk management controls are in place that take into account societal, political or economic costs."

[9.35 am]

20

And I would add that in some areas there are prescriptive requirements by codes or standards, depending.

25

"This means that provided the costs are not disproportionate to the risk reduction, all risk management controls should be implemented within the tolerable region. So risks in the unacceptable region are not allowable by society must be eliminated or reduced through the implementation of risk management controls. So the risk examination that I undertook has been done qualitatively for the CO2 bypass air and general building fires as this is the level that is suitable for those particular scenarios, unless the results from that initial examination indicate further investigation should be required. Some semi-quantitative study was also undertaken to be able to calculate the fatality potential for the turbine and generator ring scenarios. A quantitative study was undertaken for the gas pigging station and metering supply let down equipment as is standard practice where a more accurate determination of fatality potential can be calculated. The nominated hazard scenarios identified by Mercury in relation to the proposed location of the East West Link are either acceptable ie low or negligible, or tolerable, such that they can be suitably managed so far as is practicable, such as relocation of the gas pigging and metering.

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Turning to each of the hazards ..."

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MR BICKERS: Just before you leave that, paragraph 10 "semi-quantitative"? Would you just like to explain that, please?

MR ERSKINE: Sure. In the field of risk, we do not always have perfect information at hand so we must take effort to try and reasonably understand those

5 figures. So I have come from highly quantitative disciplines into the
discipline of risk work. So what we do with the semi-quantitative study
is we look at the data that is available to us for the particular situation.
So we have identified the parameters or variables that matter, we go
and look for data that we can fruitfully use to try and construct some
understanding of the risk. That may be from fundamental data that we
may have available. Just to help you understand, say for the turbine
and the other components, we might find information from libraries of
10 risk failure data, such as the offshore reliability data. That is a
compilation by large multinational companies of a great amount of
electrical and mechanical information. So we might utilise that. We
would like to, ideally, utilise site knowledge as another source, so we
put questions to Mercury to aid us in this situation. We would take on
board fundamental information, laws of physics, trigonometry, things
15 like that. We would also get professional knowledge. People with
broad experience who can get us in the right range of thinking. So from
that we get into the range where, if we're getting good confirmatory
responses from an assurance point of view, risk-wise we feel we're
getting in the right range, and that's how we do semi-quantitative. It
20 requires quite a library of knowledge and experience in that path. But
it can be done with the right support.

MR BICKERS: So you're not meaning necessarily an amalgam of qualitative and
quantitative data?

25 MR ERSKINE: It's semi-quantitative. It has a range of uncertainty, but we don't throw
- how would you say - the baby out with the bathwater. We try and
look from many angles to make sure the data is in the right range. So
there will be some uncertainty, but not so great as uncertainty to make
30 it meaningless. We look for what we can get to get reasonable output
indication.

[9.40 am]

35 MR BICKERS: So I understand the term "semi-quantitative". You're saying it is
actually an amalgam of quantitative data and operational experience?

MR ERSKINE: And operational experience, so we might have the OREDA data on the
trip rates of turbines for various reasons. We then look at the control
40 efficacy of the systems that manufacture it, such as GE or Rolls-Royce
might put on their turbines. From a functional safety point of view,
that gives us some numbers as to how many times they will faithfully
capture or trip the equipment out in the right way. And then we get
into the physical data of how discs might release, etc, and build up the
45 picture.

MR BICKERS: And this is against your background of conservatism that you
discussed?

- MR ERSKINE: Well, yes. The broader background might be how long are these turbines running for? Do we make a conservative function that they clock up hours on a constant basis, rather than a short time as a peaking plant? Do we look at the peak rates along the road? Do we pick a conservative figure for the safety of everybody, a longer-term value that's a higher level of exposure because there are more people there? Those sorts of factors, conservatively put into the mix.
- 5
- MR BICKERS: Thank you.
- 10
- MR ERSKINE: My train of thought. Thirteen, I think.
- MR BICKERS: Scenario: the failure of the gas turbine disc.
- 15
- MR ERSKINE: "So at a distance of approximately 7 metres from the road, the fatality risks associated with catastrophic failure of the gas turbine generator is tolerable and can be managed. This hazard may require some protective equipment around the new turbine to manage the risk so far as is reasonable practicable. If the station were to be recommissioned and the new turbines installed, a more detailed risk assessment could be undertaken for the specific turbine to determine if additional controls are needed. For example, blaster impact barriers could be considered.
- 20
- 25
- The scenario of generator retaining ring failure: the generator retaining failure risk to the roadway users is well within tolerability criteria. The scenario of the release from a turbine gas valve train: the analysis found that the gas venting from the turbine valve trains can be managed by conformance to the appropriate standards, such as appropriate venting height and location, therefore preventing a gas cloud which could be ignited by road vehicles."
- 30
- 35
- And by that I mean venting to a place where dispersion is more the predominant influence by application of good codes. The level of risk is acceptable if doing that to that level, depending on the selected location.
- 40
- 45
- So the scenario of ignited natural gas release from First Gas assets. My analysis found that the relocation of the First Gas assets to a position with greater separation distance from the EWL road would be appropriate. Careful selection of an alternative location of the assets could achieve an off-site risk level at the EWL that is tolerable and managed so far as is practicable or broadly acceptable. It is recommended that the risk contours for proposed locations be developed to provide guidance as to the optimum position, given the constraints of the surrounding land use and the proposed road. Supply

to Mercury can be continued from a suitable new supply metering location.

5

So for the scenario of CO₂ release from the fire suppression system, the modelling found that a CO₂ release from the fire suppression system is unlikely to impact EWL road users from a safety perspective. The level of risk is broadly acceptable.

10

The scenario of the power station fire and of that the subsets, the analysis determined that the likelihood of a fire from an on-site source being large enough to create enough smoke to reach the EWL alignment is low, and therefore tolerable.

15

So for the scenario of debris falling from the EWL on to the site, the analysis indicates the risk of debris falling from the EWL on to the Southdown site is relatively low and broadly acceptable. The installation of a road barrier on the EWL could reduce the risk of debris falling on to the Southdown site, and the equipment filtration on-site can be expected to manage that debris.

20

[9.45 am]

25

So the scenario of the vehicle falling from the EWL on to the site: the calculated risk that we've looked at of the vehicle falling from the EWL on to the site and impacting key equipment was found to be low and broadly acceptable.

30

The scenario of turbine or generator trip due to road vibration: the scenario has been assessed by the Transport Agency's vibration expert, Ms Wilkening, and she concludes that this risk is negligible.

35

For the scenario of heat plume impinging on the EWL, the risk of a heat plume impinging on the EWL is not considered a fatality issue for the EWL users and is broadly acceptable.

40

The scenario of site emergency response obstructed by the EWL: based on the current EWL alignment, neither the current access points to the Southdown site nor access to the event locations for the identified scenarios will be impeded by the EWL road or support structures.

45

"Conclusions. So, overall, I consider the identified hazard scenarios to pose low or negligible risks to the users of the EWL, or in the case of identified issues from the EWL to the Southdown site to be negligible, with the provisos stated earlier. The EWL can coexist with an operational, 135-megawatt, gas-fired thermal power station at the Southdown site."

DR PRIESTLEY: Mr Erskine, could you go back to paragraph 16, please, the ignited

natural gas release scenario?

MR ERSKINE: Yes.

5 DR PRIESTLEY: We've had evidence that the Mercury site is of strategic importance, and one of its inherent assets, if I can put it that way, is its proximity to a gas pipeline.

MR ERSKINE: Yes.

10

DR PRIESTLEY: Now, I wasn't quite certain looking at paragraph 16 what your assessment currently, without the relocation of the First Gas assets, of the risk criteria was that you are assessing for that particular scenario.

15

MR ERSKINE: The risk criteria is for a leakage of some level of significance. This is gas that is up at high pressure, so it could release through a flange or a crack in pipework such that it might give a vapour cloud or it might give a jet fire or some combination. We typically look for a range of gas scenarios: vapour cloud explosion, a jet fire where the radiant heat can cause heat damage to people nearby or equipment. It's that sort of consequence value, damage to people by a number of paths, either from the blast effects or --

20

DR PRIESTLEY: I understand that. I probably put my question inelegantly. What I was trying to find out was whether, as things are at the moment, that risk was unacceptably high.

25

MR ERSKINE: Correct. So the contours that we had in the report. Let me just dial up the right page for you. So you can see the contours if you go to the risk report, page 23, 24, 25, around that range, we --

30

MR BICKERS: The only problem is we don't have coloured versions so we don't know what is blue and green.

35

[9.50 am]

MR ERSKINE: Coloured versions. Okay. You'll see a couple of rings. Thank you. So if we have that here, you can see a blue ring at the various diagrams at your disposal there. That's the inner contour of those criteria values, the LSIR values, location-specific individual risk, around about 50 metres radially out from the metering asset. And the broader green tolerability value or acceptability value, depending on which side of the contour you want to look at, is the broader range there. So with the alignment of the road it would be prudent to relocate those facilities to a new place.

40

45

DR PRIESTLEY: All right.

- MR BICKERS: John, can I just clarify something? A new place outside the blue but inside the green or outside the green as well?
- 5 MR ERSKINE: Okay, so the blue is the LSIR values, the one 10 to the minus 5, the broadly acceptable one by 10 to the minus 7 values are the green ones.
- MR BICKERS: So it can be within the green line, the relocated position?
- 10 MR ERSKINE: But banned between the blue and the green is the tolerable region and with controls that are practicably applied to manage the risk to people in those ranges.
- MR BICKERS: Thank you.
- 15 DR PRIESTLEY: Now, gas being ignitable, regardless of the form, domestic or industrial use gas, and also under pressure gas leaks through pipe failure or joint failure are a hazard of gas reticulation anywhere, aren't they?
- 20 MR ERSKINE: They are a hazard, yes. What that transpires to actually is a risk that takes that calculation approach.
- DR PRIESTLEY: Now, am I right that your assessment of the current location of First Gas assets and this type of failure ignition being at an unacceptable level of risk, I take it that that is the case now whether the highway was there or not?
- 25 MR ERSKINE: That's right. Now, if you have a higher population base in closer proximity to it you must think about how carefully located that is as we do in Australia and other places of higher population density. Those thoughts now turn to risk values to get some management decision about what's acceptable for that society.
- 30 DR PRIESTLEY: Would I also be correct that the unacceptable risk, and I appreciate what you were saying earlier about equivalence and so on and so forth, but the unacceptable risk at the moment must primarily relate to people working or present inside the blue area, ie on the Mercury site itself?
- 35 MR ERSKINE: Interesting question. It gets back to the risk dose theory that I put to the table before. Your exposure is a factor of how long you are in that location and how close you are to that point source. So we would typically get data from a site to look at the exposure factor of individuals. So if they are there for an extremely short time just in a transitory basis and not there -- I understand from the Mercury people they manage the time in their locations around your site because of some hazards, I suppose, that's what the site manager Chris was telling me at one stage, Mr Tyas, because of the risk of being in a certain area.
- 40 45 So one looks at the population and the amount of time that they are in a location to see if the overall level is fine. We often go past sources

that are very high risk but only for short periods such that it is acceptable.

5 DR PRIESTLEY: Yes, I understand that. So if the site was totally unmanned and was being operated remotely, there was no living person on the site at all, presumably the unacceptable risk wouldn't matter too much?

[9.55 pm]

10 MR ERSKINE: Correct, so the LSIRs, you remember I said it is a step along that journey of ultimate risk determination. We look at the exposure factors of the people and the ultimate risk dosage in the acceptable Victorian criteria or other criteria that are pertinent to the case at hand.

15 DR PRIESTLEY: You visited the site yourself on occasion or more?

MR ERSKINE: I have been to the outside of the site and peered through the fences to see the equipment.

20 DR PRIESTLEY: You didn't have a guided tour inside the site?

MR ERSKINE: Not inside, no. But I am familiar with the gas equipment and combustion equipment professionally.

25 DR PRIESTLEY: Well, you haven't quite answered my question so I will rephrase it. Let's assume, and we don't have any evidence on this, let's assume in the course of any working day there are personnel actually doing things on the site, okay. My question was, is the unacceptable risk which you have identified from ignited natural gas going to primarily impact on
30 people working on that site?

MR ERSKINE: Logically it would be closer and impact on them, yes, but I wasn't privy to that data to make a calculation.

35 DR PRIESTLEY: It's a hypothetical question I am asking you.

MR ERSKINE: It could be. If we had the numbers we could crunch it through. It may come out that they have managed it well and it's down or it may be that it might be high and Mercury may have done that sort of work.

40 DR PRIESTLEY: I confess to you about my mathematical limitations but let's assume that the road is there and the First Gas assets are not moved and for some reason or other there's a god-awful explosion, it all goes "Whoomph" the first people who are going to be wiped out are the people
45 on the Mercury site rather than people on the highway, aren't they?

MR ERSKINE: Depends on the nature. I wish risk were as clear and as black and white

as that.

DR PRIESTLEY: All right. It depends on the "Whoomph".

5 MR ERSKINE: It would make my job easier but then ... but, no, the wind can be at very many directions, the size of the leak can be of many different shapes, the angular release is another factor that you must consider. These are all the things that we do. So it could be logically people nearer would be more highly exposed. That would be a general trend and observation but it does come down to the numbers, sometimes
10 which are surprising as you run them through.

DR PRIESTLEY: Well, the issues I'm putting to you, I'm not doing it necessarily for fun because they have some importance in terms of planning and our task. Listen carefully to this and tell me whether I am right. Currently there is what you would classify as an unacceptable risk of ignition of natural gas and that risk can be controlled or mitigated by a greater separation distance?
15

20 MR ERSKINE: Yes.

DR PRIESTLEY: And that risk exists whether the road is there or not?

MR ERSKINE: Correct.
25

DR PRIESTLEY: But if the road does go there the number of people entering this risk zone, very crudely, is obviously going to increase?

MR ERSKINE: Correct, and that's where we would do the societal risk calcs built on the LSIR values, which do get complicated but nevertheless the programmes that we use generate an output which are useful for our consideration.
30

DR PRIESTLEY: Given the little potted version I gave you three-quarters of an hour ago about health and safety matters and board responsibilities, this risk is a matter which needs to be addressed both by the board of Mercury and by NZ Transport Agency?
35

MR ERSKINE: Yes. So we have done early stage work here as the design evolves and as more information is available one can --
40

[10.00 am]

DR PRIESTLEY: Now, the final question you probably won't be able to answer but we are going to have to look at it because I'm sure counsel for Mercury will cross-examine you on this. Relocating the First Gas assets to a position of greater separation is the first line of your paragraph 16, it is clearly a solution but where? Relocating a gas pipeline or connection
45

to it is a little bit more complicated than going out and digging a hole. You are going to have actually find a suitable site, don't you?

MR ERSKINE: Correct.

5

DR PRIESTLEY: You have to put in a feeder line, things of that sort?

MR ERSKINE: The initial values provided to us are shown in the report but a more detailed examination would be required. So we have just highlighted the approach in principle there of either relocating further to the south to get those buffer distances. Sorry, are you driving the graphics? Good, good. So you'll see on those various pages those alternate locations and you can see those contours of effect.

10

15 DR PRIESTLEY: Still on Mercury land, do you know?

MR ERSKINE: That I don't have complete knowledge about. Because it is a First Gas asset it may not necessarily be restricted to Mercury land, but provided there is acceptable land latitude you would look at what was achievable within the location that you have.

20

DR PRIESTLEY: I just want to ask counsel a question. Mr Mulligan, is First Gas a party to these proceedings? They are not, are they?

25 MR MULLIGAN: They are, sir, but they have adopted a -- well, are endeavouring to adopt a neutral position in relation to matters that --

DR PRIESTLEY: But they have joined in?

30 MR MULLIGAN: They have always been a party to matters because while there has been some concentration on this area First Gas assets right along the alignment, major assets including a pipeline that goes from here right along the foreshore, is being relocated as part of this exercise. So First Gas has been a partner with NZ Transport Agency for a while.

35

DR PRIESTLEY: Imposition of a condition might be feasible?

MR MULLIGAN: Sir, I think we would be proposing a condition which I think Mercury has after, because their ultimate outcome is we want a gas supply and a --

40

DR PRIESTLEY: That is not an unreasonable request.

MR MULLIGAN: No, exactly, and a pigging station, etc, is required for that so a condition would be a gas supply needs to be provided in a safe location.

45

DR PRIESTLEY: Thank you. Well, Mr Erskine, you've opened up some really interesting issues there, thank you very much. Now, we will ask for

some Board questions and then hand you over to Ms Devine.

5 MR BICKERS: Before we move off this gas hazard, we talked about scenarios of gas
leaking, for example, from a flange to the sort of catastrophic failure
of, let's say, somebody puncturing the gas pipeline, having a major
release. In your analysis I noted on page 8 you have the wind rise for
the site and you look at the mixing levels. So we have probability
factors, I would assume, for things like a leaking flange that would be
10 significantly higher than, say, catastrophic puncture. But did you
model the dilution of the natural gas, having regard to the atmospheric
conditions and the combustibility range of natural gas? I understand it
is quite a limited combustibility range but I am not sure of that. So did
you model that in coming to your conclusions about the level of risk?

15 MR ERSKINE: How would I put it very simply? Yes, yes, yes and yes.

MR BICKERS: That is a good answer.

20 DR PRIESTLEY: That is the trouble with multiple questions.

MR ERSKINE: That's right and I was just trying to keep track of all of them but, yes,
in the affirmative. That is what the programme does and you're now
appreciating the statistical complexity. Yes, smaller leaks, the weeps
and seeps are much, much more common. You did actually make a
25 slightly loaded statement that a larger rupture may be from someone
taking that action by deliberate dig before you dial scenario, we term it
in Riskland rather than dial before you're dead. About 80% of ruptures
of that nature happen in populated areas, say, in the UK but in Australia
those factors and figures are actually conservatively lower. The same
30 for New Zealand because of the population density, but as our
population growth increases so does that probability.

35 The combustion, the dilution, the size of the risks: yes, quite a few
small ones, very, very few large catastrophic ones, because we bury the
pipes at a depth where they are less likely to be upturned by a digging
machine with a sharp tooth. There is even a standard for that, AS2885
tiger tooth on a digging machine. Those probabilities are all there in

the data that we use.

[10.05 am]

- 5 MR BICKERS: Yes, I am sorry about the multiple. I will get told off after but --
- MR ERSKINE: That's all right. I was just trying to keep track.
- MR BICKERS: It was just that my brain was going and I was --
- 10 MR ERSKINE: You are naturally exploring those areas that we have to get data for.
- MR BICKERS: Dribbling them out. Sorry about that.
- 15 MR ERSKINE: Yes.
- DR PRIESTLEY: Do you have any questions?
- MS TEPANIA: Mr Erskine, just picking up on some questions by the Board, you have
20 recommended in your evidence, in terms of your analysis, that
relocation and a greater separation distance would be more appropriate.
Are there other measures that can be taken to ensure that contours stay
or remain unchanged, like earlier detection systems, more sophisticated
25 warning systems, etc, of gas leaks in terms of the vapour cloud
explosion at least?
- MR ERSKINE: There are many measures. You have touched in an interesting area and
it is a good piece of history, and it is how risk people do work. Back
30 in the 1200s the English jurist, Henry de Bracton, first came forth with
the saying that is attributed to Benjamin Franklin, that is: an ounce of
prevention is worth a pound of cure. Now we look at the risk hierarchy.
We try to eliminate. Separation has the distance square law for the
radiant energy that we would like to reduce that causes harm to people.
- 35 Early detection of functional safety systems, such as in the IEC 61508
code, which is used from nuclear facilities through to oil and gas and,
in fact, in rail, has a very high integrity assurance controls that could
be employed if it is practicable to do so. Those costs and economics
40 have been improving over the last 20 years and providing much better
integrity values. It will never get down to zero. There is always that
imperfection of equipment and installation operational maintenance
that must be considered but, yes, there is an array of preventative
equipment that could reduce probabilities. You could go for thicker,
45 higher grade pipe. You could bury things at a greater depth. You could
put better protective mechanisms around. There are many things that
could be considered and it is about working through the economics and

the benefits conferred by doing that.

MS TEPANIA: In terms of the scope of this inquiry or our ability to find a pathway through this if we needed to, couldn't the parties perhaps agree, firstly, on what the fatality risk contours might be and then potentially look at what it currently is, and then condition that for any measures to be implemented beyond that, which ensures that that contour doesn't move beyond what is currently defined or currently agreed --

MR ERSKINE: Sorry, the audio is just a little bit quiet on your microphone.

MS TEPANIA: Sorry.

MR ERSKINE: Perhaps someone at the desk there can help us a little bit. Thanks.

MS TEPANIA: So my question is: if the parties were to agree what the contours currently are in terms of fatality risk, couldn't we impose a condition whereby in detailed design the parties come up with an option which ensures that they undertake such measures to make sure that that fatality risk contour doesn't change and whatever those measures are is entirely up to the parties, I suppose, but at such time they would undertake a risk analysis assessment to ensure that the measures that they propose to adopt will keep that contour within the particular range or unchanged and then there is some agreement between the parties as to sharing the costs or otherwise of those measures?

MR ERSKINE: Okay. There are a few yeses in that and there are a couple of maybes that I would put to the table. There are things that could be done. The agreement working through mutually on the practicable stage, the calculations can be done. Our basic risk data just assumes equipment of old with certain values but, as you look at the specificity of the design that you have at hand, you can put those numbers in for a better update on those contours to reduce them and the right agreements with the asset owners to do those things. I think that answers in part some but please refresh anything that I have left out for you.

[10.10 am]

MS TEPANIA: It does. I think Mercury's concern in future is its ability to ensure that the risk is kept within its own boundaries, to some extent. So they will have to agree measures, perhaps, that mean they can be confident that in future they can manage that.

MR ERSKINE: Yes.

MS TEPANIA: It is not just a matter of moving the pigging station. That might be a component of it. It might be about adopting other measures but at this stage, in terms of what we have got before us and where we can go,

5 you would agree that a condition that at-detail design - as long as the parties can agree that those fatality risk contours do not move, they stay within the accepted boundaries, that they agree what those contours are right now, to the extent that they remain unchanged and the parties do take what measures they can to ensure that that stays the same - wouldn't that help us through?

10 MR ERSKINE: Because it is a First Gas asset as distinct from a Mercury one - if I understand this correctly - from what you're asking, it can be located to a place that is acceptable now. If that happens to be on the Mercury site obviously they have a play and the consideration in that, which they would logically contribute to. It is already, of course, on their site and posing a risk to them now. Well, in their current state of non-
15 operation it is a different scenario but we are considering operational and, of course, when they kick off again, or if they kick off again with an operational situation they would make that assessment at that point in time with new equipment, as always happens. Every time you do a new gas installation you start from the ground up. You have to get the gas approvals. You have to go through all of these approval processes.
20 You would have to do that under the prevailing gas codes and safety regulations, yes.

25 MS TEPANIA: Yes. I was picking up on the technical report the different options that you had referred to, in terms of risk contours and the different options you have. I think what concerned me was that the second one, which essentially moves the tolerable risk boundary over the TR Group site more substantially.

30 MR ERSKINE: Correct.

35 MS TEPANIA: The final one you have got in terms of figure 12 has the pigging station a bit lower and potentially less effect but something potentially more manageable. Given that we don't know where the pigging station might be moved to and there is no agreement about that, what we can try to be sure of is that that risk contour, if it is agreed, doesn't change. And if we can perhaps tie the designation to that, so wherever you move it, whatever you do, as long as the fatality risk contour remains unchanged, that would provide some certainty.

40 MR ERSKINE: Yes, if that remains unchanged. So we have provided that for you as a good initial guidance. You could alter that contour by much, much better controls, so don't think of things as cast in stone there. In Riskland we say, "What have we got? What can we do to reasonably improve it?" So, yes, take it as a given at the moment but there is

improvement potential that should or could be considered as required.

MS TEPANIA: Okay. I understand that. Thank you for answering that.

5 DR PRIESTLEY: Does anyone have any more questions? No supplementaries at the moment?

10 MR MULLIGAN: Sir, just one minor one. Mr Erskine, you mentioned when there was a question from the Board in reference to your peering through the fence, I think it was, observation of the gas equipment, what, if any, professional experience do you have in relation to gas equipment and management of gas risk?

[10.15 am]

15 MR ERSKINE: Before I do the risk consulting, back at my university days, one of the majors that I did was in fuel technology, so learning about the fundamental properties of combustible fuels and materials was where I went. In the process work that I did over the ensuing years, I had the
20 role of an independent gas inspector for Western Australia, signing off on what was then the largest project in the 1990s in Western Australia, the Hot Briquetted Iron Project. It was so large that at one stage it was producing a double-digit percentage of Australia's CO2 emissions. It was about \$2.4 billion-worth of equipment in 1990's dollar currency at
25 the time. I was the gas inspector for that and that was a real turning point because the fatality potential of that equipment was multiple fatality potential and simple descriptive codes just wouldn't cut it. We had to look at fundamental risk and so as a gas examiner, I had a whole team of people. I saw deficiencies in simpler codes which were meant for smaller equipment. So that is the sort of background. There were
30 turbines there. There was much larger gas equipment, large plumes, releases from big pipes, all of the general things. Of course, the unique contribution here I fully respect. Having done that sort of equipment as well as in the power industry, working with the high-voltage equipment and the fire potential from that, as well as starting large
35 energy storage, which I wrote a research paper on and presented it recently. So there has been a lot of gas experience as well as the broader risk in power station scenarios that could give rise here. So, yes, physically I haven't been on site. I have looked at the componentry and am familiar in different ways, shapes and forms with that
40 equipment from the risk work that I have done over the years, including Hazelwood Power Station, Loy Yang, and a few others.

45 MR MULLIGAN: Thank you, sir.

DR PRIESTLEY: Thank you. Ms Devine.

MS DEVINE: Thank you, sir. I am conscious the break is in ten minutes. Are you

happy for me to proceed now or would you like me to start after that?

DR PRIESTLEY: I think so. You just choose a suitable break point at 10.30 or shortly thereafter, where it fits you.

5

MS DEVINE: Thank you, sir. Good morning, Mr Erskine.

MR ERSKINE: Good morning.

10 MS DEVINE: Following on the question from my learned friend in terms of your experience, that project in the 90s, was that a gas-fired power station?

15 MR ERSKINE: Yes. It was fired by turbines for running electricity because of the remoteness of the grid up there and the consumption required, as well as the gas consumption for the broader furnaces and equipment.

MS DEVINE: Was the gas used to fire the turbines?

20 MR ERSKINE: Yes.

MS DEVINE: Okay. And you were a gas inspector in that situation.

25 MR ERSKINE: I was a gas inspector for the broader equipment, the furnaces, and I worked alongside the other inspector, who specifically tackled the turbines for the Type B sign off, but he kept me apprised of some of the things as part of the experience curve. As I say, that was one of the components at the time that I was doing.

30 MS DEVINE: At that time, would it be fair to say that you visited the site a lot and had a look at it in a lot of detail?

35 MR ERSKINE: At that time, yes, I looked over the site and the drawings as - how would you put it? - from the sign-off point of view you typically get lots more paperwork and have to digest more of the values and what not. Then, yes, you look at the site, but really the drawings and the calculations and the design philosophy give you the substance, just as I have looked there with the equipment and the information provided. So, the site visits have a certain value. I wouldn't say it is the is-all and end-all. There are many things we do design. But there are sometimes less
40 contacted sites; sometimes more.

[10.20 am]

45 MS DEVINE: Thank you. You haven't looked at the drawings for this site, have you?

MR ERSKINE: Of the Mercury site, I have been given some diagrams. I have asked for P&IDs from Mercury and those weren't provided for me. I did ask and we were looking for information, but I do appreciate the

confidentiality needs and we have tried to work reasonably with Mercury, so they have tried to provide data for us. Drawings, again, form a component, along with many things.

- 5 MS DEVINE: So you haven't looked at the P&ID drawings, have you?
- MR ERSKINE: Not for lack of asking, no.
- 10 MS DEVINE: Let's put aside the who says, he says and she says. The answer is that you haven't looked at those drawings, have you?
- MR ERSKINE: Of those particular ones, but you are speaking of a piece of equipment that is standard and used around the world, are you not?
- 15 MS DEVINE: I'm asking the questions, Mr Erskine.
- MR ERSKINE: Okay. Well, I just need clarification, because the LM 6,000, which was the basis we were given, is a standard package, so it has standard equipment, so from a standard sign-off point of view, it has a certain amount of detail, so I have been able to have a look at a certain amount on the internet, giving me a broad understanding, as well as the Mercury information.
- 20
- MS DEVINE: But to be clear, you haven't looked at the drawings, just for a short answer.
- 25
- MR ERSKINE: The Mercury ones, no.
- MS DEVINE: Okay. In terms of the information you have looked at in lots of detail, and looked at things on the internet, have you looked at the photos of the site in lots of detail while you have been thinking about these issues?
- 30
- MR ERSKINE: I have looked at some of them, as again requested by Mercury and as provided by Mr Flexman. Again, we gave a comprehensive list and we got what we got, and a reasonable understanding of things there.
- 35
- MS DEVINE: In terms of checking the things that you have examined, your evidence doesn't refer to Mercury's witness, Mr Murray. I take it you haven't reviewed the evidence of Mr Murray. Is that right?
- 40
- MR ERSKINE: Mr Murray: there is a lot of evidence that I have reviewed so please understand I am trying to remember.
- 45 MS DEVINE: Your evidence-in-chief, at 4.3, lists the evidence that you have reviewed. It includes five people and it doesn't include Mr Murray. So

is it safe to assume that you haven't read the evidence of Mr Murray?

MR ERSKINE: Not to any great extent.

5 MS DEVINE: Are you aware that Mercury is talking about maintaining the potential to restart the power station within three to four months?

MR ERSKINE: I have seen that.

10 MS DEVINE: Thank you, Mr Erskine.

Your evidence-in-chief, at 2.6, refers to you becoming involved in this project in June 2017. So far as you are aware, no one else has worked on the compatibility of the road and the power station, have they?

15 MR ERSKINE: I could say that none has been presented to me, although I have requested information, so I don't know; someone may have done something.

20 MS DEVINE: Let me put it a different way. From NZ Transport Agency's perspective, has anybody else worked on the risk associated with the co-location of the power station and the road?

25 MR ERSKINE: There has been some earlier work by Mr Schaffoener highlighting some issues.

MS DEVINE: Are you referring to Mr Schaffoener's evidence?

30 MR ERSKINE: Yes.

MS DEVINE: Not a report, like yours?

MR ERSKINE: Correct, that's evidence, yes.

35 DR PRIESTLEY: Mr Erskine, Ms Devine's question, I think, is a fair one. You were hauled in to do this Mercury risk assessment, for reasons we know, in June.

40 MR ERSKINE: Yes.

DR PRIESTLEY: But as part of settling you down into your task, were you given by NZ Transport Agency any specific risk assessments relating to the

conjunction of the highway and the power station?

MR ERSKINE: Right.

5 DR PRIESTLEY: It is either yes or no, really.

MR ERSKINE: Yes, I was given the information from Mr Phillis. Again, that was evidence from an assessment.

10 DR PRIESTLEY: That was given to you at an early stage of your engagement?

MR ERSKINE: Yes.

DR PRIESTLEY: Nothing else?

15

MR ERSKINE: Mr Schaffoener's evidence, again not a report per se, no.

[10.25 am]

20 DR PRIESTLEY: Right.

MS DEVINE: For clarity, for the Board, Mr Phillis, is Mercury's witness, isn't he?

MR ERSKINE: Sorry?

25

MS DEVINE: Mr Phillis, who you referred to, just so the Board understands, Mr Phillis' evidence is Mercury's evidence. That's right, isn't it?

30 MR ERSKINE: Yes, that's right. There were some hazard studies but it wasn't a risk report per se.

MS DEVINE: At 2.6 of your evidence, you say that you were asked to identify appropriate risk assessment methodology, in June 2017. That's right, isn't it? It is your first sentence there, isn't it?

35

MR ERSKINE: Sorry, I'm just going to the right spot so I can be with you on the same page.

MS DEVINE: Paragraph 2.6.

40

MR ERSKINE: Sorry, just bear with me. I am getting the documentation.

DR PRIESTLEY: Your statement of 28 July.

45 MR ERSKINE: Yes. Sorry. I'm just trying to find it, in all the paperwork that I have here. Thanks. No, sorry, it's my 2.6 is what I need. If you can just dig that up. Apologies. I just need to make sure I've got the right document

for the 2.6.

MS DEVINE: Take your time, Mr Erskine.

5 MR ERSKINE: Thank you. Appreciate it. I thought I had it packed here and ready to use. Here we go. Sorry. Okay, 2.6.

10 MS DEVINE: So my question was to you about the first sentence there, simple proposition that in June 2017 you say there that you have been asked to advise on an appropriate risk assessment methodology. That's right, isn't it?

MR ERSKINE: That is what we had been asked, yes.

15 MS DEVINE: And subsequent to that you prepared a draft terms of reference for a risk assessment for the power station, didn't you?

MR ERSKINE: I was asked to prepare that.

20 MS DEVINE: And before Mercury had a chance to comment on your draft terms of reference for a risk assessment, this Board directed that the risk conference occur. Is that right?

MR ERSKINE: Yes.

25 MS DEVINE: Now, sir, I have a number of questions following that but they are sequential, so I think this is an appropriate time to break.

30 DR PRIESTLEY: Suitable break point? All right, we'll take the morning tea adjournment. Thank you.

ADJOURNED [10.28 am]

35 **RESUMED** [10.51 am]

DR PRIESTLEY: Thank you. Please continue, Ms Devine.

MS DEVINE: Thank you, sir. If I can take you back to your evidence, Mr Erskine, to 6.3 and 6.3.

40 MR ERSKINE: Yes.

45 MS DEVINE: At 6.2 you set out typical steps in a risk assessment, and at 6.3 you make the statement that the risk assessment that you have undertaken is aligned with those steps in section 6.2. My question is, your risk assessment approach for this project isn't the standard assessment approach, is it?

MR ERSKINE: Those are the components that are utilised within ISO 31000.

MS DEVINE: That's not my question.

5 MR ERSKINE: That's the standard process and we've aligned with it.

MS DEVINE: You said in 6.3 that:

10 "The risk assessment that I have undertaken is aligned with the steps in 6.2."

I put it to you that the risk assessment approach that you've taken is not the standard risk assessment approach, is it?

15 MR ERSKINE: Those are all components of the standard approach.

MS DEVINE: I'm not disagreeing that they are components of the standard approach. I am disagreeing that what you have undertaken is the standard approach.

20

MR ERSKINE: You'll have to clarify that for me.

MS DEVINE: You agree that a collaborative approach to risk assessment is generally more effective?

25

MR ERSKINE: That's what we did.

MS DEVINE: Well, let's take that part bit by bit. Your draft terms of reference advocated for stakeholders participating collaboratively in the risk assessment process in workshops, didn't it?

30

MR ERSKINE: Yes, and to a degree through the conferencing and the questions that we put to Mercury, we sought to achieve that.

35 MS DEVINE: Do you accept that it is normal practice for stakeholders to agree the risk acceptance criteria?

MR ERSKINE: The approach there was to put that on the table and I put that at the conference, so I carried that out, I put that to Mr Phillis and the others there, Mr Flexman, about the criteria. What was provided to me was they wanted to use the NZ Transport Agency tool as a screening process, so perhaps the conferencing information contains what you need there as well as what I can recollect of what we went through.

40

45 MS DEVINE: You've applied a risk assessment criteria in your risk report, haven't you, Mr Erskine? That's the Victoria criteria we're talking about, yes?

MR ERSKINE: Yes. We looked at that as the guidance, as a suggestion for people to

consider, yes.

MS DEVINE: And the workshop, the conference which you had with Mr Phillis, there's no agreement to apply that risk assessment criteria, is there?

5

[10.55 am]

MR ERSKINE: We had suggested that the societal criteria is what would be useful for this exercise.

10

MS DEVINE: But the Victoria criteria wasn't agreed between the stakeholders then, was it?

MR ERSKINE: At that point in time, I don't see an explicit disagreement and it was tabled, so --

15

MS DEVINE: But there wasn't an explicit agreement, was there, Mr Erskine? We don't need to make it harder than it is. You accept that?

20 MR ERSKINE:

Well, as far as the documentation goes, yes.

MS DEVINE: And do you accept that it is normal practice for stakeholders to agree the assumptions that should be made in the approach to the assessment?

25 MR ERSKINE:

That would be the normal process. The conditions obviously we had made that a little bit more of an effort.

MS DEVINE: And the assumptions that were made in the risk assumptions were not agreed by the stakeholders, were they?

30

MR ERSKINE: During the conferencing - let's be really clear about that - some of the values that were at my level of knowledge and that I brought to the meeting were given to the Mercury people there to look at, and as it was outlined in the conferencing on many points, they weren't disagreed. It was just beyond their knowledge, and I accept the fact that they may go back and look at other numbers to challenge constructively that which was put there at the conference.

35

MS DEVINE: I don't think you're being helpful to the Board here. Let's be clear. There was discussion about hazards at the conference, wasn't there?

40

MR ERSKINE: Yes.

MS DEVINE: And in terms of the assumptions that you have placed in your risk assessment report, those assumptions were not agreed, were they?

45

MR ERSKINE: They were tabled at the conference, not all of them documented for the sheer complexity of what we had, and we built on them systematically

in the risk assessment. So they were there but not everything was recorded, if that's what you mean.

5 MS DEVINE: So your evidence is Mr Phillis was aware of some of the assumptions that you've put in your risk report, perhaps not all of them? Is that right?

10 MR ERSKINE: Yeah. Verbally, we talked about things like the exposure factors. Although we didn't have numbers mutually, we accepted it would take time and effort to go and get those. We made simplistic ones at that time to build on it later. That was --

15 MS DEVINE: I understand you worked until the wee hours of the morning to try and do what you could in the time that you had available. Is that right?

MR ERSKINE: I encouraged everybody to remain there and put the best effort in.

MS DEVINE: After 1.00 am, wasn't it, when you finished?

20 MR ERSKINE: 1.15 am.

MS DEVINE: Yes. Even though you worked really hard at that time, there was not the detail - assumptions that are in your report - before you and Mr Phillis on that occasion, was there?

25 MR ERSKINE: The beginnings of those assumptions were there. The detail was put in later in the report, yes.

30 MS DEVINE: So it's fair to say that the assumptions that you've set out in the risk report are not agreed by the stakeholders?

35 MR ERSKINE: The ones that we've done in the risk report have been tabled for everybody, and yes, at this point in time they've yet to review and provide some indication of that.

MS DEVINE: Following that, you accept that if the stakeholders disagree about the assumptions, then the risk assessment could compare risks associated with differing assumptions?

40 MR ERSKINE: Sorry, please read that one past me again?

MS DEVINE: If you used different assumptions, you might come up with a different risk assessment, might you?

45 MR ERSKINE: Different assumptions. That's an interesting one.

MS DEVINE: Inputs, if you will.

MR ERSKINE: Well, the laws of physics and some of the data that we have --

MS DEVINE: Well, clearly, Mr Erskine, let's not talk about --

5 DR PRIESTLEY: Let him finish, please.

MS DEVINE: Sorry, sir.

10 MR ERSKINE: Yes. Look, you can change the values. Some of the parameters are
fundamental, so let's make the clarity about that. If there is better data
that you can get, we would happily put that in. So, yes, it is a process
that takes time. There are some parameters that, yes, you'll play around
with the numbers, but it is a parameter that must be considered, as we
15 talked about earlier on, from dimensional consistency that must be
preserved, of course.

MS DEVINE: Do you accept that your draft risk assessment terms of reference
20 advocated a results discussion workshop involving stakeholders before
the issue of a final risk assessment report?

[11.00 am]

25 MR ERSKINE: This risk assessment report - let me make it really clear - is for this level
at this point, and it can be used down the line constructively by Mercury
and others, so it is a step along the way. It is not final, okay?

30 MS DEVINE: Thank you. That's helpful, because NZ Transport Agency is using it as
a basis for conditions going forward, so I think that's really helpful.
Just to be clear, though, what we need to understand is you've put out
in your evidence the risk assessment process, so I'm going to continue
with a few more questions clarifying the situation, but I appreciate that
context.

35 MR ERSKINE: Sure. Okay.

40 MS DEVINE: To answer the question, in your normal practice, in the standard
practice that you've advocated in your draft terms of reference, you
would normally have a discussion about the results and you'd workshop
that with the stakeholders. Is that right?

MR ERSKINE: At various stages of the whole risk management process, of which this
is but one step. Yes.

45 MS DEVINE: And that's because mistakes can be made, can't they?

MR ERSKINE: Indeed so.

DR PRIESTLEY: Can I just ask a question here which might help the Board, if not

everybody else? On this conference which you attended at some date in July, I think it was --

5 MR ERSKINE: Yes, that's right.

DR PRIESTLEY: -- there were a number of people at it, including Mr Phillis, who counsel have been referring to, and you. It seems to me that both you and Mr Phillis stayed on and continued to work. Is that right?

10 MR ERSKINE: We did. So --

DR PRIESTLEY: Right. That's all I needed to know. Counsel is asking you about the various assumptions you've used, and is suggesting - though she will be developing this perhaps - that there wasn't necessarily an accord between you and Mr Phillis as to what assumptions you should be using. But I note in the joint conferencing statement that a lot of these risks seem to have been assessed as against NZ Transport Agency's risk metrics, which of course is something totally different.

20 MR ERSKINE: Correct.

DR PRIESTLEY: So, on the apples to apples or apples to pineapples point of comparison, how did you and Mr Phillis agree as to what you were doing with the NZ Transport Agency risk metrics at this stage of the issue you are on?

25 MR ERSKINE: At the beginning we laid out or discussed the pros and cons of using the NZ Transport Agency framework. Sorry, apologies, I know a question was asked earlier about it, about the fatality equivalent etc. I have it here now. But to the point to which you ask, the limitations of it were that it had a project orientation for the information that Mr Phillis put to the table, and it had the limit of a qualitative matrix such that we could use at that time. So I pointed that out, and it's in the notes there, about the limit, especially for the low-probability, high-consequence events. Those frameworks typically can be limited, but the other sections - more detailed in the document - talk about the quantitative analysis technique. So we did have a limit at the meeting, the conference, that what we could do, we did our best endeavours with that. I put information on the table from Mr Phillis. By the way, a bit of background, we used a team of people when compiling this information such that when I brought in assumptions, etc, to the conference we wanted to give it the best opportunity and maximum value, so we had no less than about eight risk professionals helping me assemble that information for the conference, as well as an array of specialists from many disciplines beforehand to help me try and carry as much to that conference and afterwards.

40 DR PRIESTLEY: So focusing on counsel's cross-examination points on this issue, you and Mr Phillis, and obviously Mercury have a high interest in this,

5 didn't reach any degree of unanimity as to what risk inputs you would be using but there was an agreement between you that, to the extent it might be helpful, you could both live with the NZ Transport Agency risk matrix, if you like, as the lowest common denominator. Is that a fair summary of how you went ahead?

MR ERSKINE: Partially. Let me just pull that out. That is an interesting one. The methodology of the expert conference is limiting and I do appreciate Ms Devine's points in that matter. When we went through the calculations, as you will see for instance on page 6 - let's use that one - I would table the information that I had with Mr Phillis and we would work it through and at the end we would get some values.

[11.05 am]

15 So, for instance, if it was transformer oil fire the factor was that I brought transformer data to the table. I put it there, Mr Phillis could site that and see that. We talked about the recoveries and, as you can see on that line, it was said we agreed where it was on the matrix and there were no disagreements. So if there was a point of disagreement about those assumptions it could have been put there had there been a need, explicitly, but put that table of information there in good faith and we've recorded these notes to the outcome values. You can only get to those outcome values if you agree or have some assent or some broad appreciation of the input values.

DR PRIESTLEY: Yes, I understand, thank you.

MR BICKERS: Can I just chip in there? When I look at the report of expert conference and there are a number of areas in terms of identified risk where it's stated, "Disagreed, none". But at the bottom of page 9 there was a disagreement between yourself and Mr Phillis and it appears to be about how you assess the presence of the road. Would you just explain what the opposing points of view were?

MR ERSKINE: Indeed. Indeed. Now, look I'll try my best to --

DR PRIESTLEY: Just pause there, because this is jumping to another specific topic. Does this pre-empt a line of cross-examination?

MS DEVINE: Yes.

DR PRIESTLEY: Because if it does we'll reserve the question.

MS DEVINE: I think that might be helpful to explore these issues, sorry, sir.

MR BICKERS: That's fine, I thought that's where you might be heading. I'm sorry, I

don't want to do your job.

MS DEVINE: Thank you, sir.

5 DR PRIESTLEY: Sometimes it disrupts what counsel are up to and interferes with a strategy.

MS DEVINE: Yes, sir.

10 Just to stay with the Board's questions, just briefly before I come back to where we were, Mr Erskine, is it fair to say that the expert conferencing process of identification of hazards and thinking through a little bit of those issues was a filter that you could then use to take on and apply at a more granular detail or a better basis to look at the QRA, the risk assessment process that you eventually did undertake. It was a stepping stone in that direction.

15 MR ERSKINE: It was a stepping stone and we certainly embraced the scenarios that Mercury put on the table as hazards that should be considered and worked through.

20 MS DEVINE: And you have built on that since with the report that you've created with your team of experts back in GHD?

25 MR ERSKINE: Yes, the team of risk people and specialists we should note. It takes time to do that and we subsequently also drew on Mercury's knowledge as well in that they could answer to the limit of their knowledge as well and within that time.

30 MS DEVINE: Thank you. Now, just coming back to the terms of reference and the standard approach taken to risk assessment. Just for completeness, and I appreciate that you have identified that the expert conferencing process is quite limited and that this report that you have prepared is draft and it is a step in the direction of that sort of process. We were talking about the results discussion and you had said, "Yes, of course, we do like to involve stakeholders because mistakes can be done" so it is useful to have them involved in a discussion of the results. Would you also accept that you have a results discussion workshop with stakeholders because they have the knowledge and experience of the design site operations or construction on the site?

35 MR ERSKINE: At the right stage of the process that would be a component that could be put there and we've now got the information out there, so that process can occur at some stage down the line from here.

40 MS DEVINE: And you get that input because extra operational information can be

found to be relevant later in the risk assessment process, don't you?

MR ERSKINE: The ISO31 process really outlines the iterative nature that would be multiple times, and this information is out there now that that stakeholder digestion can take place and hopefully a few times over where you refine the thinking and the design and the understanding. So the maturity takes time.

[11.10 am]

MS DEVINE: Although Mercury emailed offers to you and Mr Wickman to reconvene such a workshop before you completed this report, you have prepared your report without having a results workshop with Mercury, isn't that right?

MR ERSKINE: If there was a request, I am not sure I am aware of it.

MS DEVINE: Mr Flexman would have emailed you and asked for that to happen. You don't recall that?

MR ERSKINE: For a meeting? There were many emails and to have it all in my mind and have all those emails here I mean I could look through the thread if you want me to.

MS DEVINE: No, that's fine. But you accept that that hasn't happened, obviously?

MR ERSKINE: Yes, it hasn't happened for whatever part of the process and the time to go and collect the data and assemble that some sort of meeting would be meaningful. So there are appropriate times and there are premature times perhaps that -- the dynamics of different projects, you know, it's perhaps not the best to rush things but also the right timing to do things.

MS DEVINE: You accept that if stakeholders were to bring on their reflections of the results you might have a process of agreeing changes to the assumptions?

MR ERSKINE: That would be the case. If there's some data at hand that materially alters values. Now, of course, we said at the beginning we took conservative values for the sake of Mercury and the sake of the NZ Transport Agency and the road users. So, yes, look if more values come in it will refine and tune this as we go.

MS DEVINE: In terms of that collaborative process, the post results workshop involves agreeing potential preventative and control measures, doesn't it?

MR ERSKINE: A workshop being one part of that process. As I said in the SFAIRP discussion, if you have to do calculations, workshops can't achieve

- 5 everything. They are a valuable tool in the armoury of a risk person but there are many things that need to be done to get to that point that would quantitate -- certainly we struck that limit at the conference. You know, it can only do so much with the two people there in limited time, but we did the best we could, I think.
- 10 MS DEVINE: Do you accept that stakeholder involvement in agreeing those potential prevention and control measures is important because those measures might be operationally prohibitive, they won't work for operations on the site?
- MR ERSKINE: That is part of the process. So, yes, there is an importance there and it has to be examined at the right time.
- 15 MS DEVINE: Or that these particular controls or measures might introduce other safety risks. Do you accept that that is one of the values of stakeholders being involved in this process?
- 20 MR ERSKINE: Seasoned professionals will examine that criteria along with others and fortunately the industry has -- because of the nature of those turbines has many good components that can be considered. But, yes, we would look at those and consider adverse as well as positives.
- 25 MS DEVINE: Do you accept that it would be appropriate for Mercury and potentially other site operators at Southdown to be involved in identifying what the available and suitable measures might be?
- 30 MR ERSKINE: That's an interesting one. I accept it but when asked at the conference would they like to explore it, their initial thought was just to outline things at the moment with the understanding that maybe somewhere down the line those things would be contemplated. So I appreciated that concern and, yes, we've outlined that in the report, yes.
- 35 MS DEVINE: I think that approach seemed reasonable given the difficulty of the task you already had at that particular conference?
- [11.15 am]**
- 40 MR ERSKINE: We had a mountain to climb and those at the meeting did so admirably.
- MS DEVINE: So in terms of Mercury and the site operators being involved in identifying the availability and suitability of controls you do accept that it would be appropriate for that to happen?
- 45 MR ERSKINE: It would be part of the process, yes.
- MS DEVINE: Do you accept that Mercury should be involved in assessing the costs of the control measures and the proportionality of those costs to the

risks?

MR ERSKINE: It depends what you mean by costs and to whom they might be ascribed, which might be a bit outside of my remit but some sort of costing discussion by those who would feel the sense of obligation. They will have their due input. So I will stay within my remit but there would be some cost discussion as per the part that we talked about, so the technical component, yes, but I will leave that for those in the contractual arrangements of course to undertake. We will derive the information and that will be appropriate for others to examine.

MS DEVINE: Just to be clear before we leave that, stakeholder involvement in agreeing potential preventative and control measures is important because sometimes the measures may be cost prohibitive. That is right, isn't it?

MR ERSKINE: As we talked about, so far as practicable there can be many measures that are beneficial. There are some that can be disproportionately high for the value they introduce but that is a moving feast. What was not achievable 15 years ago is relatively achievable these days so please understand everybody that we examine it on a fundamental basis now. We get to a kind of clarity and make a reasoned, mature determination about that.

MS DEVINE: Thank you, Mr Erskine, so coming back to your evidence-in-chief, where you have 6.2 and 6.3 where we started with those questions about the process that you have taken.

MR ERSKINE: Right, 6.2, 6.3, yes.

MS DEVINE: I put it to you that what you have undertaken is not the standard process and you have said in your evidence that it is aligned with matters in 6.2. Do you accept that you have not undertaken a robust risk assessment with discussion?

MR ERSKINE: The discussion is in its formative stages and in fact is occurring right now. So hence whilst point (g) the risk treatment and management again is yet to be done, part (f) is in the throes of being tossed around right now. I am just trying to understand where you're at in your line of enquiry so that we are not getting into areas of omission or anything else. As you would appreciate we would like a full and comprehensive picture to everybody here. The dynamics of a risk process is such that part (f) and part (g) from what we do here going on, I'm not saying that this study that we have done is by any stretch complete and we've done all of those components. So ISO31000 is perhaps more -- so we have said those are the typical steps and we are embarking on that journey.

MS DEVINE: Thank you, Mr Erskine. I think the nature of my questions, and I will

come back to 6.2 just again very briefly but the nature of my questions is because NZ Transport Agency is relying on your report to make decisions. The Board is relying on your report to make decisions about the co-location of these two things. So while I appreciate you and Mr Phillis both feel deeply uncomfortable about the rushed process in terms of how these steps are taken, and you are telling me that more needs to be done, can we just ask some questions -- well, I would like to ask you a couple more questions to be clear.

5

10 DR PRIESTLEY: Just pause there because you've made possibly a logical jump and, with respect, you haven't quite got an answer to what was a very pertinent question which you just asked. What counsel's suggestion to you, Mr Erskine, is two issues which were bundled up in the same question. The first being that your risk assessment was not sufficiently robust and that secondly the degree of consultation with Mercury, the site owner was not as full as it should have been. Now, could you deal with those two issues?

15

[11.20 am]

20

MR ERSKINE: Sure. Now, if it is put to me that is the risk assessment robust or not, I think it was being made as a statement in all due respect, but if you are giving it to me as a question, robustness is an interesting point. You should be very, very clear that the risk assessment at this stage is conservative to give indication. A term of robust would be -- well, I don't know, I'd need to be given parameters of robustness and then I could give a bit of an indication but further down the line as the risk assessment matures it will become more robust. It is in a range of thinking for people now, is it broadly in, is it broadly out. So robust is a bit of woolly point unless parameterised.

25

30

DR PRIESTLEY: All right, a quick supplementary out of that then. Because it is conservative it is not as refined and detailed as it ideally could be? Is that correct?

35

MR ERSKINE: Correct, given the due course of time and the input from Mercury ongoing, as well as what they struggle to provide for me at the time of request.

40

DR PRIESTLEY: The second limb to counsel's question, the degree of consultation with Mercury? Yes, you have been there with Mr Phillis but ideally would you have wanted more input from them?

45

MR ERSKINE: Yes, that's right. Some of the input was declined by their decision. Some of it was declined by their lack of knowledge. Some was provided as it took them effort to get and I appreciate that information

takes time to get. It's not on the shelf.

DR PRIESTLEY: Okay, that's helpful. Well, you nearly didn't get there, Ms Devine, but I think you are there now. That depends what you are trying to get.

5

MS DEVINE: Thank you, sir.

DR PRIESTLEY: That is extremely helpful and I think the witness has been fair in that regard.

10

MS DEVINE: Thank you, sir. So you accept, Mr Erskine, to recap, that the process at 6.2 is not complete?

MR ERSKINE: It is underway.

15

MS DEVINE: But not complete.

MR ERSKINE: Correct.

MS DEVINE: And you have accepted that the results that you have identified could be difference once you complete that process?

MR ERSKINE: Depends on what you mean by different. It may be refined, matured. Some may take a different path but, of course, that is a speculation subject to whatever information comes to hand.

25

MS DEVINE: Do you accept, though, that different inputs could result in a different outcome?

MR ERSKINE: Different validated inputs may give a different validated assured outcome but we can throw any inputs in there but we must all be careful about what we choose.

30

MS DEVINE: Put it a different way, if we describe 6.2 an incomplete process, if we completed the process are you saying that Mercury would not add anything of value, that it would change no conclusions that you've made in your risk report?

35

MR ERSKINE: Quite a fascinating statement. Initially you said we hadn't done thing properly. We've now described that it is a journey. Mercury has opportunity on its table to look at this and gather info and bring it to us.

40

MS DEVINE: I think the Board has to make a decision based on the information that it has right now so let's work with that report.

45

MR ERSKINE: So hence why we took the conservative approach and with Mercury's knowledge of operating for many years at that site I was trusting for

good input at that time.

5 MS DEVINE: Now, we are going to go through the assumptions in a lot of detail but, to be clear, you have accepted that if the assumption changes that the outcome, the result, the tolerable level might be different?

10 MR ERSKINE: That's right. Hopefully there is good quality assurance with those assumptions and together we can -- you know, if there is better data that we can all agree that would drive it quite nicely.

MS DEVINE: Thank you, Mr Erskine. Now, there are limitations in the approach that you have taken to the risk assessment, aren't there?

15 MR ERSKINE: There are limitations of data and of time, yes.

[11.25 am]

20 MS DEVINE: If the EPA could present Mr Erskine and the Board with a copy of the good practice guidelines for major hazard facilities, the safety assessment that would be helpful, please.

MR ERSKINE: It seems I have my own copy.

25 DR PRIESTLEY: Mr Erskine, I assume the preferred pronunciation for your name is Erskine rather than Erskine, is that how you prefer it?

MR ERSKINE: It's like Newcastle and Newcastle but ...

30 DR PRIESTLEY: Yes, indeed.

MR ERSKINE: It is the Scottish heritage, I am not too worried.

DR PRIESTLEY: You are not too worried, all right.

35 MS DEVINE: Now, what I have presented to the parties, Mr Erskine, is an extract from this document. So the parties only have pages -- the title page, table of contents for completeness and pages 46 to 49, just so you are aware because you are relying on your own copy there, aren't you?

40 MR ERSKINE: Yes, that's right.

MS DEVINE: So I would like you to turn to page 48. Now, this is the appendix which talks about risk criteria. Do you have that?

45 MR ERSKINE: Yes.

MS DEVINE: If you could read the paragraph underneath the heading "Quantitative Risk Assessment and Quantitative Risk Criteria" to yourself I would

appreciate it.

DR PRIESTLEY: Do you want to read the first paragraph or the entire section?

5 MS DEVINE: Just the first paragraph under that heading. Have you read it? In terms of the second sentence there that the quantitative approach can have results that vary significantly, depending on the assumptions made for the calculations, you would accept that would you?

10 MR ERSKINE: So they allow a more precise, consistent approach to defining the likelihood but the results can vary significantly, which again is, yes, it's an interesting term that the right has used here depending on assumptions made for the calculations, yes.

15 MS DEVINE: So you accept that sentence is correct?

MR ERSKINE: That's right. Not often do our clients have the opportunity to run QRAs by two different crowds to see the actual variation, so yes there would be variation of output.

20 MS DEVINE: You accept that quantitative risk assessments can vary significantly depending on the assumptions. That is what you're agreeing, isn't it, Mr Erskine?

25 MR ERSKINE: They say can but that sentence opens up the other side with -- what is the date on this document? Let's have a look at that.

MS DEVINE: This is the document you referred to in your evidence.

30 MR ERSKINE: Yes, July 2016. Now, I am not quite sure of the author's knowledge and practising there. I know it was compiled by a few people but I think actually we had a few authors from a few different places. But anyway let's explore the thinking around there. Please continue.

35 MS DEVINE: I am just trying to get you to confirm you agree with that second sentence. So you agree with that second sentence?

MR ERSKINE: It is an emotive statement without substantiation. I would be cautious about how one can interpret the wording of that.

40 MS DEVINE: This is WorkSafe New Zealand's guideline.

MR ERSKINE: Yes.

45 DR PRIESTLEY: I would have thought it stood to reason - and again I won't bore you a third time with my mathematical limitations - that if a quantitative approach to risk assessment used different assumptions, if we have two assessments and they use different assumptions, the results would

inevitably have to differ.

MR ERSKINE: They would indeed, but to what quantum and does it justify the word "significant" which --

5

DR PRIESTLEY: The sentence counsel is asking about doesn't burrow down that deeply, does it?

MR ERSKINE: No, it doesn't.

10

DR PRIESTLEY: There is nothing heretical or misleading in that sentence. It is at a very high level but it's not intrinsically inaccurate, is it?

[11.30 am]

15

MR ERSKINE: It sets a broad landscape of the variation which is what I have interpreted from my experience over the years.

DR PRIESTLEY: Thank you.

20

MS DEVINE: Would you accept the third sentence that these risk assessment criteria may give a misleading sense of accuracy of risk estimates?

MR ERSKINE: I often counsel my team about the number of significant figures that are reported because the data that goes into it is accumulated and is averaged over a range of facilities and, therefore, the significant figures -- there is a broader principle we seek to achieve and I think there is a short form in the text here as a professional as I read it. It is about being approximately in the right zone rather than being precisely wrong, is the more important value or principle that we look towards as good risk practitioners. So, I am actually not so worried about the accuracy, so I agree with them that some reports may possibly give that impression. And the writer here I think is trying to convey that but, as a practitioner doing this, I often counsel people that it's about the broadness of the range that it is in and the due consideration of variability, which we always tell people. In fact, have put into our report at the right sections for you all to read and appreciate. Our aim is to give you clarity of management rather than a fixation on really tight numbers.

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40 MS DEVINE: You talk about adding that to your report but --

MR ERSKINE: Not adding, it is in there now.

MS DEVINE: Well, your evidence says you're aware of the code of conduct for expert

witnesses, doesn't it?

MR ERSKINE: Yes, indeed it does.

5 MS DEVINE: Would you accept that it would have been appropriate to state these limitations in your evidence?

10 MR ERSKINE: We could have put many, many things in there, and they are in fact referred to should one have the time and effort to go through all the documentation. That and so many other things we would love to put in but we do realise people have physical limits of time, so any omission please understand and appreciate it's not an omission by a deliberate act but, rather, just the sheer volume of detail that one must look at.

15 MS DEVINE: You have accepted that these are relevant matters and you are giving evidence to the Board and it is trying to rely on your report. You accept that it is appropriate that they understand it has some limitations, don't you?

20 MR ERSKINE: I accept that and had talked about it with our principal, and I think you are doing a wonderful job now.

25 MS DEVINE: But it is an omission from your evidence that these limitations are not identified. Is that correct?

MR ERSKINE: I think I have said in the brief and I would have to check in the report. Let's take the time. I will just check through the right sections in the report.

30 DR PRIESTLEY: Ms Devine, just while he is looking, are you suggesting that the limitations in those two paragraphs should be sitting in his report somewhere or other?

35 MS DEVINE: Sir, yes, the expert code of conduct requires the witness to identify the data and the information in their assumptions that form their opinion. And it is my suggestion that it would be relevant in putting forward the evidence and explaining the approach taken to identify the restrictions with the approaches taken. And in my review of the documents that Mr Erskine is undertaking, that is not identified in his evidence explaining his approach to the Board but Mr Erskine is having a look for that.

[11.35 am]

45 DR PRIESTLEY: There has been no cross-examination of the assumptions made which he has told you are at a conservative level. It is not a situation where we have two different reports of two different results. You may have

5 one but we haven't seen it. And I doubt whether there is any suggestion that at the conservative level, which has been done and which he has accepted the questions which we clarified seven or eight minutes ago, that there is a misleading sense of accuracy. He has been quite candid as to what sort of report he has done and the discussions with Mercury's representatives. I am not sure you are going to get anywhere or the Board is going to be helped if you try to attack the degree of disclosure or any degree of departure from the code of conduct. I don't think you need to do that.

10 MS DEVINE: Thank you, sir. I am happy to move on.

DR PRIESTLEY: Yes.

15 MR ERSKINE: Well, I still have a question outstanding on it to answer here, let me --

DR PRIESTLEY: Do you remember what it was?

MR ERSKINE: It's always a good help --

20 DR PRIESTLEY: Answer it then because, you are right, there is this unanswered question.

MR ERSKINE: Section 1.3 scope and limitations, the range of --

25 MS DEVINE: Is this in your evidence, Mr Erskine?

MR ERSKINE: This is in the report so it is part of the evidence.

30 MS DEVINE: So it is not in your evidence. Did you find it in your evidence?

MR ERSKINE: That was an appendix to the evidence, is it not?

MS DEVINE: It is not in the body of your evidence, is it?

35 MR ERSKINE: Well, I can look up that one. I started up with the report so that it was very clear and then let's look at the evidence.

MS DEVINE: Sure.

40 MR ERSKINE: So, in section 1.3 I laid out in that paragraph at the bottom that specific information was not available, what we did to allow the analysis to proceed, and I think that is pretty clear. The assumptions have been --

45 MS DEVINE: That is about your input, so I have pointed you to WorkSafe making a description of the approach taken in quantitative risk assessment and the inherent limitations about a quantitative risk assessment not about

the inputs.

MR ERSKINE: The input is from the output and the variation that you get, so I am just trying to understand where you are going with this.

5

MS DEVINE: In your evidence, you describe a risk assessment process that you have undertaken to help the Board make its decisions.

MR ERSKINE: Yes.

10

MS DEVINE: And in that evidence, in explaining you have done this quantitative approach --

MR ERSKINE: Semi-quantitative and qualitative, let's --

15

MS DEVINE: -- which is clearer in your summary statement and in your report than it perhaps is in your evidence. You don't identify for the Board the limitations of the different approaches you have taken, do you?

MR ERSKINE: Let me have a look through this one. I want to make sure. Certainly I have laid it out quite clearly in the risk assessment which forms an integral part of the evidence that I have put to the table here.

20

DR PRIESTLEY: Risk assessment is tied in in paragraph 4.1 of his evidence, Ms Devine.

25

MS DEVINE: He identifies that he does qualitative and quantitative assessments but he doesn't identify, sir, the limitations with those approaches. I will happily move on.

MR BICKERS: I wonder, Ms Devine, if I could because I think it is pertinent to the limitations. If we go back, Mr Erskine, to the facilitated meeting report.

30

MR ERSKINE: Sorry, I am jumping around.

MR BICKERS: It is 13 July.

35

MR ERSKINE: Yes.

MR BICKERS: And I am looking at page 9. All the way through the summary of discussion, there appears to be no disagreement, except on the point at the bottom of page 9, where you and Mr Phillis have not agreed on a matter and it seems to be the way in which the risk is assessed with or without the East West Link in place. Is that correct? Or, if it's not, can you please what that disagreement was about?

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[11.40 am]

MR ERSKINE: That was an interesting one. It's actually a bit broader than your initial

read of it. As to my memory of that night, the factoring of the vent height, if you are referring to the disagreement at the bottom, was in my role as gas examiner, I had come to realise a few things, so I need to give you just a quick bit of background.

5

I also played the role of accident investigator to furnaces and equipment that had been signed off and approved by gas inspectors and gas examiners. As was very ably pointed out earlier on, people make mistakes, and so do inspectors. In fact, Dr James Reason's work outlines the amount of error that people can do. As an accident investigator, I found that inspectors have their limits as well. In the wee hours of the morning, about vent heights and my observations from other work and the complex plume calculations that are needed to determine that, and that that piece of equipment was from the US or of US manufacture, with what we would call a class certification for its time, may possibly need re-examination when it comes in ... Sorry. Long story, short: my disagreement with Mr Phillis was from my practical experience of looking at equipment and saying, "Let's put this on the table; whoever gets to look at it explicitly later on, if they have it there, that's good; it helps their decision making and leads to a better outcome for Mercury and for the NZ Transport Agency and the EWL. Sorry, long story to that point, but that was the only real point of disagreement from my point view, was just to state that this stuff needs to be looked at carefully because our site dynamic is different to now, with a whole lot of road users near that site.

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MR BICKERS: The risk you seemed to be looking at was the ignition risk.

MR ERSKINE: Correct.

30

MR BICKERS: I asked you earlier on whether you had factored in the wind and dilution, and so on, and obviously the plume dispersion is a relevant feature in this.

35

MR ERSKINE: Correct. We have done some initial work on that and the volumes that were provided for us, by Mercury, and the calculations that we have done, indicate there would be potential, but actually I wasn't so worried about that because if conformance to the gas code is achieved - and, like I say, I was a gas inspector - that would take account of it and reorient the height and location suitably, such that that risk would be managed and dealt with.

40

MR BICKERS: Over the page, there are a number of things where it was agreed that they would be assessed outside of the expert conferencing.

45

MR ERSKINE: Correct. The information, of course, was either complex or not

available at the time, or both.

MR BICKERS: Did this happen?

5 MR ERSKINE: Yes, we did some initial rounds of the plume size and the dilution distances, but when we looked at the gas code and its requirement of some prescriptive nature of certain heights and distances, that code was built on a good sound basis and if reasonably adhered to, along with the confirmatory work, would manage that risk.

10 MR BICKERS: Were you and Mr Phillis of one mind at the end of those conversations about this apparent one area of disagreement?

15 MR ERSKINE: We couldn't have been because we didn't have that knowledge at that time, that night.

MR BICKERS: No, but you said there has been subsequent discussion. Are you now of one mind?

20 **[11.45 am]**

25 MR ERSKINE: We had these notes put out and we have had the risk assessment put out, but no, we haven't had a response back at this point in time about those matters, so that is part of the ongoing work that would have to be considered.

30 MR BICKERS: So going back to what Ms Devine has been asking you, there is a point of disagreement, maybe in terms of assumptions, on at least this issue. There are other places where there is insufficient information but on this issue, it is possible that there are different conclusions reached.

35 MR ERSKINE: It is still in the formative process. If you read the last few lines of that particular issue, on the first few lines of page 10, you will see it was agreed to be assessed outside of the conferencing, which has started. So we realised our limit at the conference and it is part of the ongoing process. That one is yet to be resolved, but I wouldn't say --

40 MR BICKERS: So it is an unresolved matter.

MR ERSKINE: Unresolved and it is in process. I don't think there is what I would call an outstanding disagreement because we haven't rejoined to a point of working it through yet.

45 MR BICKERS: Right. It is only because this document has been produced, I have noted

your table 1 refers to off-site quantitative assessments.

MR ERSKINE: Table 1 in my hearing summary?

5 MR BICKERS: Yes. It refers to off-site and I think I asked you whether that meant the East West Link and I think you said it did.

MR ERSKINE: Yes.

10 MR BICKERS: Sometime later, I think in response to a question, you said that the risk arising from First Gas assets and the need to relocate them, exists at the present time as well as into the future with East West Link being there. But I note, in the last section that we have been given, it refers to quantitative criteria for risk to persons on site.

15 MR ERSKINE: Page 49?

MR BICKERS: Page 49. Yes. It says, "on site".

20 MR PARSONSON: Under other issues, is it?

MR BICKERS: Yes, under other issues. It says that, "... needs to be justified by any operator". So I am assuming that means either First Gas or Mercury or both of them. Given that there needs to be another form of quantitative risk assessment conducted in terms of the on-site risk, versus the off-site risk, do you still stand by your statement that the risk exists to persons on the site, with or without the East West Link?

25

MR ERSKINE: Yes, there are risks to people on the site and Mercury has conveyed that to me in how they manage their staffing movements and timing. Whilst I haven't seen anything from Mercury - and, by the way, they are not under a regulatory requirement to do QRA because it is not classed as a major-hazard facility, it is but a good guideline, of which there is much good thinking that could be utilised - it is up to them, should they want to do that, but they may have other studies that they feel are adequate for what they need.

30

35

MR BICKERS: Thank you. Okay. Going back to my initial point, am I correct in saying that you and Mr Phillis are not yet of a mind in relation to those issues that were identified.

40

MR ERSKINE: We are still working, obviously, and whatever points beyond here, we would work that through, obviously.

45 MR BICKERS: All right. Thank you very much.

MR PARSONSON: Mr Erskine, the paragraph that Mr Bickers referred you to in the witness conferencing statement, under the disagreement regarding

emission of flammable vapour, is it fair to say that you were being particularly cautious in wanting that inclusion, that statement included in that disagreement?

5 MR ERSKINE: This is in the conferencing statement?

MR PARSONSON: Going back to the conferencing statement, and the paragraph that Mr Bickers discussed with you, under ignition of flammable vapour, on page 9.

10

MR ERSKINE: Page 9.

[11.50 am]

15 MR PARSONSON: Yes, bottom of page 9; disagreement. Mr Bickers asked you some questions about that paragraph. Is it fair to say you were being particularly cautious, wanting to include that statement in there?

20 MR ERSKINE: Yes, the caution is that equipment was put in many, many years ago, under different regimes of thinking. Risk has matured in that time, and it would be good to look at it with a new set of eyes, with some explicit information. That's all I really sought to achieve, such that it would get the right attention. That was my intent.

25 There was an outstanding question we needed to ...

MS DEVINE: No, there was no other outstanding question on that point.

30 MR ERSKINE: I thought you wanted to look at the approximate nature, and I was still looking through the brief on that, but we did tackle a few other points.

MS DEVINE: Yes.

35 MR ERSKINE: Did you want me to continue on that?

MS DEVINE: No. In terms of just a couple more questions, this guideline - and I think the Board has read ahead a little bit - does refer, on that same page 48, to the Interim Victorian Risk Criteria. That is the criteria that you have used in your risk report. Is that right?

40

MR ERSKINE: We have used that in our report, yes.

MS DEVINE: Do you accept that that criteria is more suited to the plotting of risk contours?

45

MR ERSKINE: It has a broader reach than just the contours, but that is part of it.

MS DEVINE: You have created risk contours in your report for the pigging station

but not for other hazards identified in your report. Is that right?

5 MR ERSKINE: One uses the contours where they are appropriate. Typically in oil and gas, when the stochastic combination, as you were thinking through, requires that contouring -- not all risks need the contour. It is good you apply the appropriate tool for the appropriate risk so you get the clarity you need.

10 MS DEVINE: Do you accept that when undertaking a quantitative risk assessment in accordance with the interim Victorian criteria, that assessment needs to assess values at an aggregate risk level, not risks in isolation?

15 MR ERSKINE: The latter pages of it indicate that, and whilst this is the beginning step, one could do a rudimentary aggregation.

MS DEVINE: But you haven't identified an aggregate risk level in your evidence, have you?

20 MR ERSKINE: For the evidence that we have here I have not, but I have explored it.

MS DEVINE: Do you accept that the division of hazards into a number of discrete assessments could have the effect of presenting a number of acceptable risk events, as opposed to a single intolerable risk event?

25 MR ERSKINE: Ah. Thank you. That was a concern of mine as well. So we'll have to take you on a journey. I alluded to this at the beginning, that the LSIRs are a step along the way. It all depends on what you need and the stage of work. But the rudimentary results could be added together, and my initial numbers through these societal curves indicate acceptability in the calculations that I have put together. I do reserve that because I truly respect the input from Mercury and others, so I don't like to overcook numbers prematurely, and we would like to get those assumptions in. So I think aggregating at the right time would be a good thing. Now I would wait and just let some more processes go through, but the numbers that I have looked at broadly - and this is the conservative basis - are in the right range.

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35

MS DEVINE: Your Honour, I'd like to produce this document as an exhibit.

40 DR PRIESTLEY: That's the major hazards facility?

MS DEVINE: Yes.

45 DR PRIESTLEY: Yes. What number, please?

FEMALE SPEAKER: M for Mike.

DR PRIESTLEY: M for Mike. Thank you.

MS DEVINE: Thank you, sir.

5 MR BICKERS: I'd just like a point of clarification if you don't mind. Mr Erskine, you referred to a stochastic process, which I would understand to be a form of Monte Carlo analysis. How did that come into this situation?

[11.55 am]

10 MR ERSKINE: Right. That's an interesting one. The Fast(?) programme has a random seed generator in it. You're getting right into the depths, but let's just conceptually understand that the programme will look at different weather, a scenario of a small gas release up or down or a large one, and through that assemble a stochastic profile conforming with the
15 Monte Carlo seeding process of distribution of likelihood, and bring together many, many iterations to produce those aggregated curves.

MR BICKERS: So it's part of arriving at a conservative outcome?

20 MR ERSKINE: The data we provide for, it does that. Its parameterisation within there is essentially a stochastic set of values that is normally industry-accepted, if you like.

25 MR BICKERS: Thank you. I just wanted to understand how it was relevant.

MS DEVINE: Thank you. Mr Erskine, do you accept that by introducing the road there are extra health and safety obligations on those operating at the Southdown site?

30 MR ERSKINE: There would be, and it is in the NZ Transport Agency's safety and design process. They look through that systematically.

MS DEVINE: And a risk assessment is one of those tools to take into account those
35 risks.

MR ERSKINE: When you say risk assessment, there are many tools within risk assessment. So, yes, it is a tool. In the design process there are other, more active ones, as well as when you look at the NZ Transport Agency safety and design guidance, yes.
40

MS DEVINE: Put it a different way, your risk assessment - and we'll get to the details - takes into account the likelihood of people being introduced into the area. That is the off-site risk.

45 MR ERSKINE: Yes.

MS DEVINE: That's right. And that is taking into account this new hazard, this new road that's proposed, isn't it?

- MR ERSKINE: Yes.
- 5 MS DEVINE: Do you also accept that more practicable steps need to be taken by the operators at Southdown, given that the road exists?
- MR ERSKINE: There may be some, yes, yet to be worked through formally.
- 10 MS DEVINE: But just to go with the First Gas assets, which I think is accepted, that would be one example of where the operators at Southdown would have to take more practicable steps?
- MR ERSKINE: Yes. There may be steps that they need to do, depending on what values and assumptions, of course, come through in the course of time.
15 Yes.
- MS DEVINE: And that is more practicable steps to protect workers or other people than there would be if there was no road there?
- 20 MR ERSKINE: There may be some, but I won't pre-empt the outcome at this point.
- MS DEVINE: For example, the First Gas assets.
- MR ERSKINE: Yes.
25
- MS DEVINE: Now, I want to come back to table 1, that the Board had some discussion with you earlier, before we move on. So table 1 is in your evidence. I think we'll use your evidence rather than your summary statement. Or maybe we'll use your report.
30
- MR ERSKINE: Table 1 in my evidence.
- MS DEVINE: I think your report has got table 1.
- 35 MR ERSKINE: Sorry, the page number to which you are referring? Sorry.
- MS DEVINE: Your evidence-in-chief, 6.1, if I can put my hands on it.
- MR ERSKINE: 6.1.
40
- MS DEVINE: Where is it? His evidence. Put my hands on it.
- MR BICKERS: 6.10, I think.
- 45 MR ERSKINE: Yes, I can see 6.10. I'm looking at 6.1. Just help me here.
- MS DEVINE: Sorry, 11. Sorry.

MR ERSKINE: 6.11?

MS DEVINE: Your table is between 6.10 and 6.11.

5 MR ERSKINE: Yes, that's right. It's the same one as in the hearing summary.

MS DEVINE: Yes. Now, table 1 says, "The risk between broadly acceptable and unacceptable is tolerable". Now, that's only if all reasonably practicable steps to reduce the risk are undertaken, isn't it?

10

MR ERSKINE: That is what it says, yes.

MS DEVINE: And you accept that the tolerable region of risk requires a demonstration that all practicable risk reduction measures have been implemented?

15

MR ERSKINE: For a major hazard facility, that is correct, and because it's guidance here, one would look at the good principles that are relevant to this case. So you may not need the full demonstration that a major hazard facility requires, but some sort of demonstration to a level of satisfaction in the principle is what we should look for.

20

[12.00 pm]

25 MS DEVINE: And would you accept that the cost or effort associated with that further risk reduction could be grossly disproportionate to the perceived benefit?

30 MR ERSKINE: The potential, if that's what you're alluding to, at this point would be a speculation. One would have to go through the process and see if that unfolds that way. But I do know from risk practitioning in many other places and for things not dissimilar to this in Victoria's CBD area of gas assets and things not dissimilar with people/population basis, we have achieved outcomes with clients in a collaborative way. So I leave that open, but broadly from experience in other locations the potential is good.

35

MS DEVINE: Now, your evidence at 6.3 refers to zero risk.

40 MR ERSKINE: 6.3.

MS DEVINE: Before I come on to that, this tolerable region: the zero-harm policies are consistent with this approach of taking all practicable steps.

45 MR ERSKINE: The zero-harm is a good philosophy and a good aim, commendable, but in risk land you always know there is some measure of risk and we end up tolerating it as an organisation or whatever.

- MS DEVINE: The world is filled with risk. No one is suggesting there is no risk. But the zero-harm policies or things that companies do, what they are trying to do is work in that tolerable range to do everything they can do to reduce risk. Would you say that's fair to say?
- 5 MR ERSKINE: One would apply those efforts there, yes.
- MS DEVINE: Yes. Now, when something goes wrong - the controls aren't sufficient or whatever happens - WorkSafe ultimately judges whether the company has done enough or not, doesn't it?
- 10 MR ERSKINE: WorkSafe would look at those variables. Here of course there is an interplay, and they would examine the input totally, I would expect. Yes, there is a legal remit for the local site, but I realise the road is coming in after the fact of Mercury's operation there.
- 15 MS DEVINE: WorkSafe hasn't indicated that the location of the East West Link, with respect to the power station, constitutes a tolerable risk, even if all practicable risk reduction measures are undertaken, has it?
- 20 MR ERSKINE: I've not seen any input which is more accurate for me to say, so I wouldn't pre-empt if they have or they haven't yet. I'm not quite sure where they sit in the whole examination here.
- 25 MS DEVINE: Could the EPA bring to the witness the WorkSafe factsheet dated July 2017? Mr Erskine, I went to look for the one that you referred to in your evidence, which your evidence was written in June, but it's been replaced since then and there are no earlier versions of last year's version of the WorkSafe factsheet.
- 30 MR ERSKINE: Sure.
- MS DEVINE: Now, at 6.13 you refer to the previous factsheet and you say that it states there is no such thing as zero risk. This particular factsheet no longer makes that assessment.
- 35 MR ERSKINE: Well, they think there is no such thing as zero risk. They talk about the SFAIRP process and that is what the essence of 6.13 is a prelude to doing, so the latter part of the statement contains the essence of the practicable components here in the July 17 one.
- 40 MS DEVINE: Now, this factsheet, it does emphasise the importance of eliminating risk. Do you accept that there is a hierarchy of risk control?
- 45 MR ERSKINE: They say if a risk can't be eliminated always it will be managed down to some level. Sorry, your question, your second part there?
- MS DEVINE: Do you accept that there is a hierarchy of risk control? You eliminate

and then move down if you can't eliminate?

MR ERSKINE: I made reference to that earlier this morning, yes.

5

[12.05 pm]

MS DEVINE: You accept that the hierarchy of risk control suggests that more emphasis should be on eliminating risk than mitigating potential outcomes?

10

MR ERSKINE: That is always done within the broader context of SFAIRP and at a micro level you can apply it I and get risk to your society totally wrong. You may win out for a local harm issue but at the broader level the broader society's wellbeing may go wanting. So careful in the application of how you run with this. But, yes, if I had a small remit and just running to that with no recourse for the broader picture then I'd just carry it out.

15

MS DEVINE: Appreciating you don't know what WorkSafe's view is of the co-location of this road with the power station, do you accept that WorkSafe might consider that sufficient controls could not be put in place for the power station to operate safely given the proximity of the road?

20

MR ERSKINE: They may do that or they may not do that within their legal remit or their regulatory remit but for them to step outside and perhaps look at the broader picture, which does happen at different places, so that would be one input of many that the Board must consider. I appreciate the bigger picture that must be examined here. So they may give that input or they may come with a finding if we get good values coming out of the study. It is an interesting speculation.

25

30

DR PRIESTLEY: Just help me, Ms Devine, this is not a question to anyone but just a dialogue with counsel, three or four questions back you mentioned this reduction issue if something went wrong on the site and WorkSafe came in but WorkSafe will only come in if there's an accident, isn't that right? They don't run around the place giving sort of sign offs to sites or am I wrong there?

35

MS DEVINE: No, sir, there is not a sign off process that they receive but there is a dialogue that parties have and they will -- the standard that the onus is on, as you have recalled, the persons conduction PCBUs, business undertakings and so the onus is on them and, of course, WorkSafe can't lift that onus from them by giving a sense of comfort along the process.

40

45

DR PRIESTLEY: Right. So it is not obligatory but it's an option to get a level of comfort

open to PCBUs, is that right?

MS DEVINE: Potentially, sir, yes.

5 DR PRIESTLEY: Thank you.

MS DEVINE: Now, in terms of the fact sheet before you, Mr Erskine, at the bottom
10 left hand corner there's a paragraph under the heading "How likely is
the risk and how severe is the harm that might result" and talks about,
in the last sentence, the greater the potential harm, the greater action
needed. Do you accept that more should be done to eliminate the risk
if death, serious injury or long-term irreversible health condition is
possible or a likely result?

15 MR ERSKINE: Sorry, let me just through that and I'll get you to recast your questions
shortly. So just bear with me. Many people write many things from
organisations so it takes time.

[12.10 pm]

20 I have just got to write a few things and then I'll get you to recast
shortly.

DR PRIESTLEY: I think, Mr Erskine, counsel's question was really limited to the heading
25 on the first page, "How likely is the risk and how severe is the harm?"
So you probably don't have to digest the whole document.

MR ERSKINE: I appreciate that one. Just forming my thinking to give a measured
30 response here. Okay, so they have said, "How likely ..."

MS DEVINE: So I will put the question to you, Mr Erskine.

MR ERSKINE: Yes, go for it.

35 MS DEVINE: It's a simple question. It's a general proposition reflecting on that
paragraph. A general proposition that more should be done to eliminate
risk if death, serious injury or a long-term health condition could result.
Do you accept that as a general proposition?

40 MR ERSKINE: I truly wish I could.

MS DEVINE: You wish you could but you can't?

45 MR ERSKINE: I can't and I don't think you could either. I don't think anyone in this
room could.

MS DEVINE: Do you accept that the greater the potential harm, the greater action

required, which is the language used in the fact sheet?

MR ERSKINE: It's a bit loose. The risk practitioner would look at the hierarchy that
5 you were alluded to earlier on, eliminate his one option but it's not
always possible so I would say more should be done to manage the risk
of death, serious injury or long-term irreversible health is possible or a
likely result. But eliminate is but one possibility and it's not always
available in a perfect world or even in an imperfect one. So I do find
10 that terminology a bit loose from a risk practitioning point of view.

I would like to, don't get me wrong, but we have to consider broader
practicalities which makes some of that content difficult.

MS DEVINE: In your analysis you've only focused on death and not serious injury,
15 haven't you?

MR ERSKINE: Let me draw you back to the initial one and there was that question
20 about the equivalence of injury and fatality. Sorry, I didn't have the
answer at the initial stage --

MR BICKERS: I wanted to ask that, whether --

MR ERSKINE: We did actually outline the majority injury --

MS DEVINE: Let me put it a different way to you, Mr Erskine, given your
25 conversation with the Board earlier this morning. So far as a
reasonably practicable approach of the health and safety legislation,
that applies to injury risk not just fatalities, doesn't it?

MR ERSKINE: Correct, but let's look at C44 of NZ Transport Agency, this is classic
30 of many of the frameworks that we have. It falls short on giving us
good risk equivalence, guidance for injury to fatality ratios so we are
left with industry average figures that we use and that's what we've duly
considered in our risk work. So frameworks do have their limitations
35 but we try to use the best essence where we can and we would consider
those injuries duly part of that consideration.

[12.15 pm]

MS DEVINE: At paragraph 9.3 of your evidence-in-chief, which is reflecting on the
40 various different scenarios as a final comment on matters, you say that
risks are broadly acceptable or could be managed by applying control
measures. You are assuming that those control measures that you think
will be appropriate in your report will be available and would be
45 acceptable to WorkSafe, aren't you?

MR ERSKINE: We've put them forward as an example and pending the assessment
going from this point I wouldn't preclude others but we are trying to

give just a bit of indication as best we can at this point.

- 5 MS DEVINE: Are you aware that NZ Transport Agency has prepared conditions which solely relate to the matters that you have addressed in your report?
- MR ERSKINE: Conditions?
- 10 MS DEVINE: Concerning the road.
- MR ERSKINE: Concerning the road. I have read some but, please, if you have got a document in the --
- 15 MS DEVINE: We will come back to conditions.
- MR ERSKINE: Yes, if you have got one, sorry, it is just so hard to contain everything in the head here. Yes, we had read some background ones.
- 20 MS DEVINE: Your honour, I would like to produce this document as an exhibit.
- DR PRIESTLEY: The WorkSafe ...
- MS DEVINE: The WorkSafe fact sheet dated July 2017, describing "reasonably practicable".
- 25 DR PRIESTLEY: Exhibit N for November.
- MR DEVINE: Thank you.
- 30 MR PARSONSON: Mr Erskine, I have a couple of questions and I thought I understood your earlier response and the response you have just given. Is it correct that you have taken into account injury equivalence in your risk assessment?
- 35 MR ERSKINE: Where it is relevant to do so at this point. It can be difficult to. Okay. You remember about the stochastic of whether and all of the other stuff? It is the probability of someone getting hit by something causing death. About 4% to 5% of the body being hit by a projectile would immediately result in death. The human body is amazingly resilient to many things and there is a certain probability of an extent of injury, so contextualising it in that background. Now the probit for heat exposure is similar. You can a sun tan on an Auckland beach maybe in the pitch of summer but it won't kill you but heat radiation from a certain distance will cause a level of harm.
- 40
- 45 We call that probit equations and they are in the complexity of the QRA modelling that we do: the probability of a fatality from an exposure at a certain time at a certain level, you know, 12 kilowatts per square

metre. I personally know someone who survived 200 kilowatts per square metre for 15 seconds. It is a stochastic thing. We try our best to tempt but it is not perfect data, so have that backdrop of understanding.

5

MR PARSONSON: One more question that arose in my mind in the last ten minutes, do you consider that you have looked at credible worst-case scenarios in your risk assessment?

10

MR ERSKINE: That is a very interesting one. I tried to scratch my head and think around, in my years of experience, anything else that would be credible. We always start off objectively. We say, "What is a hazard? What is a credible hazard?" A credible hazard is different from a credible risk, and let's make that ultra clear. A hazard establishes potential by deduction. A risk is working it through with the calculations to see if it is within your societal acceptability values or not, so many hazards may fall by the wayside and not become credible risks. And that is a normal thing.

15

20

Now, cast back to the conference. I specifically asked a number of times were there any other things Mercury would have in their experience that they would like to table, and I was willing to remain there should there be extra ones. And they did add ones earlier in the day and we worked them through. We gave it the best shot with the energy and the resources and the preparation and the time we had, so yes we tried to think. I would have to be God to say I could identify all risks, and I don't think I can make that claim.

25

30

MR PARSONSON: Well, I will ask a different question. Have you given it your best endeavour to identify the credible worst-case scenarios that you should assess?

35

MR ERSKINE: Myself and the team really tested each other rigorously to that point, as well as the specialists. I think we gave it our best shot for this stage within the fiscal resources at hand and the timing.

35

MR PARSONSON: Is that yes?

MR ERSKINE: Yes.

40

MR PARSONSON: Excellent.

MR ERSKINE: Sorry, absolute is always hard in Riskland. Sorry if I can't be black and white.

45

MS DEVINE: Now, sir, conscious of time and I am about to move on to all the different scenarios, which are involved and we will examine the assumptions. Before I go on to that, I just want to raise an issue of

time. I am conscious of scheduling and the like.

DR PRIESTLEY: Yes.

5

[12.20 pm]

MS DEVINE: At the pace we are going at the moment, I feel comfortable we will fill the whole day with questions to Mr Erskine, and I am not sure if he might even need to come back to finish cross-examination. I would like to think that would all happen today but from a procedural, organisational perspective, I am concerned about Transpower having to wait for Mr Erskine's cross-examination to finish.

10

DR PRIESTLEY: Well, thanks for raising that. Mr Gardner-Hopkins, what is the position with your witnesses? Where have they all come from?

15

MR GARDNER-HOPKINS: Mr Noble has come from Wellington and he has been here for the last couple of days in the hope that he would be heard. He also has some particular difficulties with next week. Mr Horne is based in Auckland and will be able to manage some time next week. I think Tuesday next week for him. If my friend thinks she may well even not complete this witness today, then I would ask Mr Noble be interposed at some point this afternoon so he can give his evidence and then be released.

20

25

DR PRIESTLEY: Mr Noble being the witness from Wellington?

MR GARDNER-HOPKINS: Correct, yes.

30

DR PRIESTLEY: You are from there too of course. And, Mr Mulligan, Ms Devine hasn't factored in, understandably so, your re-examination which may be reasonably lengthy, I guess, depending on what sort of issues are raised or damage done in cross-examination, but what is Mr Erskine's availability? Has he flown across today for this or what?

35

MR MULLIGAN: He flew across yesterday for this and is here until Friday. He is not available next week and he has flown from Melbourne. So, while I have some sympathy for Mr Gardner-Hopkins and for his witnesses who have come from Wellington, I suppose, if we look at a straight air points context, I slightly trump but only marginally. Trans-Tasman.

40

DR PRIESTLEY: Well, I think the way to do it is this. If you can use your best endeavours, Ms Devine, to cut through salient issues as rapidly as you can, I think the way to go is for you to have another 15 minutes now and we will take the lunch adjournment, say, at about 12.35 pm, 12.40 pm. We will then interpose your witness, then resume with you and if you look as if you might be finishing at 5 o'clock within half an hour we will just sit on late. Otherwise, Mr Erskine is going to have

45

to come back, isn't he? Is that an acceptable way of dealing with it?

MR MULLIGAN: Well, sir --

5 DR PRIESTLEY: I am also conscious of the fact that the Board had hoped but it is quite clear from some of Mr Erskine's responses that there is still ongoing dialogue. Your learned junior is shaking her head vigorously. She says, "No, there is no ongoing dialogue".

10 MR MULLIGAN: Well, I won't make any comment in relation to that. There are some limitations for Mr Erskine in terms of the timeframes and this is obviously a reasonably critical issue, as a number of issues are. He is available tomorrow afternoon. He is available on Friday. I know that there are limitations to that because of the Board's other commitments.

15 DR PRIESTLEY: Well, we are meant to be having a site visit tomorrow but, if I have got an iron clad guarantee from all counsel that Mr Erskine would be done and dusted by tomorrow afternoon, that may be a way of sorting it out. We may just have to can our site visit.

20 MR MULLIGAN: Well, sir, I am not in control of the timeframes as much as other people. My friend --

DR PRIESTLEY: No, you have made your point. Every counsel likes to say that.

25 MR MULLIGAN: Yes. We have some limitations in terms of Mr Erskine's availability. It is clearly an important point and I would prefer if we got this out of the way and actually completed it if I can. That is all I can say.

30 DR PRIESTLEY: You are not trotting off to the Court of Appeal tomorrow or anything?

MS DEVINE: That is Monday, sir.

35 DR PRIESTLEY: Monday.

MS DEVINE: Certainly, Mr Mulligan's suggestion that we continue with Mr Erskine today and tomorrow would be preferable to me and, sir, I would rather not interpose Mr Noble in between I think. And if we did it would need to be now before moving to the next topic.

40

[12.25 pm]

45 DR PRIESTLEY: Yes, but the trouble is Mr Erskine has to cover a greater distance than Mr Noble, and Mr Noble has been sitting up here in the alien environment of Auckland for two days. How long is he going to take?

Who wants to cross-examine Mr Noble?

MS DEVINE: There is quite a list, sir.

5 MALE SPEAKER: There is quite a list to examine Mr Noble, sir.

DR PRIESTLEY: Oh, God in heaven.

10 MR PARSONSON: Sir, could I ask Mr Mulligan when was Mr Erskine going to fly back to Australia?

MR MULLIGAN: Some time on Friday.

15 MR PARSONSON: Friday, so --

MR MULLIGAN: Saturday morning, sorry.

MR PARSONSON: So he is certainly available tomorrow because his booking is not to go back until Saturday?

20 MR MULLIGAN: No, and on Friday too.

DR PRIESTLEY: None of us are available on Friday.

25 MR MULLIGAN: I will say no more about Friday.

DR PRIESTLEY: Mr Gardner-Hopkins, it is not quite the air points' analogy but it comes very close to it, but I do notice - and I have overlooked it - Mr Noble seems to have excited the interest of at least four counsel, and obviously they all want to have a crack at him. My thoughts are that it is probably prudent for us - I will have to talk to the EPA staff about this - to continue with Mr Erskine and get that out of the way. But that would be on the basis, once I have confirmed it and had a discussion with the EPA staff and other Board members, that we would just have to release you and your witnesses to come back at another time. Do you see the sense of that?

MR GARDNER-HOPKINS: It is not ideal.

40 DR PRIESTLEY: Well, no.

MR GARDNER-HOPKINS: I did file earlier this morning a short summary update statement

from Mr Noble.

DR PRIESTLEY: He is the one who wants us to read rather than him reading it out?

5 MR GARDNER-HOPKINS: Yes.

DR PRIESTLEY: That is going to sort of, how can I put this, add to cross-examination time, isn't it, if --

10 MR GARDNER-HOPKINS: My hope is that it wouldn't and I haven't had a chance to confirm with any of my friends who are listed for cross-examination.

DR PRIESTLEY: Do they know what we are talking about?

15 MR GARDNER-HOPKINS: Some will. I helped them by circulating the summary statement earlier, that may shortcut some of their questions and it may address some of the questions.

20 DR PRIESTLEY: Ms Devine is not enthusiastic, and understandably so, about our interposing him. Even if there's modification of cross-examination questions of Mr Noble, I can't see him being out of here in under an hour and a half.

25 MR GARDNER-HOPKINS: I wonder if I could use the lunch break to confer with other counsel.

30 DR PRIESTLEY: I think that would be a good idea. All right, you will just have to hang around. At the moment I am pointed in the direction of continuing Mr Erskine uninterrupted until we finish him but I may be cajoled to a contrary view but I wouldn't bank on it at the moment.

All right, we will take the lunch break.

35 **ADJOURNED** [12.29 am]

RESUMED [1.37 pm]

40 DR PRIESTLEY: Thank you. Now, counsel, a couple of housekeeping matters.

45 The Board has spoken in chambers to Mr Gardner-Hopkins, who in turn has talked to counsel who want to cross-examine Mr Noble, and the Board accepts that the whole matter of lines and pylons, etc, is of interest to a number of counsel here. There is absolutely no prospect of Mr Noble's evidence being completed in an hour and a half, with the inevitable questions from the Board, and so on, and so forth, so on that basis, Mr Gardner-Hopkins, you and your witnesses are excused. I am sorry about the disruption caused, but there was an inevitability about

it, as we discussed.

5 We have also decided, Ms Devine, that we will probably crack the whip
on everybody this afternoon and sit, if need be, until 5.20 to 5.30 and
if, as I expect might be the case, although you can always prove us
wrong, we haven't yet concluded the evidence of Mr Erskine, we will
just resume that at 9.00 am tomorrow and sit until he is finished.

10 MS DEVINE: Thank you, sir.

DR PRIESTLEY: If there is an early finish tomorrow, we will then do, in a piecemeal
fashion, some of our site visits, though that does not involve too many
counsel here. Is everyone happy with that? All right. Now Mr Bickers
has something he wants to discuss with counsel, briefly.

15 MR BICKERS: The Board will issue a direction this afternoon for a conference
concerning the design of the land bridge. The Board has received
submissions for various options for the land bridge and it wants to be
20 able to better evaluate the feasibility of some of those options, so we
are asking appropriate experts from relevant parties to get together and
identify potential issues and the feasibility of some of the options that
have been put to us so that we can better evaluate them. At the moment
the Board is somewhat in the dark about the implications of various
25 links of the land bridge in terms of both horizontal and vertical
alignments and also effects on infrastructure service. So that direction
will come out this afternoon.

[1.40 pm]

30 DR PRIESTLEY: Right. Mr Hewison, we would have included in that any expert on that
issue if you had one, but you haven't. But the direction will include
Auckland Council having input from the Maungakiekie Board and that
35 may be a route in, if you have got any suggestions you might want to
make.

DR HEWISON: We do have a witness, Mr Mead, who is a landscape and design expert,
and is giving evidence in relation to the land bridge. I would suggest
40 that he may be an appropriate person to be involved.

MR BICKERS: We could. It is particularly relating to the design and constructability
rather than the urban design elements. Part of the direction asks the
parties to come forward with a suggested condition that might deal with
45 a collaborative approach to those urban design elements, because they
are harder for us to address at this point of time. We are trying to

address the question of its positioning and its length.

DR PRIESTLEY: And the depth of the trench.

5 MR BICKERS: Yes.

DR HEWISON: Certainly if we were given an opportunity, once the direction has come out, to indicate where our expertise might lie in terms of that.

10 MR BICKERS: Ms Smeaton, can we include TOES in the list of parties, please.

DR PRIESTLEY: Brackets, Mr Mead. Is that right? With or without a second E.

DR HEWISON: Yes, indeed.

15

DR PRIESTLEY: M-E-A-D?

DR HEWISON: Yes, no E, yes.

20 DR PRIESTLEY: All right. Has that cleaned that up?

MR BICKERS: Yes.

25 DR PRIESTLEY: Now I have noticed you are sitting here with Mr Owen, Mr Pilkinton. What were you anticipating was going to happen with you today?

MR PILKINTON: We are here for Mr Noble, sir.

30 DR PRIESTLEY: You have worked out that is not going to happen.

MR PILKINTON: Yes.

DR PRIESTLEY: You can both be excused at the appropriate time, too.

35 Any other matters? Right. You are on your former oath, Mr Erskine. Ms Devine.

40 MS DEVINE: Mr Erskine, before we broke for lunch, there were some questions from the Board around your dialogue with Mr Phillis. I want to ask a clarifying point on that before we move on to your report.

Would you accept that there has been no collaboration with Mr Phillis since your conference with him?

45 MR ERSKINE: The information provided - let me clarify - through Mercury through to us, is the input provided at that point. I think he may have sent an email, but I think there was a retract put on that, so I just put it to the side, but if it had come through Mr Flexman, and I wasn't aware of the

authorship of the data -certainly accept all the information that came through in a collated sense - so I don't know the full detail, but yes, that is my reasonable understanding.

5 MS DEVINE: Just trying to clarify for the Board. You are not in dialogue, you are not talking to Mr Phillis back and forth about your risk assessment. You have prepared your risk assessment with your team of experts and not with Mr Phillis. That is correct, isn't it?

10 MR ERSKINE: We had worked very hard and we put it in just by the date and through the distribution; it then would have come back. So yes, that is the overall timing and input, yes.

15 MS DEVINE: So that is a yes. Thank you, Mr Erskine.

[1.45 pm]

20 We are going to turn to your report, which involves turning the pages. The scenarios are repeated. The scenario inputs are at chapter 5, and the results are chapter 6. That's right, isn't it? When we read the results, sometimes we are going to need to flick back to the inputs, so as to understand those better, so we will need both of those parts of the report in front of you, Mr Erskine.

25 We will start with scenario 6.1 and page 21 of your report. This is the results section of your report. Do you have that, Mr Erskine?

MR ERSKINE: Yes.

30 MS DEVINE: There is a heading called "Equation 1" with an equation there. Do you have that?

MR ERSKINE: Yes.

35 MS DEVINE: The factors in that equation refer to probability of impact and probability of fatality, don't they?

MR ERSKINE: Components within that calculation?

40 MS DEVINE: Within that equation. You would accept that the numbers relating to impact and the probability relating to fatality are greater, to take into account the users of the road, aren't they?

45 MR ERSKINE: We looked at the density of vehicles and people on a per square metre basis because the projectiles aren't particularly discriminatory and on a probability basis, yes, those figures are there, yes.

MS DEVINE: You have identified that this risk is a 1 in 127,000 years risk. That is

close to the unacceptable threshold of 1 in 100,000 year's off-site risk, isn't it?

5 MR ERSKINE: It is close but, yes, it is not unacceptable. It is within that tolerability range we talk about.

10 MS DEVINE: Let's go to page 11 of your report, which is the other part of the inputs in relation to the first scenario. On page 11, one of your assumptions concerns a vent failure, doesn't it?

MR ERSKINE: Which one would you like to point us to?

15 MS DEVINE: I am looking at Table 5. This is the table that sets out your inputs for scenario 1. Do you have that? In the trip and failure rate data, the fourth row there says, "Catastrophic failure frequency". You have based that on aviation industry tolerable failure rates. That's right, isn't it?

20 MR ERSKINE: Yes. It says there, "Typical for aircraft and a literature search". So it, again, is the information I have put to hand earlier. We look for confirmatory information from a number of sources.

25 MS DEVINE: Do you accept that aeroplane engine maintenance is carried out on different inspection and servicing intervals to industrial engine maintenance?

MR ERSKINE: That would be one factor, and yes.

30 MS DEVINE: And you accept that the inspection and servicing intervals are different for industrial engines for a range of factors.

MR ERSKINE: They would be. Again, one of many factors, yes.

35 MS DEVINE: You accept that industrial engines, different types of engines, have different operating modes?

MR ERSKINE: They do indeed.

40 MS DEVINE: Different fuels used?

MR ERSKINE: Sometimes similar, sometimes different.

MS DEVINE: Different components are fitted and used?

45 MR ERSKINE: In some places yes, in some places no.

MS DEVINE: Different stress patterns are exerted on the units in the different applications. Would you accept that?

MR ERSKINE: The potential is there. One would have to look at it quantitatively.

5 MS DEVINE: Do you accept that the industrial machine maintenance schedules are based on condition monitoring, and maintenance schedules for aircraft engines are not regulated by condition?

10 MR ERSKINE: There are many components and it depends on each organisation, so they would use some of those components as well as whatever they deem they need from a risk management point of view.

[1.50 pm]

15 MS DEVINE: Aircraft maintenance: that's controlled by reliability-centred maintenance schedules which are non-negotiable, and component replacement is regulated on the operational cycles. You agree with that?

20 MR ERSKINE: Yes, there are regulations and components there. Yes.

MS DEVINE: So would you accept in relation to this row of your table that the catastrophic failure frequency might be higher than that for an aeroplane?

25 MR ERSKINE: I had already done that.

MS DEVINE: In selecting 1 in 10 million years, you have altered your frequency ratio? Is that what you're saying?

30 MR ERSKINE: As I said in the text there, there's a typical tolerability value. Aircraft was but one reference point. We looked at the OREDA data, which has --

35 MS DEVINE: No. Just keeping focused on row 4 because we'll go through it one by one, in your value --

MR ERSKINE: Well, that's what I'm saying in the assumptions, and that's the input that's gone into that line. But, yes, continue on.

40 MS DEVINE: So are you saying the 1 in 10 million years takes into account the different -- your assumption is stated to be that its typical tolerability value for aircraft is what you've used in your setting of that value. That's right?

45 MR ERSKINE: That was one input, and it says, "And a literature search". Yes.

MS DEVINE: You're saying you modified your value based on the literature search?

MR ERSKINE: It formed a factor of thinking in that range.

MS DEVINE: And the selection of 1 in 10 million, how different is that to what the value would be if it were just based on aeroplane tolerability values?

5

MR ERSKINE: You've painted a picture of part of the story, but the broader picture is the manufacturers have freedom for slightly different components on the aero-derivative equipment on the ground, which also forms part of that consideration, as well as the OREDA data which is part of that literature search and the trip failure rates, and the numbers seem to come out in the similar range. With more time and good effort we can explore that further. We also will do the other calibration of how many times have turbines failed around the world, causing harm to people, as a cross-check to these derivations and equations that we do. So that forms the broader remit of that investigation for that number. So it is an in-the-range number, and certainly more data we can look at and take as an input.

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MS DEVINE: Would you accept that the frequency of failure might be higher because it involves industrial engines?

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MR ERSKINE: That would be an interesting one. In our searches we found that those pieces of equipment, the aero-derivatives on the ground, as you say, not regulated by the aviation criteria but nonetheless having heritage and parentage of design and thinking from there which is not rendered invalid -- these pieces of equipment run near hospitals and other places where power must be kept on, and in proximity now it's difficult to get all the measurements but we did find some that were in close proximity around the world to places where people would be. Finding fatality events, we didn't seem to find too many at all. So, again, it's in the range, but look, if there's better data, we're happy to input that in.

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MS DEVINE: And you said you could do with more time to explore that particular value further, didn't you?

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MR ERSKINE: Seeking data often takes a lot of time, and one to build a study to get in the range is a good start. Would we like to do more? Of course we would, for everybody. We must make pragmatic decisions within frames and resources. But yes, we covered that one from a few different angles and it seems to align. Not always is the data that we go to look for perfectly there ready for us on a platter.

40

[1.55 pm]

45 MR BICKERS: Ms Devine, can I just clarify something? Why would it be higher for a stationary engine against an aeroplane engine used in flight, where it would be subject to variable speed?

MR ERSKINE: Yes.

MR BICKERS: Whereas in a situation like this it would be pretty much a fixed speed. Why would it be higher?

5

MR ERSKINE: Well, Mercury in their information said they could be running a peaking plant. They indicated the gear could be lower. It could be running up to or down 15 times a day, but I don't know on what frequency it does that. We would have to look at that properly, statistically. But, as Ms Devine painted part of a picture, let me fill in the rest for you. When you're on the ground, you aren't constrained by the weight parameters of what you have to do in the air, so you can pick different materials with different strength characteristics that give and yield different reliability factors. There are changes, if you look at the LM6000, that would yield different results. Does it throw all the data out? No. We vote with our wallets, and the risk is measured out by designers.

10

15

MR BICKERS: I'm really just trying to understand why the risk would be higher for an engine that, aside from its start-up, as I would assume it on a peak shaving plant, would be running at a constant speed, versus an engine that runs at varying speeds with different atmospheric conditions. So I just don't understand why it might be high. Usually stationary engines, from my knowledge, have a higher level of reliability.

20

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MR ERSKINE: They do. An aircraft, next time you go to fly, look for the filter on the front of the turbine. Most likely you won't find one. But you can put that on the ground, and there are many things you can do on the ground that will increase that reliability. Yes, the load profile is different, and if I put my reliability engineer's hat on for you now, sometimes ramping up and down takes stress on a piece of equipment, but so does running it near load all the time. As the electrical people will tell me with transformers, it takes a toll on its life. So there are many factors up and down.

30

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MR BICKERS: I think Ms Devine put it to you that the frequency might be too low in this set of circumstances because it was fixed or because it's an installed engine versus an aero engine. Have you just told me that that's not necessarily the case?

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MR ERSKINE: Sorry, when you say the risk might be too low, you mean there is a lesser risk than aviation?

MR BICKERS: Yes.

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MR ERSKINE: Okay. Look, the --

MR BICKERS: I appreciate the aviation risk is managed by all those things that Ms

Devine has talked to you about, the way in which you run your maintenance. That's how they minimise risk in those.

5 MR ERSKINE: Yes. Yes. Look, that possibility is there. Could we get better data for it and the particular profile of Mercury? And I had actually asked for that. I had asked for the reliability data early on so that I could get a bit of a feel from how they used to run and perhaps have some sort of application of understanding to how they might run in the future. So I had asked for that information, and --

10 MR BICKERS: Okay. Thank you.

MR ERSKINE: It's all the factors that you need to consider. Yes.

15 MS DEVINE: Just following on from Mr Bickers' questions there, to be clear, when you accepted that aircraft maintenance replaces components by operational cycle, wouldn't it be fair to say that you're less likely to have a catastrophic failure when you're replacing your components on an operational cycle basis rather than just when they wear out?

20 MR ERSKINE: That is getting to a depth of the LM6000. A lot of companies have RCM, reliability-centred maintenance, whether it's on the ground or in the air. The manufacturer would normally specify that, and I would imagine that newer turbines would have manufacturer recommendations for replacement for aero-derivative equipment on the ground. It would be Mercury's choice whether they stick to that or a higher level standard, if they value the safety of their employees as well too. So there are many factors, organisational ones, that come into play. I wouldn't hold aviation right up at the top. There are other places on the ground that do very rigorous maintenance. So it's there, along with many others.

[2.00 pm]

35 MS DEVINE: I'm just trying to help clarify matters for Mr Bickers. So you have said that aircraft maintenance has these reliability-centred maintenance schedules, and that can influence the catastrophic failure frequency rate, can't it?

40 MR ERSKINE: It can, but of course with the Trent 900 engines on the A380, that just totally got past the keeper on that one. And --

MS DEVINE: Just keeping it at a broad picture rather than particular examples.

45 MR ERSKINE: Yes. Those sorts of things. Well, that was a pretty big statistic. All the Trent 900 engines had to be recalled because of that fault and the inability to detect everything. That wasn't just the one aircraft.

MS DEVINE: You've accepted that industrial machine engines are not regulated by operational cycles. They're more likely to be regulated by condition monitoring.

5 MR ERSKINE: It's getting to a level and a depth that I would have to explore further.

MS DEVINE: But just trying to elaborate for Mr Bickers that the value might change. You might get a different rate of failure, a greater frequency of failure if you would, depending on how often you swap out your components. Yes, is that right?
10

MR ERSKINE: With the --

MS DEVINE: And in one scenario you are doing --
15

MR ERSKINE: Hold on, let's deal with that properly before we progress along, please. Some of the components I understand in the ground based ones, because I looked at the series of them, have different metallurgical materials because they are freed up on the ground. They are not weight constrained and they also have different strength characteristics. That may free up from the tighter regime up in the air. So I would have to go to a lot of effort and really explore that down at component level, which would take time, so it could be either way. I think it is a speculation for me to answer in an affirmative at this point. There would have to be more work but I don't know if it would be frightfully productive.
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25

MS DEVINE: You have said already that you have prepared this work in a very fast amount of time, haven't you?
30

MR ERSKINE: In the context of eight professionals working in parallel with me and another ten or more professionals providing the input, which is what we do. Many clients do ask us for many things under time pressure. So, yes, there are logical limits. We believe we have given you something in the range.
35

MS DEVINE: It is a matter of days you put it together, wasn't it?

MR ERSKINE: Sorry?
40

MS DEVINE: It was a number of days from your instructions to prepare this report to providing it to this Board, wasn't it?

MR ERSKINE: We were given the instruction quite a way back to do the risk assessment and we started looking under all of those avenues as soon as we could. When we got the updated conditions at conference that
45

gave us other paths that we had to logically examine and consider, yes.

MS DEVINE: Was it days or months?

5 MR ERSKINE: Well, I did put a count of --

MS DEVINE: You were instructed in June.

10 MR ERSKINE: -- a month and a half, so that is 46 days. I would have to do the exact counts right to this point here but we put out the report and we even kept on working past that point to ensure we were on track.

MS DEVINE: You had your facilitated meeting on 13 July, didn't you?

15 MR ERSKINE: Yes, that's right.

MS DEVINE: And you prepared your report and evidence on 28 July, that's right?

20 MR ERSKINE: We completed it then, yes, but we had started it before the conference, so let's be very clear about that. We had started on that work much earlier and, in fact, I had been collecting data for years earlier so that forms a background of context. So, yes, the report assembly is part of it but getting good useful data can be many years in the process, so there is a substrate of preparation in there that should be duly considered.

25 MS DEVINE: I put it to you that you haven't had as much time as might be useful to have a helpful variable in terms of the catastrophic failure frequency. Do you accept that?

30 MR ERSKINE: Sorry, hit me with that again, helpful variable ...?

35 MS DEVINE: You have a value in table 5 which has a value of once every 10 million hours there will be a catastrophic failure frequency. You have said in answers to me that it would be helpful to have more time to explore whether that frequency level is correct, given the scenario here relates to industrial engines and not aircraft, do you accept that it would be useful to have more time?

40 **[2.05 pm]**

45 MR ERSKINE: On a quantitative basis that may be correct but, on a qualitative basis, when I started asking specialists in turbines about this most of them, in their 20 or 30 years of experience, didn't seem to be able to come up with values where potential of harm would be credible, so I was looking at a quantitative as well as a qualitative basis. So when I say "helpful", yes, if someone needs a slightly more precise number one could go searching through. We felt we were getting into the right

range of thinking.

- 5 MS DEVINE: Are you sure you are making that statement about their experience? You have made that statement in relation to the second scenario with the generator retaining ring failure. You are attributing that the GHD specialists didn't have that experience. That is not in the report.
- 10 MR ERSKINE: That may not necessarily mean I didn't get it. It just means did I record every single iota? Most probably not. But, no, I certainly do feel that question passed our turbine specialist about these sorts of things and his experience in the power game is of a similar level, around about 30 years for one of them and there was another one who - it is always hard to make a guess on some people's age - most probably has about at least 15 or 20 to put to the play on that too.
- 15 MS DEVINE: We have you in the room, Mr Erskine. In terms of the value, do you accept that that value could differ with more information about industrial engines?
- 20 MR ERSKINE: It could but, from a risk practitioner's point of view, I'm actually not too worried because we have built in conservatism on quite a few of the other factors so if there is --
- 25 MS DEVINE: We are testing that conservatism, so we need to look at it line by line and so I hear you saying the message, "Conservative, conservative" but we are going to look at each of those items.
- MR ERSKINE: Sure. Okay.
- 30 MS DEVINE: So, in terms of the conservative approach you have taken here, it is your evidence that the number could change, couldn't it?
- MR ERSKINE: There is potential, yes, with more exploration.
- 35 MS DEVINE: Thank you, Mr Erskine. In terms of the additional data, just turn to the bottom half of that table that you have in front of you. Now your assumptions about debris flying from the generated disk failure, they are essentially course estimates, aren't they?
- 40 MR ERSKINE: They are for that point. If there is good data on the amount of fragments and the way in which they release we could refine that further.
- MS DEVINE: You have just picked the number 10% there, 10% in the next row and 30%. That is what you mean by course estimates, isn't it?
- 45 MR ERSKINE: Well, I drew a 7 metre radius circle, looked at the amount of debris that was provided by Mercury and looked at the angles and trajectories that might have fatality potential, so those were the broader considerations

to arrive at that conservative number.

MS DEVINE: If they are there to provide a broad estimate of risk level, do you accept that it is fair to say they may be assumed to have a high error margin?

5

MR ERSKINE: The conservative figure embraces a certain amount of error, just as one would do costing for a project.

MS DEVINE: Sorry, the conservative figure you are referring to here, is it the 10%

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MR ERSKINE: There are two lots of 10% there.

MS DEVINE: Is that the figures that you are referring to as being conservative?

MR ERSKINE: So which one do you want, the chance of debris ejection during catastrophic failure or do you want the probability impacting the road?

MS DEVINE: Well, perhaps if you just confirm that you believe they are all conservative.

20

MR ERSKINE: Putting past the people that I talked with, we asked if that was reasonable, based on their experience, and professionally we would think it to be in the conservative range at this point.

MS DEVINE: Would you accept that only a small increase in the risk around the debris being released impacting the road would be needed to result in an intolerable risk?

25

MR ERSKINE: So you are saying the 10% chance if that went up to 20%, 30%, 50% or whatever? Is that --

30

MS DEVINE: If that is the approach you are taking, yes.

MR ERSKINE: Okay. Yes, like I say, when we do risk work we build it into all the numbers. So the chance of all the numbers being higher statistically is quite extraordinary, and that came back to the panel's earlier point about Monte Carlo. To do one percentile, times 1 percentile, times 1 percentile usually results in not frightfully meaningful results, so from a risk point of view we try to avoid that trap.

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[2.10 pm]

MS DEVINE: Let's look at row 2 of that additional data, the probability of degree impacting the road where road users are. Would you accept that if that number increased from 10% to 13%, just 1-3, that it would result in an intolerable risk level? That is where the maths leads you?

45

MR ERSKINE: Yes, I see what you are trying to play out there. You could game those

- 5 numbers up if you wanted to but, as soon as you start playing the gaming action - just posing a hypothetical - I would say pose a more credible hypothetical and do the research, we could game the numbers up or down but I think it would be a waste of time. Have a basis, give us data, we will put it in.
- MS DEVINE: But you have accepted that the numbers are coarse numbers, so they don't have to change by much to become intolerable.
- 10 MR ERSKINE: They are all coarse and up at conservative, yes, so gaming one number without looking at the whole picture I think is not constructive in a risk process.
- MS DEVINE: But you are relying entirely on these inputs to come up with your 1 in 15 127,000 years, aren't you, Mr Erskine?
- MR ERSKINE: As a first point. This gaming process is not how we would progress from here. If we were going to do this in a disciplined, informal way, 20 we would put all of them on the table to a credible basis and do them all together. Gaming one or two up or down, such as that just to get it over a line or get it under a line, is deterministic thinking which is not how we run.
- MS DEVINE: You have just picked a number, so I could pick a different number, 25 couldn't I, that is not very different from 10% and get something that is actually in that red zone of your table which is intolerable?
- MR ERSKINE: If you joined the team and we did it in a collative way, then we could 30 and you will now have the data and you could do that in a formal, disciplined way but gaming it up to try and generate a value like that I think is to look at the numbers in isolation.
- MR PARSONSON: Mr Erskine, I think you have provided an explanation about what you 35 think the approach would be to refine the number but the simple question was: would a small change in the assumptions influence the number that you have generated in terms of risk?
- MR ERSKINE: Oh, yes, mathematically it could do that. Professionally, I wouldn't do 40 it that way. So, yes, look, mathematically I don't have a disagreement. Get a fact or a data and if it validates that point upwards that is a fact. No disagreement there. But playing mathematically versus the systematic formal process of risk, which is the proper analysis which you need to go from here, is the caution I put to the table.
- 45 MR PARSONSON: So to take that a step further then, with further refinement in which direction would you anticipate the number move?
- MR ERSKINE: As stated in our information, once we get more rigorous for all of these

it would like, in aggregate, move down. Now, I can't guarantee that is in time what is needed to bridge that gap.

MR PARSONSON: When you say "move down" can you just relate that to the --

5

MR ERSKINE: To lower the risk, let's coin it in that phrase.

MR PARSONSON: Thank you.

10 MR BICKERS: Can I just explore the three lines? I understand what Ms Devine's asking you and Mr Parsonson has clarified but can I just get a better idea, the chance of debris ejection during catastrophic failure is determined by what? Is it determined by the nature of the machine, presumably there are only a specific number of areas through which
15 debris can be ejected?

MR ERSKINE: I talked again with our turbine specialist and a particular component that Mr Flexman raised was the disc at the exhaust end. There are protective shrouds and casings around the new ones so that is most probably a conservatively high one. The shrouds are normally built these days, especially on the ground because you don't have that
20 constriction of weight anymore, to be quite sturdy. It could be quite lower.

25 [2.15 pm]

MR BICKERS: Yes, so what I am examining is you've got 360 degrees, how much of that is protected? To me what you are saying is that there is only 10% of the circumference through which debris can go.

30

MR ERSKINE: Okay. No, the 360 degrees would be protected normally. It's the probability of ejecting somehow beyond that. So we are saying the full 360 is encompassed. Is there some imperfection in the metal, is the tolerance for the circumstance or the condition with the design
35 adequate?

MR BICKERS: So it has to find its way through the protective shroud?

40 MR ERSKINE: This is getting to the bowels of turbine experts but I think there are two boundaries that it would have to make it way through in short.

MR BICKERS: Okay, and you are saying there is a 10% chance of that happening?

45 MR ERSKINE: That was a number, a conservative number, we put to the table and they agreed it was a conservative number on their professional experience. On them I rely.

MR BICKERS: So having got through the shroud we move to the next one, the

probability the debris impacting the EWL. So you then presumably have to look at the trajectory of the debris ejection which is going to be determined by the geometry of the East West Link over the top of this area, the velocity of the ejection and the angle of the ejection, right?

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MR ERSKINE: Yes, yes.

MR BICKERS: What I remember of basic ballistics.

10

MR ERSKINE: Really good. Really good. You also take into account the compressive strength. Now, my brief was if it comes slightly under and hits the concrete section that's not my concern. My concern was about the fatality to potential people on the road. Yes, there will be a little bit of damage of some substantial concrete underneath, but that is basically a dead end path. You have to come from down at the level where the turbine is ejecting at the angle, either hit the barrier or over it. So you have to come out of two shrouds which will take away a significant proportion of the energy and, again, those ballistics accounts are quite hard to do.

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20

MR BICKERS: We don't want to double count this so the first one is 10% get through the two apertures?

MR ERSKINE: Correct, that's right.

25

MR BICKERS: The second one is relating to estimating the angles and the distance. So this is a matter of V^2 over $2G$, I think from ballistic theory?

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MR ERSKINE: Half MB^2 , that's the kinetic energy but it's lost some of it to get through the shroud.

MR BICKERS: It's lost some of it getting through the shroud.

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MR ERSKINE: And it may have changed its angle a little bit but it's still essentially a randomised component.

MR BICKERS: Then you arrive there at 10% of hitting the structure?

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MR ERSKINE: Correct. On the shape factor of the way it may come up a vehicle angle, to cause harm to a person in a vehicle and the probability of them being there is the other probability, of course, but there is a small probability it shoot right up at 400 metres a second - I have already worked out the drag coefficients - it then has to go up to the air, it's lost the majority of that kinetic energy and falls back down and could possibly, by a very random slim component, hit a vehicle at terminal velocity not at

45

centrifugal energy.

MR BICKERS: Now we have got the frequency of vehicles passing it's got to hit.

5 MR ERSKINE: Correct, and we put in a conservative one of 30%. We were looking at the data and we actually found a little bit of an error in the data. We deliberately picked peak hour and we got the traffic engineers to provide that for us. I then looked at the people per square metre and the size of the material and it is substantially lower than 30 but we left
10 it at 30 to be conservative for everybody's sake.

MR BICKERS: Okay, that is where I was going. So how did you get it to 30?

15 MR ERSKINE: Just putting the sheer amount of detail in here, we were mindful of trying to keep the --

MR BICKERS: We are determining whether this set of assumptions in the equation is valid or not and I am going back to first principles.

20 MR ERSKINE: First principles. It's a very complex area. If we go there we use the broad understanding from those first principles in risk land.

MR BICKERS: Okay, all right. Thank you.

25 MS DEVINE: Now, 1 in 127,000 years as you've accepted being near the intolerable end of the spectrum, on page 21 of your report, the very bottom of your report, you come up with the factors of why it should be much more comfortably in the tolerable section and less in the intolerable section. In there, if you find that --
30

[2.20 pm]

MR ERSKINE: Sorry, which part are you ...

35 MS DEVINE: Page 21.

MR ERSKINE: Yes, I am on the whole of page 21 but --

40 MS DEVINE: Very bottom, last paragraph.

MR ERSKINE: Thank you. Right.

MS DEVINE: Here, in your last sentence, you make some assumptions on the operational model being slightly less than 100% and that might

increase the number up.

MR ERSKINE: I wouldn't say up, reduce the risk.

5 MS DEVINE: Sorry, reduce the risk, as you say, to the more tolerable or less near the red zone.

10 MR ERSKINE: The background knowledge for that is continual operation of high speed turbines causes a metallurgical creep in things and the longer you have it running and the stress is on there, the wear and tear you have on that equipment, so provided Mercury does good maintenance on the up and down run, that's the background thinking there.

15 MS DEVINE: So what you are doing there in recalculating from 1 in 127,000 to 1.27 million, you are making assumptions about how many hours the site might operate?

20 MR ERSKINE: No, it's not an assumption. It was provided to us by Mercury. They said they could run peaking, they could run synchronist condenser mode or they could run baseload. So we gave back to you the thinking that you gave to us.

25 MS DEVINE: Your assumptions are that the site would operate at 10% of the time, about 880 hours, is that right?

MR ERSKINE: We just put in that number. If you have some better data to provide to us --

30 MS DEVINE: Is that what you did? Could you answer the question?

MR ERSKINE: Well, that's what it says there so, yes, if there's better data ...

MS DEVINE: That 880 hours, I put it to you, you didn't get that figure from Mercury?

35 MR ERSKINE: No, we put that in because peaking plants -- well, it depends on what the nature of peaking here is. We weren't provided with peaking data so we were left, not by our choice, that we had to put that in to seed some thinking to get the discussion going.

40 MS DEVINE: So in picking the 10%, that involves making assumptions about the state of the electricity market in the future, doesn't it?

45 MR ERSKINE: Many speculations reside there, yes. Look, if you've got some good knowledge we can incorporate that thinking.

MS DEVINE: I'm testing your knowledge and what you've put in there and I put it to you that the number is dependent on a number of assumptions that you

can't be certain about?

- 5 MR ERSKINE: When you are saying me, there was a few people and collectively we just tried to get a broad understanding. But, again, the future forecasting is a difficult area I fully admit.
- MS DEVINE: So you accept that the 10% figure is not to have any weight on that figure?
- 10 MR ERSKINE: No.
- MS DEVINE: You don't accept that?
- 15 MR ERSKINE: I don't. As I laid out at the beginning very carefully, risk is about being approximately right versus precisely wrong. If your argument is around 20, we've already given you the risk range that shows tolerability. If it is down at 8, am I worried? No. It's in a range.
- 20 MS DEVINE: Do you accept that no one can know what the market dynamics might be in the future?
- MR ERSKINE: People can make best estimates.
- 25 MS DEVINE: Would you accept the 10% is on the low side of what might be the future?
- MR ERSKINE: It could be, it could be on the high side. I just don't know what people are doing, and not for the lack of asking.
- 30 MS DEVINE: So you don't know -- so you've got no information about the supply and demand balance overall in Auckland, have you?
- MR ERSKINE: There are many risk variables that could change it either way, as well as just general trending forecast.
- 35 MS DEVINE: So that's one, isn't it? Supply and demand of electricity overall in New Zealand or in Auckland? That's one variable that would change that percentage?
- 40 MR ERSKINE: Yes, it could be even a government regulatory one that changes the landscape. There are many things to explore here.
- MS DEVINE: And the demand growth in Auckland, that would be another variable?
- 45 MR ERSKINE: There are many variables. But then the renewables and the policies that governments might have would also be in that mix, it could go the other direction. So there would be many plays on those numbers, but

we left 100% in for you at that point so we have the 100% value there.

MS DEVINE: Your 100% value is at 1 in 127,000 years, though, right?

5 MR ERSKINE: With conservative numbers as we pointed out deriving them, yes.

MS DEVINE: You are aware that there is no restriction in the resource consent or in a district plan restricting Mercury's hours of operation?

10 MR ERSKINE: That's right, so we left that range in there, with a whole range for everybody. We're not saying, by any stretch, it is cast in stone at ten, that's just a ranging figure.

15 MS DEVINE: Do you accept that it's not reasonable to make assumptions based on usage of hours of power station when there is no restriction on the power station operating?

[2.25 pm]

20 MR ERSKINE: Sorry; hit me with one again, a little bit slower.

MS DEVINE: Do you accept that it is not reasonable to assume hours of operation when there is no restriction on the hours of operation?

25 MR ERSKINE: We just put in estimate values. If Mercury wants to run at 50, the numbers mathematically play out. I'm not dictating a value here; I am just showing a range, so reasonability here, I am not sure is relevant. I am just giving you a range.

30 MS DEVINE: I am putting to you that the range that you presented in your 10% is not a reliable one.

MR ERSKINE: Okay. Well, if you've got a better value, I'm happy to incorporate it. It will just mathematically multiply out.

35

MS DEVINE: Do you accept that it is not reliable because you don't have that information, those many factors we have just conveyed?

40 MR ERSKINE: I never put it forward as a reliability figure; I just put it to help people understand a range. I am not saying it is cast in stone, as I have said before, it is just ranging, thinking. If you've got another value, it can be put in. I am not dictating anything. I am showing no value or assumption or projection or forecast. I am just giving you ranging data. That is what we do, in risk.

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DR PRIESTLEY: Mr Erskine, it is very clear from an early stage of your evidence that there was a limited degree of information given to you by Mercury, when you were asked to carry out this risk assessment exercise.

Counsel is entitled to ask you questions about imponderables and you have very fairly made the point that you are coming up with a range, and not necessarily an accurate assessment, which is designed to reflect risk and the many scenarios available.

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MR ERSKINE: Indeed.

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DR PRIESTLEY: So it is probably not helpful for you to repeat, as you have six or seven times now in the last few minutes, "If you can give me a better number, or an accurate number, I can do it". We understand that point. Ms Devine, as counsel, is not likely to make any significant concessions in that regard, so you just don't need to spar with her in that area. We understand it all. All right?

15

MR ERSKINE: I am just saying the basis, not a forecast --

DR PRIESTLEY: Yes, we understand that. All right? I am just trying to speed things up slightly. Yes, Ms Devine.

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MR ERSKINE: I'll say it once and we can move on.

DR PRIESTLEY: You have said it a number of times. It would be helpful if you didn't say it again.

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MR ERSKINE: Sorry. I was just answering questions as they were continually posed. Yes.

30

MS DEVINE: We are going to move to conditions as we go through these scenarios. If a copy of the expert conferencing joint witness statement to the Board of Inquiry on conditions, dated 4 August, could be presented to the witness, that would be helpful.

35

DR PRIESTLEY: This is the joint conferencing statement.

MS DEVINE: Yes, sir, on the Southdown conditions.

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Do you have that, Mr Erskine, or do you need the EPA to provide that to you?

MR ERSKINE: Let me have a look. I have one dated Friday, 4 August. Is that the one?

MS DEVINE: Yes, 4 August.

45

Did you help Ms Hopkins prepare her risk conditions for the

Southdown site?

MR ERSKINE: I gave some input at a certain point, but then the document came out.

5 MS DEVINE: So you helped her inform her thinking in preparing these conditions. Is that right?

MR ERSKINE: In some components, yes.

10 MR BICKERS: Ms Devine, we seem to have the wrong document. The Chair and I both need to ...

MS DEVINE: It is the expert conferencing joint witness statement on conditions, 4 August.

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[2.30 pm]

DR PRIESTLEY: On conditions.

MS DEVINE: Yes.

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DR PRIESTLEY: Thank you.

MS DEVINE: Mr Erskine, you were saying that you provided some input to Ms Hopkins. What did you tell her needed to be included in the conditions from a risk perspective? Let's limit that question for the moment, to in relation to scenario 1, about turbines

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MR ERSKINE: Turbines, some sort of consideration, at a suitable stage, about protection equipment, at some process down the design.

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DR PRIESTLEY: Has this witness got something to do with this document?

MS DEVINE: Sir, he has identifying the effects, I am trying to understand how they are supposed to be mitigated through the conditions, and he has given input to Ms Hopkins.

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DR PRIESTLEY: Which condition are we looking at?

MS DEVINE: We haven't got that far, sir, so you are not too far behind.

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DR PRIESTLEY: I am not dragging the chain too much. Thank you.

MS DEVINE: Mr Erskine, you were saying that you had provided some input to Ms Hopkins in relation to the turbine in terms of what conditions might be

useful to address the risk related to the turbine.

MR ERSKINE: Yes.

5 MS DEVINE: Can you point us to the matters that you consider address the risk related to scenario 1?

MR ERSKINE: Let me have a look through.

10 MS DEVINE: Ms Hopkins' are the conditions at the back of the document. You will probably want to refer to those.

MR PARSONSON: Ms Hopkins' are in portrait format, and Mercury's are in landscape.

15 MR ERSKINE: Okay. So, if I read the correct section here, SD8, on page 5 at the very back; that is the last page of the document I have.

MS DEVINE: That is the condition that proposes a barrier next to generator D105.

20

MR ERSKINE: So the input was, yes, that if the further risk work indicates the need, then the consideration would be around some sort of barrier, and left it open from a point of view as to how that might play out.

25 MS DEVINE: Is this what you refer to in your evidence as a turbine debris shield?

MR ERSKINE: Yes. The thinking had further progressed when I talked with the turbine person about how to go about that, but this was relevant for that time.

30

MS DEVINE: Your evidence was dated 28 July. These conditions were made available to the public on 4 August, just to be clear. Your recommendation in your evidence that a turbine debris shield be included in the conditions, that has been adopted by Ms Hopkins in SD8B(i). Is that what you are saying?

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MR ERSKINE: Yes. That is what is there.

MS DEVINE: And that is the only control that you consider necessary to mitigate the risk associated with the turbine failure in scenario 1.

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[2.35 pm]

45 MR ERSKINE: It was the one that we had considered at the time. One would go through the risk assessment in more detail and at the right place duly consider this along with other aspects.

MS DEVINE: You don't know if a barrier on site, or next to the generators, would

constrain operations, do you?

MR ERSKINE: That would be a detail that would have to be examined by the appropriate discipline specialists.

5

MS DEVINE: Something you are not familiar with. Is that what you are saying, Mr Erskine?

MR ERSKINE: That's right. You are putting it back into the realm of the specialists, aside from the risk people. We look at the numbers but specialists have to make things happen. But also, earlier on, in that part B section, we stipulated unless identified as not being required, so it leaves the right option and flexibility for people to consider in mature sense what they have to deal with at that time.

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MS DEVINE: That is not a feature that you consider needs to be in place when the road is built, is it?

MR ERSKINE: Sorry; run that past me again.

20

MS DEVINE: Do you agree that the barrier should be installed as soon as the road is installed?

MR ERSKINE: If the sequence of events is different, if the site is up and running in four months' time, and the road is built at some stage, and with all of the detailed engineering, there may be a need. Or, if the road is up and running first and then the site is to recommission, there would be a different play.

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MS DEVINE: At present there is a limited scenario in that condition.

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MR ERSKINE: We have left the flexibility there such that the right people at the right time can deliberate wisely over that

MS DEVINE: That condition only applies after construction, doesn't it? If after the road is built and Mercury is operating, then the barrier should be put in place. There's no requirement in that condition or in SD2 that the barrier be put in place earlier.

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MR ERSKINE: So:

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"Following the completion of construction, Mercury provide formal advice with intent ..."

That's how that particular section reads. Yes.

45

MS DEVINE: At the beginning of the questions that I put to you, you said that you had looked at photos of the site, and I put it to you that there will not

be space to put a barrier next to GE105.

5 MR ERSKINE: An external one, yes, that's one option, and with the knowledge that you're now providing to the table, that may be a problem, as you're relaying to me.

MS DEVINE: You said you read the evidence of Mr Flexman, didn't you?

10 MR ERSKINE: I have read the evidence, yes.

15 MS DEVINE: Perhaps if the EPA could put on the screen, just for ease of visual reference, attachment 2 to Mr Flexman's evidence-in-chief. It's a small version. Yes. Make it a little bit larger. So you read this. When you wrote your evidence you had seen this map, this plan or photograph, hadn't you, Mr Erskine?

MR ERSKINE: That was part of the factors of consideration, yes.

20 MS DEVINE: And you're aware that Mercury needs 7 metres to maintain access to each of its generators, aren't you?

MR ERSKINE: That's what I read and that's what they put forward, yes.

[2.40 pm]

25 MS DEVINE: And you're aware that the road is proposed to go near GE105, aren't you?

30 MR ERSKINE: Yes, that's right.

MS DEVINE: Would you accept that there's not enough space to put a barrier between GE105 and the road?

35 MR ERSKINE: If you're thinking of an external barrier, yes, but the barrier can be a range of things.

MS DEVINE: And you haven't explored that with Mercury, have you?

40 MR ERSKINE: At this point, no. They've flagged an external one would be a limit, but barriers can be quite diverse in design, and giving the right job to an ingenious structural engineer with those criteria, there might perhaps be other solutions that still afford that protection. But I haven't explored that detail at this point. I've just given the concept of a barrier because that is what's used in the industry right now in other places.
45 Shape constraints might dictate the form and shape of it, but the efficacy and the values you stipulate to the right people to look at and to work through.

- MS DEVINE: It's the only control that you've identified at this stage to manage the risk and the tolerable level in relation to this scenario, isn't it?
- 5 MR ERSKINE: We've left it open that other ones could be considered but I haven't explored them explicitly.
- MS DEVINE: Your report doesn't include any other controls to respond to the turbine scenario other than a barrier at this stage, does it?
- 10 MR ERSKINE: Yes. In terms of what we have there, we've left this space with the discussion for the right people at the right time, so I haven't gone and done end analysis yet. I've just gone to reduce initial indication.
- 15 MR PARSONSON: Mr Erskine, what's the implication to your risk assessment regarding GE105 if a barrier cannot be installed?
- MR ERSKINE: Okay. If it impedes the operation, then that would be a problem for Mercury's operation. But of course if they've looked at more detailed data and if it's down at a manageable level with better trigonometric values and a lot of better data, it may render the point moot.
- 20 MR PARSONSON: But it may not.
- MR ERSKINE: Correct. You've got to look in. We've erred on the conservative side, so we've left downside margin there.
- 25 MR PARSONSON: But you're agreeing, are you, that if a barrier could not be installed for whatever reasons, then that potentially creates a problem for Mercury to address?
- 30 MR ERSKINE: As I was saying, the barrier, you could possibly go back to the supplier and query them as to what they could do.
- MR PARSONSON: Yes, but the thing is, as you've said, you're not sure at the moment.
- 35 MR ERSKINE: Correct.
- MR PARSONSON: So it may or may not be possible.
- 40 MR ERSKINE: It needs to be explored further.
- MR PARSONSON: So if it was not possible, and I'm not sure whether that's equally likely as the outcome where it is possible, but it's certainly a possible outcome at the moment that a barrier could not be installed for some reason --
- 45 MR ERSKINE: It's one that should be duly considered. Yes, that's right. There could possibly be --

MR PARSONSON: If that is the case, then there is a problem for Mercury to address based on your risk analysis.

5 MR ERSKINE: That's right. If those three "ifs" some together into an actual - and any time there's an if, there's a measure of probability about it - and that were to happen, that would be a logical outcome.

10 MR PARSONSON: But is it fair to say that Mercury is entitled to look at negative ifs, rather than positive ifs?

MR ERSKINE: The data on the table is really worthwhile to examine.

MR PARSONSON: Thank you.

15 MR ERSKINE: Yes.

MS DEVINE: Let's turn to scenario 2, the generator retaining ring failure, or sometimes referred to in the evidence as the end caps.

20 MR ERSKINE: Sorry, where are we? Which document?

MS DEVINE: Well, let's go to your report at 6.2 where you have the results.

25 MR ERSKINE: Okay.

MS DEVINE: It might be useful if you left your report out because we're going to flick through it a lot.

30 MR ERSKINE: Yes. I'm finding, jumping around between documents, if I leave them out and lose the form in order, it could take longer in the long term. Sorry. Which one?

35 MS DEVINE: 6.2. We're moving to the second scenario. On page 22 you have the results for scenario 2, the generator retaining ring failure. Top of page 22.

MR ERSKINE: Yes.

40 MS DEVINE: Now, your assessment of the risk relating to ring failure is only based on the risk relating to one generator, isn't it?

[2.45 pm]

45 MR ERSKINE: That is correct. We looked at the nearest one. You could run through the probability calculations for the other ones, and the shape factors start changing for those other ones, yes.

MS DEVINE: So if it were three generators with the same failure rate and

assumptions, that would reduce to 1 in 500 years, wouldn't it?

MR ERSKINE: No.

5 MS DEVINE: You don't accept that?

MR ERSKINE: No, I don't accept that.

10 MS DEVINE: We'll move on. The bottom of page 11.

MR ERSKINE: I mean the raw rate. Each one will have a raw rate. Sorry, but let me clarify. If you're talking about the end fatality potential to the road or you're just looking at the raw fatality rate. Let's be clear, sorry. We could be talking at different cross-purposes here.

15 MS DEVINE: If you put into your equation three generators, in table 5.2, which is on page 11.

20 MR ERSKINE: 5.2. Right. Okay.

MS DEVINE: The failure rate there, that first row, if you have 3 generators, then the failure rate reduces to 1 in 500, doesn't it?

25 MR ERSKINE: Now, which lines are you looking at on page 11?

MS DEVINE: First row.

30 MR ERSKINE: Okay, so that is 2.38, if I tender the minus 5, and we just simply multiply the initiating event frequency, yes. That mathematically would increase.

MS DEVINE: And that 1 in 500 years figure is a tolerable range, isn't it?

35 MR ERSKINE: One in 500 years, tolerable?

MS DEVINE: On your table 1, you have in the tolerable region.

40 MR ERSKINE: Table 1. Now I'm flicking over to page 12. Are you looking at the page 12 numbers or are you still on page --

MS DEVINE: I'm comparing your reference to 1 in 500,000 years to the off-site risk criteria, table 1, which has broadly acceptable as 1 in 10 million and unacceptable as 1 in 100,000, with the tolerable region being the difference between the two.

45 MR ERSKINE: So you're jumping to the end fatality values, but the other factors alter dramatically the fatality potential for the other generators, of course. So are you looking at the initiating event frequency numbers and just

multiplying them by three and then just running it through the mill, or are you treating each one as individual? Because you must do that to get credible output numbers.

5 MS DEVINE: Well, do you accept that taking into account three generators rather than one will change the calculation on this scenario so that it is in the tolerable region?

10 MR ERSKINE: We can run those calculations through, but given the differences you've noted on the layout, the distance square law comes into play here and alters those numbers quite dramatically. So rather than running them through here, yes, I could run them offline. They would marginally increase, but you're dropping off with the square of the distance to the harm to the road. So from that point of view, I wouldn't linearly add.
15 I'll caution you against that. They would have to be individually added and each one looked at for the distance and the risk they pose.

MS DEVINE: Now, the bottom of page 11, you've got that row that says, "Failure rate".
20

MR ERSKINE: Yes. That's what --

MS DEVINE: And you've mentioned the OREDA reference that you've held up to the Board earlier. You have based this particular row calculation on the assumption of particular failure rates taken from that OREDA handbook. That's right?
25

MR ERSKINE: That is correct, yes.

30 MS DEVINE: Now OREDA uses two types of failure rates, one based on calendar time and one based on operational time. That's right, isn't it?

MR ERSKINE: Yes, there are some different values. There is quite a range of values there, yes.
35

MS DEVINE: You don't say what you use but I understand that you took the approach based on the calendar time, is that right?

40 MR ERSKINE: Oh, I would have to have a look. There is so much data that we brought to the table.

[2.50 pm]

Now, for the calendar time you have a factor value there and for the

operational time you have one.

MS DEVINE: Just checking first, Mr Erskine, did you use --

5 DR PRIESTLEY: She wants to know which of those two times did you deploy to get to what you have got in table 6.

MR ERSKINE: Yes.

10 DR PRIESTLEY: Calendar time or operational time?

MR ERSKINE: Sorry, at this point I'll just have to go through to just double check. It would appear that we took the calendar time.

15 MS DEVINE: Do you accept that the calendar time approach results in a lower risk rate than the operational time approach, because it incorporates the time that the turbine generator is not in operation?

20 MR ERSKINE: I would have to take that one offline with the dips of the counts but let's play that one out if that is correct. We can update that number should it be required.

25 DR PRIESTLEY: Well, you haven't answered the question. I gather that from your penultimate answer, when preparing table 6 you used calendar time, correct?

MR ERSKINE: We have noted calendar time there. Now, if that is a factor that is -- the trouble is, I don't have the whole of the text with me.

30 DR PRIESTLEY: I understand that, and if you find that you didn't use calendar time at all but some other time but let's assume for the moment you did use calendar time, Ms Devine's question is: would you accept that --

35 MR ERSKINE: Oh, yes, logically I would.

DR PRIESTLEY: -- operational time is a very different concept?

MR ERSKINE: Correct. So, look, logically I would update that.

40 DR PRIESTLEY: Yes.

MR ERSKINE: Yes, that's fine. Sorry, just having the whole of the book here was a bit hard to carry over to run the calculations through.

45 DR PRIESTLEY: A generator which is operating for, say, 24 hours a day for a 3-month period is obviously going to be clocking up more operational time than

a generator which is only running for 10 hours once a week.

MR ERSKINE: Correct.

5 DR PRIESTLEY: Yes.

MR ERSKINE: It may be other data and other values which I would have to run through, yes.

10 DR PRIESTLEY: If they don't put enough oil or lubricants in it, it may blow up anyway but still. Now, go on

MR ERSKINE: That's right. Yes, we can redo that.

15 DR PRIESTLEY: Now that I am fired back to life again, are you absolutely sure - and I am asking this in a very courteous way, Ms Devine - that this length of cross-examination is going to help us or, indeed, the process? In the absence of some other maybe more detailed risk assessment report from Mercury, which hasn't been filed yet, because he has already
20 made what seemed to me to be very prompt concessions that he has had to operate on limited data and that there is more work which could be done and, for those very reasons, his calculations are conservative.

[2.55 pm]

25
Now, it may well be that you can bring evidence which shows that those conservative estimates, because of the limited data, are setting the risk far too high. I don't know whether you can do that or not, absent such a report. Where is this going to get us at the end of the
30 day? Do you see the point?

MS DEVINE: Yes, sir.

35 DR PRIESTLEY: Yes.

MS DEVINE: These questions are designed to help you understand the inadequacies of this report, which is the report that the Board is relying on in terms of the co-location of the power station and the road. There is no other
40 magic report and Mr Erskine has said more work is needed in this and the other areas, and it is important for Mercury for you to understand the difficulties with each of these scenarios and, related to that, the controls or the mitigation put forward in the conditions and how that is also not appropriate and, therefore, the relief that they are seeking is

more appropriate. And so I do feel my questions are --

DR PRIESTLEY: Sorry, the relief which what is seeking is more appropriate?

5 MS DEVINE: That Mercury is seeking, that the road be declined and this project.

DR PRIESTLEY: You just want us to knock it on the head?

MS DEVINE: Correct, sir.

10

DR PRIESTLEY: Well, "inadequacies" I guess that is a word you could use but the report is not totally hopeless. It is rather like the second draft of a novel rather than the final published version, isn't it?

15 MS DEVINE: Well, sir, it remains to be seen what else Mr Erskine concedes as we go through all the different assumptions.

DR PRIESTLEY: Okay. Well, we do understand your point and I am not in a position yet where I think we need to or should curtail your cross-examination, but the points you are making could probably be applied across most of the data in the report.

20

MS DEVINE: Sir, I am not going to go through all of the data in the report, I can assure you of that.

25

DR PRIESTLEY: But it is, nonetheless, evidence --

MS DEVINE: Correct.

30 DR PRIESTLEY: -- and I have already indicated to you what the concessions are which Mr Erskine has made, and I suspect he would be the first to acknowledge that this is not a final conclusive and binding report on the risk assessment of Mercury at some future date wanting to get back in turbines and gear up its plant but, nonetheless, it is not totally hopeless and useless. That is the point I am making.

35

MS DEVINE: The question is whether you have enough information to make your decision to grant the project or not, sir.

40 DR PRIESTLEY: All right. Well, if you want to put all your eggs into the cross-examination basket, and making huge dents in this witness's overall credibility and assessment, you can do that. There are other ways of

doing it, though, if Mercury so chooses.

MS DEVINE: Thank you, sir.

5 DR PRIESTLEY: Proceed.

10 MR PARSONSON: It would be very helpful - and I imagine you are planning to do this - if there is some reinforcement of Mercury's preference for its own set of draft conditions, and whether they are elements of Mr Erskine's analysis that could be used to test the appropriateness of that. I understand Mercury's first position is that no road goes through the site but the fallback position, which came out of that conditions conference, would be there are two sets of conditions. And the point you have made on draft condition SE8 is well understood and if there is progress that can be made there that would be really useful too.

15

MS DEVINE: Thank you, sir.

20 DR PRIESTLEY: Yes, but that assumes that Mercury want to impose conditions in the first place. At the moment I sense Ms Devine's stance is Sydney or the bush, isn't it?

20

25 MS DEVINE: Well, sir, I am putting questions both about the substance of the report, so as to inform the Board about the reliability of the information but also in relation to questions, as Mr Parsonson has noted, and I will continue to do that.

25

30 DR PRIESTLEY: That is helpful but, anyway, if you can refocus on it and take aboard my comments because we do understand your core points.

30

35 MS DEVINE: Thank you, sir. Mr Erskine, if you could turn to the top of page 12 of your report. We are still in scenario 2 here, but that is the row that deals with the probability of not detecting failure. You have assumed a 1 in 1,000 probability of not detecting failure. That is of 1,000 events 999 of the time systems would militate against it. That's right, isn't it?

35

40 MR ERSKINE: It was reinforced to me by the manager there, Mr Tyas, when we asked him at length at the conferencing when we did the scenario about the number of sensors.

40

[3.00 pm]

45 I am trying to recollect the emails. I don't have all of them with me. We did ask about the number of sensors and the vibration. It was reinforced to us, and Mr Flexman had, oh, how many questions did I pose to you? About 20-odd of which that was in there. The number of those sensors and the more sensors you have detecting that sensitivity of vibration as a potential precursor, they're not all perfect but the more

45

you have the better the chance you have of taking some action, as Mercury would naturally want to shut that down safely for their own operational needs as well as the safety concerns of their staff.

5 MS DEVINE: Mercury thinks that you have misunderstood some of that information, so I am going to put some information to you. So you are referring to Mr Tyas and Flexman providing you with this information about trips, the tripping the system, and they referring to multiple senses and single voting trip logic systems?

10 MR ERSKINE: I asked them does one sensor take it out, do multiple sensors need to vote to be required. The efficacy of their control system I didn't quite get to that level but certainly if they were able to provide more information there we could refine that info along with the original request I had about the nature of their operations and the tripping and what they did.

15 MS DEVINE: Now, that information that Mercury has provided around those trips, that is only trips in relation to fire that's not in relation to the likelihood of end caps failing in generators.

MR ERSKINE: It was portrayed to me as vibration sensors not fire.

25 MS DEVINE: I take it that you had appreciated it differently but if you assume, as will be Mercury's contention, that the trip sensors that you have thought of when you set your number of 1 in 1,000, that that is only for fires and not generator end cap failure. Would you accept that the number you have selected shouldn't be such a high number?

30 MR ERSKINE: I was given information, to the best of my recollections, on vibration detection.

35 MS DEVINE: I put it to you if you made this assumption that I've asked you to make, that the number would be more appropriate to be 1 in 100 rather than 1 in 1,000?

40 MR ERSKINE: That would be different to functional safety type probability of failure and demand calculations and the information I specifically asked for was about vibration because that was the particular issue at hand. So if they feed back to me fire sensors versus -- when I asked for vibration, I think there may be a misunderstanding that would need to be clarified. But I was specific in my request and the multiple sensors as provided to me indicated the sensitivity and redundancy in the high level of reliability required.

45 MS DEVINE: So the 1 in 1,000 is based on what you believe is a very high level of

safety integrity in the system, isn't it?

MR ERSKINE: It was based on the higher reliability of equipment now. I didn't do a formal calculation because I wasn't provided formally with information, so it's an estimate and if better data can be brought to the table we can do something.

5

MS DEVINE: You picked those numbers based on the information is what you are saying?

10

MR ERSKINE: Of the performance of those --

MS DEVINE: You picked the 1 in 1,000 probability of not detecting failure based on your belief that there were trip systems in place that would address a rotor end cap failure, didn't you?

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MR ERSKINE: Yes, on the vibration information request.

MS DEVINE: Based on the information you had that's the approach you took, correct?

20

MR ERSKINE: Upon the request and the response that was given to me, that's the result. Now, I looked up the exceeder instrument on vibration sensing to try and find out the reliability and, again, see if it was in the right range.

25

MS DEVINE: Would you accept that without that information, without any assurances that a multiple sensor and single voting trip system was available that it would be more appropriate to pick the next level of safety integrity, which would be 1 in 100 probability of not detecting a failure?

30

[3.05 pm]

MR ERSKINE: I would have to work through the calcs before jumping to that.

35

MS DEVINE: I'm not asking you to calculate it, as an approach to putting inputs into your table you pick a value based on level of safety integrity, don't you?

MR ERSKINE: No, it was on the number of sensors and the typical reliability of that sort of equipment.

40

MS DEVINE: That number, called SIL something 3, 2 and 1, aren't they?

MR ERSKINE: No.

45

MS DEVINE: Sorry, let's not go into that.

MR ERSKINE: No, let's be very clear about that. Let's be very clear, it was about the

amount of equipment and the reliability, it was about the amount of equipment and the reliability. If it needs to be explored further we can do that offline to keep this moving.

- 5 MS DEVINE: Well, Mr Erskine, we are looking at the conclusions you are giving the Board, it is safe that this road co-locate and the variable here, if this were 1 in 100 then the result would be unacceptable, wouldn't it?
- 10 MR ERSKINE: Yes, if the numbers were gamed in that direction then you had some facts to support it.
- MS DEVINE: Mr Erskine, I would put it to you that your assertion of gaming could equally be applied to yourself in picking the numbers that you have chosen to put in the table, isn't that fair to say?
- 15 MR ERSKINE: We always look at overall numbers without going to try and drive an end figure. We just put the numbers in to see where they would calculate. I did not in any way, shape or form look to a number and drive backwards. We just gathered the input numbers and worked forward. If they were intolerable like the pigging metering, so be it. Without fear or favour, we just put in values and I had the cross-check done on my values by people around me.
- 20 MS DEVINE: You accept that if you have made errors then that calculation could be wrong and it could be unacceptable?
- 25 MR ERSKINE: That's right and we just have to determine if, indeed, an error has been made and work it through.
- 30 MS DEVINE: Now, let's go back to the conditions document, in terms of the controls that you propose to address this tolerable or, depending on the scenario, intolerable --
- 35 MR ERSKINE: Sorry, which page are we at now?
- MS DEVINE: We are going to go to conditions, back to that 4 August document. Now, your evidence-in-chief -- what control do you propose to address this risk which is in the tolerable region?
- 40 MR ERSKINE: Now, under SD8, I'm just having a look there, we've got the generator and the vents. I can say that we don't have an explicit item for the ring under SD8 unless there is a particular line that you'd like to point me through to that's in your thoughts here. But I certainly can speak to those ones there because I only got to see this after it was put out.
- 45 MS DEVINE: Your evidence refers to a number of control measures. What control measures do you propose to address this risk of generator end cap

failure. You don't propose any, do you?

MR ERSKINE: I don't see any here but consistent with the report and the dialogue that I had with the turbine and generator people, I asked a couple of generator people how credible was it that generators throw their parts as projectiles and causing risk. Their finding, their understanding, was that the risk posed was very, very low so, again, if there's better data we can --

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[3.10 pm]

MS DEVINE: If it were found that it is in the tolerable range, what sorts of controls do you think would be appropriate?

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MR ERSKINE: Sorry, if it was in the tolerable range?

DR PRIESTLEY: I think you said "intolerable", didn't you?

20

MS DEVINE: Tolerable. To be in the tolerable range you need controls, what sort of controls are you using?

25

MR ERSKINE: If it's in the tolerable range, if I understand you correctly, and you go through the SFAIRP process, again, generator people would need to examine that in more detail as to what they could or should do. Maybe strengthening casings or a particular aspect there compared to the older version equipment. I don't know, I'd leave it up to them. That becomes specialist areas. There is only so much I can do as a risk person.

30

MS DEVINE: But you accept that a control needs to be put in place, don't you?

MR ERSKINE: After the SFAIRP process is undertaken the examination of what would be needed could be considered.

35

MS DEVINE: Well, that is the process, that in the tolerable range you need to consider what controls are appropriate?

MR ERSKINE: Yes.

40

MS DEVINE: Because they are only there if they are controlled?

MR ERSKINE: Sorry, they are only?

45

MS DEVINE: If you think of your table 1 document, the broadly acceptable ones don't need controls, the unacceptable ones shouldn't go ahead and the tolerable ones need to be there but under appropriate controls so far as reasonably practical?

MR ERSKINE: That's right, you have to do the SFAIRP examination. Again, with

more detail around there on the numbers you can do a more detailed SFAIRP that would be meaningful. To race through and do a SFAIRP perhaps at this point could be a touch premature but, nevertheless, that is what you as the next steps.

5

MS DEVINE: Thank you. I am going to move on to the next couple of scenarios which deal with gas. Before I go into scenario 3 and scenario 4, I just want to check your understanding about the gas system. You've said after the facilitated risk workshop and as you were preparing your evidence you asked some very specific questions about the gas system, didn't you?

10

MR ERSKINE: We put those questions through, yes.

15

MS DEVINE: They were questions like how much gas is released in a controlled manner during the machine and things like that?

MR ERSKINE: Yes.

20

DR PRIESTLEY: Just pause a minute, Ms Devine.

MS DEVINE: Thank you.

25

DR PRIESTLEY: Ms Devine, when we sent off the experts to the Southdown site, the expert facilitated conference, which took place, I think, on 13 July, there were a number of issues, including the one you are on at the moment, which were agreed and Mercury's expert was at that conference, together with Mr Erskine. As you will know, the purposes of these conferences is to try and narrow the area of disagreement. What page number was that on?

30

MS DEVINE: Sir, perhaps I can pre-empt your question there. There is agreement about identification of hazards; a risk assessment was not undertaken by those two experts on that occasion. They identified the hazards and applied them to a risk matrix. They didn't undertake a quantitative risk assessment or a qualitative risk assessment. Mr Erskine built on that.

35

[3.15 pm]

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MR PARSONSON: One of the queries we have, using the generator end cap failure at page 8 of that witness statement, under the bolded heading "Probability" Mr Erskine indicates that based on the OREDA data that:

45

"An incident of this nature can be conservatively considered as less than 1 in 1,000-years frequency."

The question I suppose I could put to Mr Erskine is, was the accuracy of that 1 in 1,000-years prediction, or number, questioned by other

experts at that conference?

Mr Erskine, I've got the joint witness statement from the expert conference of 13 July in my hands.

5

MR ERSKINE: Sorry. I'll just get one up. Page number?

MR PARSONSON: Page 8.

10 MR ERSKINE: Just trying to keep some form of order on my desk, as you can appreciate. If I let it all hang out, it would ...

MR PARSONSON: You might risk losing one of them.

15 MR ERSKINE: Okay.

MR PARSONSON: Okay, at page 8, about two-thirds of the way down, under the generator end cap failure section, there is a bolded heading, "Probability" and in that it refers to your conservative, as it says, consideration that the risk of failure is 1 in a 1,000-year frequency. Was that number that you proposed at that conference questioned or debated by other parties? There is no indication in this document that that was a point of disagreement. Now, I'm not sure whether that is the purpose of this document or not, but I just want to clarify. It's being questioned now, but was it questioned during that expert witness conference?

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25

MR ERSKINE: It was put on the table for Mr Phillis to examine. We looked at that and, as you see, it was agreed it was very low - again, of course, only for Mr Phillis to have a short time to examine it and familiarise with the OREDA data, so, yes, we reached agreement. It states that I had put that on the table. It shows that there was no disagreement in that regard. So he had seen it, looked at it, just like you have gone through quite a curve of data now and much of that you either have to trust or examine in detail if you feel the need.

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35

MR PARSONSON: Is it something that he could subsequently have delved into in a bit more detail and raised some concerns about it?

MR ERSKINE: He could have done that in preparation or he could have done that in arrears, after the meeting, had he had access to some similar data or that same data, and looked at it, maybe viewed in a different way.

40

MR PARSONSON: Okay. Thanks.

45 DR PRIESTLEY: I take it, Ms Devine, you are going to be calling Mr Phillis at some

stage.

MS DEVINE: Yes, sir. Next Wednesday.

5 DR PRIESTLEY: If you are lucky.

MS DEVINE: Wednesday is the day currently allotted to Mercury's witnesses, sir.

10 DR PRIESTLEY: What is concerning the Board here, I think, is that the whole purpose of these conferences is to try to narrow or resolve differences. It is certainly not going to be helpful if a witness comes along and says, "Well, yes, I was at the joint conference and yes, that is my signature there, but although this was agreed, there is a lot more work which we should have done, or, it was based on certain hypotheses, which may or may not be correct". Leaving aside that wrinkle, the Board is going to be left in a position where, in a highly technical area, we may be asked to resolve risk issues, which lie outside our area of expertise. One or two of us may know some of the formulae relating to ballistics, but that doesn't happen very often in the real world.

20 MS DEVINE: Sir, I think both Mr Erskine and Mr Phillis will tell you that their work takes time, it was a directed conference of the Board, and they did what they could in the time available, and it wasn't a complete risk assessment. What they did was what is indicated in that document. I am not trying to rephrase that document. In my earlier questions, at the beginning of my questioning of Mr Erskine, he accepted that in terms, it was a filter, it was part of the information, that record of that discussion was filter that he built on and did a lot more work around the detail that is in there.

30 [3.20 pm]

35 So, sir, I appreciate your lack of desire to want to get into reconciling different expert views on some of these matters and I appreciate you will have questions to Mr Phillis about all of these matters. I note in relation to the 1 in 1,000-year frequency point that Mr Parsonson points to, that is a statement of what Mr Erskine indicates in that probability note, and that the next line item is that they both agreed that it was very low likelihood, and I don't see Mr Phillis necessarily disagreeing, or departing from his statement there.

40 DR PRIESTLEY: All right. I think what we are going to have to do is this. You will have to continue with your cross-examination to the extent you think it is necessary, but it is clear that NZ Transport Agency, in conjunction with Mr Erskine and any other experts he or they may want to consult, they are going to have to come up with a series of conditions which adequately mitigate the risks which they accept are there, some high, some low, or whatever, and you are probably going to have to do the

45

same, because your plan A --

MS DEVINE: Sir, with respect, that has been done.

5 DR PRIESTLEY: No, let me finish.

10 Your plan A is that this road shouldn't be there at all and you want us to decline that section of the alignment. I understand that and you have made that pretty clear right from the outset, including in your opening. But in your plan B, if we disagree with your plan A, then presumably you too would like some conditions to protect the operational integrity of the Mercury site if the road is there, so it may well be that Mr Phillis in conjunction with you is going to have to come up with your competing set of conditions. That makes it easier for us to reconcile, I think.

15 MS DEVINE: Sir, that exercise has happened. If you recall my questions to Ms Hopkins, she said, "I will wait for the risk experts" so she couldn't answer those questions. The risk experts who subsequently met, had that outcome. Mr Erskine prepared his evidence, and then both the planners for Mercury and NZ Transport Agency have reflected on the evidence that Mr Erskine has prepared, and they have both prepared conditions in light of that risk information.

25 DR PRIESTLEY: So they did.

MS DEVINE: So you have had that information already.

30 DR PRIESTLEY: All right. That is of some relief to me, I suppose, except you have been cross-examining Mr Erskine inferentially on the basis that his paw marks are somehow or other on some of the conditions and it is not clear to me that he really has, in a hands-on way, been responsible for preparing the conditions. In fact, some of these conditions that have come in, have come in as a result of this risk-assessment conference on 35 28 July. One of your people was there, and it is Ms Hopkins, isn't it? It has been signed off by ... No, I am looking at the wrong thing.

40 MS DEVINE: Mr Grala and Ms Hopkins were at that conference, sir. Mr Erskine has said that he has briefed Ms Hopkins for attending that conference, so clearly he did not attend that conference with her; it was a conference of planners. He is familiar with the conditions and my questions to him have pointed out that the information in his report and the concerns that he raises with the approach he takes around the need for controls and conditions, are not reflected in NZ Transport Agency's version of the 45 conditions. NZ Transport Agency, Ms Hopkins, has chosen to take that approach in light of the advice she has already received from Mr

Erskine.

DR PRIESTLEY: Can I just clarify that? That may assist.

5 Mr Erskine, I don't want lengthy answers on this. You understand that in any big planning project like this, large numbers of conditions are imposed to control or avoid or mitigate adverse effects.

MR ERSKINE: Yes.

10

DR PRIESTLEY: NZ Transport Agency have put up some conditions which relate to the Southdown site. Have you had any detailed, or hands-on, involvement in those conditions, which were prepared, as we understand it, as far as NZ Transport Agency was concerned, by Ms Hopkins?

15

MR ERSKINE: I was given the information at short notice.

DR PRIESTLEY: Keep your voice up, please. You were given something at short notice; yes.

20

MR ERSKINE: Given the information at short notice about those three scenarios. I think it was the turbine, the vents and, sorry, something else. I fed that information through. That was my involvement at that point.

25

[3.25 pm]

DR PRIESTLEY: So you were asked for information?

MR ERSKINE: Yes. I was asked for information.

30

DR PRIESTLEY: You didn't sit down and do a line-by-line analysis of these conditions to say, "Yes, that's adequate to safeguard the risks which I perceive"?

MR ERSKINE: There was an email - sorry, trying to recollect - with initial words and conditions and I tried to give my best input at a short timeframe into those conditions.

35

DR PRIESTLEY: So if you did have any input or quality check, if you like, of the conditions - and this is not a pejorative comment - it was a once-over-lightly thing because of time constraints?

40

MR ERSKINE: Yes, it was a time constraint.

DR PRIESTLEY: Have you been asked whether NZ Transport Agency's conditions comprehensively cover the risks which you have analysed?

45

MR ERSKINE: I was made aware of that meeting, of those particular items. That was the input that I looked at. I did have read through other areas to try and

think of input, but again it was under a short frame.

DR PRIESTLEY: Right, so the answer to my question is "perhaps"?

5 MR ERSKINE: Yes. It's been a little bit time-constrained.

DR PRIESTLEY: I understand. We're not browbeating or bullying you here, Mr Erskine.

10 MR ERSKINE: No, no. I fully appreciate it.

DR PRIESTLEY: And I suppose, given the nature of your risk assessment report, that where you consider there is no risk or an acceptable risk, you wouldn't see the need for any conditions at all, would you?

15 MR ERSKINE: At this stage that's correct. Yes.

DR PRIESTLEY: Yes. All right.

20 MR ERSKINE: Look, if it progresses a bit further, yes.

DR PRIESTLEY: Okay. Now, I think that gives us a very clear picture of what this witness's involvement and limitations are on that, and that may help you refocus some of your cross-examination.

25 MS DEVINE: Thank you.

30 DR PRIESTLEY: And it also opens the door for you to flesh out plan B, because if your plan B is there are huge conditions and the populace at large is going to be at enormous risk with exploding turbines and plumes of goodness knows what and these conditions are inadequate, you need to come up with some conditions that you think are sensible. That's if you don't win on your plan A. All right? You can see the logic of all this.

35 MS DEVINE: Thank you, sir. Yes.

40 MS TEPANIA: Sorry. Ms Devine, as I understood it, the position of Mercury is in line with Mr Grala's proposed conditions that we have here, and I take it your questions to the witness will be around whether or not he's considered those, and the answer we've just heard is likely to be no.

MS DEVINE: Yes. Thank you, Ms Tepania.

DR PRIESTLEY: Shall we take the break?

45 MS DEVINE: I think that would be helpful, thank you, sir.

DR PRIESTLEY: This input has exhausted me.

MS DEVINE: Thank you very much, sir.

DR PRIESTLEY: Well, I hope it's helpful. Right, we'll take a break.

5 **ADJOURNED** [3.28 pm]

RESUMED [3.50 pm]

10 DR PRIESTLEY: Thank you. Ms Devine, just before you continue with your cross-examination, I do want to make it quite clear to you - arising out of our plan A/plan B dialogue - that the Board intends to be absolutely scrupulous about this in the way that you deal with this witness and, indeed, your entire case. It is not for us to decide what plan you may be advancing, either or both, and it is slightly unsatisfactory, through
15 no fault of your own, that we are hearing this evidence now before you have had the chance to present your own witnesses. That is just the way it has happened.

20 I don't want you to think, in any shape or form, that the ultimate presentation of your case and that of your own witnesses is contingent or the Board has any views at all on the merits of your case as a result of this witness being called and cross-examined by you when he has been. Do you understand that?

25 MS DEVINE: Yes, thank you, sir.

DR PRIESTLEY: That is helpful. The Members of the Board were thinking during the adjournment whether it might be helpful for you, and also for us, for you to take in a reasonably expeditious way the witness through the various conditions which are there. It is quite clear from his answers to my questions that his hands-on knowledge of the various conditions is pretty basic and he hasn't had the opportunity - no criticism of him -
30 to have any detailed input.

35 So, to the extent that you have a clear idea of what risks are concerning Mercury, you might like to ask him about the adequacy or otherwise of the conditions which are currently before us. The timing of that is a matter for you, but that is obviously quite a nice way to try and close the gates if you want to go that way. That said, how are we going time-wise? Is there a faint chance you might be finished by 5.30 pm? No faint chance? All right, on you go, please.
40

MS DEVINE: Thank you, sir.

45 DR PRIESTLEY: The other thing, it is clear from your opening this is not some vague academic exercise, despite our interest in ballistics formally, etc, because we are very cognisant from your opening that, although currently decommissioned, this is a site of some strategic importance

5 and, although there has been no direct evidence on it, we rather suspect that, for instance, if fired up with the generators that it has got, this power plant could probably produce somewhere well over 13% of the capacity of all your client's hydroelectric dams on the Waikato River, so it is not an insignificant site. But, as with all things here, we are dealing with so many hypotheticals, aren't we? Anyway, I think my comments should reassure, I hope. On you go.

10 MS DEVINE: Thank you, sir. I appreciate that. I really do and I am sure my client will as well.

15 Mr Erskine, the final quarter of the day, we are going to turn to the question of gas as I signalled before the break. Earlier our discussion talked about the process and instrumentation diagram, the P&ID documents. Do you recall those questions I put to you on that matter?

MR ERSKINE: Yes.

20 MS DEVINE: I have during the day asked Mr Flexman to check, in terms of the requests that you have made and that your counsel have made for information from Mercury, and he assures me that there was no request made for P&ID information, and I am not asking you to go through your emails but, if I put that to you that Mr Flexman says there was no such request, would you accept that? Would you believe Mr Flexman to be correct? You disagree? I don't need a long answer.

[3.55 pm]

30 MR ERSKINE: If he hasn't seen it I would logically have to check on my side. But if he hasn't seen it - he claims he hasn't seen it - then he can't respond to something he hasn't seen logically.

35 MS DEVINE: I think what might be useful is if the EPA now gave Mr Erskine the exhibit with the picture at the front and the P&ID documents at the back.

MR ERSKINE: Sorry, to what document are we referring now?

40 MS DEVINE: The EPA is going to pass you a document, Mr Erskine.

MR ERSKINE: Sure.

45 MS DEVINE: And it will include a photo at the front and three pages, which are the process and instrumentation diagram for the fuel gas system at the Southdown Power Station. What would also be useful to have as I ask you these questions, and might be needed from the EPA also, is a hard copy of Mr Flexman's evidence-in-chief and his attachment 2. Either document can be on the screen, but just wait until you get all those

- 5 documents, Mr Erskine. That is attachment 2. If you just have that to hand. They are two different pictures of the site, Mr Erskine, which you have there as well as the diagram. I want to take you to Mr Flexman's attachment 2 first, which is in that folder you have just been presented with. I will start with a broad question. Do you a sense of the proximity of the main station vent to the road?
- 10 MR ERSKINE: We looked at the drawings that we had and the general arrangements and, as I do reflect, I think we did ask for all relevant drawings that would help us, so apologies if my specificity wasn't to a complete level in the request. I am just reflecting on those emails. We looked at the diagrams and what was given to us about the events, and Mr Tyas also gave information at conference about the vent height.
- 15 MS DEVINE: Perhaps if you indicate on the picture that is on the screen, which is in the folder in front of you, and Mr Flexman's attachment, if you could indicate with your mouse where you think the main gas vent is that you refer to in your evidence.
- 20 MR ERSKINE: The detail of that drawing, I was given some photos from the site and the assurity of where the vents were as distinct from just the height.
- MS DEVINE: Could the EPA zoom into that picture if that is possible, just to help Mr Erskine if you can. I am not sure if you can.
- 25 MR ERSKINE: The mouse doesn't seem to function.
- MS DEVINE: Here we are.
- 30 MR ERSKINE: This one doesn't seem to be working.
- MS DEVINE: Just approximately, Mr Erskine, can you point with your mouse or point on the screen.
- 35 MR ERSKINE: The mouse doesn't work.
- MS DEVINE: I think the EPA can help you with the mouse. It is probably better than approaching near the Board, Mr Erskine.
- 40 **[4.00 pm]**
- MR ERSKINE: Yes, unfortunately, this drawing doesn't really represent it. There were a couple of pipes coming out a point by either there or just to the side.
- 45 MS DEVINE: Sorry, could you point that again, please?
- MR ERSKINE: Around that area there. Unfortunately, this one just doesn't seem to

have the clarity of the photos --

- 5 MS DEVINE: So you are pointing to an area to the west of GE105. You are focusing on, in terms of, the main vent for the site. That is roughly to the west of the words "GE105", to the left of that?
- MR ERSKINE: Yes, that region. But again, there was more conveyed about the pipes in the profile and unfortunately I wasn't given a great deal --
- 10 MS DEVINE: You need to be by your microphone, Mr Erskine.
- MR ERSKINE: Sure.
- MS DEVINE: I am just going to come to the one where Mr Erskine can see and the Board can see.
- 15 MR ERSKINE: Yes.
- MS DEVINE: Mr Erskine, you have been pointing to an area over here, in terms of where you see the main gas vent or this location.
- 20 MR ERSKINE: A little bit further down than that.
- MS DEVINE: Around here? Just to the left. I am not going to get any more specific.
- 25 MR ERSKINE: Yes, that was --
- MS DEVINE: Mr Erskine, if I put it to you, the main gas vent is here.
- 30 MR ERSKINE: Okay.
- MS DEVINE: You wouldn't know that because you haven't viewed the site, have you.
- MR ERSKINE: That's right and asking for the various drawings in the broadest senses earlier on ...
- 35 MS DEVINE: Now, in terms of proximity of the main gas vent to the road, you appreciate that Mercury has sought a 7 metre set back and you can see that that is about 7 metres, that concrete pad outside GE105. Do you see that?
- 40 MR ERSKINE: Yes.
- MS DEVINE: And you can see that the location of the main gas vent is quite close to

that, isn't it?

MR ERSKINE: Close to what?

5 MS DEVINE: The proximity of the indicative road.

MR ERSKINE: Yes, we would have to get some more exact dimensions and figures, but, as I have said, I left that for code examination at the right time. I looked more at the volume of gas for the approximate distances to see if there was enough of an issue at a 6.5-metre level. You could conceivably have that in slightly different positions, slightly further away or closer. The plan was enough to say you would have to reconsider the height, even in the exact position that you are proposing, with the better knowledge that you have.

10
15 MS DEVINE: Do you accept that that vent that I pointed you to is at least within a metre of the indicative road?

MR ERSKINE: Is there a drawing that shows the alignment of the road?

20 MS DEVINE: Yes, if you could go to attachment 1 in Mr Flexman's evidence, the folder that the EPA gave you just before.

MR ERSKINE: Yes.

25 MS DEVINE: Do you see the blue line on that map, that shows the indicative road?

MR ERSKINE: Yes.

30 MS DEVINE: Would you accept that it is approximately less than one metre?

MR ERSKINE: Yes, with that knowledge, it appears to be much closer. I can't see a scale there, but let's take that all in good faith.

35 MS DEVINE: Yes. And would you accept that someone standing on the road could lean over the road barrier and touch the vent stack?

MR ERSKINE: If it were in that current state, yes. But our examination was to do that all from the ground up and relocate it, heightwise.

40 MS DEVINE: We will come on to the detail. Just answer my questions.

MR ERSKINE: Sure.

45 MS DEVINE: So they could lean over and touch the stack from that location where it

is built at the moment.

MR ERSKINE: Yes, if it's that close, yes.

5 MS DEVINE: In terms of the rest of the site, this is just to give us context before we talk about gas in more detail, do you appreciate that there is gas pipework running from the distribution point all the way around the equipment and through the site?

10 MR ERSKINE: Yes.

MS DEVINE: Do you appreciate that there is a pipe bridge between the southern corner of the wet sack through to GE105?

15 **[4.05 pm]**

MR ERSKINE: A piperack, yes, I can see that.

20 MS DEVINE: You would appreciate that the piping infrastructure that sits on that pipe bridge includes the gas supply to GE105.

MR ERSKINE: Yes.

25 MS DEVINE: My next question, you may want to look at the P&ID drawings that you have, to feel comfortable with the answer, but would you accept that there are multiple valves, flanges, instruments, drain valves, safety relief valves, filters, and all sorts of other gas-related equipment directly under or adjacent to the proposed bridge structure.

30 MR ERSKINE: I see the piperack going over to the equipment. The other componentry to which you are referring, the photograph doesn't provide that level of detail. I can see it on the P&ID, but P&IDs are not location specific.

35 MS DEVINE: I understand. And you would accept that where there is piping around the gas-fired power station, that there are things that I have just described, equipment, wouldn't you.

40 MR ERSKINE: Normally, in the gas and power industry, you would put that componentry where it can be ably services, and on a rack at height, with minimal access ... So, are you saying it is all on that rack, or down more at the unit level where it can be readily maintained, properly, by staff?

45 MS DEVINE: Near the ground, under the bridge.

MR ERSKINE: So the ground under the bridge, could you care to point out that, for

myself and everybody else's clarity, those components, please?

MS DEVINE: Beneath the vent, where I have just pointed you to when I came over to the screen.

5

MR ERSKINE: Just the vent at the side there?

MS DEVINE: And a bit further across, closer to the cooling tower area, the yellow pipes in the picture. You see the yellow pipes?

10

MR ERSKINE: Okay. Yes, I can see the yellow pipes.

MS DEVINE: Do you accept the nature of infrastructure at power station includes multiple valves, flanges, instruments, drain valves and the like, that I have mentioned?

15

MR ERSKINE: Yes, I am taking your word for it on this matter.

MS DEVINE: In terms of, with respect, not taking my word for it, what about the P&ID? Does that give you comfort that there are such pieces of equipment associated with piping that goes around?

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MR ERSKINE: Oh, yes. That tells me of the presence of the equipment, which we would expect to see the location of; that is not the purpose of the P&ID.

25

MS DEVINE: But it helps, giving you information to feel comfortable that there is --

MR ERSKINE: This is information that builds things up, yes.

30

MS DEVINE: That's right, and that there are all these types of equipment. Would you accept that?

MR ERSKINE: That's right. Yes.

35

MS DEVINE: Do you accept that having a better understanding about the detail of the gas piping could have altered your assessment of the risk in the power station and the road co-locating?

MR ERSKINE: Yes, it would. This information should, or could, have been present, made available, at the conference as well. It is good to see it here now and it could be utilised productively.

40

MS DEVINE: Do you think it might change your conclusions? To streamline the conversation, the questions for his Honour, do you think it might

modify your views on the risk associated with gas at the sight?

MR ERSKINE: Sorry. Are you putting that to me, there?

5

MS DEVINE: Yes.

MR ERSKINE: Yes. This additional information will help and we can look at hazard scenarios associated with that piping.

MS DEVINE: I can take you through questions, but do you want to share your initial view on what the hazards might be? Would they be in the tolerable range or would they be in the unacceptable range, in relation to gas coming from that gas train.

MR ERSKINE: That, we would have to run through. Generally, if you had a catastrophic release of that equipment to that proximity ... Now, the height of the rack, can you give me an idea of the height of that rack, please.

20

[4.10 pm]

MS DEVINE: No.

25

MR ERSKINE: You can't. Okay.

MS DEVINE: Not off the top of my head, sorry. Mr Flexman suggests it could be 8 metres, but I am not seeking calculations to do a mathematical assessment right at this moment.

30

MR ERSKINE: Let's run it with 8 metres; we will take your knowledge. If it is at 8 metres, there might need to be some risk attachment considered as a scenario. Like I said, at the conference we wanted to examine all scenarios. Logically this one can be in that mix, but it wasn't at that time.

35

MR PARSONSON: I think the previous question was, would the knowledge you now have about the location of that piece of the infrastructure result in your modifying your assessment. Would that result in you modifying your assessment in some way?

40

MR ERSKINE: Yes. We would run through the counts.

MR PARSONSON: No. Just as a principle, now that you know that it is in a different location, would that result in you modifying the outcome of your

45

assessment, that particular piece of risk factor?

MR ERSKINE: Yes, I think we would have to modify it based on that information as presented here.

5

MR PARSONSON: The second question was, is it likely, without the detailed analysis, that the modification would result in it being IDd as an increased or a decreased risk?

10 MR ERSKINE: With extra pipework, and extra gas, logically there would be some level of increase that would have to be considered, yes.

MR PARSONSON: I need some help to understand the drawings.

15 MS DEVINE: Sir, to understand the P&ID drawings?

MR PARSONSON: Yes. You talked about the main gas vent.

MS DEVINE: Yes, sir.

20

MR PARSONSON: And we have been talking about GE105, which is the third sheet. There are two vents shown on that plan, two 3-inch vents, one about the middle of the page and one to the left-hand side of the page. When you talked about the main vent, which one are you talking about?

25

MS DEVINE: In relation to GE105, there are three vents, as Mr Erskine corrected in his summary statement at the beginning of the day. On sheet 23, you will see GE105.

30 MR PARSONSON: Yes, that is what I am looking at.

MS DEVINE: The highest diagram, which has a number 6 at the bottom of it, that is the main vent. Sorry. I take that back. That is the drain and the safety-valve relief. The one to the left of that, that has smaller line that is coming out, that is the main vent, I am told by Mr Flexman.

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MR PARSONSON: I am still not clear.

MS DEVINE: The one that says "vent" that is to the right-hand side of the GE105 box, immediate right-hand.

40

MR PARSONSON: Yes. The 3-inch vent. If I am looking at the grid on the plan, it is round about F7 on the grid

45 MS DEVINE: Yes, sir. That's it.

MR PARSONSON: Okay. I just would like to know, what is the function of that vent? Is

it operating intermittently?

5 MS DEVINE: When the power station turns on and off, each time, which can happen rapidly through the day, there is a gas release from that. It is referred to in Mr Erskine's report; 48 cubic metres is released from that gas vent, every time it comes on and off.

10 MR PARSONSON: I have seen that in the evidence, yes. So that is where that gas is released and that is the one you are talking about as in close proximity to the East West Link.

MS DEVINE: Yes.

15 MR PARSONSON: All right. Thank you.

MS DEVINE: The other ones are just the other side, right beside it.

20 I think, Mr Erskine, it is fair on you if we go through this in a step by step process because I appreciate your answers to the Board, Mr Parsonson, were around modifying your approach in the report. Your approach in the report focuses on two scenarios. One is about controlled release from vents and one is about the First Gas assets. Is that a good summary of the third and fourth scenarios?

25 [4.15 pm]

MR ERSKINE: Sorry, which page are you referring to here?

30 MS DEVINE: I'm not referring to any, I'm summarising. You've gone through a number of scenarios. So if you want to look at 6.3, we are going to come on to 6.3 and 6.4.

MR ERSKINE: Yes.

35 MS DEVINE: 6.3 is about a controlled release, is that right?

MR ERSKINE: Indeed, yes.

40 MS DEVINE: And 6.4 is about risks associated with the First Gas assets? I will come back to those.

MR ERSKINE: Sure.

45 MS DEVINE: But neither of those scenarios deal with a rupture of high pressure gas line on the Southdown plant in the event of a disc failure or a ring failure, do they?

MR ERSKINE: Those particular ones don't. The scenarios we were given to look at

was the rupture of the disc to people, yes?

MS DEVINE: So you haven't assessed the risks of a rupture of high pressure gas in the event of a disc failure or ring failure, have you?

5

MR ERSKINE: Correct. At the conference we asked whether there were any other credible scenarios worth to consider, none were put on the table so we ran with those that we had. But that could conceivably, as a scenario, be examined.

10

MS DEVINE: I don't know if I would be bothered going to the report, the report of your meeting with Mr Phillis -- perhaps we will go to that if you need to. Page 9 of your report. It refers to gas discharge.

15 DR PRIESTLEY: This is the conferencing report?

MS DEVINE: The conference report, 13 July, sir. I put it to you that you have selected the scenarios for your risk report and that at the workshop and your conferencing with Mr Phillis, as demonstrated on page 9, you examined gas discharge not specific scenarios, the two that we have just described?

20

MR ERSKINE: Sorry, we're looking at page 3 and page 4 of the conference?

25 MS DEVINE: No, I'm looking at the risks you assessed on page 9 with Mr Phillis, which says, "Gas discharge".

MR ERSKINE: Sure, we set the tone back on page 2 and 4 of what Mercury identified was worthy of consideration and we looked at that and then the working out as you are alluding to is on page 9, yes.

30

MS DEVINE: One page 4, C(ii), one of the risks identified is ignition of flammable or combustible material, isn't it? Sorry (iii)

35 MR ERSKINE: Yes, in the broader context, yes.

MS DEVINE: In the event, C talks about fire and explosion at the Southdown site. That is what C is about, isn't it? Quite specific concerns, fire and explosion.

40

MR ERSKINE: A broad concern, yes.

MS DEVINE: So it was identified in the workshop and the conference and your report focuses on two specific scenarios which you have confirmed, that's right, isn't it?

45

MR ERSKINE: Yes, they are the ones that Mr Phillis and myself worked through at

that time based on that local site knowledge.

5 MS DEVINE: In terms of a rupture of the high pressure gas lines on the Southdown plant, in the event of the disc failure or a ring failure, that might have been something that could be brought up at a results discussion workshop that hasn't happened yet?

MR ERSKINE: That could be a scenario that could be examined, yes.

10 **[4.20 pm]**

MS DEVINE: A good example of feedback working with the parties to understand the risks such as going to a site visit and seeing what the issues are, is that fair to say?

15 MR ERSKINE: Within the broader circumstance, yes. Obviously the particular role that I have had I have had to work with what I can, yes.

MS DEVINE: Now, do you accept that the rupture of a high pressure gas line in the event of a disc failure or a ring failure is a potential hazard?

MR ERSKINE: It is a potential hazard, yes.

MS DEVINE: Do you accept that it is an extra individual risk that should be considered?

MR ERSKINE: For the road, yes. I am just amazed that the site would have gone for this long without considering it for their own staff. Please help me here.

MS DEVINE: Well, we are not here to give a commentary about Mercury's views otherwise, I am trying to understand what is included in your report and what is not included in your report.

35 MR ERSKINE: I put the request through to Mercury, "Please give me site information to help inform my process". That was one of the questions.

MS DEVINE: Mr Erskine, I pointed you to where Mercury has identified the risk of gas explosion in the conference. We have covered that already. I appreciate it hasn't been addressed due to the limitations of the process, I'm just getting you to confirm that it is an extra risk that ought to be considered?

MR ERSKINE: Indeed, and it could be.

MS DEVINE: Now in terms of those two scenarios that --

DR PRIESTLEY: Just pause there, Ms Devine, because I don't want to misunderstand

what you are saying. If you look at page 3 of the joint conference report, it says under "Facilitated meeting, the statement of risk", it says right down the bottom:

5 "Mercury has identified the following risks without undertaking any additional mitigation at the existing Southdown site."

Then there follows all the risks they have identified and which a gas pipeline rupture by ring, etc, explosion, is not there, Ms Devine, is it?

10 MS DEVINE: Those words aren't there, sir, that's right.

DR PRIESTLEY: So ...

15 MS DEVINE: Fires and explosions of gas fired power stations are identified.

DR PRIESTLEY: You may well be right and it is a hazard issue, but you can't really berate this witness for not having considered it because it wasn't put on the table by Mercury, as I understand it.

20 MS DEVINE: Sir, I have put questions to the witness that he hasn't met with Mercury on site, he hasn't had a follow up to check his assumptions, he hasn't had these particular plans, which we say haven't been asked for, I think it is fair to question him on what has been omitted from the report.

25 DR PRIESTLEY: Yes.

MR BICKERS: Can I just pursue a couple then? Mr Erskine, Ms Devine's identified the position of that main vent and from your report at page 12 you've confirmed the 48 cubic metres release of gas from that vent, if I understand it, when the plant starts. So it is quite close to the East West Link and you've identified that it's probably closer than you assumed, is that correct?

30 MR BICKERS: Can I just pursue a couple then? Mr Erskine, Ms Devine's identified the position of that main vent and from your report at page 12 you've confirmed the 48 cubic metres release of gas from that vent, if I understand it, when the plant starts. So it is quite close to the East West Link and you've identified that it's probably closer than you assumed, is that correct?

35 MR ERSKINE: Yes, that would be correct.

MR BICKERS: Now, you've also indicated that the height of the vent stack that you assumed was 6.5 metres, that is shown in table 7, and when we look at -- there's a diagram on page 9 of your report which indicates the cross-section of the East West Link in proximity to Mercury's site. So the vents stack would seem to be slightly lower than the deck level of the bridge, is that right?

40 MR ERSKINE: Correct, and that was our thinking.

45 MR BICKERS: Is that the way you assumed it?

MR ERSKINE: Yes, from the broad knowledge we had. We may not have had the

exact location but we looked at the height and the relevance to the EWL as the primary consideration.

5 MR BICKERS: Okay, thank you. When I go to the wind rows, which is on page 8 of your report, I am assuming that that is based on the direction from which the wind is coming, not where it's going, is that right?

[4.25 pm]

10 MR ERSKINE: That is correct, it is always from where it is coming, yes.

15 MR BICKERS: So if I look at the quadrant from west to north, there is quite a reasonable -- it's not the predominant quadrant but it's quite a reasonable proportion of the wind coming from there. Have you factored in the height of that stack the proximity to the East West Link and the prevailing wind or the wind statistics? So when you talked about your stochastic analysis, is that still valid in terms of those changes that are being now identified?

20 MR ERSKINE: The stochastic analysis is very good for when there is gas continuously there. The venting situation, of course it only vents on sporadic occasions so we reverted to another tool of trade that the risk person has and that is to do the consequence analysis. So you just take the plume and say, "Okay, frequent C could be variable, is the plume big enough and from a consequent point of view could it drift across and cause an issue?" Our finding was that it would and we came to the conclusion through the normal codes you would just relocate it and move it up. That is what you would normally do.

30 MR BICKERS: You'd relocate the vent, would you?

MR ERSKINE: Correct.

35 MR BICKERS: Okay. All right. Thank you.

MR ERSKINE: And move it to a safe point where the plume would then disperse without interaction with the road.

40 MR BICKERS: I understand. Yes.

MR ERSKINE: Yes.

45 MS DEVINE: Your Honour, sorry, I've taken my jacket off because I'm getting a lot of the heater there. No disrespect intended. Not as much as an explosion from a gas power station, I'm sure.

DR PRIESTLEY: No, not yet, anyway.

MR BICKERS: Kilowatts per square metre.

5 MS DEVINE: Now, just to pick up back again with the scenarios before we go into scenarios 6.3 and 6.4, the other scenario that you haven't examined is the scenario where that equipment that you agreed would be located along the gas pipework accidentally released gas. You haven't assessed that scenario, have you?

10 MR ERSKINE: The equipment along the pipework. That would normally be done with the pipework and the equipment. You'd look at that as an integrated component. So, yes, if the pipe rack we haven't done and could be explored, we could examine whatever equipment is there with that detail now provided.

15 MS DEVINE: In that scenario that you haven't examined, firstly, you accept that - I don't know if you do know this - the pressure is still 50 bar on those pipes? Do you know that?

20 MR ERSKINE: Yes. We've run with that, as provided by Mercury about the site pressure.

MS DEVINE: Fittings and equipment have an inherent failure rate, don't they?

25 MR ERSKINE: There is statistical information that we use, yes, in a generic way.

MS DEVINE: That's a yes, isn't it?

30 MR ERSKINE: That is what we do. We use generic information as best aligns with the information we're provided.

35 MS DEVINE: Now, in comparison to the controlled venting, which you've identified as needing quite significant changes to reduce those risks, would you accept that an accidental release of gas from the fittings and equipment would be an intolerable risk?

40 MR ERSKINE: We'd run through the calculations and determine values. It would be close here at this proximity and certainly credible and worthy of investigation to find out.

[4.30 pm]

MS DEVINE: What does your instinct tell you? It's going to be an intolerable risk, isn't it, Mr Erskine?

45 MR ERSKINE: Being that close, intuitively it would appear to be the case, so, yes, worthy to investigate, but I always try to maintain the objectivity. Yes.

MS DEVINE: You're trying to help the Board here, and we may not have time to go

- 5 and do more reports and the rest of it. This is the evidence of NZ Transport Agency. You're telling me that your instinct is, without having done the calculations and done the proper studies and examination of the facts, but just at a high level, it's probably going to be an intolerable risk, isn't it?
- MR ERSKINE: Probably.
- 10 DR PRIESTLEY: Well, certainly close enough to intolerable risk to justify caution.
- MR ERSKINE: Indeed.
- MS DEVINE: And you can't state that it's acceptable, can you?
- 15 MR ERSKINE: No. We'd have to go through the process.
- MS DEVINE: Okay. I'd like to turn to scenario 3 now, which is the gas train valves. This is the controlled, Mercury-vented gas scenario, isn't it?
- 20 MR ERSKINE: Sorry, which page are you on?
- MS DEVINE: Your results, page 22, scenario 6.3.
- MR ERSKINE: Yes.
- 25 MS DEVINE: Now, you made a correction this morning that three vents need to be considered. Did your report take into account the three vents on GE105?
- 30 MR ERSKINE: The three vents. Any vent would have to be examined as per the Gas Code and located properly. So if there's one, three or ten vents, you would go through the same process.
- MS DEVINE: Was your report based on one vent or three vents?
- 35 MR ERSKINE: It was based on any vent that must discharge and that quantum. So we weren't given the specific detail, but that broad information is the broad approach we would take?
- 40 MS DEVINE: Is that a no?
- MR ERSKINE: Without the information we couldn't give an exact value, so we just ran with what we had.
- 45 MS DEVINE: Does your report take into account the vents in relation to GE101 and 102?
- MR ERSKINE: It does in the sense of the principle of the action of the adhering to the

codes, yes. It doesn't do an exhaustive study. It takes you through the code in the normal process you would go to achieve that output at the right time.

5 MS DEVINE: And when you talk about the Gas Code there, that's a shorthand way of saying the controls are in place, the controls around the Gas Code provide controls to make sure, wherever the gas is, it's going to be safe. Is that broadly what you're saying?

10 MR ERSKINE: It gives you prescriptive and risk-based guidance at the right time, yes.

MS DEVINE: And when you say that if they comply with the Gas Code, it'll be fine, that's not helpful, is it? That presumes that changes need to be made to do that, doesn't it?

15 MR ERSKINE: That's the law.

MS DEVINE: Yes, and so in terms of --

20 MR ERSKINE: You have to do the change at that time. Let's all be clear about this. You pull away a gas turbine and you recommission another bit of equipment later on - because I was a gas inspector - any time you make a change, you have to re-examine the whole gas system from the ground up to the current code. Legacy codes do not count, and you start from the ground up, and you follow the new code, prevailing code at the time.

MS DEVINE: The release, the control-vented release, in proximity to a road, may involve changes to the vents is what you're saying, isn't it?

30 MR ERSKINE: That's what we've said here, yes. That's right.

MS DEVINE: Do you accept that some of these vents are outside the designation footprint? The footprint is on the screen, so the black line is the breadth of the footprint. The blue line is just where the indicative road is. The black line is the footprint of what NZ Transport Agency has sought control over through its projects.

40 **[4.35 pm]**

MR ERSKINE: We covered that very carefully at the conference and we made an agreement that cut it short on the blue line. If there was some alteration to the alignment within the black region, we would have to go back and look at it again. That's what we've said at the conference, so we took the blue as the basis because we had to do something at that conference that was productive and useful.

MS DEVINE: Sorry. Just to be helpful for you, Mr Erskine, you can't act contrary to

NZ Transport Agency's designation, the purpose of the road within that black area, and I put it to you that some of the gas vents are outside that designation area. Do you accept that? I don't know why the map has changed. There you go.

5

MR ERSKINE: So the vents are outside, but the --

10

MS DEVINE: Well, this is a different document. This is not the document that's in the application document, so if I could have the document that was before for the witness remain on the screen that would be helpful, which was the Flexman attachment.

15

MR ERSKINE: I'm trying to understand your point carefully here. The other vents from the other pieces of equipment, or just 105?

MS DEVINE: All of them is where I'm going.

20

MR ERSKINE: Sure. You recommission any gas equipment, you look at the holistic picture and --

25

MS DEVINE: Putting that aside, the gas vents that are visible in the photographs that I've given you, that are demonstrated as existing equipment in the P&ID(?) document, some of them are located on GE101. You accept that?

MR ERSKINE: I'm sure they would be on 101 if it's gas-fired.

MS DEVINE: And GE102?

30

MR ERSKINE: Yes.

MS DEVINE: And there are three in relation to GE105, correct?

35

MR ERSKINE: Sure.

MS DEVINE: And GE105 is within the footprint, but GE102 and 101 are not.

40

MR ERSKINE: They're not within the footprint, but the thinking we had at the risk scenario was the potential effect of a gas plume in the direction of the road. So in the consideration we said, "Go through the process and examine it duly at the right time".

45

MS DEVINE: And if there were gas pumping from vents in GE102 and 101 in that scenario, you would like to see a control where the vent heights were at an appropriately safe location? Is that right?

MR ERSKINE: That is correct, and that is what we've put in the report.

- MS DEVINE: Are you aware that the Board of inquiry and NZ Transport Agency can't make Mercury change the vent heights that are outside the designation?
- 5 MR ERSKINE: There are many regulatory jurisdictions and the gas inspection one, hence that's put the note in the conferencing, should take due account for it at the right time, was the frame that I've put there. I appreciate the limitations of certain authorities and what they can and can't do.
- 10 MS DEVINE: Would you accept that it's not reasonable to assume that the height of the vents will change?
- MR ERSKINE: Not reasonable that the height of the vents will change? Why's that?
- 15 MS DEVINE: That's because it's not in the control of NZ Transport Agency what those vents are doing, or the Board.
- MR ERSKINE: That's right. It's not their control. But the gas examiner -- you have gas examiners here in New Zealand to --
- 20 MS DEVINE: And that's because the road has been introduced to Mercury.
- MR ERSKINE: It's an additional variable.
- 25 MS DEVINE: And it's an effect on Mercury, and the gas inspector, or whomever, would say, "It's not safe to operate your power station at any of those vents", is that what you're telling me?
- MR ERSKINE: No.
- 30 MS DEVINE: Right. So they can't operate their gas-fired power station is what you're saying, isn't it?
- MR ERSKINE: No.
- 35 MS DEVINE: They can't release gas from those vents in those locations unless changes are made.
- 40 MR ERSKINE: There are changes that could be made that reduce that risk, just as we alluded to earlier with other fire equipment that is in close proximity to other buildings you will locate the vents appropriately for the unique circumstances in each case. It could be done so here. I have put equipment where we have had vent stacks up at 100 metres because of the particular requirements at that place. I am not saying prescriptively here but I am saying that is how the code plays that one out and that is how a gas inspector could view it.
- 45 MS DEVINE: You accept that the gas-fired power station, as it operated in the past,

cannot operate in that same way in the future if a road is there?

MR ERSKINE: That's right. There would have to be changes carefully considered.

5 MS DEVINE: I want to turn to the next scenario, 6.4.

MR BICKERS: Sorry, Ms Devine, can we just clarify on the vents. There are multiple vents. As I look over these drawings, there are vents all over the place and they will all be performing different functions and releasing different quantities of gas under different sets of circumstances. Were you able to assess the risks associated with those gas releases from multiple vents or did you not have information to do that?

[4.40 pm]

15 MR ERSKINE: At the time we didn't have the information we used from the conferencing when I was in dialogue with Mr Tyas about the broad volumes. He said he would come back with the volume and the other detail, and we trusted on that. We took the single approach that the calculations can run through for a multiple one but the outcome is essentially the same. You look at the height and the volume and make sure there is no interaction of the gas with the surrounding ignition sources.

25 MR BICKERS: Are you saying then that the example that you used of that particular vent - the 48 cubic metre discharge - was the worst case or potentially the worst case?

30 MR ERSKINE: As provided to us with that data, yes, it was the worst case. So we could rerun with different values, 1 or 5 vents or 20, yes. It is just a standard gas code thing.

MR BICKERS: All right. Okay. Thank you.

35 MS DEVINE: In 6.4, Mr Erskine, you are addressing here the ignited natural gas release from First Gas assets, aren't you? You say that fire and explosion events were evaluated. Could you describe them for me?

40 MR ERSKINE: Yes, we look at jet fire characteristics. We would look at vapour cloud explosions and look at the stochastic combination of those, so in some instances you might have a pressure wave, some you might have an instantaneous heat blast, and others you might have a jet fire of some duration. These are the sorts of typical scenarios that would be considered.

45 MS DEVINE: A pressure wave, a heat blast, a jet fire, are those the main sorts of

events that you have evaluated?

MR ERSKINE: Yes. It boils down to radiative time and exposure and blast properties, yes.

5

MS DEVINE: And perhaps whether there is a fast release of gas or a delayed ignition?

MR ERSKINE: Well, that's right. That would be a subcomponent. In the modelling we look at immediate ignition and we look at delayed ignition. I have tried to keep it simple and give you the output and the outcomes. The model - once you programme it properly - does quite a lot of calculations.

10

MS DEVINE: And your assessment is that the risk of locating the road where it is proposed and the gas vents where they are currently located is unacceptable, is that right?

15

MR ERSKINE: Yes, because of the many fittings and the particular pipe layout that we were able to examine and understand.

20

MS DEVINE: Is that based on rupture events or smaller releases from those pipelines or both?

MR ERSKINE: Yes, both, and everything in between. The data has a whole range of values and associated probabilities that are utilised.

25

MS DEVINE: And a rupture, perhaps, might be more likely for a pigging station, would you accept that? Or a rupture might be more likely from a pigging station and release from small holes might be more likely to be from facility-type pipework. Would you accept that?

30

MR ERSKINE: Not necessarily. The pigging station, it depends on the pigging frequency and the procedures and the controls that are there, if you are looking at the metallurgical failure of the pigging station versus procedural.

35

MS DEVINE: I am not suggesting ruptures are likely, more that bigger First Gas assets might have a rupture-type characteristic to them, and then you could have pinpricks or damage to pipes or corrosion or other things which would have small holes and the release come through in that way, not a rupture, and have those fire consequences that you have described.

40

MR ERSKINE: Those small ones are statistically much, much more common. The larger ruptures tend to be from different formative mechanisms. So

45

they have different probabilities associated.

MS DEVINE: And both can have an impact, like you have just described?

5 MR ERSKINE: We quite often find that the smaller millimetre ones statistically set the
LSIR contours. The larger ones can set what we would call
consequence distances, but they are very, very infrequent. So, as we
indeed hear of around the countryside, very, very few large ruptures
10 but many, many smaller events - if you have got ears attuned for those
on the evening news or at least places where you can get that
information.

[4.45 pm]

15 MS DEVINE: And both have the potential to impact the road. That is why you have
recommended that the assets be moved?

MR ERSKINE: Yes. So we utilise the International Association of Oil & Gas
20 Producers' data or the UK HSE executive data to drive those numbers
through to get some determination.

MS DEVINE: That is a yes for both to impact the road?

MR ERSKINE: Yes.
25

MS DEVINE: Yes. I will come on to the First Gas assets more particularly in a
moment but, before we go there, you are not aware of an agreement
between NZ Transport Agency and First Gas that the gas assets can be
30 moved, are you?

MR ERSKINE: That hasn't been in my remit. We just looked at the relocation, so others
would be better to answer that for you.

MS DEVINE: Would you accept that you have no comfort that the control measure
35 you have suggested, the relocation can be achieved at this stage?

MR ERSKINE: We have looked purely at the potential of relocating without the
particular commercial aspects.

40 MS DEVINE: Are you aware that there is a letter from First Gas in the evidence that
says it would not want to move away from the power station?

MR ERSKINE: I have recollections of that amongst many, yes.

45 MS DEVINE: How familiar are you with the equipment that is in the First Gas
compound that you have concluded should be relocated?

MR ERSKINE: Sorry, I am just trying to dwell on the last question, the tone of that

letter. Do you have a copy of it that we can have a look at just to refresh? There is an awful lot of data and, look, I could say yes --

5 MS DEVINE: I don't think it is necessary for you, conscious of time.

MR ERSKINE: I seem to remember a First Gas one but I am not sure if the wording was exactly as you say, so if we could put that on note.

10 MS DEVINE: That is all right. We can get the letter. It is exhibit A, EPA. Mr Erskine wants to have a look at it.

DR PRIESTLEY: Exhibit A to what?

15 MS DEVINE: Exhibit A to the Board's proceedings, sir, one of the produced documents by Mercury.

DR PRIESTLEY: Oh, you are right.

20 MR ERSKINE: I am really appreciative of that. Thanks.

MS DEVINE: I would refer you to the penultimate paragraph of that letter.

MR ERSKINE: Sorry, which paragraph?

25 MS DEVINE: The second to last.

MR ERSKINE: Yes, they obviously put a rider on it. So they said:

30 "NZ Transport Agency has raised the possibility of relocating the First Gas infrastructure away from the Southdown site. First Gas would not want to do that if it would prejudice the ability to supply gas."

35 Yes, so they have put that condition on there but my remit hasn't been to explore the commercial aspect of it. My remit has been to examine the technical aspect of it.

40 MR PARSONSON: Have you considered the possibility of relocating that piece of infrastructure somewhere else within the Mercury site in your risk assessment?

MR ERSKINE: We were just given the locations to the south and to the north. I haven't got exact boundaries but we just looked at those and the contours. So

that is what --

MR PARSONSON: Within the general proximity of the Mercury site?

5 MR ERSKINE: Yes, that's right.

MR PARSONSON: Thank you.

10 MR ERSKINE: So that is what we have done. That is the limit of what we could do in the time given.

15 MS DEVINE: Mr Erskine, your scope of work has included identifying some controls, and the control response to this scenario of ignited natural gas from the First Gas assets has been to suggest their relocation. If that is not able to be achieved, is there any other control that you can think of?

20 MR ERSKINE: It depends. If there is absolutely no other location we would look around some controls in the gas. I am just trying to think, because we haven't physically explored that at this point in time.

MS DEVINE: Well, perhaps I am making too many presumptions. This was in the unacceptable range, wasn't it? It's not about controls, is it?

[4.50 pm]

25 MR ERSKINE: Yes, we looked at the eliminate principle by alternate locations. That was our brief just to consider that and for others to work through the commercial ramifications of that. So sort of at the limit here. I'd have to --

30 MS DEVINE: Well, it's inherent in being in an unacceptable limit that they can't co-locate, can they?

35 MR ERSKINE: Sorry?

MS DEVINE: You have assessed the risk of the power station being located to the First Gas assets, which could ignite, as unacceptable.

40 MR ERSKINE: Yes.

MS DEVINE: You've suggested that won't be a problem if the assets are relocated.

MR ERSKINE: Correct.

45 MS DEVINE: But as an unacceptable result, then they cannot co-locate.

MR ERSKINE: They being the two components.

MS DEVINE: The road and the First Gas assets.

MR ERSKINE: So still trying to understand, but yes, if they can't move it there, there is a present risk with the road, yes.

5

MS DEVINE: Now, unless the Board has questions, I'm going to turn to the First Gas assets themselves. Now, how familiar are you with the equipment that is in the First Gas compound?

10 MR ERSKINE: Sorry, please come again?

MS DEVINE: The First Gas assets, the First Gas compound, the thing that you want to relocate, and we'll come on to your relocation proposals. But how familiar are you with what equipment is in there?

15

MR ERSKINE: I walked past and we took photographs. I could see the typical dropout components, the valves, the various aspects of the pigging equipment that was normally there, but again the P&ID wasn't made available to me for the exercise, so we took for this initial stage the best approach with the components that we could photograph from being adjacent through the fence there.

20

MS DEVINE: But First Gas would have its own P&ID, wouldn't it? That's not a Mercury --

25

MR ERSKINE: They would indeed, yes.

MS DEVINE: Your Honour, I've just realised that we haven't given an exhibit number to this P&ID document which I would like to take Mr Erskine to. I have handed up the photograph with the P&ID documents.

30

DR PRIESTLEY: This one here?

MS DEVINE: Yes, sir. I'd like to produce that so that it has an exhibit number, which I think is O, sir.

35

DR PRIESTLEY: O for Oscar?

MS DEVINE: Yes, sir.

40

MR BICKERS: Can we just identify too that the gas plant is this --

MS DEVINE: Yes. So if Mr Erskine could have a look at that photograph, you'll more easily be able to see the gas compound in that photograph that accompanied the P&ID drawings. Do you have that in front of you, Mr Erskine?

45

MR ERSKINE: No, I've got this drawing here. I've got the P&ID attached at the back.

Is there something else to --

MS DEVINE: Yes. Photograph and the P&ID. Just the photograph to have in front of you, Mr Erskine.

5

MR ERSKINE: Sure.

MS DEVINE: In terms of the assets that are in that compound, you'd agree that there is a delivery connection, currently blanked off, for the supply of gas to the power station?

10

MR ERSKINE: Yes.

MS DEVINE: And a pig trap?

15

MR ERSKINE: Indeed.

MS DEVINE: Would you accept that there's an associated condensation filter?

20

MR ERSKINE: Yes.

DR PRIESTLEY: Would you like to tell me where all this stuff is on this --

MS DEVINE: Sorry, sir. On this diagram - Mr Bickers has it - just here on the picture, to the right, there is a photograph of the First Gas assets.

25

DR PRIESTLEY: I see.

MR BICKERS: This pile of stuff here.

30

DR PRIESTLEY: Why have you got nice turquoise patches on yours? Is that something else, is it?

MS DEVINE: My highlighting, sir.

35

MR BICKERS: That collection of stuff there.

DR PRIESTLEY: I see. Right. That is helpful.

40

[4.55 pm]

MS DEVINE: A little distracting.

DR PRIESTLEY: Thank you.

45

MS DEVINE: Thank you, sir. Now, Mr Erskine, are you aware that there is a main gas line stop valve as part of the First Gas assets on the site?

MR ERSKINE: That would normally be the case, yes.

MS DEVINE: Would you accept that such a valve would be there to release approximately 25 kilometres of gas in an emergency?

5

MR ERSKINE: A stop valve. You'd have to do that with a proper venting process.

MR BICKERS: I think the point he's making is the stop valve stops the gas. You're going to need another valve to let it go.

10

MR ERSKINE: You normally very carefully select venting points because these major pipes can release quite a lot of content. That's normally done under a variety of either maintenance, and less so for emergency, but, yes, anyway, continue on.

15

MS DEVINE: If I put it to you that there is a valve there for First Gas to use to release at least 25 kilometres of gas if it needed to, would you accept that that would be a large volume of gas?

20

MR ERSKINE: Indeed. They would be extremely reluctant, of course, (a) for the greenhouse, (b) for safety, whether or not the road is there, that protocols for main gas pipelines have to be very carefully adhered to.

25

MS DEVINE: They put them along at various measures so that they only release 25 kilometres as opposed to a longer stretch, don't they?

30

MR ERSKINE: Under the pipeline codes they again would duly consider what's around and make sure the venting is done in a safe way. And we have that same situation in Melbourne where there's a lot of CBD material around and high-pressure pipe, and our gas companies, like yours, would have to consider what's around and how they do it safely.

35

MS DEVINE: And do you accept that the main line would have manual block valves and various associated vents?

MR ERSKINE: Yes.

40

MR PARSONSON: Can I just ask a question? From your experience, and having been at least outside the boundaries of this site, within a developed urban context do you consider this to be a logical place that such a release valve could be located under the current land use?

MR ERSKINE: Under the current land use.

45

MR PARSONSON: And proximity to other features such as the coast.

MR ERSKINE: The gas companies will tend to vent off at set rates that they know are either safe for the surrounding land use or they usually try to have a

- 5 choice of venting in a couple of locations, so if one area is less conducive, the golden principle is to have venting at another point, so this would not be their only point of venting. It is not a do or die location. They would have something at the other end. If there's 20 or 25 kilometres of pipe, as you say, there would be logically other points along the way. They'd make a holistic decision about venting and how they do it. Yes, that again would have to be a level of detail I'd have to get into with further analysis, but that's normally what they do in principle.
- 10 MR BICKERS: From what you can see, is that venting to atmosphere or is it flared?
- MR ERSKINE: If it's controlled, they'll bring a flare along and flare it to height and release it safely and burn it off.
- 15 MR BICKERS: Okay. I'm not going to go any further because you might be going to ask questions about that.
- MR PARSONSON: I have one more question. Is this location currently more suitable than a more heavily developed location?
- 20 MR ERSKINE: Given the wind direction, if they have the right equipment, it could be suitable. Again, complex thing, but yes, you'd take in all the variables and you'd do it right. It's a very strict procedure and you look at all the risks as you do this and the quantity and how you do it, structure it for each job.
- 25 MS DEVINE: Mr Erskine, I put it to you that there's no difference between the First Gas assets and the controlled release from the Mercury assets. Would you accept that?
- 30 MR ERSKINE: The assets that we did an examination for included the First Gas material as it came above the ground, so we've included that in our consideration.
- 35 MS DEVINE: You didn't answer my question.
- [5.00 pm]**
- 40 MR ERSKINE: Just run it past me again. We've done both, but ...
- MS DEVINE: Well, no, you haven't done both. You've identified a number of things that you haven't assessed in your report, but --
- 45 DR PRIESTLEY: Just ask him the question again.
- MS DEVINE: The question is: there's nothing different between the First Gas assets, the risks associated with the First Gas assets, and the controlled release

from the Mercury assets, is there?

MR ERSKINE: And the controlled release from the Mercury assets.

5 MS DEVINE: Or any release from the Mercury assets, controlled or uncontrolled.

MR ERSKINE: Yes, there would be differences. It's the quantity in reserve of material that could go up, and yes, that would be a difference. We haven't done the controlled venting of the First Gas assets. But then again, it is a controlled event in the majority of circumstances. We've modelled the leak frequencies for ruptures and leaks around the First Gas assets.

MS DEVINE: You'd accept in terms of your distinction around the volume or the quantity of gas being released between the Mercury assets and the First Gas assets that the Mercury assets have large volumes of gas. You've already accepted that.

MR ERSKINE: That's right. We've --

20 MS DEVINE: So your distinguishing point, that there's the difference between the First Gas assets and the risks associated with the Mercury assets, it doesn't hold up that that's a difference in the risk, does it?

MR ERSKINE: It does. There are very different protocols. One is of a gas code down at the appliance level, and the other one is a code up at the sales, petroleum Gas Act level. They are quite different.

MS DEVINE: You accept that the consequence of these fire events that you've identified would be the same in both Mercury assets and First Gas assets.

MR ERSKINE: So yes, we've looked at that with the scenario around the pigging and metering, and we've incorporated that.

35 MS DEVINE: And you'd accept that's the same consequence in relation to the Mercury assets, wouldn't you?

MR ERSKINE: The pressures are slightly lower, but yes, there will be similar scenarios to contemplate, as we talked about earlier on that scenario that should be examined.

MS DEVINE: So you accept that both scenarios have the potential for pressure waves, heat blasts and jet fires? Is that right?

45 MR ERSKINE: As a consequence, yes.

MR BICKERS: Is the magnitude the same?

- MR ERSKINE: There is a bigger reserve of gas in the sales gas pipeline.
- MR BICKERS: Yes, I would have thought so.
- 5 MR ERSKINE: So you could have a much larger cloud and the jet fire, so pressure is slightly higher in the main gas pipe. From memory I think 65 bar, so there is a slightly elevated pressure and a slightly larger line.
- 10 MR BICKERS: So, when you said the consequence is the same, you are meaning in a general sense rather --
- MR ERSKINE: The consequences are jet fires, etc. The magnitude of them, yes.
- 15 MR BICKERS: The magnitude would be very different.
- MR ERSKINE: Correct, that's right. But probabilities are also different for gas pipelines. They come under a different standard and the probabilities are much lower compared to site leakage frequencies, so consequence, probability and risk.
- 20 MR BICKERS: I understand, but it was just the comment you made that the consequence was the same.
- MR ERSKINE: Yes, the consequence types. The scenario types are similar, yes.
- 25 MS DEVINE: Now, sir, I am conscious it has just turned 5 o'clock, and I am going to turn to the relocation of the First Gas assets, and I know you said that we would sit until 5.35 pm or thereabouts. I am happy to proceed if you would like me to proceed. I just thought I would check in given the time.
- 30 DR PRIESTLEY: I think that would be helpful but, Mr Erskine, you were showing distinct signs of fatigue after lunch I thought.
- 35 MR ERSKINE: Oh, okay.
- DR PRIESTLEY: Are you okay to go on?
- 40 MR ERSKINE: I am appreciating you are trying to do things but I can continue on, but sometimes if people can supply me with the right information so we can have the right context it will help. I think I can.
- 45 DR PRIESTLEY: You have a lot of documents to sort your way through, some of which we have here, some of which you don't. But my general question was: you have been in the witness box all day now and I just want to make sure that you are not going to suffer from terminal exhaustion if you

stay there for another half hour.

MR ERSKINE: Your concern is greatly appreciated. Let's continue.

5 DR PRIESTLEY: There you go.

MS DEVINE: Thank you, sir. Thank you, Mr Erskine, I appreciate that. Actually,
10 just one wrap up question in terms of your comments to the Board
around the probability of risks from the Mercury assets relative to the
First Gas assets, and you said that there were a lot of stringent codes
around the First Gas assets, didn't you?

MR ERSKINE: There are different codes, yes, compared to onsite ones, yes.

15 MS DEVINE: And you said that they are more stringent than would apply to industrial
pipelines, didn't you?

MR ERSKINE: Yes. If I go from recollection, the 2885 code I think it has jurisdiction
20 here but I could stand to be corrected on that.

MS DEVINE: Wouldn't it make sense that it is more probable that there will be
releases from the power station sites, so the Mercury assets, than the
First Gas assets?

25 [5.05 pm]

MR ERSKINE: No, because it is always a function of the summation of the
componentry, the distances, many, many other competing factors. I
30 would not jump to that conclusion.

MS DEVINE: I am clear that you don't like jumping to conclusions, Mr Erskine.

MR ERSKINE: Thank you. That's a dangerous place to be.

35 MS DEVINE: However, I would put it to you that a number of those inputs would be
the same: proximity to the road, volumes of gas being large, and here
you have said they are variable in terms of the power station assets not
having to be monitored as stringently as the First Gas assets. I think
40 you are just deflecting what is uncomfortable for you in terms of
assessing that these risks are quite similar, aren't they?

MR ERSKINE: A quite fascinating implication, but no. I am just merely objectively
laying out the base data and, as I have said before - and, apologies, I
45 will say again - I don't do deterministic risk work off the cuff --

MS DEVINE: I understand that, Mr Erskine.

MR ERSKINE: -- and I have looked at high pressure risk as well as low pressure ones

and respect the difference between them, and it is complex. I would not proffer things at this table that could possibly give a false impression.

5 MS DEVINE: You have acknowledged that you haven't assessed those risks yet, have you?

MR ERSKINE: Now, that is an interesting one. As I said, give me the time, at the end of the day I just need to be methodical.

10

MS DEVINE: You have answered my questions previously around dealing with accidental release from Mercury's site, and you said that that has not been assessed. Are you changing your view on that?

15 MR ERSKINE: Accidental release from Mercury's site? Just bear with me.

DR PRIESTLEY: Is that in terms of pipeline rupture rather than ...?

20 MS DEVINE: All sorts of accidental release, sir: flanges being left open, valves and corrosion and the like.

MR ERSKINE: Okay. Can I draw you to page 14, table 9?

25 MS DEVINE: Of your report?

MR ERSKINE: Yes. So we have in table 9 some of the site pipeline data, as you can see there, and the failure frequency from the aggregate of pipeline data. Okay. So I will just point you to that, and just bear with me. Now, the First Gas asset data, table 8, we examined the length and the key attributes of that pipeline. We have that fundamental data, so let's run with that at page 14.

30 MS DEVINE: Mr Erskine, I'm not asking you to do calculations, creating new conclusions based on things you haven't previously assessed. We are just asking you questions based on the work you have done to date.

35 MR ERSKINE: Sure.

40 MS DEVINE: I am not sure what you are doing, Mr Erskine. I haven't asked you a question that you're answering.

DR PRIESTLEY: Well, I think you asked him whether he had assessed First Gas assets -

-

MS DEVINE: Well, asked and answered I think.

5 DR PRIESTLEY: -- and he is referring you to two tables which suggest he has.

MS DEVINE: Well ...

10 MR ERSKINE: That was source data. We find quite often that piping has a much lower risk level than equipment does at the surface. So, it may be in the calculations. I would have to say I would go back to the fast modelling. Just for the Board's benefit, there was a small period where I was under a little bit of duress, when I was putting this together, and there were a couple of people compiling the information and this particular one I'd have to go back and take a check on and honestly come back to you. But you can see the source data and our thinking was in and around that. I remember some of the questions I was asking about the lines and the contours but, yes, I would need to check that.

20 [5.10 pm]

25 Sorry, it is just really hard. I don't have the programme here that I can interrogate for you straightaway. It's a very detailed area. Nevertheless, we took the time and effort to incorporate the base data, and certainly doing something meaningful with it within whatever scope we were provided, so I would have to cross-check against that.

30 MS DEVINE: So, Mr Erskine, are you saying that table 17, the 5.10 scenario, is an assessment of uncontrolled releases from the Mercury assets?

MR ERSKINE: Sorry, which page are you on again?

MS DEVINE: You have just referred us to page 19 with the table 17 on it and --

35 MR ERSKINE: Page 19.

40 MS DEVINE: -- page 13 with the table 8 on it, and I am trying to understand what you said, genuinely. Are you suggesting that you have undertaken an assessment of an uncontrolled gas release from Mercury's assets through those two references that you have just made?

MR ERSKINE: Yes, look, we have looked at those assets at the station. We have looked at the station as a whole and we considered it in that.

45 MS DEVINE: And 5.10 there refers to a heat plume from the turbine air stacks, doesn't

it?

MR ERSKINE: Sorry, 5.10 you're on now?

5 MS DEVINE: I am just trying to follow you, Mr Erskine, in terms of what you are pointing to and I am a bit confused, to be honest.

DR PRIESTLEY: Which page are you on in the report, Ms Devine?

10 MS DEVINE: Page 19, 5.10. I thought he referred to table 17 or was it table 9?

DR PRIESTLEY: Table 9 is on page 14: gas asset leak frequency data.

15 MR ERSKINE: Yes, that is where I was at. I'm just trying to find where you are going.

MS DEVINE: No, I am not going anywhere with it. I am just trying to clarify what your long statement to the Board was when I asked you the question had you assessed uncontrolled releases from Mercury's assets, and I was just trying to follow what your answer was and --

20 MR ERSKINE: Okay. Well, please wait while I just go through the results section.

MR BICKERS: If you are confused how do you think we are? I think Mr Erskine made a comment that Mercury's uncontrolled releases and the First Gas releases were not significantly different in terms of risk, and I think we were trying to get our head around why that would be because the intuitive reaction is, we have got 25 kilometres of pipeline, so intuitively you go, "Well, that's got to be a lot worse than some accidental releases, even though they may be at a higher frequency". I think we were trying to get our head around that and understand the reasons behind his answer. Is that right?

30 MS DEVINE: Yes, sir. There is probably 25 kilometres worth of gas on the Mercury site too.

35 MR BICKERS: Yes, a smaller diameter, lower pressure.

MS DEVINE: No, sir, not at all.

40 MR BICKERS: Not lower pressure?

MS DEVINE: Most of it is at 50 bar, the same pressure.

MR BICKERS: Okay. So I think that is what we were trying to understand, was it not?

45 MS DEVINE: I am happy to leave it there.

MR PARSONSON: Were you asking that there had not been a specific assessment of that

type of risk from the First Gas site, is that right?

MS DEVINE: Yes, I had previously asked that and then I made the mistake of repeating the question and he came up with something different, so --

5

MR PARSONSON: Well, no, earlier on Mr Erskine said, well, his assessment of that risk was that it would be relocated, so he hadn't specifically assessed the risk of it remaining in place. Is that your understanding?

10 MS DEVINE: Of the Mercury assets, or First Gas?

MR PARSONSON: First Gas.

MS DEVINE: Absolutely, First Gas.

15

MR PARSONSON: Yes. Okay.

[5.15 pm]

20 MR BICKERS: Can we clarify? The line of questioning, then, were you taking a line that said we don't have an agreement with First Gas to relocate? Were you trying to assess the risk if it had to stay where it was, which has already been said is intolerable, isn't? Is that what you were doing?

25 MS DEVINE: That's right, sir. And that if he is uncomfortable with the First Gas assets, he should be uncomfortable with the Mercury assets.

MR PARSONSON: Right, which won't be relocated necessarily.

30 MS DEVINE: Correct.

MR BICKERS: We are right with you now.

35 MR ERSKINE: So just to draw you to 6.4, we have looked at the First Gas pipeline and the pigging station, which is what we did in the modelling on --

MS DEVINE: Sorry, Mr Erskine, 3.4, did you say?

40 MR ERSKINE: No, 6.5, page 22. So we have looked at the pipeline and the pigging station, and that was, of course, based on data - sorry to jump around - but that was on page 13 section that I referred to earlier, with the higher pressure in the large pipes. Again, the details, like I say, that is getting right into the detail of the model there. But anyway, those sorts of things were considered as scenarios. Again, if there is some different thinking, we can suitably consider it.

45

MS DEVINE: That information, Mr Erskine, has led you to conclude that the risk is

intolerable. That's correct?

- MR ERSKINE: Off-site impact in this area, if we look at the bottom paragraph, it is tolerable, provided the risk is being managed to its lowest reasonably practicable level in any given year from the First Gas assets in the area beyond the green contour. Okay?
- 5
- MS DEVINE: You don't make the statement that it is intolerable, but you jumped that statement and you assume that if it is moved somewhere else, it could be tolerable. But the inference is that it is intolerable at that location.
- 10
- MR ERSKINE: That is correct and that is what we have said there. It needs to be a relocation.
- MR PARSONSON: So in lay terms, why, then, is the risk of a similar type of incident at the Mercury site considered tolerable?
- 15
- MR ERSKINE: Okay. We have different frequencies and we have different material, but nevertheless the scenario was put forward which we would have to examine today and then arrive at some conclusion. So I wouldn't want to pre-empt that. Intuitively, it looks like it's got to be examined.
- 20
- MR PARSONSON: So at this stage, it is an unknown risk assessment element.
- MR ERSKINE: We do quite a few pulsing gas pipeline exercises in straight pipe; without componentry on it, it has a much, much lower risk level. When you start adding components, the probabilities start adding up.
- 25
- DR PRIESTLEY: I am probably being very dumb asking this question, but there has been an exchange which suggests that the gas pressure on the Mercury site is the same as the pressure of the gas being reticulated through the First Gas system. Is that your understanding?
- 30
- MR ERSKINE: No, our data shows quite contrary to that. We show 65 bar and bigger pipe. I can have 20 bar in much, much larger pipe, and the volume of gas coming out from a big leak is different. So you have to look at all the parameters.
- 35
- DR PRIESTLEY: One of the things I think you agreed with, a long time ago, this morning, was that with any gas reticulation system there is a risk of pipe or valve failure.
- 40
- MR ERSKINE: Indeed, yes.
- MR PARSONSON: Inflammable material can be released outside the pipes and, of course,
- 45

in some circumstances, can ignite. Correct?

MR ERSKINE: Yes.

5 DR PRIESTLEY: It is that risk, I think, which has led you to believe - and I am going to use the word "unacceptable" rather than Ms Devine's coined term of intolerable - it is that unacceptable risk which has led you to say that this First Gas station should be located somewhere else, off site.

10 MR ERSKINE: Yes, that's right.

DR PRIESTLEY: What I think I would like to know, and I think other members were edging in this direction, is why is the risk of this accidental discharge, explosion, etc, any less inside the Mercury site, ie same gas being used but away from the First Gas station, why is it not the same?

[5.20 pm]

MR ERSKINE: Purely the factor of the line sizes and the probabilities of those pieces of equipment versus the station.

DR PRIESTLEY: Which is the higher risk, of the two?

MR ERSKINE: We haven't done the scenario that was suggested earlier. I'd have to sit down ...

DR PRIESTLEY: So you don't know which ... If it is an unacceptable risk on the First Gas current station, which bizarrely is at the moment right underneath the alignment, why is it not also an unacceptable risk inside the Mercury site itself, where they will be using the gas, coming from the same station, with a variety of equipment which I would have thought would give you greater potential for failure, the more pipes and things they have snaking around the place?

MR ERSKINE: Correct. There are smaller diameters and having seen the P&IDs, I would run it through. Intuitively, it looks like there would be a tolerability issue. I'd like to drive it through, but that is just high-level qualitative view.

DR PRIESTLEY: But you can't tell us at the moment because the work has not been done, no fault of yours, on whether the risks inside the site, in Mercury's own property or tolerable or unacceptable.

MR ERSKINE: That's right.

DR PRIESTLEY: Right. That's got that sorted out.

MR BICKERS: I can understand where the witness is coming from and I presume you

- 5 need to take into consideration in that analysis, which you haven't done, is the valving configurations that I see right through this. While there are vents, there are all sorts of valves that we don't understand the function of - whether PSV means pressure sustaining valve, or some other thing, but you would have to give that whole picture some consideration in assessing the risk. So I understand your reluctance to give an off the cuff generalisation even of the relative risks.
- 10 MR ERSKINE: Yes. It definitely should be attended to, no disagreement. We just normally work it through from there.
- DR PRIESTLEY: You had some questions you wanted to ask at the end of the day. Or have they disappeared? They've gone? All right.
- 15 Continue, please.
- MS DEVINE: Mr Erskine, I want to talk about the relocation of the First Gas assets. You have said - you probably want me to refer you to it - you refer in your report that the results suggest that a careful selection of an alternative location could achieve an off-site risk level that is tolerable and managed as far as practicable. You accept that further work is needed to select an alternative location, don't you?
- 20
- MR ERSKINE: Yes.
- 25 MS DEVINE: You would need to quantitatively work through the operational constraints and the risks of each potential location, wouldn't you?
- MR ERSKINE: Yes.
- 30 MS DEVINE: You accept that there are limited locations where a gas distribution point could be relocated for the power station to use in the future.
- MR ERSKINE: There would be some limit. I am not aware, though, of the details.
- 35 MS DEVINE: You would accept that there is no guarantee that they can be relocated.
- MR ERSKINE: Beyond my scope. We have just looked at the technical component.
- 40 MS DEVINE: In your report, page 24 - page 23 has the current location that we looked at this morning, referred to as the pigging station location, but First Gas assets - and page 24 has the first location. Do you have that?
- MR ERSKINE: Yes, that is one of the potential locations that we were given to examine.
- 45 MS DEVINE: The EPA might find it useful to have that up, the report, page 24, and we will go through the different contours up on the screen for the

Board. That first location, this is what I would describe as the northern option. That is near the Transpower 220 kV outdoor switchyard, isn't it?

5 MR ERSKINE: It is to the north of it, yes.

MS DEVINE: Would you expect that to be relevant to any risk assessments about relocating the infrastructure?

10 [5.25 pm]

MR ERSKINE: Yes. We would duly consider that.

15 MS DEVINE: Do you accept - I think of it as three parts of the First Gas asset, the pigging station the main line stop valve, and the distribution point - have to be on the main gas line?

20 MR ERSKINE: The details of that, I would have to check the exact route of the line, but to relocate it to that point, there may be some piping required to get it to there. Again, that is a level of detail.

25 MS DEVINE: Do you accept that that type of asset, those three types of assets that I have described, need to be located on a main gas line, as a general principle?

MR ERSKINE: Located on the main gas line? There are branches coming off the main gas line. I don't know the full remit of where all those branches are, and the detail.

30 MS DEVINE: Just at a high level, not a particular scenario in New Zealand. You would accept that a pig wouldn't work on a spur, wouldn't you?

MR ERSKINE: Yes.

35 MS DEVINE: Would you accept that location 1 would require a spur off the main line?

MR ERSKINE: Yes, there could be some pipe to that effect.

40 MS DEVINE: Sorry?

MR ERSKINE: Yes.

45 MR BICKERS: Why wouldn't a pig work on a spur? A pig essentially is for cleansing the line, as I understand it, so why can't you clean a branch line with a pig?

MR ERSKINE: It's complicated. You need to have a consistent run for the pig to

physically transfer through from one end to the other. Branch points could be a jamming location for a pigging facility.

5 MR BICKERS: Are you saying it's got to be a straight line?

MR ERSKINE: No, pigs can run around corners if designed properly and your off take would have to be carefully designed such that it doesn't have the requirement for pigging. So a spur would be a careful design consideration. Normally you like to pig as much of the line as you can.

10 MR PARSONSON: Is NZ Transport Agency able to bring up the utilities relocation plans? So there's two that relate to the site. U107 and U108. U108 is the one that has the location of the first gas line in the closest proximity to the relocation point we're talking about. Yes, so that's 107, if we could bring up 108 as well. Yes, so if we can zoom in onto the left-hand side of that image. Zoom in a bit more if you can. Yes, so if I could just confirm that there are two purple dash lines coming in from the top right and then zigzagging down. Essentially one of those is the First Gas line, as I understand it. So if we can drop this image down so we can see the top of the image, the other way, and Ms Devine are we talking about in the scenario you've been discussing, the relocation of the First Gas pigging station would be somewhere to the top left of that image. Is that the area you're talking about?

15 MS DEVINE: Yes.

MR PARSONSON: Give or take.

30 MS DEVINE: Yes.

MR PARSONSON: Thanks.

MS DEVINE: So in terms of the question around the purpose of pigging and the location of it on the gas main line, a pig cleans the main line, doesn't it?

MR ERSKINE: Yes.

MS DEVINE: So it makes sense that the pig be located on the main line, doesn't it?

40 MR ERSKINE: Yes, that's right. You design the spurs very carefully for a different maintenance regime, should you go down that path.

[5.30 pm]

45 MS DEVINE: Would you accept that location 1 with the spur probably wouldn't suit

First Gas?

- 5 MR ERSKINE: That is getting into a pipeline designer's area of expertise and I would defer to them. So I think it would be a bit of a speculation and I'd have to put it to the right people.
- 10 MS DEVINE: Mr Parsonson has shown you a utilities map. From a planning perspective there's a designation map that is similar and it shows the existing location of the pipeline. You would accept that location 1 is not alongside the existing designation, it spikes out to the north, doesn't it?
- MR ERSKINE: Yes, that's right.
- 15 MS DEVINE: I'm going to the second location, your Honour, if you're happy for me to continue.
- DR PRIESTLEY: Yes.
- 20 MR PARSONSON: Can we bring up the other utilities plan you've got now? 107, the other plan you brought up. Yes, that one. If we can just zoom in so we can focus on the right-hand half of that drawing. Yes, that will do.
- 25 MS DEVINE: Thank you, Mr Parsonson. So that's actually location 3 you've just identified. That's all right, we'll stay with that because it is up on the screen. That's the western option as I think of it. That one's not alongside the existing designation or footprint of the pipeline either, is it, Mr Erskine?
- 30 MS DEVINE: Sorry?
- MR ERSKINE: It's not alongside the existing designation or pipeline, it requires a spur out to a different, separate are, doesn't it?
- 35 DR PRIESTLEY: Designation 3?
- MR ERSKINE: Yes, that's right.
- 40 MR PARSONSON: Do you want the other image up again for the location 2?
- MS DEVINE: Yes, just with the third location, do you think First Gas would take it into account in choosing its location that the ground underneath that location might be contaminated with asbestos?
- 45 MR ERSKINE: If it does have that, that would be one of the things that has to be examined to do that.
- MR PARSONSON: Is that an insurmountable construction constraint, though? Is that

something that can be managed through construction.

5 MR ERSKINE: No, many developers handle contaminated land sites. It's about careful removal. Yes, it will cross more and take more time but it certainly can be done.

MS DEVINE: The same as location 1, it can't be used for pigging, can it, because it's a spur?

10 MR ERSKINE: Again, I defer to the pipeline designers as to what they can and can't achieve with the pigging. They may opt for an off take which doesn't require the pigging but still have drop out and let the pig run past or they might consider something in the design. But, again, there are experts who do that work for a living. That's not my remit.

15 MR PARSONSON: In your experience, would it be possible to install a relocated alignment of the pipeline under that wide rail corridor?

20 MR ERSKINE: Relocated under the --

MR PARSONSON: So we've got that wide rail corridor heading through from the bottom to the sort of top left of the screen, from a construction point of view is it possible to relocate a pipeline under that?

25 MR ERSKINE: Just point that to me.

MR PARSONSON: Okay, if you look at the left-hand side of the screen you'll see a purple line crossing a green line, so if you traverse directly horizontal across the screen you'd end up going under the rail corridor?

30 MR ERSKINE: Correct, that's right.

MR PARSONSON: Is it possible to construct a gas pipeline under that rail corridor?

35 [5.35 pm]

MR ERSKINE: That can be done. We've located a gas pipe adjacent or near to railway. They are special assignments. They take more effort but, yes, can be done.

40 MR PARSONSON: All right, thank you.

45 MS DEVINE: Can you see KiwiRail having a problem with that, the rail line operator?

DR PRIESTLEY: Well, he wouldn't really know that, would he? You might as well ask

whether pigs can fly.

MS DEVINE: We have talked about pigs, yes. I'd like to turn to location 2. But, your Honour, you had a question?

5

DR PRIESTLEY: I think if you knock off location 2 and then we'll have a recap and see where we are. Just before you do that, though, these three locations that counsel is cross-examining you on and you've made some reference to them, I think, in your report, where did the idea of these three locations come from? In other words, who was the originator of them, do you know? I assume you weren't wandering around thinking, "That might be a spot" but somebody must of.

10

MR ERSKINE: No, that's right. Those were positions provided for us. Our remit was to do the technical assessment. So I didn't query them in great detail.

15

DR PRIESTLEY: They were just given to you? Presumably by NZ Transport Agency?

MR ERSKINE: Yes, that's right. We have them the broad understanding of the contours in the commercial deliberations, but that's, again, outside my remit.

20

DR PRIESTLEY: Yes, all right.

MS DEVINE: If we could have location 2 up on this map. It might be useful to scroll --

25

MR PARSONSON: I think it is just sitting on the left-hand side of the map, give or take.

MS DEVINE: Yes. Actually, with Mr Parsonson's acceptance, I would like to use a different map for reference on this occasion. Could we go to Mr Flexman's attachment 1? It might be useful. That's helpful, no, that's fine. Stay there, you can see the alignment.

30

Now, are you familiar, Mr Erskine, with the fact that the road will have a pedestrian walkway and cycleway?

35

MR ERSKINE: Yes, on the southern side.

MS DEVINE: Yes. The proposed location number 2 is on the southern side of the road, isn't it?

40

MR ERSKINE: Yes.

MS DEVINE: Would you expect that to be relevant to any risk and planning assessment undertaken in terms of relocating this piece of

45

infrastructure?

MR ERSKINE: That would be considered as we do in Australia when we look at natural
5 gas reticulation points, similar to this, that are in park areas around
Melbourne or other places, yes.

MS DEVINE: Conscious of the limits of your expertise, the next question may not be
10 appropriate for you. I'm trying to think of a way to phrase it that you
can help the Board. Are you aware that there's been a desire by NZ
Transport Agency not to move the road to the south so as to avoid a
number of ecological items that have some form of protection?

MR ERSKINE: I'm aware there have been a great many ecological and many other
15 determinations to stay within my remit, as you've ably pointed out,
we've taken the road as a given. That's been our basis so we've just run
with that. So it's not been challenge point for me to anyone else.

MS DEVINE: And would you accept that planning constraints or environmental
20 constraints at the very highest level would be relevant matters to take
into account when considering the relocation of the First Gas assets to
this location?

MR ERSKINE: Yes, there are many constraints that others would duly consider.

25 MS DEVINE: Lastly, on this location, are you aware that that location is a location
where the KiwiRail substation is being contemplated? One of the
locations?

MR ERSKINE: No, again we technically examined and with tight real estate I
30 appreciate there would be jostling for position but that, again, is outside
the remit of our examination.

[5.40 pm]

35 MS DEVINE: You appreciate that the KiwiRail substation also has been identified as
needing to be relocated, don't you?

MR ERSKINE: I'm broadly aware of that, yes.

40 MS DEVINE: Thank you, sir, I think that is an appropriate time to finish for this
afternoon.

DR PRIESTLEY: Thank you, Ms Devine. Now, so that we can gird up our loins for
tomorrow, how much longer do you think your cross-examination is

going to take?

MS DEVINE: Difficult to say, sir.

5 DR PRIESTLEY: That is what you said at 9.00 am.

MS DEVINE: Well, it could be another hour, sir.

10 DR PRIESTLEY: Can I rely on that?

MS DEVINE: The answers are given by the witness, sir.

DR PRIESTLEY: We have questions coming in from the Board.

15 MS DEVINE: Absolutely, sir, I have to work through the other scenarios that are in the risk report and so I have questions relating to them and some of them could involve long answers from the witness. I would like to think -- no, let's be conservative in our approach and suggest it might take longer given the track record. So perhaps an hour and a half.

20 DR PRIESTLEY: Is there a need for you to cross-examine on the specificity of any of the conditions which are relevant to this site at the moment?

MS DEVINE: In terms of the planning conditions?

25 DR PRIESTLEY: Yes.

MS DEVINE: Yes, in relation to ... yes, sir.

30 DR PRIESTLEY: Have you factored that into your time?

MS DEVINE: I have, sir. I have contemplated condition questions already. But, sir, if you are trying to plan the day just based on my estimation of my questions and no further questions from the Board ...

35 DR PRIESTLEY: I think we would be obliged if overnight you sat down and just looked carefully at the structure of your cross-examination and see whether you can get there by a reasonably direct route. Mr Mulligan, of course you have been sitting there all day alert, preparing your re-examination. How long so far?

MR MULLIGAN: I would say probably an hour, sir. That's off the top of my head.

45 DR PRIESTLEY: Well, EPA staff, that takes us through to lunchtime, doesn't it? I'm not quite sure -- it has been so muddled today with so many different scenarios, I have forgotten what we decided we were going to do or not

going to do.

MS DUFFY: If that's the morning, sir, and I check with parties on the site visit and we can take the site visit in the afternoon if you want.

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DR PRIESTLEY: Well, if the weather is diabolical tomorrow we don't want to be trudging around Anns Reserve looking at geraniums and things like that. Inside visits might be possible but you will need to sort that out. I think that makes sense, doesn't it, counsel? You don't want to slot in any of your witnesses do you, Mr Lanning, tomorrow? Thank you for that, counsel, you get a good night's rest, Mr Erskine, because it will be more of the same tomorrow, plus ça change, okay?

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MR ERSKINE: Thank you.

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DR PRIESTLEY: We'll adjourn until 9.00 am.

**MATTER ADJOURNED AT 5.43 PM UNTIL
THURSDAY, 10 AUGUST 2017**

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