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TRANSCRIPT OF PROCEEDINGS

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INDEPENDENT PLANNING COMMISSION

PUBLIC HEARING

RE: NARRABRI GAS PROJECT

PANEL:	**STEPHEN O'CONNOR (Chair)** **JOHN HANN** **PROF SNOW BARLOW**
SENIOR COUNSEL ASSISTING:	**RICHARD BEASLEY SC**
ASSISTING PANEL:	**CASEY JOSHUA**
LOCATION:	**VIA TELEPHONE AND VIDEO CONFERENCE**
DATE:	**THURSDAY, 23 JULY 2020**

MR S. O'CONNOR: Good morning. Welcome to the public hearing for the Narrabri Gas Project. My name is Steve O'Connor and I am the chair of this IPC panel. Joining me are my fellow Commissioners, Professor Snow Barlow, Mr John Hann, and counsel assisting, Richard Beasley SC. Before we begin I would like to acknowledge the traditional custodians of the land on which we meet and pay my respects to their elders, past, present and emerging, and to the elders from other communities who may be participating today. In line with the current COVID-19 regulations, we have moved this public hearing online and registered speakers are provided with the opportunity to present to the panel via telephone, video conference or the studio we had set up in Narrabri.

In the interest of openness and transparency, each day we are live streaming this electronic public hearing via our website. As always, this public hearing is being recorded and a full transcript will be made available on our website. Before we hear from our first registered speaker today I would like to outline how the hearing will proceed. Each speaker will be introduced when it is their turn to present to the panel. Each speaker has been advised how long they have to speak. We have received a record number of registrations and it's important that everyone registered to speak receives a fair share of time. I will enforce timekeeping rules as the chair. We have a very busy schedule ahead of us today - - -

MR R. BEASLEY SC: Okay.

MR O'CONNOR: - - - so we will be strictly adhering to the timelines that we have established. You will hear a warning bell at one minute before your allocated time expired and two bells when your allocated time is finished. I also ask that speakers today refrain from making offensive, threatening or defamatory statements as per the guidelines available on our website. It is important that all speakers understand that the hearing today is not a debate and the panel will not be taking questions. If there is something you would like the panel to consider and you don't get the opportunity to raise it, the panel will consider any written submissions lodged up to the extended deadline of the 5th – sorry – of 5 pm on Monday, the 10th of August 2020.

All written submissions are weighed in the same way as verbal submissions made during the public hearing. It's important to understand that any person can make a written submission irrespective of whether they have been allocated time to speak at the public hearing. If you have a copy of your speaking notes or any additional material to support your presentation it would be appreciated if you would provide that information to the Commission. Please note that any information given to us may be made public. Thank you. I will – will now ask Richard to introduce today's first speaker.

MR BEASLEY: I think at the last moment we have Mr White of counsel for the New South Wales EDO and others. Mr White, can you hear me?

MR R. WHITE: Mr Beasley, thank you. Commission, I'm instructed to appear this morning on behalf of North West Alliance which is an affiliation of groups across New South Wales. It's comprised of local, regional and statewide community groups and individuals, including groups and individuals close to the proposed development. Community responses to a development are, of course, an important aspect of the public interest, particularly where their responses and concerns are justified by the objective evidence and shown to be reasonable, and I will return to that matter in a moment.

As well as the EDO, which North West Alliance has engaged to present its legal case, there follows after me presentations from some nine experts who have been retained to present scientific evidence as to the potential impacts of the project. The evidence they present will demonstrate that the project represents a risk of serious harm to important aspects of the environment and shows that community objections to the project are objectively justified. In my time this morning I'm going to focus on two principal things: the role of the IPC in the decision-making process; and, the role of the precautionary principle in the IPCs decision. It's necessarily a broad overview. We shall make detailed written submissions in due course by the 10th of August. May I now present a screen of the slides that I wish to show to you. It doesn't appear to – can anyone see a screen of mine?

MR BEASLEY: Not yet. I - - -

MR WHITE: No.

MR BEASLEY: To – to help you, we are – we have all read your – your written submission, so - - -

MR WHITE: Okay. All right. Well, I'm - - -

MR BEASLEY: - - - we're up to speed at least with that.

MR WHITE: Okay. Thank you very much. Well, what I'm going to talk about is, firstly, the role of the IPC. Sorry, Mr Beasley. I've just been thrown out because I can't find my presentation now which should be on my computer but isn't.

MR BEASLEY: Just to help you – I mean, you were probably listening, but in relation to the precautionary principle I had some discussion with Mr Kitto on Monday about that.

MR WHITE: Yes.

MR BEASLEY: I think fundamentally he took the view that it doesn't really arise because he didn't think – his view is – the department's view is that on the evidence there's – there's no risk – this is how I understood his evidence. There was – there's no risk of serious or irreversible harm to the environment, and, therefore, I – as I understood what he was saying, the precautionary principle is just not engaged.

That's obviously a different view that you and your clients take given your written submission. We're now getting something up on your screen – on the screen, so I think we're getting your slides now.

MR WHITE: Can you – can you see something from me now?

MR BEASLEY: Yes. I've got – we've got role – three – four circles. It looks like the solar system.

MR WHITE: Okay.

MR BEASLEY: Role of the IPC, Precautionary Principle, Groundwater Impact and Climate Change.

MR WHITE: Okay. Well, Mr Beasley, I'll come back to the precautionary principle in a – in a moment, if I may.

MR BEASLEY: Sure.

MR WHITE: I want to just say something firstly about the role of the IPC, and its role obviously – but it's important to restate it – is to be independent and fair. It's – it's a statutory body and it's tasked to undertake a merits assessment of state significant development and, in particular, it's stated to be independent from the Minister and the department. The MOU which has been signed between the IPC and the Minister for Planning expressly stated that the IPC is not subject to the direction or control of the Minister. It's independent of the department and other government agencies. A Statement of Expectations has been signed between the Minister and the IPC and under section 4.15 of the Act no precedence should be given to the department's assessment report.

To the extent that the Statement of Expectations suggests otherwise, that is wrong. It is contrary to section 4.15 and all relevant evidence is to be taken into account and given equal weight. I'll now turn to the precautionary principle and I just want to identify what we say the precautionary principle means and it's a principle of ESD which is a component of the public interest. It's a tool for decision-makers to manage environmental risks on a project. It's a mandatory consideration when determining State Significant Development once it is found to be engaged, and it is engaged whence – once of these two – sorry – when both of these two conditions or thresholds are satisfied. Firstly, there is a risk of serious or irreversible harm, and there is a lack of scientific uncertainty as to that harm.

MR BEASLEY: How big does the - - -

MR WHITE: Once the - - -

MR BEASLEY: How – how big does the risk have to be before the – or the threat have to be? Is it just something that's beyond fanciful?

MR WHITE: Yes. The – the risk of serious or irreversible harm, Mr Beasley, must be supported by scientific evidence.

MR BEASLEY: Yes.

MR WHITE: That's the first issue. The scientific uncertainty is as to the nature and scope of the threat of environmental damage and where the relevant risk - - -

MR BEASLEY: So a low – even – even a low risk of serious or irreversible harm combined with a lack of scientific uncertainty still engages the precautionary principle?

MR WHITE: Yes. It does.

MR BEASLEY: And then it becomes - - -

MR WHITE: We would say that's from - - -

MR BEASLEY: Then it becomes an issue of – of what's the – what's the proportional response to it.

MR WHITE: Absolutely.

MR BEASLEY: Yes. Okay.

MR WHITE: Where, for example – we say that in this case the relevant degree of magnitude of potential environmental damage is – is quite high. That's because of the potential impacts and – on groundwater and their importance in this – in this region. In those circumstances, the degree of certainty about the threat can be lower for the precautionary principle to be engaged. The – what we – what we say is – is that the – the – the Commission would be quite easily satisfied in this case that both of these conditions or thresholds are satisfied and that, in that case, a – the test is that a precautionary measure may be taken to avert the anticipated threat of environmental damage. But the – but the response or the precautionary measure should be – should be precautionate.

MR BEASLEY: Yes. Can I just - - -

MR WHITE: And - - -

MR BEASLEY: - - - ask you one question so that we – the Commissioners use their time most efficiently today. For obvious reasons, given your expertise, you're outlining the legal groundwork.

MR WHITE: Yes.

MR BEASLEY: Is – would – in terms of the efficiency of how we proceed today, should I take it that the Commissioners should take up specific questions regarding groundwater or GHD with the – with the experts that are going to follow you?

MR WHITE: Yes. So, for example, we're - - -

MR BEASLEY: Yes.

MR WHITE: - - - about to hear from Dr Currell and Professor Khan and - - -

MR BEASLEY: Yes.

MR WHITE: - - - from Mr Hayley on – on groundwater and for – for the reasons that will become obvious, the precautionary principle - - -

MR BEASLEY: Yes.

MR WHITE: - - - is most obviously engaged in respect of groundwater and I do respectfully suggest that the – the questions are directed to those - - -

MR BEASLEY: Sure.

MR WHITE: - - - three individuals on this issue.

MR BEASLEY: Yes. Please go on.

MR WHITE: Also, Mr Beasley, we also say that the precautionary principle is engaged in relation to impacts arising from biodiversity impacts.

MR BEASLEY: Right.

MR WHITE: For example, the biodiversity values of this area – the Pilliga – are significant. You're going to hear evidence from Mr Milledge and Mr Paull and Mr Serov about that. And they raise concerns about the risk of serious harm to the biodiversity interests of the area as a result of the project and they also raise concerns as to the lack of certainty as to what that harm will be because the extent of clearing is not fully identified – vegetation clearing is not fully identified in the environmental statement and the proposed offsets have not been identified by the proponent as yet. So that's a good example - - -

MR BEASLEY: Yes.

MR WHITE: - - - as to how the precautionary principle is engaged in that – in that context. We do want to say something as well about climate change, Mr Beasley, and if I could just move on now in my slides - - -

MR BEASLEY: Yes.

MR WHITE: - - - to this topic. You're going to hear from Professor Penny Sackett and from Professor Will Steffen, so – both of whom are eminent climate scientists, and they will give evidence as to why no new fossil fuel developments including, of course, gas developments should be permitted if we are to remain within the Carbon Budget of seeking to ensure that temperature rises around the world are – are no greater than 1.5 to 2 degrees Celsius above pre-industrial levels. There are three - - -

MR BEASLEY: And, now, I understand the – the – the expert issue that – that arises there, but just in terms of assisting the Commission with a – a legal question, what – what weight do you say the Commissioners should give to Preston Js merit decision in Rocky Hill about no more fossil fuel mines, if you like, forgetting wrong place is an issue, but wrong time?

MR WHITE: Yes. Well, I – I appeared, Mr Beasley, in the - - -

MR BEASLEY: Yes. I know that.

MR WHITE: In – in that case, so I strongly endorse the – the decision in terms of its logic as to how climate change impacts play a role in the – in the statutory decision-making process, as is shown in this slide. Those were the three pathways identified by the Chief Judge as to how a fossil fuel development can be refused. We endorse that. And if we go to the next slide, the - - -

MR BEASLEY: Do you say Justice – if you ignore the visual impact and social issues from Rocky Hill, do you say that properly read the Rocky Hill decision – Preston J would have disallowed it on GHD issues alone, that development?

MR WHITE: Yes, yes. I do.

MR BEASLEY: Right.

MR WHITE: Because it's – it's – it's - - -

MR BEASLEY: Are you going to develop that in your written submissions? So I won't take up more time - - -

MR WHITE: I will do.

MR BEASLEY: Yes. Okay.

MR WHITE: It's an important component of the - - -

MR BEASLEY: Yes.

MR WHITE: - - - public interest and, of course, the burning of the fossil fuels – whatever type of fossil fuel it will – it – it will be, adversely impacts the New South Wales environmental both individually and cumulatively, and as the Chief Judge so

eloquently put it in the Rocky Hill decision, all cumulative impacts in terms of climate change impacts need to be considered because it's all of those impacts which are potentially adversely impacting the environment. So, for example, the gas which has been burnt is obviously not being burnt primarily in the Narrabri region, but is being burnt elsewhere in New South Wales, but all of those – the burning of that gas, wherever it takes place, is individually and cumulatively contributing to increases in global temperature which are becoming – the evidence demonstrates – highly dangerous.

So if we return to the final slide here, this is what's described as the IPCC burning embers diagram, and this is a – a graph presented by Professor Steffen in his presentation, but is adopted from the IPCC report of 2014 showing the reasons for concern about the impacts of climate change with increasing temperature. You can see if – if we limit temperature increases to between one and two degrees – two degrees – that being the Paris Agreement climate target – the level can - - -

MR O'CONNOR: Mr White, if you could please wrap up now. We're – we're running out of time.

MR WHITE: Yes. The level of additional risk is – is moderate, but as you go above that – above those temperature increases then the risks become high and very high.

MR BEASLEY: Yes.

MR WHITE: Thank you, Commission. I think we'll now hear from the experts.

MR BEASLEY: Thank you.

MR O'CONNOR: Thank you. Our next - - -

MR BEASLEY: We now have Dr Kevin Hayley. No. Dr Hayley, is that – are you – can you hear me?

DR K. HAYLEY: I can hear you. Is that working?

MR BEASLEY: Yes. It is. We can hear you, so please go ahead.

DR HAYLEY: All right. So I'm Kevin Hayley. I've been retained by the EDO as a groundwater modelling consultant to provide an external expert advice of Narrabri gas groundwater impact assessments. My background is – I hold a PhD in geophysics, applied to groundwater, and then I've got 16 years of experience in groundwater assessments for numerical modelling and consultant in the oil and gas industry, mining and infrastructure in North America, Australia and Asia. My subspecialty as a geophysicist is I look at groundwater model calibration and uncertainty analysis, and it's the uncertainty analysis that I'll talk to you about a lot during this presentation. I will try sharing my screen. Hopefully – can you see that?

MR BEASLEY: Yes.

DR HAYLEY: And I'm going to start just by reviewing a few of the fundamental concepts of modelling and the prospect science. To start with the scientific method where you formulate a hypothesis, you conduct an experiment and you revise that hypothesis, it's been the foundation of scientific discovery. An important facet of that is that a hypothesis is never proven correct. It's only discounted when it's shown to be inconsistent. So we extend that to modelling of physical processes. We consider a model just to be a hypothesis, and so the extension of the scientific method is that you consider a wide range of all the plausible models that are consistent with the background information.

You collect observations and you revise that range of plausible models. It's – in practice it's a statistical technique called Bayesian inference where you consider a statistical range over all your plausible models that are consistent with background information. It gets called the prior in the statistical terminology, and then you cull or revise that range of models based on observations again and that revised set of models or that revised distribution is called the posterior. In groundwater modelling and in predicative modelling that leads to – we run all of those plausible models through the simulation and come up with a range of predictions that ideally narrows as you collect observation data that's informative of that prediction of interest.

So in groundwater modelling in Australia, in recent – more recently documented, the IESC, an – an expert committee on coal seam gas produced an explanatory note on this in 2018 that augments the Australian Groundwater Modelling – Modelling Guidelines and ..... so getting to the actual groundwater model, the first step in groundwater modelling is the development of a conceptual model. This is the consideration of all that background material that goes into the prior. It's a qualitative description of the groundwater system that incorporates the geological and the hydrological aspects of it.

And the proponent's consultant, CDM Smith, did a really thorough job going over all of the background information that was available in terms of water fluxes and water outlets in the Narrabri region and also considering all the available information from geological conceptualisation. And it's the geology that I'll, kind of, focus in on because as stated within the EIS and both with the 2020 Water Expert Panel report, it's the connections that are going to happen between the target coal seam down here that are going to be exploited in the CSG production and up here is beneficial use aquifers Namoi alluvium and Great Artesian basin. The hydrologic connection or the permeability is – I was talking about before is going to be critical in understanding the impact of the CSG.

Now, this sort of conceptual model is really based on point bore holed data and in between those hard bore holed points it's really geological extrapolation and it's based on informed knowledge and background understanding, but there's a lot of room for uncertainty in that conceptualisation. It's pointed out in the 2020 WEP report that the impact of faulting just on a local scale is – is absent from the

conceptual model adopted, and even just spatial headers in there just – variability and the ability of these shale areas that are interpreted to stop the flow can have a really large impact on that uncertainty section of impact.

So taking that conceptualisation and turning it into a numerical model involves dividing space and time into discrete pieces so that the groundwater flow equations we understand can be solved in a computer. So the CDM Smith – the EIS model, that involved a process where it was districtised into these cells and simplified. And one of the aspects of the simplification that was done to create a numerical model was lumping large zones – so pretty much everything in between these beneficial use aquifers and target coal seams was lumped into a large uniform zone that was assigned parameters of this impermeable layer. And these parameters that go into a model – the permeability or hydrologic conductivity and storage parameters, they can take on a really large range of values.

The hydrologic conductivity of a sand and the hydrologic conductivity of clay can be six orders of magnitude different. So when you're picking values for these it's equivalent to picking a number between one and a million. We're lucky on background values if we get it down to ..... often it's more uncertain to that. So even with a thorough review there's a lot of room for uncertainty than just picking numbers based on a background understanding. They're applied over a really wide range and just a single value. There's alternative methods of applying parameters in spatially variable fields that will allow you to, kind of, consider the uncertainty that could – could come up on a local scale but that wasn't used in this – in this study that could have been for a more rigorous uncertainty analysis.

So in the model calibrations, this is the stage where you consider that observation from the Groundwater Modelling Guidelines. The parameters are adjusted to fit historical measurements. From that Bayesian inference perspective is where we cull all the models that are inconsistent with the observation data and we keep ones – that range of models that are – fit or match our background and our observation data. So an important aspect of that is it's only useful in reducing the uncertainty of the prediction when the observations are similar to the prediction, and the issue with this modelling that's been done in the EIS and any subsequent is that there is no observation data that's similar to the provision that's available to calibrate these models.

The only thing considered in the EIS model was shallow water levels over the alluvium to just give a bit of a starting background water level for the predictive models. So there's nothing sensitive to the permeability between these target coal layers and shallow aquifers in terms of data set. That's critical in assessing this likely impact. There's no reduction in uncertainty from that initial provider estimate of the range of models. And we get to the predictive modelling. The EIS model used one single value based on a best parameter set from the review of the conceptual model, and it shows nominal groundwater impact of the shallow aquifer to the project.

So it is consistent with all available data that this project could have no impact or nominal impact, but I think I've set the stage for you to understand now that using one model is like drawing one number out of a deck of cards. It doesn't give you a really great understanding of what the project impact could be. A formal uncertainty analysis wasn't undertaken in this ..... EIS, and they cited reason for that was a lack of suitable calibration data ..... didn't have the data, they didn't assess the uncertainty. In lieu of that, seven alternative-model parameter ..... seven additional models were run, varying parameters by an order of magnitude, so a very narrow range still, given the wide range that it could be, and some of those model-parameter combinations show an order of magnitude larger drawdown ..... model ..... groundwater impact assessment's based on.

Further modelling was done by the CSIRO, and that had a substantial improvement in uncertainty analysis. It considered 500 alternative parameter sets conditioned on available ..... follows that Bayesian inference kind of approach. It adopted the EIS conceptual model, and the – the range of parameters that were used were really centred on the same parameters ..... so unsurprisingly, the median predictions from this CSIRO model were quite consistent with the EIS modelling. They had a really large range, and it's that range of plausible outcomes ..... understanding the predictions in the high end of that range were equivalent to 10 per cent of water of the long-term annual extraction limit ..... from these beneficial-use aquifers by the project.

Those impacts were persistent for 100 years into the future – maybe not a catastrophic impact, but certainly a considerable one is within the range of plausible outcomes ..... project, based on our current state of information ..... the limitations of this study identified by the author was that it does not account for uncertainty in the conceptual model, and it still used that uniform – at least laterally uniform application of hydraulic ….. permeability parameters across that entire range of geologic strata that separates the beneficial use – doesn't consider spatial variability ..... you know, what if there's a small localised faulting, and that sort of thing, so this would mean that it – this aspect is still probably an underestimation of uncertainty in model prediction ..... possible impact on groundwater users, so where all of this analysis should lead to is to informed decision making on your part, by allowing you to understand a true distribution of the predicted impact and then looking at what are the likelihood of bad thing happening, in this case, unacceptable impacts to groundwater users, within that likelihood or distribution of a predicted impact.

I think I've kind of discussed, right now, we don't have – got an idea but not a great quantification of the distribution of predictions, but the CSIRO work showed that at least considerable impacts to groundwater – groundwater users in these near-surface aquifers are within that envelope of plausible outcomes in this model, so this project carries groundwater risk, by this definition, and what's the only way to reduce that risk is either to redesign the project or to reduce the uncertainty. Now, the DPIE has proposed some really thoughtful conditions of consent on this project that involve development - - -

MR BEASLEY: Could I just – could I just ask you a question there, Doctor, on reduce the uncertainty. What – what does that mean? Would that involve drilling more holes to get more data to feed into the model?

DR HAYLEY: Exactly.

MR BEASLEY: Right.

DR HAYLEY: So it's – this DPIE has proposed conditions of consent to develop a – to develop a – a network of groundwater-monitoring wells that's designed to reduce this uncertainty, and after something like phase 1 of the model or a groundwater experiment that's very similar to the development, then there will be a dataset that's able to – able to reduce this uncertainty, so that's the irony of it – is that you're not going to going to reduce the uncertainty in this prediction until you have a dataset that's similar to the prediction of interest, in which case requires substantial dewatering of ..... seams and observations elsewhere, so really, it's after the phase 1, it – all – all of the conditions of consent after phase 1, a reassessment, the thorough uncertainty analysis, would reduce this distribution of predictions, but it's not until then that you're going to actually .....

MR HANN: Could I ask you a question, Dr Hayley.

DR HAYLEY: Yes.

MR HANN: I presume you're familiar with the Water Expert Panel's report, and I just wanted to talk about following on the point about uncertainty, and in particular, despite the Water Expert Panel acknowledging – this is relating to permeability and the flow - - -

DR HAYLEY: .....

MR HANN: - - - the different – different units, nevertheless, despite the Water Expert Panel recognising that there was fairly limited sampling, in terms of in – testing of permeability, they still accepted and concluded that the risk of unintended groundwater movement or contamination is small, so how do you believe – how do you reconcile that, in terms of their conclusions and what you've just presented to us, Dr Hayley?

DR HAYLEY: Perhaps it's just a bit of a different interpretation on it, but in – from a Bayesian inference point of view and this informed decision making, it's been shown in the CSIRO report that the impact – a considerable impact on groundwater users is within that 90 percentile range of plausible outcomes, so it's within – it's – it's predicted by a model out of there that is completely consistent with all available observation .....

MR O'CONNOR: Snow, do you have a question you'd like to put to - - -

PROF S. BARLOW: Yes, I do. Thank you, Steve. Dr Hayley, in terms of how much data might significantly reduce the uncertainty of this modelling, as you're aware, the proponent of this project seeks to drill 850 wells in the course of the project. That – if ..... were 850 further datapoints providing some data on the connectivity of particular aquifers and aquitards, what impact do you think that would have on the potential predictive qualities of this model?

DR HAYLEY: That would reduce things, but it's not as much the drilling of the wells and the providing the point data. It's observations of pressure changes due to extractions at depth, so it's a dataset that's similar to the predictions of interest that will really – so more than drilling those wells, it's actually doing the extraction and observing pressure changes of the strata in different locations, and CSIROs identified ..... most value .....

PROF BARLOW: Okay ..... question. Are we talking about predominantly the alluvial aquifers here, or are we talking the recharge areas of the Murray – the ..... the Great Artesian Basin?

DR HAYLEY: The prediction of interest that was quantified in the CSIRO report was really flux out of the Great Artesian Basin, so that's where – upon reviewing that report, that's the numbers that I can look at and ..... the Namoi Alluvium was not specifically targeted in and discussed in the CSIRO report, so I can't comment on exactly what – what impacts or what sort of .....

PROF BARLOW: .....

MR O'CONNOR: Doctor, we're running out of time, so is there any final comments you want to make, in summing up?

DR HAYLEY: I think I've kind of made it right now, that – right now, that the risk of a bad thing happening is within that sort of envelope of possible outcomes, and you're not going to reduce that envelope until you have more data, so phase 1 of this modelling gets completed and – or phase 1 of the operation can get completed, and you do a reassessment .....

MR BEASLEY: Can I just ask you a question - - -

DR HAYLEY: .....

MR BEASLEY: - - - Dr Hayley - - -

DR HAYLEY: .....

MR BEASLEY: - - - following from what Commissioner Hann asked you. The – the Water Expert Panel's report has, in several places – I'll have to do this at a high level, because we haven't got time, but several places it says, "There is some knowledge gaps that we have, and – but overall, we think there's – it's unlikely that,

for example, faulting constitutes a major risk. It's unlikely that there's hydraulic connectivity between the coal-seam layer and the alluvial freshwater aquifers. I imagine – first of all, please tell us if you have an overall response to that, but in terms of finding out precisely what the Water Expert Panel thinks about likelihoods and unlikelihoods, you've got to ask them, at a - - -

DR HAYLEY: Yes.

MR BEASLEY: - - - fundamental level, but do you have a general response to those propositions?

DR HAYLEY: Yes, that, as I said at first, the proponent's consultant did a really good job at – and a thorough job looking at the background data, and the numbers that I'm pulling out or saying it's within the envelope are at the high end of that – the high end of the numbers that have been considered, so I would say if you're looking at that distribution of predictions, there's probably a substantial amount of those – of that distribution that would predict nominal impact as – and there – but right now, because that distribution is so wide, because that spread of distributions is so wide, due to an absence of any ..... calibration data, that there is a significant, or at least not an inconsequential, amount of those predictions that's showing a potential for consequences ..... so the Water Expert Panel is right that there is a substantial portion of these models that I would imagine would be predicting nominal impact, but right now, because that spread is so wide, because the uncertainty is so wide and because the – there's no observation data to constrain it, there is a portion that you can't disregard, currently can't eliminate, that predicts – that predict impact – groundwater users.

MR O'CONNOR: Thank you, Dr Hayley. That was very helpful. We'll move on to our next speaker now.

MR BEASLEY: No. I think the next speaker is Associate Professor Matthew Currell from RMIT University. Can you hear me, Professor?

ASSOC PROF CURRELL: Yes, I can. I can. Can you hear me?

MR BEASLEY: Please – please – yes, please go ahead.

ASSOC PROF CURRELL: Thank you. So I'm going to start by sharing my screen here. I've got a few slides to present, and I just want to stop the share. Sorry about this. So we'll share this PowerPoint presentation. Hopefully you can see this all clearly.

MR BEASLEY: Yes, we can now.

ASSOC PROF CURRELL: Excellent. Okay. Thank you. So I would like to start by acknowledging the Kamilaroi Nation, whose lands and waters we are discussing today in this hearing, pay my respects to elders past, present and emerging for them

and any other indigenous nations represented today. I've been asked, through EDO, to examination groundwater impacts and risks associated with the Narrabri Gas Project, and – and this process actually started some years ago. I've been involved in looking at technical documents and data related to this project since around 2013. My background is in hydrogeology, trained as a field geologist and then specialised in hydrogeology, and I now work as an environmental engineer at RMIT University, teaching groundwater skills, including groundwater field assessments ..... quality issues and – and modelling.

I want to start with the overall big picture here. Based on my review of this material over – over a number of years, I believe that the decision regarding the Narrabri Gas Project is of major consequence for groundwater and the users and ecosystems dependent on it in this region, and there are significant future implications for an aquifer system which is of great value. I think the context is absolutely critical in this case, so this is a region with unusually high yielding aquifers containing unusually high-quality groundwater, and there are existing stresses on the system from irrigation usage, which has been high over many years, along with recent climate, which put this groundwater system under significant stress already.

MR BEASLEY: Does significant stress mean it's being depleted because of a lack of recharge, and – and irrigation use?

ASSOC PROF CURRELL: Essentially, yes, high rates of usage have been coming out of this aquifer for a long time, and there's been a process over many years of trying to reduce groundwater usage for irrigation to bring it onto a more sustainable footing. In recent times, it's the climate that's made that such a – a difficult task, to – to keep this system healthy. Yes, so I'm just going to break the potential risks to groundwater into two primary areas, the first being contamination, two primary pathways by which this can occur, so spills and leaks of the produced water which comes out of the gas wells; secondly, increased leakage of methane gas coming from deep layers into shallow aquifers and contaminated bores.

This – these impacts would be occurring in a zone of recharge for the Great Artesian Basin, the Pilliga sandstone Aquifer, where it retains its highest quality groundwater in the whole system. The second major impact is increased drawdown or leakage of water from shallow aquifers, affecting the availability of water for water users – that's irrigation and domestic groundwater users – as well as groundwater-dependent ecosystems, including a couple of high-value systems identified to the east of the project area. How do these impacts occur? It can sometimes be hard to visualise how groundwater contamination and, you know, things that are happening deep in the – in the earth actually have an impact on groundwater users.

So firstly, looking at contamination, the primary pathway here is actually at the surface. It's spills and leaks of the water that is produced by the gas wells. About 40 gigs of water is planned to be produced from the gas wells. Once that's brought to the surface, we have a risk that it is spilled at the well head in flow lines, in storage tanks and ponds where it's kept, usually due to equipment failures and – and errors

along the way. The migration of methane gas into water bores generally occurs via either geological structures or manmade structures, in the form of faulty gas wells, historical wells that are, you know, not well quantified in the area, and so forth, and in terms of drawdown and leakage, as Kevin mentioned, you know, when they're depressurising coal seams at depth, this will cause a – a pressure redistribution within the sediment package, and that can lead to the leakage of water from shallow overlying aquifers, which, in this case, as I mentioned, are the – the quite high-value high-quality aquifers, both of the GAB and the Namoi Alluvium.

This cartoon just produced by the CSIRO recently just helps people to perhaps visualise how those impacts actually occur. You know, so here is a – an example of a storage pond with reduced water. There may be some leaks or spills along the way that contaminate the shallow groundwater, and then at depth, when we're taking water out of the coal seams, to – to depressurise and get the gas flowing, if there are any conduits such as these faults, they can be pathways either for leakage of water downwards, so depressurisation of the shallow aquifers, or, alternatively, methane gas upwards into water bores, if there are conduits allowing that to happen.

MR BEASLEY: Can I just ask you to pause there. Just ignore methane leakage and drawdown for a moment. In terms of spills, though - - -

ASSOC PROF CURRELL: Mmm.

MR BEASLEY: - - - if that happens at a – at a well, is that something that would only produce localised damage, or it – or should the commissioners view it differently?

ASSOC PROF CURRELL: Look, it just depends on the size of the spill, how quickly it is observed or contained. Yes, if it's at the wellhead and its noticed and observed and contained quickly - - -

MR BEASLEY: Yes.

ASSOC PROF CURRELL: - - - and the volume is low, it will be localised.

MR BEASLEY: Yes.

ASSOC PROF CURRELL: If it's occurring through something like a leaky flow line that's conveying the water some – you know, to the wastewater treatment plant, it may not be immediately detected, and you could get a substantial volume impacting shallow groundwater.

MR BEASLEY: Right.

ASSOC PROF CURRELL: Yes.

MR BEASLEY: Okay. Thanks.

ASSOC PROF CURRELL: Moving to the department and the Water Expert Panel's recommendations, they've made two sort of overarching judgments on the project: (1) that impacts to land and water are likely to be relatively minor; secondly, that the impacts that do occur can be managed through post-approval processes, so using what we call adaptive management, so see how things turn out, and we manage along the way in response to what we see. There are major problems with both of these conclusions, and evidence which I'm – will go into which calls both of them into question.

MR BEASLEY: Right.

ASSOC PROF CURRELL: First, the – the question of will there be no significant impacts on groundwater – Kevin talked already about uncertainties associated with the current modelling. It's my view that the level of field investigation that's been presented in the EIS and current modelling is not sufficient to support the conclusions that impacts will be limited. The IESC echoed this when they reviewed the EIS and the groundwater modelling, and they said that while the groundwater has some degree of predicted capacity, providing an early indication of the general location of impacts, it is not able to reliably indicate the magnitude of impact. This is quite important, particularly when we look closely at the proposed conditions that – that have come out recently from the department.

There has been no detailed field-based study of groundwater recharge flow paths and inter-aquifer connectivity within the study area, at least in my view, to properly inform the modelling and risk assessment. Kevin mentioned that, yes, existing data has been reviewed in a – in a thorough way. My issue is that the – the data that's there currently is not sufficient to be making confident judgments about the conceptual geological model here. There's also recent peer-reviewed research that actually contradicts some of the assumptions that have been made in the groundwater modelling, particularly around inter-aquifer connectivity, which I'll go into shortly, and the basically, the – the – the main finding from that evidence is that it foreshadows potentially enhanced risks of cross-contamination of groundwater and also enhanced potential for leakage from the shallow to – to deeper aquifers.

The second point about impacts being able to be managed post-approval using conditions has a number of problems associated with it in the groundwater context. So firstly, based on the current level of understanding, as we heard from – from Dr Hayley, the potential range or full range of groundwater impacts associated with the project has not been presented to the public and – and decision makers. There's a model and some predictions, but it's my belief that the full range of impacts has not been properly characterised, and so the public and – and you commissioners are being asked to judge the merits of the project without full information about its full potential impacts.

Secondly, the current baseline data and, importantly, baseline understanding of the hydrogeological processes in this study area is limited in many areas, and so, in this case, it would be unfeasible to determine the extent to which observed changes in

groundwater condition in the future are actually caused by the gas project, as opposed to other influences in the region. Another point that's really important to – to take home here is that the large groundwater systems are characterised by significant hydraulic inertia, so they respond, over a long time period, to changes that have been made at a given point in time.

This means you can actually lock in future impacts, for example, by dewatering a certain amount, that you can't see the immediate or full consequence of those impacts and can't feasibly go in and remediate or, you know, fix impacts that are beyond what you expected, and – and, lastly, there are some impacts associated with unconventional gasfield development that are really, really difficult to eliminate from any project of a significant size, as I'll talk ..... about here. So just looking at some of the empirical data from unconventional gas around the world, Patterson et al did a big review of wastewater spills and leaks associated with unconventional gas in the US, over 30,000 wells looked at in four states of the US, and they found that spills and leaks of wastewater occur somewhere between one to 15 per cent per – per – of oil and gas wells per year.

Similar rates of long term well-integrity and well-barrier failure have been noted in a major review, hundreds of thousands of wells from around the world, by Davies et al. Certainly, no oil and gas operator wants these issues to happen. It's just that the – when you're operating a really large-scale project with many, many wells, lots and lots of high-tech equipment involved, failures are really, really difficult to eliminate, and so, you know, here, there's a breakdown of the causes of spills of unconventional gas wastewaters here. A lot of it's due to equipment failure, just human error and sometimes, you know, freak weather events or natural conditions can make it really hard to control your – your waste streams.

In this case, we've got very high-stake consequences, so this is – has some of the best quality groundwater I've seen in 15 years as a – as a hydrogeologist. It's well within the range for direct drinking water, in the Pilliga sandstone. It's also a recharge area for this – for the GAB and currently largely unimpacted by any potentially contaminating land uses in the area, and to – to sort of compound this, the potential hazards of the coal-seam gas wastewater from these particular wells is actually unusually poor quality. It's much more saline and contains much higher levels of trace elements than most of the CSG wastewater produced in the Surat Basin, and so there's an arguably – because of this sort of combination, there's a much greater risk of adverse consequences from contamination in a typical project.

I'm just putting here that, you know, this is an old geological map, but just showing ..... of the project area and the outcrop of the Great Artesian Basin aquifer units there, as well as a couple of important ..... to the east of the project, so this is just a table showing, you know indicative composition. It's from the EIS, just looking at groundwater in the Pilliga sandstone. It's very fresh, high quality. Comparing that to produced water from the Narrabri Project, you can see a very, very big contrast in the qualities of these – these two waters, which would sort of magnify the – the – the level of impact where spills and leaks are happening around the study area.

There is some precedence here for the spills and leaks of coal-seam gas wastewater in the area, largely to do with Eastern Star Gas' operations in previous years, and actually, Professor Khan, who's speaking soon, documented some of these incidents associated with – with the Bibblewindi water management facility, so spills and leaks of produced water, and so, you know, not saying that this means there's definitely going to be analogous incidents, but just saying that this is a challenging area. When we have a really big-scale project with a lot of wells and a lot of wastewater produced, there is – there is scope for significant risk of these spills.

Okay. Secondly, just moving on to the issue of inter-aquifer connectivity, there's some key research, as I mentioned, that hasn't been considered by DPIE or the Water Expert Panel, so there's some peer-reviewed research done by a group at University of New South Wales and ANSTO, PhD study by – by Iverach et al, and this has basically gone in and looked at detailed field data from as close to the project region as possible, and they had two really important findings for this project. Number 1, they found that geological structures do occur throughout this basin, including faults and intrusions that penetrate from deep in the Gunnedah Basin, where coal seam gas is proposed to be extracted, and the – the shallower GAB aquifers above, and secondly, there's geochemical and isotopic evidence that indicates that these structures actually facilitate the movement of gas and water from deeper to shallow layers within the sedimentary system.

As Kevin mentioned earlier, this is not something that's captured in the current modelling either by the – the proponent or by the CSIRO, so this – this issue would actually have a high chance of being exacerbated by the gas project, so depressurising the coal seams can facilitate greater rates of gas transport along existing structures as well as enhance the level of drawdown and leakage from shallow aquifers, and this is just a diagram taken from their – their research paper, so they sampled bores within the – the north west of the Narrabri Gas Project area, looking at the alluvium and GAB, largely.

They analysed geochemical, isotopic and microbiological characteristics, and they synthesised this with historical seismic surveys and other geological data from the area, and they came up with this model that is basically saying that, in this region, we have a number of faults and structures deep in the basin that actually facilitate transport of methane gas upwards into the GAB system and then, by basal artesian flow, put that GAB water into the Namoi Alluvium, indirectly transporting water and gas from deep in – in the system up towards the – the primary shallow aquifer of interest for many of the irrigators in the system, and so – so a quote just from their paper, and an important figure actually mapping out geological structures based on a whole lot of seismic surveys done by the State Government and Eastern Star Gas – so:

> *Seismic data, additionally, showed numerous structures in the study area that propagate ..... formation that's presumed to be an aquitard into the Pilliga sandstone from deep underlying formations.*

So this is a significant finding for two issues: one, the issue of cross-contamination of methane in groundwater bores. I've just got a number of samples from the US, high-profile case studies, where we've seen methane contamination of bores associated with unconventional gas development. In extreme cases, this has actually led to a gas explosion in – in this township in Ohio .....

MR BEASLEY: Can I just ask you a question about this. What – what do you think - - -

ASSOC PROF CURRELL: Sure.

MR BEASLEY: What should the commissioner make of the observations or opinion of the Water Expert Panel that the – the risk of migration of methane into the overlying aquifers is – is low to very low? Are they missing something - - -

ASSOC PROF CURRELL: Yes.

MR BEASLEY: - - - or - - -

ASSOC PROF CURRELL: Yes, two really important - - -

MR BEASLEY: Yes.

ASSOC PROF CURRELL: - - - things they're missing – one, the geological structural data that was contained in the EIS and also presented to the panel by Santos in response to their questions, was very limited and was not the full range of data that was available and that was reviewed in the Iverach study I've just mentioned, and – and when you look closely at that data, there is evidence of significant structures connecting deep and shallow layers in the system; secondly, the – the geochemical and isotopic evidence that – that Iverach et al collected. Unfortunately, that paper was published sort of second half of 2019, and so the Water Expert Panel didn't have access to that, but it's quite significant in terms of demonstrating connectivity between deep and shallow layers.

MR O'CONNOR: We have another question for you as well.

ASSOC PROF CURRELL: Sure.

MR HANN: Professor Currell, just around the question of uncertainty. If you could just give your view on this. In your opinion would more exploratory data, would that satisfy the question of uncertainty, and that's going to the data that you've just indicated that hasn't been taken into account, the geochemical data, but also some of the geological structural data. I'm particularly talking about more appraisal data, or do you believe you would only obtain enough data to satisfy the uncertainty question through what you would, I guess, call production drilling scale?

ASSOC PROF CURRELL: Yes, a really good question. So I think there's enough information now to update the - what Kevin was talking about, which is the conceptual geological model of this system. So you have enough information now to actually model what could be the impact of including some faults within this system and see how that effects your predictions of, you know, drawdown related to the gas project. So you can actually address the issue of conceptual uncertainty based on existing data but, you know, more data would, of course, be useful and in my opinion I think that in terms of looking at hydraulic conductivity and specific storage values, pumping tests need to be down within the aquifers. That doesn't necessarily mean you need to go and develop gas wells, you can do this through pumping tests, analysis of nested bore sites, to get a much better handle on the range of parameters that's appropriate for different parts of the model domain.

MR O'CONNOR: I think - - -

ASSOC PROF CURRELL: So some of this work can be done pre, you know, at the moment, but I think to get a real reduction to uncertainty you would also want to do some additional targeted field work.

MR O'CONNOR: Thank you.

ASSOC PROF CURRELL: Yes.

MR O'CONNOR: Snow, I think you also have a question.

PROF BARLOW: Yes, thank you, Steve. Dr Currell, this most recent data that wasn't available to the Water Expert Panel or, indeed, Santos, such with regard to the identification of connecting structures between the various layers, and the corresponding leakage that they have shown of both, presumably, salts, but also methane into the upper layers. If those coal seams in the lower layers were depressurised by gas would that increase or decrease the potential leakage of both salt and methane into the upper layers of what now appears to be demonstrated?

ASSOC PROF CURRELL: Yes. Excellent question. So in the case of actual saline fluids the risk of leakage from these communication pathways is probably not so much in the upwards direction, so fluids are not going to go up well bores and contaminate aquifers, like upwards; however, gas is not coming out of a solution through - such as methane gas. If that's able to make it into the - if it's in gas phase then, yes, you know, these structures can provide pathways for it to move upwards, you know, from the gas reserves, particularly once they've been pressurised via any conduits towards those shallow aquifers and the atmosphere, indeed, as well.

PROF BARLOW: So you're - just to be certain about that, you're saying that the liberation of the methane, which is part of the coal seam extraction process, would make methane more available to leak up to the surface through the pathways that currently exist?

ASSOC PROF CURRELL: Yes, exactly, exactly, and that's - we're sort of seeing that on screen with the example of a faulty gas well in the US where you see the methane bubbling up the annulus of the well which is not perfectly sealed, and then making its way out into the overlying shallow aquifers above.

PROF BARLOW: Thank you.

MR BEASLEY: Professor Currell - - -

MR O'CONNOR: Go ahead.

MR BEASLEY: - - - I just wanted to ask you one quick question that comes from the Water Expert Panel's report, and what you make of this, but there's - I don't need you to go to it, but on page 33 of the expert panel they say in relation to whether there are - there's faulting that it's likely that you would have expected some salt migration from the coal seam layer to the fresh water aquifers if there was any significant faulting. Do you have a response to that?

ASSOC PROF CURRELL: I would say, look, you know, it's hard to judge it without field data, but it's generally a less likely risk. If we've got saline fluid it's likely to be somewhat more dense than the fresh water - - -

MR BEASLEY: I see.

ASSOC PROF CURRELL: - - - and so it's unlikely to take an upwards pathway - - -

MR BEASLEY: Right.

ASSOC PROF CURRELL: - - - unless there's some hydraulic gradient that causes that movement.

MR BEASLEY: Okay. Thanks.

MR O'CONNOR: Is there any final comments you would like to make, because we've run out of time, and we need to wrap up.

ASSOC PROF CURRELL: Yes, sorry about that. I do just want to quickly talk about the water quantity impacts. I know that Dr Hayley talked about this, but I think there's some important implications here as well, so I'm just going to quickly come to my last couple of slides here. So in terms of water budget and quantity implications, the modelling is currently not estimating high rates of leakage from the deeper to shallow layers, so both papers by Iverach et al, including an earlier one, foreshadowed that there is, in fact, a greater degree of interconnection between the GAB system and the Namoi Alluvium, which is where a lot of people are concerned about water uses, and so with the present geological structures that can act as

conduits for flow, I would expect that the modelling of leakage rates would actually see increased rates of leakage coming from shallow aquifers.

So there is some issues here, you know, the current ground water model is not currently able to provide accurate estimates of leakage from shallow aquifers, and incorporating the new data and information from this research is likely to result in increased estimates of leakage. It leaves major questions open about the sustainability of the project's water usage. And this is the really important point, based on the proposed conditions of consent; it's the ground water model that's actually going to be used as the basis to determine what's the licence allocation volumes that the component needs to have in order to account for its impact on those shallow aquifers.

So at the moment there is, clearly, a lot of uncertainty about those model predictions, and yet that model will be the thing that is used to say, well, this is the amount of water take that's acceptable, because that water can't actually physically be directly measured, the flux coming from the shallow aquifers down to the deep. This is quite problematic, and I've just put that condition up on screen there. And so I think the DPIE, as well as Santos, they're asking water users and the public to, sort of, trust that these issues will be resolved after approval. I don't think a proper assessment of the risks and merits of the project can, however, be made without doing significant additional work on these issues, and I think that, you know, in some the risks are considerable here.

A good practice in hydrogeology is to first do rigorous conceptual model development based on good available field data, not do this backwards, the other way round, and without proper field investigations our numerical model is getting quite unreliable. Secondly, the decision-makers and the public are not currently presented with a proper account of the full risks and impacts of this project, and some of them may have been significantly understated. And, thirdly, the adaptive management approach that's embedded in the conditions is really risky. Ground water systems often have time lagged responses, and secondly, in terms of contamination impacts, things are really difficult to remediate once you actually contaminate an aquifers. It's a lot easier to go one way and contaminate, than it is to clean up once you've got a problem spreading through that subsurface. So I might just wrap up and leave it there, and sorry for taking the extra time with the Commission, I know you've got a tough job today.

MR O'CONNOR: Thank you, Professor Currell, that was very helpful. Our next speaker please.

MR BEASLEY: Our next speaker is Professor Stuart Khan from the University of New South Wales. Professor Khan, can you hear me?

PROF KHAN: Yes, I can, thank you.

MR BEASLEY: Please go ahead.

PROF KHAN: So my name is Stuart Khan, I'm a professor in the School of Civil and Environmental Engineering at the University of New South Wales. My areas of professional expertise are water and waste water quality, and water and waste water treatment, and I've particularly worked with advanced treatment processes, such as reverse osmosis, membrane filtration. I'm here today to explain why I believe that the salt management and the salt disposal aspects of this project can't be approved.

I've been engaged with this issue of produced water and salt management for coal seam gas operations for most of the last decade. In 2011 I appeared as a witness at the New South Wales Parliamentary Inquiry for Coal Seam Gas. I would like to read you a quick excerpt from the final report to that inquiry. It says:

> *A significant issue arising from the treatment of produced water to very high standards through processes such as reverse osmosis, is that as contaminants are removed from the water, a large volume of solid waste is generated. Dr Khan described the water treatment processes as follows:*
>
> *The problem is that when you treat water by reverse osmosis you are not destroying chemicals and salts, you are separating the water into two components: one is a highly purified component and an equally highly concentrated component. It is managing that concentrated brine that presents a number of challenges.*
>
> *Then you have a solid waste disposal problem. You have large volumes of contaminated salts that need to be disposed of somewhere, usually to landfill.*
>
> *The Committee was not advised of any commercial options for the re-use of solid waste generated from treated waste water. As noted by Dr Khan, solid waste is usually sent to landfill. When questioned on whether there are industrial uses for the brine from produced water Dr Khan responded by comparing solid waste to the salt generated by desalination plants, and noted that industry re-use is generally not economically feasible.*
>
> *The Committee is aware that work is being done to find a beneficial use for the solid waste generated by the coal seam gas industry. For example, the Committee received a submission from the company Fodder King, which advised that they are in the process of "... demonstrating that we can devise cost-effective solutions for sustainably using CSG water that can mutually benefit both the agricultural and resources industries and their host communities."*
>
> *Coal seam gas companies are also investigating how to deal with solid waste products generated by coal seam gas activities, with Santos advising that they are undertaking a study of the commercial and technical feasibility of brine disposal.*

In relation to the disposal of solid waste the Committee considered that the New South Wales Government should not approve any coal seam gas activity without a solid waste management plan included in the relevant approval.

And, indeed, recommendation 5 from that Parliamentary Inquiry was:

That the New South Wales Government not approve any coal seam gas activity without a solid waste management plan included in the relevant approval.

In 2013 I was commissioned to prepare a report - a background report on the topic of Coal Seam Gas: Produced Water and Salts for the New South Wales Chief Scientist and Engineer. This was to support the larger report that was being prepared by the Chief Scientist in response to a request from the New South Wales Government. The report that I provided includes detail on the risks associated with salt production from coal seam gas activities, approaches that can be adopted to manage the produced water and salt, and the associated risks, and opportunities for beneficial re-use of the ultimate disposal - beneficial re-use or the ultimate disposal of the salts.

Among the various options identified is treatment of the saline produced water by advanced water treatment processes, including reverse osmosis membrane filtration. Various options for managing the concentrated brine solution from the RO process were also identified, and these included further volume reduction by thermal brine concentration, followed by crystallisation of the salts to produce a solid waste product. So the concept that has now been adopted by the Narrabri Gas Project is this, it's the Rolls-Royce of produced water management options being highly energy intensive and expensive, but as previously indicated, a major obstacle is the production of this solid waste product requiring further management and/or disposal.

According to the Environmental Impact Statement submitted with the Development Application 430,000 tonnes of salt are projected to be produced over the life of the project. That's more than 10,000 B-double truckloads of salt. The Eiffel Tower weighs 10,000 tonnes. The mass of salt produced from this project is equivalent to 43 Eiffel Towers. The mass of steel in the Sydney Harbour Bridge is 50,000 tonnes. The mass of salt produced by this project is more than eight times the mass of steel in the Sydney Harbour Bridge. But that's only half the story. In their assessment report the New South Wales Department of Planning Industry and Environment stated that due to significant community concerns about the land and water impact the department established an independent Water Expert Panel for the project, as you know. The DPEI assessment report notes that the proponent's Environmental Impact Statement predicted that these 430,000 tonnes of salt would be produced over the life of the project, but it then states:

However, based on an updated water baseline information in the response to the submissions the Water Expert Panel considers that salt production could be up to approximately 850,000 tonnes over the project life.

If so we're now talking about 85 Eiffel Towers, or 17 times the mass of steel in the Sydney Harbour Bridge. For such an enormous mass of salt waste the Environmental Impact Statement submitted with the Development Application for this project is very brief on the issue of salt disposal, but it does state that the salt would be classified as general solid waste under the NSW EPA Waste Classification Guidelines. In their response to submissions Santos further emphasised that the salt would be classified as general solid waste, and to support this they provided chemical analysis of potential chemical contaminants in the salt to demonstrate that they are expected to be below the contaminant thresholds included in the Waste Classification Guidelines, as to be classified as general solid waste.

I believe that this seriously misses the point of the New South Wales EPA Waste Classification Guidelines. These guidelines, last updated in 2014, were not prepared with large masses of salt in mind as general solid waste. In fact, they provide a long list of some types of solid waste that are pre-classified as general solid waste. To give you the picture examples include glass, plastic, rubber, plasterboard, ceramics, bricks, concrete and metal. The list is long, but a common characteristic is that all of these substances are substances that won't rapidly dissolve in water, be that ground water or rain water that falls on the landfill surface.

Highly water soluble salt is fundamentally different; it dissolves in water. And some of the types of waste - some other types of wastes, that are explicitly prohibited from classification as general solid waste in these guidelines include liquid waste. There's a reason for that. The reason is that liquids are mobile and cannot be effectively contained in a landfill designed and licensed only for general solid wastes. As CSG salts do not appear on the list of pre-classified general solid wastes the guidelines require that they be subject to chemical contaminant assessment in order to ensure that no harmful contaminants are present above the identified, acceptable concentrations.

But these contaminants include things like Benzine, Cadmium, lead, mercury, various harmful pesticides and carcinogenic poly aromatic hydrocarbons. Anyone with experience in the field of chemical contaminants will immediately recognise that the intention is to prevent harm from exposure to toxic chemicals. The idea of highly saline water containing hundreds of thousands of tonnes of salt leaching from these landfills is an entirely unrelated and unconsidered concept in these guidelines.

In my opinion these guidelines and the waste management regulatory regime that they underpin are, in this case, not fit for purpose. The New South Wales Classification Guidelines cannot be reasonably applied to hundreds of thousands of tonnes of CSG salt, and attempts to use them for that purpose will inevitably lead to the production of highly saline leachate and an associated high risk of seriously contaminated ground water and surface water. I was concerned to read that the New South Wales Department of Planning, Industry and Environment accepted, and supported, the assumption that this material could be classified as general solid waste. Page xiv of the DPIE Assessment Report states:

The salt is likely to be classified as general solid waste which can routinely be disposed of at one of the 11 existing licensed waste facilities within 150 kilometres of the site.

The NSW EPA also has guidelines for the design of solid waste landfills. For general solid waste landfills there are requirements for barrier systems to control contaminated leachate, and these include a compacted sub-base and a compacted clay liner. As rainwater enters the landfill this barrier system is designed to prevent it from mixing with the ground water; however, the saline solution produced will need to go somewhere. General solid waste landfills must be constructed with the leachate collection system. This is composed of a layer of gravel along the bottom, and pipework to drain the leachate from the landfill.

The next issue then is disposing of that leachate which will eventually wash out all of the salts. The challenges for a solid waste landfill operator in disposing of a concentrated brine solution are effectively the same as the challenges that the coal seam gas company faces in disposing of a concentrated brine solution. One option to consider might be reverse osmosis, followed by thermal brine concentration, followed by crystallisation of the salts. But while these highly energy intensive and expensive technologies might be viable for a coal seam gas company, they're unlikely to be affordable to a solid waste landfill operator, and in this scenario a lot of energy, money and greenhouse footprint has been invested in shifting a problem from one location to another, but the problem is far from solved.

A more ideal scenario might be that the salt waste is appropriately classified as a hazardous waste that requires significantly enhanced containment and leak detection measures. But even this is a temporary solution, since the risk of loss of containment exists for perpetuity. The salt does not break down, and will require ongoing management to contain long after any solid waste landfill ceases to operate. The future will necessarily involve at least one of the three following options: that ongoing active management of - that there will be ongoing active management of the landfill storage for ever, acceptance that the containment will eventually fail and salts will be released to groundwater and surface water, or (3) recovery of the salts by digging them all out again. In any of these three circumstances we will be passing the burden of addressing this problem onto future generations. In my opinion such an arrangement is not acceptable and should not be approved under any circumstances.

I'm running out of time, I can see, but I collected a bit of information in response to Santos' current memorandum of understanding that they've announced with a sodium bicarbonate manufacturer. I think it's disappointing that there's not a lot of time to - well, there's very little time, it's an eleventh hour announcement, there's very little time to properly assess that proposal, but I've spoken to a number of people in that industry and it does sound like you could, in fact, develop a viable soda ash and bicarbonate industry again in Australia that we had up until 2013.

In that case I would strongly suggest that development approval be conditional upon much more than just a memorandum of understanding, or even a detailed business case. A full-scale commercial soda ash production facility would need to be seen to be well under construction and realistic financial commitments to its completion would need to be in place. Peak water and salt production will occur during the first four years of CSG operation, and a sodium bicarbonate plant would need to be operational by that time in order to process the salts as they're produced. Zero salt should be approved to be produced until there is an actual operational plant. Anything less, in my opinion, is an unsatisfactory condition for approval of this or any other coal seam gas development in New South Wales.

MR BEASLEY: Can I just you a couple of questions, Professor Khan. There's a slight - something is perhaps not quite mentioned in the assessment report that is in the Water Expert Panel's report about the classification of the waste. The WEP says based on the information we have, and the criterion in the EPA Guidelines it would appear that the salt produced would meet the requirements of general solid waste, but then it goes on to say:

> *However, it is noted that concentration levels of some compounds of interest in the produced water and their fate in the treatment process are not provided in the EIS.*

Should the Commissioners understand that you think there's - from the submission you've just made today, there's real doubt as to whether the salt produced would be considered general solid waste under the EPA Guidelines. I heard you say they're not set up to deal with salt in these quantities, but is there anything about the chemical composition of the waste that causes you to have concern?

PROF KHAN: No, no. So I think if you follow the EPA Guidelines to the letter you naturally come to the conclusion that salt meets all of the conditions, and, yes, they would need - because it's not a pre-classified type of general solid waste, they would need to do the chemical analysis to demonstrate that there aren't high concentrations of contaminants, but as I pointed out that approach is all about - is all based on the assumption that the contaminants might be the problem, that they might be toxic, whereas really the issue here is that the salt is the problem, and it's a problem in a very different way to what trace chemical contaminants of, perhaps, carcinogenic substances might be, which is the usual practice that needs to be investigated for classification of general solid waste.

So, no, I do think that if you read the guidelines to the letter you would say that this fits within the guidelines. The problem is that this is not what was being considered. This was not what was being thought about when those guidelines were being developed a decade ago before we had a coal seam - or significant coal seam gas industry in New South Wales to speak of. And I think when you read those guidelines that's obvious, that's clear, and that should be taken into account.

MR O'CONNOR: Professor Khan, Snow has a question for you as well.

PROF BARLOW: Professor Khan, it's Snow Barlow here. With regard to the contaminants that have been mentioned earlier, and you've just mentioned it again, but in a different context, the suitability for the use of this large amount of salt by a commercial company to produce sodium bicarbonate or carbonate - sodium bicarbonate, what's the state of the art of the separation technologies available? So would it be particularly onerous to separate those contaminants which apparently include cadmium, and a few other things as well, to create something that was fit for industrial use and human consumption?

PROF KHAN: Snow, I'm not an expert on soda ash or bicarb production by any means, but I did speak to some people in the industry recently to ask questions like that, and nobody was really able to answer straight off whether a coal seam gas produced water and the salts from a coal seam gas produced water would necessarily cause challenges for production of a purified product for food uses or for non-food uses. I think that that's something that still needs to be investigated, and it's unfortunate that we haven't been given time to investigate that, but I think the bottom line of what I was told is - and this is what I normally say about water treatment in general, is that you can produce any quality of water you like from any quality - any poor quality of water you like by filtering it through money, and that's the case. You know you can do chemical refinement and purification if your technology - you're prepared to invest in the technologies to do that. So I'm sure it's not physically impossible, it's physically possible. The question is whether or not it proves to be economically attractive for the proponent.

PROF BARLOW: Thank you.

MR BEASLEY: Can I just ask you another question. The WEP recommended - this is recommendation number 21, that Santos provide to the EPA formal statements from licensed waste disposal operators confirming they have available the necessary storage facilities for this amount of salt. That hasn't happened. If the approval goes ahead, and Santos can't get a licensed waste disposal operator to take this waste, what are the options?

PROF KHAN: So that's one of the questions I was asked to answer in my background report to the New South Wales Chief Scientist in 2013, and there are a broad range of options for how produced water in the first place can be dealt with. Very rarely is it treated to this degree where you actually crystallising out the salts, but if you assume that they're going to that point of crystallising out the salts, there is - the options are to continue to stock pile it until you can find an option.

MR BEASLEY: Stock piling means stock piling it safely obviously, so there's a range of precautions that would have to be taken there.

PROF KHAN: Which, in effect, a landfill operation is a stock pile, it's not a permanent solution without ongoing permanent management. So it would need to be stored in some sort of containment like that for a long period of time, or a beneficial re-use opportunity such as soda ash and bicarb is one of the other options. The only

other option that really is conceivable for a large mass of solid waste like that is marine discharge. You know, if you can transport it to the ocean then you potentially have a big opportunity to dilute those salts in the ocean. I can imagine that there might be social acceptance - social acceptability and acceptance issues around such a proposal, but they're the only - the only solutions that I can physically imagine.

MR O'CONNOR: Professor Khan, would incineration be an option?

PROF KHAN: No, you can't - it's inorganic material. Some of the carbonate can be driven off as carbon dioxide, and, in fact, that happens during the treatment process. I'm concerned that that's an unaccounted for aspect of the overall carbon footprint, is that the soda ash - or bicarbonate is converted to soda ash in the process, and you lose carbon dioxide. So there are heating processes like combustion that can reduce the mass of some of this salt, but ultimately the sodium aspect of it, the sodium is not going anywhere.

MR O'CONNOR: Thank you. I think that wraps up our questions. Thanks for your time this morning.

PROF KHAN: Thank you.

MR O'CONNOR: The next speaker please.

MR BEASLEY: Mr Milledge from Landmark Ecological Services. Can you hear me, Mr Milledge?

MR MILLEDGE: I can hear you, Mr Beasley. Can you hear me?

MR BEASLEY: I can. Good to see you again.

MR MILLEDGE: Good. Yes, likewise. I'm David Milledge, I'm a threatened fauna specialist with more than 50 years experience in conducting surveys and research in Eastern Australia. I'm an accredited expert for several threatened bird and one mammal species under the Government's Biodiversity Assessment Method. I sit on the SoS technical group, or the Save our Species program, and I'm also an accredited biodiversity assessor under the Biodiversity Assessment Method. I've had a relatively long experience with biodiversity assessment in the Pilliga Forest and Woodlands.

I conducted a large owl survey at 500 sites there through the Pilliga in 2001, and with colleagues I undertook a rapid threatened fauna targeted species assessment through the State Forest section of the gas project area in 2011. And I've undertaken two previous reviews of the threatened species issues associated with Santos' Narrabri Project for the North West Alliance, and I made a presentation to the Planning Assessment Commission in 2014 on the expansion of gas production in wells there.

So I've had a fair bit of a background in the Pilliga and its biodiversity. The Pilliga Scrub at half a million hectares is the largest relatively unfragmented stand of semi-arid forest and woodland in Eastern Australia. It's a major refuge for biodiversity, particularly against climate change, represents a stronghold of a suite of threatened fauna species which are adapted to these ecosystems. Because of its landscape scale integrity populations of these species, if they're provided with effective habitat management, have the potential to remain viable in the longer term, particularly in the face of climate change.

Key species in this regard are the Pale-headed Snake, the Barking Owl, Eastern Pygmy Possum, black-striped wallaby, south-eastern long-eared bat, and, of course, the endemic Pilliga Mouse. Now, many of the threatened species in the Pilliga belong to groups of vertebrates that have been identified as under particular stress from key threatening processes across the forests and woodlands of Eastern Australia, and these include declining woodland birds, migratory birds, and hollow dependent species. And the Pilliga's refuge function in supporting viable populations of these threatened species represents a unique and irreplaceable value which is of national significance.

Now, although the Pilliga possesses relatively high level of vertebrate habitats integrity and supports significant populations of these threatened species, it has been subjected, in the past, to ongoing environmental stresses, and these have already had detrimental impacts on biodiversity in the area. For example, the extreme temperature and fire has resulted in a severe decline in the Pilliga koala population which 20 years ago was considered the most important koala population east of the - west of the Great Dividing Range. And now a recent Upper House inquiry has found that koalas are functionally extinct in the Pilliga now. So from a population of about 20,000 20 twenty years ago, you've got an iconic marsupial that has now become extinct, and this koala case cautions against potential losses of other threatened vertebrates in the area.

And my contention is that the Narrabri Gas Project, particularly the indirect impacts from the project which importantly include fragmentation, increased fire risk and increased pressures from introduced predators and herbivores will only increase the risk of a pressure on these threatened vertebrates, and put them at even greater risk. Now, the department's assessment report has accepted Santos' onsite mitigation measures, together with offsetting as minimising the impacts of the project on biodiversity in this area, but I contend that both these approaches are seriously flawed in relation to conserving key populations of threatened vertebrates in the area, and also the many other significant threatened vertebrates that occur there.

The onsite mitigation measures are compromised by Santos' inadequate field survey. I've detailed this in previous reviews, but just for example in the four years that Santos conducted surveys in the Pilliga they were only able to find five individuals of two of the key species, the south-eastern long-eared bat and the Pilliga Mouse. Five individuals in four years, whereas the rapid assessment survey that we

conducted in 2011 we recorded 21 individuals of the south-eastern long-eared bat and 25 individuals of the Pilliga Mouse, and this was in only a 10-day period.

So if Santos had identified the important locations for these threatened species prior to the department's assessment then this would have enabled conditions to be imposed on siting the gas infrastructure. It would, perhaps, have provided some certainty in onsite mitigation. And now this identification of these species and the hotspots, the important areas, that they occur in, is now dependent on the so-called micro-sighting surveys, but these are going to be limited in time and in season, and even if important habitat attributes and hotspots for these threatened species populations are identified, mitigation measures are only going to be applied in the greatest extent possible, and they're going to be implemented where practicable, and they might even be dispensed with if they're not considered feasible and reasonable, and this engenders little confidence in the process, and it suggests that commercial concerns are likely to prevail over biodiversity values.

MR BEASLEY: Can I just ask you, are you making a submission that there was some flaw in the survey process conducted for the purposes of the EIS?

MR MILLEDGE: Yes, yes, Mr Beasley.

MR BEASLEY: Can you just expand on that?

MR MILLEDGE: It's inadequate.

MR BEASLEY: Because?

MR MILLEDGE: They simply didn't put - Santos didn't put in the required survey efforts to identify - - -

MR BEASLEY: What does that mean though? Does it mean not enough traps, not enough area covered, not enough time spent, what's the specific - - -

MR MILLEDGE: Yes, yes, yes, just the survey effort simply wasn't adequate.

MR BEASLEY: All right. Please go ahead, sorry I interrupted.

MR MILLEDGE: Yes. You will find more detail, Mr Beasley, in my previous reviews of this, and I think the Commission has been provided with copies of those by the Environmental Defenders Office.

MR BEASLEY: I've certainly got a report you did in 2017.

MR MILLEDGE: Right. And there's one in 2018 where I responded to their response.

MR BEASLEY: Yes, yes, sorry, I've got that too, yes.

MR MILLEDGE: So you will find some detail that you're inquiring about there, I think.

MR BEASLEY: Thanks.

MR MILLEDGE: Okay. So offsetting, which is the other arm of mitigating the impacts on threatened species here, I say is a fundamentally flawed process, particularly with species which are designated ecosystem credit species under this system, and it assumes that the occurrence of particular threatened species can be predicted on the basis of plant community types, which are essentially just based on floristics, and you can't - you simply can't predict the occurrence of threatened species which are essentially rare, specialised species, patchily distributed, on the basis of plant floristics.

You have to take into consideration structural attributes, functional attributes, and it simply can't be done, and these species - particularly the species that are in the declining bird species group are just going to be passed off with offsets where the species are not even going to be necessarily present in those areas. There's nothing to guarantee that they will actually be effectively offset. The offsetting process doesn't mandate like for like. It doesn't require that the species, as I mentioned, the subject species are going to be present there, and if the plant conservation - sorry, the plant community type can't actually be found as an offset then the scheme allows - simply allows payment into the Biodiversity Conservation Fund.

And what is really, perhaps, significant here is that despite the use of offsets in recent major resource projects in Western New South Wales there has been no auditing of the effectiveness of offsetting. There's no guarantee that it's going to benefit the species that are impacted at all, and although Santos claim that there's more than adequate area of land in the region to allow offsetting, and the retirement of species credits, then - but there's no - there's no guarantee that this land is available, and whether, in fact, it contains the species involved, and it's highly likely, I contend, that impacts on threatened vertebrates from the gas project is highly unlikely they can be offset in the Pilliga area because the Pilliga is a stand of forest and woodlands that's virtually an island in a sea of agricultural development. So I simply think that these offsets are just not going to be available.

MR O'CONNOR: Can I just interrupt there. Are you saying if they're not available then there's the option - or the default position is they just pay some money into a fund?

MR MILLEDGE: Yes, that's the fall-back position.

MR O'CONNOR: Okay.

MR MILLEDGE: It's, you know, not going to benefit those key threatened species in the slightest. So in combination with the indirect effects of this project and one lack of certainty that the mitigation measures will have is probably going to have

serious and irreversible impacts on these key threatened species, and the other threatened species in the area, which could quite likely lead to localised extinctions. And this lack of certainty in the landscape scale refuge function, I can't stress this too strongly, the landscape scale refuge function, and the ecological integrity of the Pilliga and the key vertebrate - populations of the key vertebrate species that it supports - - -

MR BEASLEY: When you say a refuge function, do you mean we've lost other habitat, this is the last spot we can go to; is that - - -

MR MILLEDGE: Well, this is - yes, we've lost most of the habitat of many of these species. There are populations existing in the Pilliga and within the gas project area that have the potential to remain viable in the long term future, and the loss of this function, and the potential rendering of unviability of these populations I contend militates strongly against approval of this project.

Perhaps, just in finishing I could invoke the analogy of the science writer, David Quammen, in his book Song of the Dodo, where you take a fine Persian carpet, you look at its integrity, you see the connections of the weaving, and then take a knife and you cut it into, say, 20 small pieces, and from this fine Persian carpet you - you still have the same area, but do you have 20 fine throw rugs from this carpet. No, what you have are 20 useless pieces of carpet, that are all unravelling at the edges, and I think this mirrors the issues we're facing with biodiversity conservation, particularly in Western New South Wales today, and I might finish there.

MR O'CONNOR: Thank you very much and there's no further questions, we'll look for our next speaker.

PROF BARLOW: Steve, I have a question if - - -

MR O'CONNOR: Sorry, Snow, go ahead.

PROF BARLOW: Mr Milledge, you've stated that the koalas are extinct. Does that mean there aren't any in the Pilliga any more, or does it mean the population is so low that it's not viable?

MR MILLEDGE: Yes, I think the latter. There have been some recent surveys, and they've only found a few individuals scattered across the whole of the Pilliga.

MR BEASLEY: You said functionally extinct. I take it to mean there's no breeding pairs.

MR MILLEDGE: Yes, functionally. That's right.

MR BEASLEY: Yes.

MR MILLEDGE: That's my understanding. And this was highlighted in the recent Upper House Inquiry into the Koala in New South Wales.

PROF BARLOW: Thank you.

MR O'CONNOR: Thank you once again.

MR BEASLEY: I think we now have David Paull from Ethical Ecology. Can you hear me?

MR PAULL: Yes, I can. Can you hear me?

MR BEASLEY: We can. Please go ahead, sir.

MR PAULL: Thank you for letting me speak today. I'm reasonably well-placed to be here as an expert on biodiversity matters. I've published about eight scientific papers on the wildlife in the Pilliga and the Brigalow Forests. I've conducted - organised and conducted the - two of the largest wildlife surveys done in the Pilliga by - for forestry, and national parks. I did my research masters here on the Pilliga Mouse, the endemic species of mammal here, plus the Common Dunnart, which is a little marsupial. And I've been a BioBanking - accredited BioBanking assessor for eight years between 2008 and 2016.

So I would just like to go on a slightly differently tack to what you've heard before, and emphasise - maybe emphasise some of the points that David was saying, but I just want to first say that this is the first time an environmental assessment for a gas production field has been attempted in New South Wales. Uncertainly about the location and scale of the direct and indirect impacts, and the offset arrangements, has made it a - has not made - has made the transparent assessment of the biodiversity impacts impossible. It would be fair to say that the approach taken and the dearth of information on what will actually occur so that the proponents and the government really have failed to provide significantly to an acceptable level of reliability so an informed judgment can be made.

The Pilliga Forest constitute the most important refuge area for wildlife in Western New South Wales, and significant recharge area for the Great Artesian Basin. And as well as the other high conservation value remnant patches of Brigalow to the northern forest, have failed to recognise national biodiversity hotspot containing high species diversity, endemic species, but with high levels of ongoing threats. I would say the irreplaceability of this system is of the highest order. There are significant deficiencies in the way that the impact assessment is being presented, and I would just like to - my - bring this up for you. My points about the - I'm just doing this. Can you see that?

MR O'CONNOR: It's coming up now.

MR PAULL: Okay. These are my main points, and I'm not going to talk to all of these today. David has dealt with some of them, but I would like to really tackle some of these other ones. The first one is the actual scale of direct impact is uncertain. I mean, the clear - the actual clearing. The figures provided by Santos are likely to be underestimated. Santos' field development protocol does not exclude sensitive ecosystems or EECs, and instead has upper limits of clearing, rather than following policy and avoidance. The magnitude of indirect impact which David mentioned has been grossly underestimated. This is a fault with the methodology used as well. As a result there are a number of threatened species that will be disproportionately - are disproportionately impacted by indirect impacts, are not accounted in the bio - in the methodology. Things like - this includes things like feral predator activity, increasing isolation of bush fragments and increasing bush fire risk. None of these things can be quantified within the methodology.

Cumulative impacts were considered by Santos to a limited extent. They only considered the previous gas development; did not consider the other mining development which is right next door, or previous forestry operations. Let's not forget this is a State Forest which has had commercial forestry in for well over 100 years. Now, the survey effort, as David mentioned, in the EIS was either insufficient or misplaced yielding poor data for key species like the koala, the Pilliga Mouse and Eastern Pygmy Possum, and the Five-clawed Worm-skink. This had an inadequate assessment impacts on these key species. The retirement of ecosystem predators comes with no feasibility assessment on the suitability or availability of offsets, for some of - particularly for some of the key vegetation types. Retirement to species credit, as David said, I believe, almost impossible.

DPIE, in their planning report - assessment report, claimed - refuted, basically, Santos' claims that they can use rehabilitation to create ecosystem and species credits upfront. That was completely rejected by the consent authority, as was the idea to include the feral animal control program as a way to make their species credits. This was also rejected by the department. Santos make many claims that can't be validated. I would say that it's the holes that are concern.

So uncertainty of direct impacts. What do we know about what Santos is actually going to do in the forest? Well, we don't know where. We don't even know how much. Now, I can - what we know can be easily summarised in one graph - one table, I'm sorry, that the - that's in the EIS - so in the planning. At the top - table at the top, where impacts - we have a figure for the infrastructure corridor. We have a figure for the underground pipeline. So the main thing is in the gas field where they are saying that they are going to - this is in the EIS, said that they were going to clear 926 ..... but what did they say in the assessment report, well, they've obviously had a bit of ..... planning and they've revised that down to somewhere between 300 and 500 hectares.

How did this happen? Why did this happen? What's the explanation? We don't know. Okay. The - this is pretty insufficient detail, and underneath that top table you can see summary that Santos provided for their GLNG gas field development

project in Queensland, which was their last approval which they had. A lot more information. There are gathering lines, transmission pipelines, compression facilities, water management facilities. Importantly, access roads, that are an important part of the whole footprint. In fact, if we go down to the next table - I can't actually do that there, but it would have shown that the actual area of access tracks is greater than the footprint for the well sites themselves.

But in this case Santos is saying that they are going to try and put all of their - well, most of their well sites on existing tracks, so they won't be doing many additional tracks. Well, I just can't see how that's possible. I mean, if you look at - look at other evidence and you will see that in Queensland, in fact, most of developments which have occurred in State forests, most of the clearing is because of tracks, and these are locators. There's an image there, on the top image, showing a State forest in - near Dalby in Queensland, and most of the well sites are not - were not put on existing tracks, so most of those are new tracks.

Also Santos have provided an indicative layout of their well site, and if we look at it because they give a considerable amount of detail there. Obviously we're not supposed to take this very seriously, but if we go in we can see that it is very detailed. If I can focus in on this you can see that, again, most of the wells are on new tracks. And even it's quite detailed, it actually shows where a lot of these wells theoretically would be located. The idea that the well sites are going to be on existing tracks is not supported by this map, because you even have tracks parallel to existing tracks, at not too far a distance where they put the well sites. I would have to say it just cannot be believed, to be honest with you. So that's what I want to say about that.

They are also saying that all their well sites will be - pads will only be one hectare in size. They're going to fit two wells on that. Well, that's certainly possible, and current, sort of, technology for multiple sites. In Queensland they actually put their wells on pads of ..... hectares. Again, we're proposing something new here, which has never really been demonstrated before. I could move on, now. Basically, Santos' mitigating measures rest on this idea that they will have a field development project, so they – micro-sighting where these pads ..... go. There's a limit to how much they can do ..... They seem to be saying that they were able to do this to such an extent that they can avoid sensitive matters. But, in fact, there is a lot – plenty of leeway for them to cause harm in sensitive matters.

They are not proposing to avoid any sensitive ecosystems such as EDEs or EECs. ..... they have a clear upper limit for all ecosystems, including EECs and ..... In other words, Santos, on the one hand, micro-sights, established clearing – clearance allowances in the protocol, then ..... have to avoid to a certain extent. In fact, the area of Brigalow endangered community ..... to be cleared has increased ..... 19.3 hectares, not counting the dry grassland. But, in the EIS, it was only 7.3 hectares. I mean, that speaks volumes to how little attention Santos is paying to avoidance. ..... way. ..... hear a bell?

MR O'CONNOR: Yes. You have one minute remaining.

MR PAULL: Right, okay. I'm going to go into some ..... in survey methodology. But I wanted to – which I think David has covered, so I just want to quickly show you one key way that the methodology has basically let species slip through the cracks. Here is the black-striped wallaby, an endangered species; should have been a high priority to make sure that its ..... was going to be okay. Santos found 17 animals. We know that they're relatively uncommon in the Pilliga, but still present and – but concentrated around these two Brigalow nature – two Brigalow reserves to the north forest. This species will be completely surrounded by .....

90 per cent of its known distribution will be within ..... fields, and they're proposing to have 50 metre buffers around these reserves. What is that going to mean ..... animal to be able to disperse across the landscape? What is the impact – all this other indirect impacts, increased traffic, light, noise, and all these other things, what are they going to be on ..... No. Instead, we are just told this animal can be a – will be okay as long as they find 30,000 species credits. Where on earth are they going to find those credits when its species is only here, this area? Failure of the methodology.

MR O'CONNOR: I think we have a question for you from Snow.

PROF BARLOW: Hello, David. Snow Barlow here. The question is, your point about that – again, the probably more accessed tracks than currently shown - what is the sort of minimum width, or sort of maximum width, of an access track that would be an effective barrier to some of these threatened species? So, you know, how narrow do they have to be not to afford a barrier to connectivity of the forest?

MR PAULL: Depends on species. I studied Pilliga Mouse for quite a long time in the Pilliga, and they are very ..... They don't even like going out into small open spaces. I actually radio tracked and used transmitters, and was able to track where they went, and no, they don't being exposed very much. But the biggest problem with this hacking apart ..... fragmenting internally, fragmenting forest like that, is there will be a net increase in feral predator activity. Foxes use tracks to hunt. The science is they spend 30 per cent of their time near tracks. If you're increasing the level of tracks in a forest, you will – that – you're increasing feral predator activity. Now, that's only going to be detrimental to these small animals, like the Eastern Pygmy Possum and the Pilliga Mouse. These are impacts which cannot be offset.

MR O'CONNOR: Can I just ask a question around the forest? You showed us an aerial photograph of the forest in Queensland. Are you familiar with that forest at all, and how the fragmentation has impacted species in that location?

MR PAULL: From what I understand, there, there's very little actually follow up information on how these impacts played out. One of the big problems with the oil and gas industry in general around the world is the lack of scientific studies on the

impacts on ..... operations. ..... indirect impact. We just don't – it's just not well documented.

MR O'CONNOR: Okay. Look, unless there are other questions, which I'm not seeing, thank you very much for your time and your presentation this morning. We will now take a break and we will return at 11.55. Thank you.

ADJOURNED **[11.38 am]**

RESUMED **[11.54 am]**

MR O'CONNOR: Welcome back. We will hear from our next speaker.

MR BEASLEY: Our next speaker, we have Dr Peter Serov. Can you hear me, Dr Serov?

DR SEROV: Yes, I can. Thank you for having me this morning.

MR BEASLEY: We can hear – good. We can hear you, so please go ahead.

DR SEROV: Excellent. Excellent. My name is Dr Peter Serov. I run a company called Stygoecologia. My expertise is in Groundwater Dependent Ecosystems, aquatic ecology, both surface water and subterranean, and I'm also an invertebrate ecologist/taxonomist. I've been working with both government and industry for over 30 years. My experience with Groundwater Dependent Ecosystems spans in excess of 20 years, and my experience with working with the Pilliga in particularly has spanned over eight to nine years. I've looked at the Pilliga stygofauna community and Groundwater Dependent Ecosystems since 2012.

I've worked on local projects where I've produced three reports examining the location and diversity of stygofauna, and particularly in the Pilliga. Actually, I've ..... four reports. In 2016, I conducted a study looking at the extent and biodiversity of stygofauna of around and within the Pilliga region and, out of 22 bores, we found 14 locations which had fauna present. I've been asked to comment on the Santos EIS report covering – hang on a second – covering the appendix B, which is a groundwater impact assessment report, and appendix C, the aquatic ecology and stygofauna assessment, and section – and I'm also going to make a small comment on section 4.1.1, the endangered ecological communities.

Now, before I start, I would just like to define what we're talking about in terms of what is a Groundwater Dependent Ecosystem – a GDE – and, also, what is groundwater. Groundwater is – it has been defined as water occurring naturally by the ground level, groundwater level – ground level – whether in an aquifer or otherwise, including the saturated zone, both under streams and in the soils, and the

unsaturated vadose zone. Now, to put this into context of what a GDE is, a GDE is any ecosystem which have this species composition and natural ecological processes wholly or partially determined by groundwater.

Now, the issue with groundwater in the landscape is it is highly connected with surface water and with terrestrial ecosystems. So, in order to understand what is a Groundwater Dependent Ecosystem, we need to look at the whole landscape. This includes all terrestrial ecosystems, aquatic ecosystems, taking in wetlands, springs, river systems, and then also the subterranean system, which is a highly complex zone of different types of organisms and ecosystems. Now, I've been asked to comment on the Santos EIS and asked to review it. I've reviewed it several times, and what I came up with was a number of issues with the execution of the aquatic and groundwater assessments, the interpretation of those findings, and thus the final conclusions.

In summary, I found that there was an oversimplification of what constitutes a GDE by the use of earlier publications. I'm referring to Eames & Frohander (2006). I will also add here that my publications with Groundwater Dependent Ecosystems includes the – as the principal author of the New South Wales Government's Groundwater Dependent Ecosystem guidelines for risk assessment, and that was done in 2012, which provides definitions, background information on all GDEs present in New South Wales, and the methodology for assessing both ecological value and ecological condition. Now, dividing GDEs up is very important, as each type and subtype of GDE has varied environmental parameters and requirements that are impacted by different degrees, both potentially changing everything from water chemistry, water level, water pressure, water direction or flow, and aquifer structure, and this is implicit in the assessment process that we developed.

One of the issues was there was a complete misinterpretation of some groundwater cues in the landscape, and a downplaying of ecological values within a sand-based ecosystem, as well as neglecting the important groundwater habitats and dependent organisms. There was the inappropriate use of satellite imagery to determine groundwater dependency of wetlands. Although this technique is informative, particularly with terrestrial systems and on the general physical characteristics of the wetlands, it is not effective or appropriate method for assessing dependency at all. There was a lack of appropriate interpretation of the ecology of the water dependent flora and fauna present in relation to the groundwater dependency of the wetlands, the streamways and, certainly, the connection with terrestrial ecosystems.

There appears to be no recognition of the assessments that the Pilliga Forest is covered by the Lowland Darling Aquatic EEC listed under the Fisheries Act. There does not seem to be – this does not seem to have been included in either the surface aquatic ecosystem assessment or the GDE assessment. Within the GDE assessment, the first stage of assigning ecological ..... asks if the GDE occurs within a recognised area of high ecological value, and if it is all – if it is, all GDEs within that area are automatically regarded as high ecological value systems. Therefore, all GDEs listed within the Pilliga are of high ecological value.

In addition, the Pilliga area and the waterways have been acknowledged recently by the CSIRO 2018, Namoi, by a regional assessment, to be a unique and separate ecosystem within the region due to its quite unique geomorphology. It's a sand-based system and separates quite distinctly from all other aquatic ecosystems in the region. The upland riverine landscape class in the Pilliga region was addressed within a separate modelling exercise due to streams in this region having a unique set of conditions. These streams were characterised as having sandy beds, temporary flows, with some permanent pools above highly stratified sandstone.

Therefore, the streams and the aquatic biodiversity cannot be compared with the surrounding region. For this region, only these aquatic ecosystems should be regarded as a high ecological value in the region. The inference of groundwater dependency is an essential component of determining the presence of GDEs. However, this was described in the Risk Assessment Guidelines (2012) as an early stage of assessment process was – that was intended to highlight potential GDEs, but not to be used to cut potential habitats or sites altogether. The process requires a field-based confirmation of this dependency, and the fact that they did not do field-based assessments is a major flaw in the assessment, and one that needs to be considered when looking at the final results.

They did very limited or no examination of depth of nearby wells, bores, in relation to the water levels in wetlands and streams, as well as a number of other parameters they use which were interpreted incorrectly. Sorry, I'm not very good talking like this. All of my information is in my reports, which give much more detail than I will present here. Considering the time available for the predevelopment study – that's the other thing. The number of assessments that were done were insufficient. The methods that were used were insufficient to adequately characterise the area in terms of stygofauna and Groundwater Dependent Ecosystems and, therefore, the data and the conclusions that came out of it were effectively misrepresenting what was there.

And, in terms of the stygofauna sampling, this was insufficient, both in terms of number of samples, location of samples, and methodology of sampling was inadequate and inappropriate and, essentially, misrepresented the biodiversity that is ..... Effectively, they found that there was no stygofauna present within the Pilliga. My sampling has recorded stygofauna in each of the surveys that I've conducted, and I found that stygofauna is present across much of the Pilliga. But what I would like to try to do is give a brief rundown through each of those three sections that I was alluding to earlier, the first one being a groundwater impact assessment report.

Section 6.2, the potential impacts to GDEs on page 65, does not identify all the relevant potential impacts. The following potential impacts should be included and assessed as required: contamination of the land's surface and streamways from gas well wastewater spills, as well as leaky well wastewater from the early evaporation holding dams that were originally put into place with the Eastern Star operations. The Pilliga sands – the Pilliga area is essentially a sand-based system, and the Pilliga sandstone is a very porous system and, therefore, potential contamination between

leaky wells and ..... previous talkers have gone on about the potential for contamination from leaky wells.

This potentially has already happened from earlier gas exploration operations, and I refer to the impacts at Rockdale, one of the farming operations in the middle of the Pilliga. Contamination of aquifers from damaged or incorrectly installed and aging wells, contamination of naturally isolated aquifers during the drilling process. The impact of drawdown on biodiversity of sensitive ..... such as the mussels and other aquatic fauna in refugial base flow pools within the streams, such as Bohena and Coghill Creek. And there is no discussion at all of the speed or timing of drawdown, or frequency of drawdown of the alluvial and the Pilliga sands aquifers.

This is a significant factor that needs to be considered, as the rate of drawdown is a critical rate – critical factor when considering terrestrial vegetation communities dependent on shallow groundwater, as well as the water level sensitive surface aquatic fauna and the stygofauna present in the thin water-bearing zones. The sentiment does not appear to have a robust methodology in ecological value assessment. GDEs have been assigned a lower ecological value as a result of this. The risk assessment process that they use appears to have had – made many incorrect assumptions on groundwater dependency and its associated risks.

The inappropriate methodologies have been employed in assessing the aquatic systems. One of the flaws, both in terms of sampling macroinvertebrates or surface stream aquatic ecosystems, is that most assessments rely on a technique called AUSRIVAS, and this is essentially a condition assessment index. Now, this is used extensively in assessing developments, not only Santos' but many of the major mining operations use this in their EISs. Now, this is a flawed system. It is used as a condition index, but not, and should never be used, as an indicator of stream biodiversity, and this is because the identification process only goes as far as family, and this is probably one of the major problems associated with this EIS, is that much of the comment that has been made is in relation to the level of identification. So they have covered things such as there is no threatened species. Well, you can't apply that comment to this assessment because they were never identified as a species and the same applies for stygofauna communities.

MR O'CONNOR: So I take it your major criticism, then, is we, as a consent authority, can't really make an assessment of the impact on ground dependent ecosystems or stygofauna because we don't have the data before us to know what's there and, therefore, how it might be impacted.

DR SEROV: Absolutely. Absolutely. One of the issues with stygofauna and Groundwater Dependent Ecosystems is they're associated solely with an aquifer. Now, these aquifers can have quite short regional extents. The type of GDE associated with that aquifer is dependent on whether it has groundwater discharge to the surface or not. It's controlled by hydrological connections. So, in terms of subterranean systems, subterranean systems are very special in that they have a very

high level of short range endemic species. They are very sensitive to environmental change. Aquifers typically – excuse me a second.

MR O'CONNOR: We have to wrap up there, Doctor, so - - -

DR SEROV: Sorry. Yes. Look, I do apologise. There is so much that can be ..... in 15 minutes certainly doesn't do it.

MR O'CONNOR: I take it you're documenting that in a submission that you will be forwarding to us.

DR SEROV: Yes. So, look, thank you for the chance to talk. Groundwater Dependent Ecosystems are much misunderstood and, in the current process environment that we have for including them in these sort of EISs, the methodologies and techniques used for all those assessments are completely inadequate. And this is – and this report and this EIS starkly highlights that. And what I would like to say, just in wrapping up very quickly – and I know I'm taking valuable time .....

MR O'CONNOR: Yes. It has to be very quick.

DR SEROV: Very, very quickly, is that the risk of impact from water quality changes, water level changes, is regarded as high as any change in water quality parameters outside the natural range can adversely impact subterranean systems. Any changes in the water level across the region will impact the terrestrial systems and the surface water ecosystems, which are very shallow. The most important concept to consider here is that, once these ecosystems are lost, there's no rehabilitation or recolonisation, as they can't come from anywhere else, and this is particularly in the subterranean ecosystems. Once they are gone, they're gone forever. And the impacts posed by Santos are likely to have severe and irreparable damage.

MR O'CONNOR: We have to leave it there. Thank you, Doctor, for your advice.

DR SEROV: Thank you very much.

MR O'CONNOR: Okay. I will move on to our next speaker, please.

MR BEASLEY: Next speaker is Alison Ziller. Can you hear me, Ms Ziller?

DR ZILLER: Yes, I can.

MR BEASLEY: Please go ahead.

DR ZILLER: Good morning, Commissioners. Yes. My expertise is in social impact assessment, and I would like that to draw your attention to the likely social impacts of this project. So the Department has put to you that the Narrabri – I'm quoting:

> *The Narrabri Gas Project is likely to result in both positive and negative social impacts in the region. These impacts could be tangible in terms of putting pressure on public infrastructure and services, adversely affecting the housing and rental market and increasing labour costs, but they could also be intangible in terms of affecting community cohesion, the mental health of certain people, and people's sense of place.*

There are a number of things to say about this statement. Firstly, that there would be both positive and negative social impacts is not the point. The point is, which would predominate. The social impact assessment submitted by Santos says that 200 operational workers will be needed once construction is completed. But, it says, at best, 90 of these workers will already be present in the region. Another 50 might relocate, but that is speculative and may not happen, and the remaining 60 workers would live elsewhere. That is: the expected jobs benefit for the town is 50 current employees and 40 local residents who would get jobs on the project, a local effect of 40 additional jobs for current residents, not 200. The Department noted that negative impacts on housing and labour costs will be marginal, but this is because the number of local jobs will be few. And the applicant agrees, noting in a response to a review by the Centre for Social Responsibility in Mining, and I quote:

> *The job opportunities created by the project will be highly skilled and well paid, but they are of low magnitude, particularly in the long-lasting operations phase and will, therefore, not cause a significant impact on local businesses' access to skilled labour.*

If the number of jobs is of low magnitude, the social and economic flow on benefits to the town will be few, and that brings me to my third point. The Department believes that community cohesion, mental health of certain people, and people's sense of place are intangible. The World Health Organisation states that the key social determinants of health are the social gradient – that is, the size of the gap between rich and poor – stress, experiences in early life, social exclusion, workplace stress, unemployment, lack of social support, and addiction to alcohol and/or other drugs. There is a steep social gradient in the Narrabri local government area.

A significant proportion of the population experiences more than one of the adverse social determinants of health identified by the World Health Organisation. These include unemployment and low income, particularly – but, by no means, exclusively – among the Aboriginal population. Unemployment and low income are associated with social exclusion, addition to tobacco and alcohol, and stress. Rates of several causes of potentially avoidable death, which is a basic indicator of public health, are less favourable for Narrabri than New South Wales as a whole. Rates of intentional self-harm, suicide, domestic violence, and breaches of apprehended violence orders, are all higher than for New South Wales as a whole.

This is a population that is suffering measurable and tangible social harms. The Department's assessment that these are intangible minimises the real effects on local people when they discover that, actually, the promised jobs are not for them. And,

again, Santos notes, often, socioeconomically disadvantaged groups in the community are unable to take advantage of economic benefits. Not only are these consequences tangible, they are life-threatening. I also want to draw your attention to the big social impact picture. Most of the likely adverse social impacts derive from the social and economic exclusion of most of the town residents, the high level of social tension and discord already present and evident in the submissions to you, which approval of this project is unlikely to dissipate, the serious public health issues present and the extreme distributional inequity of what is proposed.

Most of the benefit of the project claimed by the Department accrue to the state and people living somewhere other than Narrabri, while the costs are experienced locally. There is a lack of distributional equity in this situation, which is not in the public interest. I am concerned that this is passed over by both the Department and the applicant. Distributional equity matters and the precautionary principle applies to social impacts just as much as it does to environmental impacts. The Department and the applicant rely on four main strategies to offset these large social impact considerations, and these are: $14.5 million paid to the Narrabri Shire Council through a VPA, some 21 management plans, a social impacts management plan, and a gas Community Benefit Fund.

So, briefly. Only 21 per cent, or $3 million, of the VPA is for community initiatives or local infrastructure. This is not as much as it seems. It might pay for one community hall, maybe, but not if the money is spent on short term initiatives. As reported, the VPA does not appear to earmark any portion of the fund for actual social infrastructure. The Shire does not appear to have a social plan with tangible social infrastructure objectives awaiting implementation. Relying on 21 management plans that have yet to be written amounts to relying on assurances and assumptions that they will be adequate, coordinated, timely, properly implemented, and effectively audited.

Failures in some of these plans will have social impacts – for example, by affecting public health. The social impacts management plan places numerous strategies to promote social cohesion, address public health and community development, in the hands of the mining company. The mining company is not a social planning agency. It is not a community development organisation. The draft conditions of consent state that Santos must engage people to prepare the plan. That is, engage consultants, who would write the plan and possibly implement part of it such as data collection and ongoing analysis. Expenditure on consultants is money not spent on actual initiatives.

The plan is required to identify negative special impacts, but these should be identified before determination, not afterwards. The plan is required to identify opportunities and monitor effectiveness of actions to address social impacts, but the council, the community consultative committee, and representatives of the local community would only play an advisory role about what should happen, not a decision making role, which would rest with Santos. There is no deadline for the preparation of the plan, no penalties for non-compliance, late compliance, or

ineffective compliance. There is no auditor. And, finally, the terms of a gas Community Benefit Fund are unknown.

However, if they are similar to others administered by the Rural Assistance Authority, then this fund will only support short term ephemeral projects for which the Shire and community organisations must compete via an application process. The amounts that will actually be disbursed each year is unknown and the royalties may, after all, be quite small. In short, the likely social benefits of this gas project to the residents of the Narrabri Shire are few. The distributional inequity of the project is substantial. No work seems to have been done to identify how the adverse impacts of this project on an already disadvantaged Shire could be offset by social mitigation actions and, as a result, there is a strong likelihood that the available moneys will benefit consulting firms, but not result in tangible and long term benefits to local residents. This would add insult to injury, and adding insult to injury is a social harm. Thank you.

MR BEASLEY: Can I ask you a question, Doctor, about – there's a report that's part of the Department Commission from Professor Kemp. Have you had a chance to look at that?

DR ZILLER: I have.

MR BEASLEY: I don't want to ask you, because we don't have time to drill down into the detail of that report, but just at a higher level, that report was commissioned as a desktop study. I'm just wondering what your view is as to how much reliance the Commissioners can place on a desktop study as distinct from a study where the relevant professional goes out in the field and does actual surveys, etcetera.

DR ZILLER: A social impact assessment should be based on both desktop and outreach to the local, likely to be affected community. However, you know, I've just shown you that you can draw a number of conclusions from a desktop study by looking at the public health and crime data that's available for the area. So I don't at all say that, just because it's a desktop study, that that means that you shouldn't take it into account.

MR O'CONNOR: Thank you, Doctor. I don't think there's any further questions. Thanks for your time.

DR ZILLER: Thank you.

MR O'CONNOR: Next speaker, please.

MR BEASLEY: The next speaker is Professor Penny Sackett from the Climate Change Institute at the ANU. Professor, can you hear me?

PROF SACKETT: Yes, I can. Can you hear me?

MR BEASLEY: We can. Thank you. Go ahead.

PROF SACKETT: Okay. Thank you. So just to introduce myself briefly, yes, I am associated with the ANU Climate Change Institute. My PhD is in Physics. I currently sit as Chair of the ACT Climate Change Council and, for three years, was Chief Scientist for Australia. Thereafter that time, I have spent all of my professional life working on climate change. I would like to speak to the Narrabri Gas Project in the context of climate change. I have read chapter 24 and appendix R of the EIS. Those are brief documents, so they didn't take me long to read. So I thought I might actually put a little background about climate change in for the Commission, but I will say that the three points that the proponent raised were the claims that increased gas production is consistent to holding global warming to 2 degrees; that this project would have on effect on Australia meeting its emissions targets, and that gas is a transitional fuel to a world with no more than 2 degrees warming.

I will take exception with each one of those comments. But, first, I would just like to review a little bit about climate change. As you know, human activities are adding energy to the earth's system through greenhouse gases that's driving climate change, and the primary greenhouse gases are carbon dioxide, methane, and nitrous oxide. So far, this warming has resulted in 1.1 degrees above pre-industrial levels. That's globally. Every decade since 1980 has been warmer than the decade before and, in fact, if you were born after 1978, you have never lived in a year where the global mean temperature has been below the 1960 to 1990 .....

Just to show that in graphical form – let's see if I can do this properly and share my screen so that you can see, very quickly, how fast those emissions have been rising over – this is a 1000 year period that you're looking at and that you can see the extraordinarily sharp increase that is due to human activities since basically industrialisation. At present, about 85 to 90 per cent of the CO_2 that's primarily responsible for this warming comes from the burning of fossil fuels – coal, gas, and oil. Not only does fossil fuel emit CO_2, but it also emits methane, and I mention that particularly because, over a 20 year period, methane is 84 times more effective than CO_2 in trapping heat, and 28 times more effective over a 100 year period.

We already know that the current effects of climate change worldwide are substantial and costly, and these include increased severity of storms and heatwaves, species extinctions, wildfires, coastal inundation from rising sea levels and increased storm surge, and the possibility of crossing so-called tipping points that would accelerate climate change and greatly intensify its impacts, perhaps irreversibly. Australia is witnessing serious climate-related impacts now. All the years since 2013 have been amongst the 10 warmest years on record, and this has resulted in extreme heat events, which I might attempt to show you in the next slide.

Here, we're looking at data from the CSIRO and BOM that shows the increased frequency of heat events. These are events that are in the top 1 per cent of heat events from the average, and you can see how dramatically they have increased over

time over the past century. This is, in largest part, due to climate change. Rainfall across Southern Australia has led to even greater reductions in stream flows. 2019 was Australia's driest and hottest year on record and was also the year in which the Forest Fire Danger Index was the highest since it has been recorded in 1950. All of these effects, in fact, have been felt, and some are more extreme in New South Wales, which also had its hottest and driest year, with 55 per cent below average rainfall and average temperatures that were nearly 2 degrees above average.

Now, what will happen in future? Well, that predominantly depends on what we, as humans, do, particularly between now and 2030. But we do know that if the Paris target of 2 degrees of warming is reached, coral reefs, including the Great Barrier Reef, are very likely to be eliminated entirely and, regardless, we are going to see an increase in high fire danger weather. The Narrabri Gas Project region, in particular, is said with very high confidence, or high confidence for each of these things, to be experiencing temperatures that will continue to increase in all seasons, winter rainfall decreasing, increased intensity of extreme rainfall events, and harsher fire weather danger.

That's certainly going to happen. The degree to which it happens depends on what we do and, if I might show, in the next slide – if I can get it up on screen here – here we see the IPCC reports for three areas. The first group of four is for unique ecosystems. The next group of four is for extreme weather events, and the last group of four for singular scale events. You can think of those as local tipping points, if you like. Each column represents a different year – the IPCC study in 2001, 2009, 2014, and 2018 – and what I want you to see is that the colour of those bars is changing as we go to the right. That change – the colour indicates the degree of risk.

So, as the IPCC wrote its reports over the past decade, at a given temperature – say, 1 degree temperature, where we are here now – the colour goes from yellow to red, yellow to red, or white to yellow. That is to say, the risks are increasing. The more we learn, the more we know. And if we should go up to 2 degrees of warming, these colours will now, according to the IPC, be going into the red and purple region, high – very high .....

MR BEASLEY: Professor, can I just interrupt you there. The point of the 2 per cent – sorry, 2 degrees average increase – it's really so much – it shouldn't be thought so much as, for example, a town that once had average temperatures over a year over 23 degrees going up to 25. It's where towns that have historically, for example, had a week of 40 degree plus temperatures will, it's predicted, have, like, a month of such days, and it's the extreme event impact of that whereby crops die, that sort of – that's the sort of problem with a small degree in average rise, correct?

PROF SACKETT: That's right. This is just the way that scientists use to describe different climate systems, by their average temperature.

MR BEASLEY: Yes.

PROF SACKETT: But the way that humans feel that change, the way ecosystems feel that change, is through a rapidly increasing number of heatwaves, rapidly worsening fires, rapidly rising storm surge events that destroy coastlines, decreased runoff.

MR BEASLEY: Yes.

PROF SACKETT: For year after year after year. Those are the things that humans and ecosystems feel, and that's why we don't want to go above 2 degrees C in – as a scientist would call that pattern.

MR BEASLEY: Yes.

PROF SACKETT: So how can we figure out what to do? Well, this is where scientists use what's called the carbon budget approach. It turns out that, even though CO_2 has a complicated relationship moving through the oceans, land, and the atmosphere, that there's almost a linear relationship between how much CO_2 humans emit over all time – carbon budget – and the amount of warming, a certain temperature range. Unfortunately, because there are lines of evidence that show that we may have already passed that lower Paris target of 1.5 degrees, I'm not going to talk about that. I'm going to talk about the absolute upper limit, the 2 degrees of warming, that we absolutely don't want to pass.

What kind of a carbon budget, how much carbon, can we spend, so to speak, and still keep that carbon budget? I illustrated that in the next slide, and it goes a little bit like this. This is based on very, very recent information. So, if we look at the IPCC report that came out in 2018, it gave us a base budget. Now, these budgets aren't measured in dollars. They're measured in gigatonnes, billions of tonnes of carbon. So, given all the carbon that humans have already emitted, what we have left for 2 degrees of warming is 435 gigatonnes. Except, of course, that's a budget to 2011, and between 2011 and 2019, we've already spent – we've already emitted more carbon.

We have to subtract off 100. Furthermore, because it's going to be very difficult to reduce methane emissions quickly - especially those from agriculture, when we have 2 billion more people to feed in 2050 – to allow for that, we subtract another 50. But the good news – recent science shows that non-linearity in the relationship may allow us a little breathing room of 70. We add that back in, but unfortunately carbon feedbacks in the earth system – that is, ways that the earth releases its own carbon as the world warms – we have to subtract off 65. Do the sums – it leaves 290. What does 290 gigatonnes of carbon mean from now until humans have zero emission economy? At our current rate of spending, it means that budget would be used up in 25 years. Now, if you - - -

MR BEASLEY: Professor – sorry, Professor. What's put in the EIS is that the direct emissions - - -

[BROADCAST OUTAGE]

MR BEASLEY: I will let you know when we're back. I think we might be back now. Sorry. We might have to do that question again. What I was – I think you're coming to the issue of the EIS saying this is only 0.2 per cent of our emissions, and so it's not going to compromise the government's ability to meet the Paris targets.

PROF SACKETT: Yes. And I'm getting to that directly.

MR BEASLEY: Sure.

PROF SACKETT: The difference is not to compare it to what we're doing now, but to where we want to go, okay? So I will get to that immediately. I just want to say that you can also divide this budget up by population and you can come up with a notional budget for Australia and a notional budget for New South Wales and, if you do that, and you ask what the rate of emissions are in Australia and New South Wales respectively, you would say that Australia would use up its budget in about nine years and New South Wales in about 12 years. We're talking about time scales, therefore, that are basically within the next decade. But ..... go to the question that you posed.

MR BEASLEY: Yes.

PROF SACKETT: And that's illustrated here. Can you see this chart?

MR BEASLEY: Yes.

PROF SACKETT: Good. Okay. So if we look at the submission, and I take those numbers at face value – I won't make any particular arguments about fugitive methane emissions and so forth. I will just take them at face value – then, according to their own calculation, the Narrabri Gas Project, over its 25 year lifetime, will have annual emissions of about 1 megatonne of CO_2 equivalent, okay? So that's all gases of CO_2 equivalent. Now, indeed, if you calculate that, that's about 0.2 per cent of Australia's direct emissions in 2018. But here's why that matters. Australia has a 2030 target. That target is to reduce emissions by 26 per cent on 2005 levels.

Okay. So subtract that 26 per cent off, see where you're supposed to be at 2030, see where you are now, and then ask how much you have to reduce. And the answer is that Australia has to reduce every year, from now to 2030, about seven and a half megatonnes of CO_2. Well, the Narrabri Project, if approved, will be emitting one megatonne compared to those seven. So it's emitting about 15 per cent of the reduction. Now, emitting is in the wrong direction. Now, let's look at New South Wales. New South Wales has just – and I would like to commend it on its 35 per cent reduction target to 2030. In order to do that, New South Wales will have to reduce its annual emissions by 2.4 megatonnes of CO_2 every year. It has to reduce by two, but the Narrabri Project alone would be adding one, making its work 50 per

cent harder, this single project, 50 per cent harder to carry out as a result of – if it was to proceed. So - - -

MR BEASLEY: Can I put another proposition to you? I'm sorry to deal with this in such a high level of generality, but we have to because of time. But what's also in the EIS is this, and I would like you to tell the Commissioners your view about this. The EIS says: even if this project is not approved, the demand for gas in New South Wales will stay the same, and so GHG emissions associated with gas will be the same in New South Wales, whether the project is approved or not.

PROF SACKETT: Well, you know, that - - -

MR BEASLEY: Do you have a response in relation to that?

PROF SACKETT: Yes, I have two responses. One is that's a hypothetical, and if – I would say that, if the New South Wales Government is intent on meeting its own reduction targets, it will be looking at reducing all fossil fuel emissions and, therefore, weaning New South Wales off of gas as well as coal. But it is a hypothetical. So – and the other thing I would say is that, from a global climate sense, all fossil fuel new production basically has to stop in order to meet the 2 degree target, and this has been studied by the Stockholm Environment Institute with something they call the production gap, and I can show you a plot of that, if you like, to see how different what we expect might happen – what the energy industry might expect might happen – how different that is from actually meeting 2 degree target. I included that plot in my submission, if you would like to see it.

MR BEASLEY: Sure.

PROF SACKETT: Another way to describe this – in their submission, the proponent said that the increased gas production was consistent with holding global warming to 2 degrees because of something called the 450 Scenario report coming out of the - - -

MR BEASLEY: Paris.

PROF SACKETT: ..... Yes?

MR BEASLEY: Yes.

PROF SACKETT: So I had a look at that. I had a look at that 450 Scenario. First of all, that 450 Scenario is one that gives the world a 50/50 chance of meeting 2 degrees. So that's a flip of a coin. I don't really call that a 2 degree scenario. That's just a flip a coin. That's one. The second thing is that that scenario was predicated on gas emissions increasing by 14 per cent from 2014 to 2040. That's what that scenario was based on. Unfortunately, gas emissions have already risen by that amount from 2014 to 2019, so another way to say it is that we've already produced

the amount of gas – the gas increase and production has already occurred for that scenario that only gives us a 50/50 chance of .....

MR BEASLEY: Okay. Can I ask you this again – I apologise for the high level of generality but, when you're talking about IPCC reports and trying to keep global average temperature rises to 1.5 degrees, or we're talking about 2 degrees rise, if the best science at the moment from IPCC and multiple other sources is that, if global emissions are not reduced, the predictions of temperature rises of 1.5 degrees Celsius and above are at high levels of certainty now. They're not "this might happen". It's a high level of certainty, and the only way it would change is if the laws of physics somehow changed.

PROF SACKETT: I'm not exactly sure I understood – can I rephrase your question to make sure .....

MR BEASLEY: Sure, go ahead.

PROF SACKETT: Yes. So are you asking that there's a high level of probability that we're going to reach 1.5 degrees of warming?

MR BEASLEY: Without reducing emissions, yes.

PROF SACKETT: Yes. Yes. That's – yes, absolutely. Very, very high degree of - - -

MR BEASLEY: And that's just physics.

PROF SACKETT: ..... That's just physics. Yes.

MR BEASLEY: Yes. Okay. Thank you.

PROF SACKETT: In fact, we've already omitted so much that the inertia in the earth's system means that we will increase a few tenths of a degree, no matter what, and we're already at 1.1. Even if all emissions stopped magically tomorrow, the earth would still warm by a few tenths of a degree. What we're trying to avoid is it going above that, and it may sound like small differences, but some of these effects are non-linear, exponential. So you get six times, 10 times more heatwaves. That sort of thing. That's what we're trying to avoid.

MR O'CONNOR: Professor, we're going to have to draw to a conclusion there, just from a time constraint, but I'm assuming your submission will cover off on those three claims in the Department's report that you are concerned ..... contradict.

PROF BARLOW: Steve, I have a question.

MR O'CONNOR: Yes. No, go ahead.

PROF BARLOW: Penny, you ..... stated what the, you know, the assessment report from the Department stated, that the last point in that was that gas is a transition fuel from basically coal to renewables. What's your view on this and, you know, how much greenhouse gases would we save if you took a set amount of greenhouse gas emissions – say, a megatonne – and you transferred from coal to gas? How much would you save?

PROF SACKETT: Well, so there – very, very approximately, the answer would be about 50 per cent. But, of course, that doesn't take into account a couple of things. One is building the greenhouse gas emissions from actually building a new facility, as opposed to one that may already exist, and also the concern that I think other speakers will speak to, so I shall not, about the rise of methane emissions from gas facilities. And even a very small increase, a very small fugitive emissions from methane, if not properly monitored and understood, can have a huge effect, because its global warming potential is 25 to 86 times that of CO_2.

So, when I say 50 per cent, it could be that, or it could be that it's not any better than coal at all. And that uncertainty has to do with how well we understand what's happening at the facilities. That's one point. The second point is, quite frankly, we don't have the time to transition from 100 per cent of coal to something that looks like 50 per cent of coal. There's not enough time. The time for that, for gas to be a transition fuel, was probably about 20 or 30 years ago. Right now, in order to meet these targets, we have to transition from coal to something with literally no or very, very view emissions. That is, we need to convert to hydro, wind, and solar. And, luckily, these are the cheapest forms of new energy. So that's the good news. That's what makes possible, if we have the will to do it.

MR O'CONNOR: Thank you. We might leave it on that point. Thank you, Professor.

PROF SACKETT: .....

MR O'CONNOR: Next speaker, please.

MR BEASLEY: We have Tim Forcey. Mr Forcey, can you hear me?

MR FORCEY: Yes. Can you hear me?

MR BEASLEY: We can. Please go ahead.

MR FORCEY: Very good. Yes. My name is Tim Forcey. This is my face. There's not a lot to see there, so I'm going to go straight to the slides. I trained as a chemical engineer and worked for years with ExxonMobil. I worked for years with BHPs Oil and Gas Division, where I was Senior Advisor to Facilities and Operations and, later, I worked with Jemena as Commercial Manager for the Queensland Coal Seam Gas Pipeline. Have I shared those slides?

MR BEASLEY: No, we've still got your face. We find it interesting, but we will get to the slides.

MR FORCEY: There we go. I will get this up. I knew it would take a bit of time. Here we go. Share screen – okay. How is that?

MR BEASLEY: It's coming up now. Yes, we've got it now.

MR FORCEY: Thank goodness. Right. So, a bit of my background there. Exxon, BHP. Later, I worked with Jemena as Commercial Manager for the Queensland Coal Seam Gas Pipeline. By 2010, I was acutely aware of the climate emergency, so I joined the Australian Energy Market Operator as their Planning Principal and, later, I became a researcher at the University of Melbourne. Today, I'm presenting as an independent, unpaid person. Opinions expressed are my own but, rather than just opinions, our report on research we did at Melbourne Uni into greenhouse gas emissions ..... gas production and about how we can save money by not burning gas.

Today's presentation is a summary of my written submission, which will have links and references to everything I will say. Please contact me if you have questions later on. This slideshow is some of our Melbourne Uni reports. Five years ago, I appeared before a Victorian inquiry, which led to Victorian legislation. So what's proposed for Narrabri, chasing coal seam gas, is now illegal in Victoria. Farmers and communities in Victoria got organised, so now they don't have to worry about this industry anymore. Five years ago, I also appeared before a New South Wales inquiry. In 2015, Narrabri supporters were saying that, without Narrabri's immediate approval, New South Wales wouldn't have enough gas.

By 2018, people would freeze in their homes and power stations would run out of gas. But if you don't remember that happening and anyone freezing in the dark, our research showed those fears put forward by the gas industry were unfounded. Back then, the gas industry solution, as always, was to call for more pipelines, more gasfields like Narrabri. But our research found the real problem wasn't going to be a physical shortage of gas; rather, a shortage of cheap gas thanks to the gas price rise following the development of expensive Queensland coal seam gas. Now, I will turn to our research into the greenhouse gas emissions from this industry.

I will speak about carbon dioxide, and then I will speak about methane. The gas in the coals of the Narrabri Region is made up of methane, of course, the stuff that burns, but the coals are contaminated with high concentrations of nationally occurring CO_2. Unfortunately, both of those chemicals are greenhouse gases. CO_2 in the gas is not a good thing. It can't be burned. It can't be used for heat. The amount of CO_2 in these particular coals exceeds what can be put into any gas distribution pipeline, so an enormous sum of money will have to be spent on a large CO_2 removal plant, as you see in the picture. As an example, Exxon and BHP recently spent over $2 billion for such equipment down in Gippsland.

And then there will be high, ongoing costs and energy costs to operate this equipment. And then, what do you do with the CO_2 once you've separated it from the gas? The industry is allowed to simply vent these greenhouse gases straight up into our air. The CO_2 and also a lot of methane that can't be separated from the CO_2, all that is vented as well. So this CO_2 in the Narrabri coal means the gas produced at Narrabri will be even dirtier and more expensive than you might have thought. The Santos EIS describes a half a million tons per year of emissions from this source alone. Another large source of greenhouse gas will be the direct release of methane.

This chart illustrates why we must focus on methane. We know fossil gas is bad for our climate but, when we burn it, methane coverts to CO_2. But because methane is a far more powerful greenhouse gas than CO_2, if only a few per cent of the original methane is released before it even gets burned, this is very bad for our climate. This chart shows how, if only 1 per cent of the methane is released, the impact is significant, versus burning the other 99 per cent. Releasing 3 per cent of the methane will have the same climate impact as burning the other 97 per cent. So, at that release rate, you've basically doubled the emissions of the whole situation, and it gets even worse from there, if more than 3 per cent of the methane is released, as we see does happen in many gasfields around the world.

People talk about gas being cleaner than coal for electricity generation, but the problem with that statement is that it's probably not true. Here is a satellite image from the so-called Four Corners region of the United States. This satellite is picking up a large volume of methane being released into our atmosphere. What's going on there? The Four Corners region happens to be one of the largest coal seam gas producing regions of the world. Upon observing this hotspot, researchers flew an aircraft overhead, instrumented with infrared detectors, and found over 250 emission sources releasing anywhere from 2 kilograms per hour of methane up to 10,000 kilograms per hour of methane.

The largest sources were given a name – super-emitters. Going down to the ground, the researchers found the causes of some of these emissions; equipment failures, corroded pipelines, but also some large emissions were just business as usual operations in the gasfield. Very recent data from satellites is coming in showing globally what a poor job the industry does with methane emissions. When people say emissions in the US are down thanks to gas replacing coal for electricity, they're not telling you that those figures are based on outdated assumptions and simple factors put forward decades ago by the industry before gas production from coal seams and shales was even much of a thing. And then these factors are used by governments, including in the US and Australia; simple, wrong factors are used for reporting emissions.

See, the gas companies aren't required to measure what they actually do. Nor are they required to report what they actually do. They have been allowed to use these factors so far. But now, with the satellite data coming in, there is mounting pressure on the industry to clean up its act. Let me show you the disconnect between what companies do and what they say they will do. From a US Pennsylvania shale,

researchers found 3 to 17 per cent of the methane that came out of the ground was being released into our atmosphere. But Narrabri supporters would say, "Ignore that. That's not coal seam gas." Okay. In a US Wyoming coal seam gasfield, 30 per cent of the methane that came out of the ground was ending up in our atmosphere.

In the Denver area, emissions of 2 to 8 per cent were recorded for a variety of fossil gas sources. The US EPA claims that emissions from the industry are only 1.4 per cent but, every time the US EPA looks at this issue, they increase the figure and, with the new satellite data and maybe a new regime in Washington, this figure will have to be adjusted up again. In Australia, our government claims only 0.5 per cent emissions from the industry. Again, based on outdated factors from the industry. In their environmental impact statements, the Queensland coal seam gas industry made a heroic claim: they would keep emissions at 0.1 per cent.

But there is no proof that there is anywhere near this. And, lastly, Narrabri. In the EIS, there is the claim that emissions emit and will be held to 0.02 per cent of what comes out of the ground. Believable? No. Has Santos underestimated methane omissions by a factor of over 200? Could be. In my view, the EIS does not provide credible information about methane emissions. So that's what goes on in the gasfields. Closer to home, methane is released from pipelines and gas distribution systems, too, as seen here for the city of Boston. Thousands of methane releases found using infrared technology. The gas industry says their product is a clean source of energy but, when they say that, they hope you've not brought along an infrared camera.

So, to see for myself, I travelled to the Queensland coal seam gasfields with an infrared camera, and I found methane being emitted continuously 24/7 from high point vent stacks. Methane is invisible to the naked eye but, with this camera, it appears as a black plume. When Queensland Government regulators visited 58 coal seam gas wells in 2010, they found gas being released at 26 of them. Nearly half of the wells, were continuously releasing methane. People ask: doesn't this wasted gas have a value? Why are the gas companies so wasteful? Sometimes methane is released because of a one-off event but, often, the methane is released by design, continuously, as you see here.

So I don't use terms like leakage or fugitive emissions because, often, these continuous emissions are a designed in feature of the operation. To the designers, this isn't a problem. It's a feature. These aren't leaks. These aren't fugitives that just somehow managed to escape. This is normal, business as usual, operations in the gasfield. But, again, we could ask: why so wasteful? The answer is, with no carbon price and with regulators requiring no measurements and setting no firm requirements, what we see is the industry's self-declared best practice. The industry could do better, but doing better comes at a cost, and we already know that Narrabri gas will be expensive to produce.

This project can't afford any of that green tape. I know that, in the Department's approval conditions, words such as "reasonable" and "feasible measures" – the

industry is happy with these words, these so-called conditions, because they aren't very specific, are they? Such loose wording leaves the industry free to interpret them as they see fit. So these conditions are basically meaningless, in my view, and won't require the industry to do anything beyond what they were going to do anyway. That's what I will say about emissions. I will now change topics and discuss our research into how we can save money by not burning gas.

There is no economic benefit for producing expensive, dirty gas because no one wants to buy it. The case is made that the coal seam gas industry has been a net penalty for the majority of the Australian people, damaged Australian businesses, and overall is a drag on our economy. Thanks to the coal seam gas industry, we've had a dramatic increase in the price of gas. Fortunately, today, one reason that no one wants to buy expensive, dirty gas is because we don't have to. There are less costly, cleaner alternatives. Here is one example. It's winter. I'm in Melbourne and, while I sit here in lockdown, some folks are in Melbourne freezing while running up big gas bills.

But, on the other hand, some Victorians aren't freezing; nor are they running up big gas bills. How can this be? Because the basics in their homes – draft proofing, insulation, window coverings – have been attended to. This is called energy efficiency. And these Victorians aren't using any gas in their homes at all. So how do we stay warm? We know a secret. We found the heat button on our reverse cycle air conditioners and we worked out, as we reported at Melbourne Uni and as have others since, that heat pumps can be a far cheaper way to heat than burning expensive fossil gas. Here in my home, we heat with reverse cycle air cons for a third of the cost of ducted gas.

At Melbourne Uni, we calculated that Victorians and others could save hundreds of millions of dollars each winter, simply by pushing the heat button on their air conditioner. And, since then, we've been spreading the word about this economic opportunity, and we now have more than 17,000 members at the Facebook Group, My Efficient Electric Home. People are switching off gas, having their gas metres pulled out of the ground, to be replaced by a shrubbery. Now, even AGL are telling their customers they would be better off having no gas in their homes. These days, entire suburbs are being planned without any connection to a gas grid, because that's a smart and economic thing to do.

That's it for homes. What about gas in industry? Industry can also save money if they burn less gas. Industry needs to recognise that, Narrabri or not, cheap gas isn't coming back. Industries should get on with improving energy efficiency, saving money, and getting off gas as much as they can by investing in electrically powered technologies such as industrial heat pumps. And how about gas for electricity? Our report from three years ago marked the point where solar and wind went beyond gas as an economic choice for electricity. That was the situation three years ago and, since then, wind and solar have become cheaper still.

In their integrated system plan, AEMO sees no role for expensive gas. So what governments should be doing instead of taking up our time today assessing fossil fuel projects – governments should be helping people and businesses to get off gas. It's too expensive to burn. But even with little support from governments, we see less and less gas being burned in all sectors of the Eastern Australian economy. The gas industry won't tell you this, but gas burning peaked in 2012, eight years ago. Since then, less gas is being burned for electricity, in industry, and more and more people worked out they're better off at home without a gas bill.

The gas industry is not a growth industry. Demand is down 14 per cent since its peak. To close, in the midst of a climate emergency, the Narrabri project will lead to the emission of a lot of greenhouse gases, and we don't have to do that because, today, there are cleaner and more economical things to do than to keep on producing and burning fossil gas. Thank you.

MR BEASLEY: I think you've probably covered it in – my question in your address, but I just want to make sure there's nothing further you want to tell the Commissioners. What is contained in the Department's assessment report is that this is a strategic energy project for New South Wales, and it's critical for the energy security and reliability in New South Wales, with an emphasis on the needs of industry, and that there's – we're not ready to transition to renewables yet. We don't have that – we need gas to be an energy source leading up to that. Is there anything further you want to say to the Commissioners about that?

MR FORCEY: Our 2015 report looked at gas demand in New South Wales, and we showed a scenario there where gas demand could fall significantly in New South Wales, and it has fallen since 2015. Recently for Victoria, a study was done looking – you know, basically looking at the gas demand side. No one ever looks at the demand side for gas. It's always supply, supply, supply, more gasfields and gas pipelines. So people also need to look at the demand side and what can be done there and, certainly for Victoria, a study was recently done that showed, you know, if we looked at these economic things that are already economic, like people using less gas at home, that really puts a big dent in the gas demand.

So no one that I know has done recent work for New South Wales. Someone should, but Victoria is a big user of gas for sure, and that recent reports showed how Victoria could use a lot less gas. And, of course, you really need to look at the whole eastern states situation combined, because it's an integrated system with the pipelines connecting everything up. Someone really needs to do a good study looking at that more from the demand side rather than just supply, supply all the time.

MR BEASLEY: Sure. Thank you.

MR O'CONNOR: Can I ask a question around – you seem to have an emphasis in your presentation on there might still be some demand for cheap gas, but certainly not expensive gas, and Narrabri has claimed to be – or proposed Narrabri project is

claimed to be expensive gas. Can you just point out why it's expensive gas? Just to understand why it falls into that category.

MR FORCEY: Yes. Coal seam gas, full stop, is expensive gas. I mean, I used to work more in the conventional oil and gas industry and, really, it was the oil that paid the bills. I mean, gas was really just, in some cases, a bit of a by-product that got in the way of the oil production, and so you wanted to get rid of that gas as quickly as possible and just to put it out there on the market, and that's how, you know, Victoria and the other eastern states operated for a long time. It was the oil and the LPG. That's where the value was. Gas wasn't really of much value. So when you look at cost of producing just gas – I mean, at a coal seam, all you get is methane.

You know, where's the oil? Where's the OPG? What's going to pay the bills? So it's expensive gas to begin with. I mean, you know, you could put one – in the old days, you could put one well down from the snapper field out in Bass Strait and pretty much light up Melbourne. I mean, this coal seam gas, obviously you need the 700, 10,000 wells, whatever it is. That's expensive, and you then – that's why some companies such as Exxon as BHP that, of course, participate in Bass Strait, never got into the Australian coal seam gas, but they may have made some mistakes later with shale gas overseas. But people looked at that and said, "Hey, there's no money here."

MR O'CONNOR: Thank you. We think we've run out of time now, so we will have to move on. Thanks for your presentation.

MR BEASLEY: I think we now have Dr Alistair Davey from Pegasus Economics. Dr Davey, can you hear me?

DR DAVEY: Yes, I can. Can you hear me?

MR BEASLEY: I can, and I've just got a very good view of your hand, but please go ahead now.

DR DAVEY: My apologies.

MR BEASLEY: Don't worry about it.

DR DAVEY: Yes. Because of some problem – technical problems using Zoom on my laptop, I've had to resort to a mobile phone, so I apologise for that.

MR BEASLEY: Go ahead.

DR DAVEY: Well, my name is Dr Alistair Davey from Pegasus Economics and, in the space of the last 12 months, I've done two reports on the Narrabri Gas Project, firstly late last year on behalf, and commissioned by, The Wilderness Society and, more recently, on behalf and commission by Lock the Gate, and today my appearance has been organised on behalf of the North West Alliance. There's

several topics which I would like to cover today. The first is that of looming and impending gas shortages on the eastern seaboard of Australia. Prior to the COVID-19 outbreaks, numerous parties were predicting gas shortages on the eastern seaboard by the mid 2020s, including the Australian Energy Market Operator.

The proponent for the Narrabri Gas Project, Santos, has often claimed that the development of the Narrabri Gas Project will assist in offsetting and delaying impending gas shortages on the eastern seaboard and, undoubtedly, that's true. However, when it comes to identifying underlying causes as well as culpable parties for any impending gas shortages on the eastern seaboard, no one unfortunately holds a candle to Santos. Santos and its affiliated Gladstone LNG Project decided, back in 2010, 2011, to build two LNG trains at its Gladstone facility, when the project only had sufficient gas reserves to actually justify construction of one LNG train. Despite assurances that the Gladstone LNG Project would not divert gas from local gas markets to export markets in its Environmental Impact Statement in 2009, unfortunately, it has done exactly that. To quote directly from Santos' 2009 Environmental Impact Statement:

> *The project may initially support domestic gas markets, but it is not diverting gas from local markets to export markets.*

Unfortunately, for the domestic market, Santos, in late 2010, entered into the Horizon contract with the Gladstone LNG Project, where it prioritised LNG exports over the domestic market and directed its production from the Cooper Basin to the LNG export industry and, particularly, the Gladstone LNG Project. Prior to this year, the Gladstone LNG Project has rarely processed more than 50 per cent of its own gas reserves in a quarter since it commenced operations, drawing instead on gas previously directed towards the domestic market. And to quote, once again, from the 2009 Environmental Impact Statement of Santos:

> *The gas to supply the LNG facility will come from newly developed coal seam gasfields.*

That has certainly not happened. Although Santos and the Gladstone LNG Project have lifted their game in that regard, at least in the current financial year, it is still processing more than 47 per cent of its LNG gas, or sourcing more than 47 per cent of its LNG gas in the current calendar year essentially from the domestic market, and diverting gas from the domestic market to LNG export markets. So, essentially, while – so, essentially, any concern that Santos has expressed over looming gas shortages is somewhat disingenuous, in my opinion, and it has used looming – the prospect of looming gas shortages on the east coast of Australia as a fulcrum to garner regulatory approval for approval of the Narrabri Gas Project.

The second topic that I want to address today is LNG imports onto the east coast of Australia and their actual competitiveness. I understand that the Santos Chief Executive Officer, Mr Gallagher, claimed on Monday that the Narrabri Gas Project would always be producing gas that is cheaper than LNG imports. With all due

respect to Mr Gallagher, that is just simply not correct. For the purposes of today, I actually did a comparison of LNG import prices as of 1 July this year and compared them to the likely gas prices coming from the Narrabri Gas Project. A good proxy for LNG spot prices is actually the Japan/Korea Marker, which is the cost, or the delivered cost, of LNG to obviously Japan and Korea.

There are also some other similar LNG spot price indicators out there. This is ..... good price ..... cost of LNG to the east coast of Australia would be because the marginal source of supply for spot price LNG ..... the north Asian region essentially comes from the US Gulf Coast and transported through the Panama Canal, and the transport distance between the US Gulf Coast through the Panama Canal to Korea and Japan is roughly the same distance from, for example, the US Gulf Coast through the Panama Canal to Port Kembla. In fact, the distance is slightly shorter than the route from the US Gulf Coast to Tokyo, for example.

And, on 1 July, you could - according to the PLACS LNG report, you could order LNG for arrival in the month of August on 1 July and get it delivered to Australia for just under $3 per gigajoule, and to regasify it would cost you roughly in the order of another $1.20. So you're looking at a price, a delivery price to Port Kembla for gas that is usable, of about less than $4.20 a gigajoule. This compares to the most recent quoted marginal cost price for the Narrabri Gas Project of gas delivered via pipeline that hasn't yet been approved, delivered to the Sydney to Moomba gas pipeline, in the order of $6.40 per gigajoule and, in Santos' own economic assessment of the Narrabri Gas Project, it quoted a price of $8.70 a gigajoule in 2016/17 constant prices.

Translated in today's price terms, that's in excess of $9 a gigajoule, so it is not true, in my opinion, to say that the Narrabri Gas Project will always be in a position to deliver cheaper gas prices to New South Wales than LNG import terminals possibly could. Of course, one of the factors promoting the possibility of LNG import terminals on the east coast of Australia is the simple fact that gas prices produced from domestic sources on the east coast of Australia are far too high. A good – the Australian Competition and Consumer Commission have raised concerns about the level of gas prices; in particular, the level of netback prices offered by the Queensland LNG projects, which essentially represents the Asian spot price netting back the cost of transport and LNG processing, and observing that the prices charged by these LNG export projects haven't – have somewhat diverged and haven't reflected more recent changes and fallen as much as the spot prices in the Asian region.

All this goes to suggest that there is something of a de facto gas cartel in operation on the east coast of Australia, engaging in tacit collusion. In its most recent gas report, the ACCC brought to the attention the fact that one of the Queensland LNG projects, in late 2019, was actually tendering to sell LNG spot cargoes in the Asian region for less than they could contract that same amount of gas into the domestic market. All this suggests that the LNG export projects operating from Gladstone aren't behaving in an economically rational way, and suggests that, essentially, there is a de facto gas

cartel in operation ..... in tacit collusion and, unfortunately, Santos, as one of the operators of one of these LNG projects, is part of this essentially de facto gas cartel.

So that gives one cause to be concerned, as well as perhaps somewhat sceptical about the ability of the Narrabri Gas Project to actually lower gas prices, given that they – Santos itself seems to be part of some sort of illicit de facto gas cartel. Unfortunately, it's the case that, because we're talking here about tacit collusion, essentially, it's almost impossible to prove some sort of price fixing arrangement, if parties are engaging in a tacit manner and not an overt manner. Hence, the reticence of the competition regulator for calling out conduct that it can't possibly prosecute under existing competition laws.

MR O'CONNOR: Tim, can I just - - -

DR DAVEY: Because you – yes, sorry.

MR O'CONNOR: Sorry. Can I just ask a question around that comparison you just gave us of delivering a kilojoule of gas to Port Kembla for $4.20 as opposed to something like $8 for the Narrabri Gas Project.

DR DAVEY: Yes.

MR O'CONNOR: Does that, in your view, then lead you to the conclusion, if the project proceeds, it may well end up as a stranded asset, or not?

DR DAVEY: Sorry. The Narrabri Gas Project?

MR O'CONNOR: Yes.

DR DAVEY: Look, I think there's a very good possibility that the Narrabri Gas Project could end up, if it actually does proceed, as a stranded asset, particularly if spot prices in ..... Asia from which LNG export prices in Australia would inevitably be benchmarked to remain low.

MR O'CONNOR: Okay. Thank you.

DR DAVEY: So there is a massive commercial risk associated with the Narrabri Gas Project. And, on that very topic itself, my last point and concern is that another commercial risk facing the Narrabri Gas Project is the widening difference between spot LNG prices in Asia and the current contracted prices that the LNG export projects in Queensland are receiving under long term contracts, which are actually linked to oil prices. These contracts were signed around the period of 2010 because the Gladstone LNG projects needed long-term contracts to justify positive final investment decisions and needed surety in regard to the contract left, contract terms and length of contract in order to pay off the investments. They went for the old and more traditional oil-based contracts; however, with the – with increasing supply of spot LNG available in the Asian region, of course there has been a massive – a

massive gap has opened up between the spot price and the oil – oil-linked – oil-linked gas prices received by the – by the company's own LNG projects.

This creates incentives for the customers of those Queensland LNG projects to renege as well as take much lower – take much lower off-take from the projects when they can, obviously, receive cheaper gas on the spot market. And this creates the possibility that, of course, co-operation in amongst the de facto gas – gas cartel on the eastern seaboard could break down entirely as – as these projects to recover and recoup whatever – whatever investments they can turn the direction of – of where they send their gas around from – from export markets back into the domestic market. So - - -

MR O'CONNOR: Did I understand an earlier comment from you saying that that Gladstone facility wasn't operating at full capacity; it was well below its full capacity?

DR DAVEY: My understanding of it of more recent times is that the Gladstone LNG project has – has ramped up its processing capacity. I think, at least in terms of what I said earlier, it was a case that that Gladstone LNG project has always been heavily reliant on sourcing gas from the domestic market rather than gas from – from its own – from its own reserves.

MR O'CONNOR: Okay.

DR DAVEY: Was the comment I made, but other – other speakers may have - - -

MR O'CONNOR: No.

DR DAVEY: - - - also talked about the Gladstone LNG project.

MR O'CONNOR: No, thank you for clarifying that. I think we've – over time so thank you for your input this afternoon and we'll move on to our next speaker.

MR BEASLEY: Where's the sound again. The next speaker is Mark Ogge from The Australia Institute. I apologise if I've mispronounced your name, sir.

MR M. OGGE: That's all right. It's Ogge, but everybody mispronounces my name so it's completely fine.

MR BEASLEY: I was certain to. It wasn't intentional. Please go ahead. We can hear you.

MR OGGE: No worries. Thanks very much. We really appreciate the – the – the opportunity to speak to the Commission about the – respond to the – the department's assessment of the Narrabri Gas Project. The Australia Institute has – we've been engaged in this process for a long time with this project. We submitted to the – in response to the original Santos EIS and then to the – then to Santos'

response to the EIS as well. We – we've published a lot of work about this project and about unconventional gas in – through – throughout Australia over many years. So we appreciate the opportunity to speak here. I will just – I'll just share – there's some slides, hopefully. Are they – no, they're not.

MR BEASLEY: It's coming up now. Yes.

MR OGGE: They're up there now?

MR BEASLEY: We've got them. Yes.

MR OGGE: Okay. And it's – it's displaying properly, yep.

MR BEASLEY: Yes.

MR OGGE: Great.

MR BEASLEY: We can read it.

MR OGGE: Excellent. Okay. So the assessment has – the assessment justifies the project, basically, on the basis of two things. And the first thing is that it's critical to energy, security and reliability. And I've just listed the dot points there on the executive summary where they – that they talk about that. And that includes providing gas to – to avoid shortfalls, to facilitate the extension of pipelines and encourage gas-fired power stations and put down pressure on gas prices. The second sort of general area that they – that the assessment justifies the project, their – their recommendation for approval of the project on the basis of its economic benefits and, basically, that it will – it will create jobs, give some money to the local communities and – and facilitate an industrial state.

And it's couched in terms of as a response to the COVID – COVID pandemic, in terms of recovery. So I want to speak to those points and I want to start by speaking to the – the claims that it'll increase energy, security and reliability to New South Wales. So these two quotes are from the department's assessment and they explain the reasoning of the department. And the first one is that – is that New South Wales imports 95 per cent of its gas from other states and the second one is that the Narrabri Gas Project would be – could – could supply or could supply New South Wales with 50 per cent of its forecast demand. Now, these lines are lifted pretty much directly from the Santos EIS and they explain the reasoning of the department. And they're lifted from the Santos EIS, but uncritically.

It would only make sense – the – the – it would only make sense that New South Wales could import gas or the one project would supply 50 per cent of its gas if there was an autonomous gas market in New South Wales. And, of course, there is no autonomous gas market in New South Wales. What we have is an east coast gas market that's made up of producers and consumers and pipeline operators across the east coast and – and – and, also, collected to international markets. And state

boundaries are irrelevant. So it's made up of, you know, a series of bilateral agreements between those parties, regardless of state orders.

This – this renders the department's sort of unquestioned acceptance of Santos' lines in the – in the EIS that – that it could supply – that it would supply 50 per cent of New South Wales' gas as – as meaningless because Santos can – could, for instance, simply reduce the amount of gas being sent from the Cooper Basin by the equivalent amount of – of certain petajoules if the Narrabri project went ahead. So they can simply – you know, it's not necessarily that – so the – it's not necessarily the same molecules, but the – but the gas can simply be shifted around because – because there's not a – a gas market where New South Wales, as an entity, can decide how much gas is produced there and how much is imported and exported. It's a – it's a pretty fundamental misunderstanding of how the gas market operates.

The second – sorry, the – sorry, my slide order's a bit confused. The – Santos also – sorry, I should – I should say before I move on from that. In regard to shortages, the – the department also kind of echoes – well, it echoes Santos' claims that the Narrabri Gas Project would prevent shortages that have been forecast by the Australian Energy Market Operator, AEMO. And it won't project – it won't prevent these kinds of shortages for exactly the same reason because it's an – it's an interconnected gas market connected to export facilities. So while the molecules from Narrabri won't necessarily – you know, are not likely to be – those molecules may not be exported, Santos can simply send more gas from the Cooper Basin – less gas to New South Wales from the Cooper Basin and – and export that gas.

So there's – so no matter how much additional gas is produced in Australia, it's still able to be exported. And this is even more likely because the Queensland – the big Queensland CSG produces overestimated – sorry, under – sorry, overestimated the productivity of their fields. And even though they were actually approved on the basis of producing the gas from their existing – from the tenements of CSG that they have in Queensland, they've been sucking up vast amounts of gas that was developed for the domestic gas market in eastern Australia. So huge amounts of – less or – or cheaper gas from the Cooper Basin and elsewhere have already been – been exported overseas. I think it's really important also to understand that there is no gas shortage in Australia. Australia – production of gas in Australia has increased, has tripled over just a few years, which is one of the largest and vastest expansion of gas production anywhere in the world.

The problem isn't that there's any shortage of gas; the – the problem is that we're actually allowing – we're just allowing that gas to be exported overseas at the expense of Australian – Australian customers. So the other thing that's strike – that strikes me in – in terms of – and – and I should say that AEMO could – when AEMO warns of these potential gas shortages, it does so in order to give markets and governments opportunities to actually move to avoid those things. So – so it doesn't take into account things like the ADGSM, the Australian Domestic Gas Security Mechanism – Gas Security Mechanism or market responses and things – things like that. And that's why they've – they've forecast shortages over the last few years that

haven't eventuated because markets do actually respond to potential shortfalls and – and governments also respond.

And it's really striking that the department's assessment doesn't – doesn't even mention the Australian Domestic Gas Security Mechanism because that's the key Federal Government policy to deal with potential gas shortages. The way that works is that if the – if the AEMO warns of the potential shortage, the government can declare a shortfall year and the – and then it has to consult with the gas industry and give them an opportunity to supply enough gas to avoid a shortfall. And if they don't, it can divert – it can divert gas from being exported overseas into the domestic market. So it's absolutely inconceivable that an Australian government would, in – in the case of a shortfall, the Australian government would fail to trigger the ADGSM and allow a gas shortage while vast amounts of gas – Australian gas are being exported overseas.

So it's really surprising that the – that the department in their assessment just didn't – just ignored that really important context. Another major justification for the project in the department's assessment is that it would "put downward pressure on gas prices". This actually ignores what the response of Santos to the expert – to the department's own export – expert advice, BAEconomics. In response to questions from BAEconomics, and this is actually attached to the department's assessment, the – Santos actually said, and I – I would seek to emphasise there, it was assumed that the project itself did not drive – drive changes to gas market prices. In effect, the project was a price taker and not a price maker. So Santos is saying, "No, it won't bring down prices," and yet the department has still included as one of its main justifications, its four main justifications, that it will put downward pressure on gas prices.

And then, the director, David Kitto – sorry, David Kitto, the other day to the commission, kind of bell the cat with it and said that it wouldn't bring down gas prices anyway, even though its own assessment emphasised that that was one of the main justifications for it. Following him, Kevin Gallagher got up and said that – well, kind of implied that if the Narrabri Gas Project went ahead, it will save 2 to 4 dollars a gigajoule in transport costs. And, you know, thus bring down gas prices. So just quickly looking at the short-term trading market, the – the spot prices for gas, you can see in blue there you've got the Brisbane gas price over a number of years and you've got the Sydney gas price in grey. And the difference between the two is – is, on average, about 60 – 60 cents. Nothing like 2 to 4 dollars. So the 2 to 4 dollars claim is – is not relevant.

And if you got the Narrabri Gas Project going, it wouldn't actually – it wouldn't get rid of that 60 cent gap anyway because Narrabri still needs a – an enormous pipeline that has to be built, paid for and tariffed. So – so, you know, the gas price is going to be pretty similar either way. But it could actually be worse than that because the – because Gunnedah is relatively expensive gas. As I was saying before, Santos can simply send less gas from the Cooper Eromanga Basin if Gunnedah goes ahead – if, sorry, Narrabri goes ahead. If Santos can just send less gas from the Cooper

Eromanga Basin and produce gas for New South Wales from Gunnedah, well, according to AEMO, core energy – core energy figures in – in their Gas Statement of Opportunities, Gunnedah gas is far more expensive than Cooper Basin gas.

So expensive Narrabri gas would just be displacing cheaper gas from the Cooper Basin. So it's like they're actually driving up gas prices in New South Wales. And I note that, you know, in recent days, Kevin Gallagher has come up with a – or said that, "Actually, the cost of our production in Queensland has – has come down." And it's – and it's a bit cheaper, but – and it's still more expensive than 2P reserves from the Cooper Basin. And even if you accept that number, and I'd be disinclined to accept that number because – you know, it – it's a very self-interested figure on Santos' behalf whereas the – whereas Core Energy and AEMO are independent – have done detailed independent valuations based, as I understand, largely on numbers that were given to them by the proponent companies.

Another pillar of the department's assessment is that it will encourage gas-fired power stations. And you can see a quote there from the assessment that – you know, that would be a good thing for New South Wales and it would be helpful for – for renewable energy as coal plants close down. So the – it's – it's interesting, the assessment. First, the assessment says – this is just for one paragraph of the assessment and it says it's forecasting a small decline in – in gas demand for gas-powered generation over the next few years. And then, in the very next line, it says that, actually, that could increase as a result of closure of coal power stations in New South Wales.

But, actually, if you look at AEMOs integrated system plan, their projections for power generation in New – in New South Wales – sorry, on the east coast are that you'll have no increase or, in fact, a slight decline in peaking plants and a big decline in – in CCGT plants like the – which is shown in – in blue, like Tallawarra or Colongra in New South Wales. And even more interestingly, if you look at the projections from AEMOs 2019 Gas Statement of Opportunities, you can see that actual gas production for gas-powered generation on the east coast has fallen significantly over the last few years and it's expected to drop significantly over the next 10 years with a – with a little bit of a rise after that, but nothing to justify building more gas power stations in New South Wales.

And the reason that this is happening, of course, is that renewable energy with storage, so enough storage to provide the same firm function as peaking gas plants or CCGT plants is already cheaper than – than gas, and this is from AEMO CSIRO GenCost 2018 and this is their 2030 projection. And you can see in green, you've got renewable energy under various scenarios with various levels of – of storage. And yellow, you can see the – you can see the cost – the levelized cost of electricity from gas generators with a five per cent risk premium due to its carbon impact. And I've also circled the cost of gas with CCS because Kevin Gallagher was spruiking that as an option on – on Monday morning.

It's ridiculously expensive and it – it just amazes me that it can even be claimed that it would be worth building gas power stations and then connecting them to pipelines to take the gas hundreds of kilometres to be stored underground with all the risks and uncertainty involved in that at such a huge cost when you can simply do the same thing by building renewable energy with a bit of storage, which are commercially available technologies.

MR O'CONNOR: Mark, we've come to the end of the time allocation. So is there any sort of final point you want to make before we move on to our next speaker?

MR OGGE: I'd also just like to say that the – the local economic impacts are – are a big justification for the – for the project and the – but – but, you know, from the department's perspective, and Kevin Gallagher was talking a lot about them in his presentation, but the – the research from these and – and the general experience in Queensland is – is very, very different. And we'll – I'll include in our submission, but the – I'll include it in the submission, but that – you know, detailed research in these regions shows that – that people in the regions have had a – you know, very – very negative experiences of costs in gas, both economically and socially.

MR O'CONNOR: Okay. Thank you, Mark.

MR OGGE: Thanks very much.

MR O'CONNOR: And we'll look forward to receiving your submissions and learning more about that. We'll move on now to our final speaker before lunch.

MR BEASLEY: And we have Professor Will Steffen on the phone. Can you hear me, Professor?

PROF W. STEFFEN: Yes, I can.

MR BEASLEY: Please go ahead.

PROF STEFFEN: Thanks. I want to bring up the issue of climate change with regard to increasing gas production. Australia is a signatory to the Paris Climate Agreement and that means that our government is obliged to do everything it can to keep the temperature increase to well below two degrees, aiming for 1.5. Those temperature targets can then be assessed using a Carbon Budget approach, a very robust scientific way to examine how much more carbon emissions are allowed to meet the Paris targets. We've done that assessment for both the 1.5 and well below two degrees targets. The quick answer to that is that there is already more than enough carbon emissions built into existing fossil fuel developments or infrastructure here in Australia and around the world to more than – than – more than is allowable in the Paris Agreement.

In other words, existing fossil fuel infrastructure will push us well beyond the Paris targets. That means, quite clearly, that we cannot allow any new or extensions to

existing fossil fuel infrastructure. That will be in violation of the Paris Agreement. And, of course, we've seen what it means to violate these temperature targets in terms of the bleaching of the Great Barrier Reef and – and in terms of the bushfires which drastically affected New South Wales and many other parts of Australia during the summer. So the science is really clear on – on this issue and on the issue of any other new fossil fuel developments, be it coal, oil or gas. They cannot be allowed if we are to meet our obligations under the Paris Agreement. So the – in summary, the – the science is really clear on this. The fossil fuel industry cannot continue to expand.

This is incompatible with a stabilisation of the climate. It's incompatible with protecting Australians and other people around the world from the increasing impacts of climate change. Our challenge is to phase out existing fossil fuel infrastructure by 2040, over the next two-decade period. The good news, of course, is that we have plenty of alternatives to fossil fuels. The rapid development of renewables, plus storage. And particularly here in Australia where we have some of the best renewable resources in the world means that we can meet the Paris Climate Agreement. We can ban any new fossil fuel infrastructure without deleterious impacts on our economy or on our way of life. So just very briefly to summarise because I know we're running short, the climate science assessment is really, really clear. There is no way we can allow any new fossil fuel infrastructure to be developed if we want to meet our obligations to the Paris Climate Agreement. Thank you very much for allowing me to make my presentation.

MR O'CONNOR: Thank you, Professor. And that brings us to the end of the session. We will reconvene at 2.20 pm. Thank you.

RECORDING SUSPENDED [1.48 pm]

RECORDING RESUMED [2.22 pm]

MR O'CONNOR: Welcome back to our afternoon session. Our next speaker, please.

MR BEASLEY: We have Bruce Robertson from the Institute of Energy Economics and Financial Analysis. Mr Robertson, can you hear me?

MR B. ROBERTSON: I can indeed.

MR BEASLEY: We can hear you, so please go ahead.

MR ROBERTSON: Thank you. I'd like to pay my respects to the Birpai Nation and elders past and present on whose land I stand today. I'd like to thank you for giving you me the opportunity today to speak to you about the Narrabri Gas Project. It has

struck me how little context surrounding the decision on the Narrabri Gas Project has given by either the proponent, Santos, or the department on the economics of the global and domestic gas industry or in the environmental and social governance factors critical to your decision today. I will submit that if either the economics or any singular one of the environment, social or governance factors in this decision were contemplated, the project would be rejected.

I would also like to place on record that the approval is not just for 850 wells that is stated. As we have seen in Queensland on a practical level, once the first stage is approved, subsequent stages are rubber-stamped and granted approval quickly. The proponent owns PELs to cover the entire northwest of the state, and this approval is instrumental in them rolling out a 10,000 well-plus project. The project has an initial life of 25 years, as stated in your documents that you've received. However, subsequent approvals will extent that out to over 50 years. I will start with the global aspects and then look at the domestic gas industry.

Global, the renewables are overwhelming fossil fuels and nuclear and new power station builds. In 2020, 200 gigawatts of renewable power plants were built, whilst only 100 gigawatts of fossil fuel and nuclear were built. Since 2010, renewables have grown by approximately 148 per cent, whilst nuclear plus fossils have declined by 38 per cent. One is growing rapidly; the other is declining. It should be noted that less gas power plants were built in 2020 than in 2001. Gas is not a transition fuel. In Australia, gas usage in gas-fired power plants has declined by 59 per cent since 2014, whilst renewables have increased to produce 25 per cent of the energy in the National Electricity Market.

The AEMO, the only agency to model a future electricity bid in - grid in its Integrated System Plan has shown that it a renewables-rich grid by 2040, the amount of gas being used declines. Gas peaking plants only contributed 1.8 per cent of the National Electricity Market's generation in the year to April 2020, while they account for 13.4 per cent of capacity. Put simply, we need gas peaking plants, but they're not run for very long. Therefore, we don't need much gas. That's the key point. You don't need much gas to power a renewable system. All the new investment in Australia is ..... into solar, wind and hydro.

The most recent example is the Central-West Renewable Energy Zone, where the New South Wales Government calls for tenders for three gigawatts of renewable power projects and got back responses for 27 gigawatts. The tender was nine-times oversubscribed. This is post-COVID in an environment where investment is difficult to get. People want to invest in renewables and it's surging ahead. Getting back to the global picture for the gas industry. We are not seeing a slowdown in demand or even a recession. What we are seeing is a gas-fired depression globally. We are seeing ships circling the Pacific and the Atlantic, their cargos having nowhere to go.

We're seeing gas prices at historic lows. We're seeing the US fracking industry implode before our very eyes. The number of drilling rigs in the USA has fallen 73 per cent in the last 12 months. That's the number of active rigs. There have been

over 19 oil and gas bankruptcies in the US so far this year. Deloitte, who, you know, are a large accounting firm, has estimated almost a third of US shale producers are technically insolvent at current oil prices. The shale industry according to Deloitte has been cash-flowed negative every year in the last decade. US LNG exports have declined by more than half so far in 2020 and plants are currently running at 20 to 40 per cent capacity utilisation levels.

In short, there's a massive global glut in gas supply that will extend out to late this decade. The global gut - gas gut was not caused by COVID-19. I for one have been talking about the looming gas gut three years ago in an address I gave in New York. COVID-19 merely sped up the process. The very last thing that the world needs is more gas. Turning to the domestic market, the Australian gas industry is very clearly divided between an east coast market and a west coast market. We are talking about the east market here and what has happened is that it's now seven per cent exports following the building of the three export terminals at Gladstone starting in 2014.

The gas companies made two fundamental mistakes. They dramatically underestimated the costs of the LNG plants and they got their costs of production for - wrong, horribly wrong. Far from producing gas at 2.20 to 2.70 at the well head, they actually produced gas of between $3.50 and $8.50. Santos has been unable to fill the contracts to supply gas to offshore customers that it wrote with those customers every year since 2014. The result has been that well over 20 billion has been written off the failing east coast CSG to LNG industry. Shell is currently attempting to sell its 26 per cent interest in its failed investment.

Santos, the proponent of the Narrabri Gas Project, has written off just under $8 billion in its failed CSG to LNG experiment. The latest write-off of $950 million on GLNG was made just on Tuesday. Rystad, the economic energy consultant, estimate that at the current pricing, 18 per cent of east coast production is uneconomic. Santos' failed investment in the CSG to LNG industry has seen investors torched. In 2014, Santos' shares were 12 to 13 dollars. Today, they are under half that, at just around $5. While the market has risen, Santos has fallen. Far more significant is the effect of the east coast industry on the Australian economy.

For many years prior to 2014, the - we paid reasonable prices for gas. Since that date, we've been gouged by a cartel of producers that have consistently kept the Australian gas price above the price we should be paying and for large periods of time we are - the price here has even been above those in our export countries, such as Japan. Cartels incidentally are an illegal market structure, as is the price fixing that so clearly occurs. The ACCC has written report after report after report after report saying the same thing. We're paying too much for gas on the east coast of Australia and that ..... the evidence clearly shows that there's price fixing going on.

The cost of the economy has been immense of this gas cartel and its illegal behaviour. What we've seen is you've seen gas use in industry has fallen 12 per cent since 2014 in the world's largest exporter of gas. We can't even supply our own industry with gas at a reasonable price. Gas is a price setter in the National

Electricity Market. For every $1 - gigajoule increase in the price of gas, the price of electricity rises by $11 a megawatt hour. We've seen the recent effects of lower gas prices in Australia with the wholesale electricity price falling from, you know, the $100 - over $100 level to down to the 40 to 60 dollar level.

This is cost the Australian economy many billions of dollars. What will Narrabri do to the east coast gas prices? Well, Narrabri gas is high-cost gas; we've heard already today. The average cost of production on east coast fields is around $3.05 a gigajoule according to Core Energy, who were commissioned by the AEMO to look at these things. They say that Narrabri costs - gas will cost a minimum of $7.28 a gigajoule, over twice the average price of the currently-developed field. It's simply not possible to reduce the cost of the commodity by producing it at a higher price. That is an absurd proposition. Producing high-cost gas embeds high-cost gas into the Australian system.

And that will force the price of gas up over time for Sydney consumers. But we do need gas. We need gas - as I've said, we need a little bit of gas for peaking power plants and we need some gas for high - some high-heat applications. So what can we do about this? Well, our previous presenter gave you the perfect answer. Narrabri Gas only produces 70 petajoules of gas. By getting consumers - residential consumers off gas and saving them money, we can actually save 190 petajoules and divert that for industry and for gas peaking plants. That solves any gas price - gas - perceived gas shortages that there are. Now to taxes and royalties.

Santos has stated that it expects to pay 1.2 billion in royalties to the New South Wales Government and up to 120 million in community benefits. I'm sorely disappointed in the department's report. They do not look just north of our border to Queensland to see of the lived experience there. In 2014 Queensland budget, petroleum royalties were expected to rise from 60 million in 2013/14 to 660 million by 2016/17 on the back of the boom in coal seam gas. The result was a fraction of the expectation at just 98 million in 2016/17. In other words, the coal seam gas industry in total in Queensland gave the Queensland Government an extra $30 million in royalties.

If we turn to taxes, if you pay one cent of tax, you are paying more than the combined tax paid by Santos, Origin and Shell, the three proponents of the three major consortium ..... plants at Gladstone. In 2016/17, according to the ATO figures, which are the latest figures you can get out of the ATO, those three companies paid no tax. So in summary, the economic effects of developing the Narrabri Gas Project, it will increase the cost of gas to consumers; it will increase the price of electricity in the NEM; it will only produce 70 petajoules of gas, which is far less than the 190 petajoules of gas that could be access by lowering demand in just one sector of the gas market, residential and commercial consumers.

Narrabri will continue the cycle of wealth destruction that the failed CSG to LNG industry has unleashed on the Australian economy. Sorely lacking from the Department of Planning's assessment is any mention of environmental and social

governance factors. With your permission, I will fill in the gaps. The big issue we've heard already has been climate. I would state that we don't actually use much combined cycle gas plants or gas baseload plants. Most of our gas is produced in - is burnt the less efficient gas peaking plants. They are only 31 per cent according to - better than coal, according to GISERA. Most of our gas is exported and the LNG and shipping process is energy intensive, so gas is only 18 per cent better than coal.

That's before any leakages. Now, GISERA, who is the gas industry-funded and controlled arm of the CSIRO, states that only three per cent leakages of gas is worse than coal when you burn it in a coal baseload plant. BP has stated that it believes the broader gas industry leaks at a rate of 3.2 per cent, making coal - I mean, making gas worse than coal for greenhouse gas emissions. Gas is worse than coal, the greenhouse gas emissions, according to the gas industry. Turning to social factors, the record number of submissions with 97 per cent above surely should trigger you to say that this project does not have a social licence.

It needs a social licence to operate. It has to put in pipelines still that haven't been put in. It has to operate from people's land. Without that social licence, it will make operating this project an extraordinarily difficult social exercise and one that I think knocks it out as a doable project. Governance. There has been a total failure of governance surrounding the process for the Narrabri Gas Project approval; that was clearly illustrated in earlier submissions in this, but I won't go into them again. Suffice to say, only two of the 16 recommendations have been fully implemented and a further six partially implemented of the chief scientist's recommendations.

I also point out that the largest insurance company in Australia and one of the prime insurers for farmers has recently excluded CSG infrastructure and activities on people's land for their broad form liability, which is a form of third-party liability that all farmers take out.

MR O'CONNOR: Could you please wrap up now ..... over time.

MR ROBERTSON: Okay. I will wrap up now. In summary, if we're asked that the IPC considers the economic and ESG factors of the Narrabri Gas Project, it urges the IPC to look at the domestic and international gas markets and where Narrabri fits into the global cost curve. The Narrabri Gas Project is not approvable on economic or ESG metrics. The east coast CSG to LNG industry has torn up the wealth of our nation. To continue to allow it to by approving Narrabri is not logical or reasonable. Thank you.

MR O'CONNOR: Thank you for your presentation. We're moving now to our next speaker.

MR BEASLEY: Next speaker is Greg Mullins from Emergency Leaders for Climate Action. Mr Mullins, can you hear me?

MR G. MULLINS: Yes, I can.

MR BEASLEY: Please go ahead. We can hear you.

MR MULLINS: Thank you very much for - good afternoon and thank you for the opportunity to speak to you today. I'm a former commissioner of Fire and Rescue New South Wales. I'm a deputy group captain in the Rural Fire Service, former head of the peak council for fire and emergency services in Australia and New Zealand, and the founder of Emergency Leaders for Climate Action, which is a coalition of 33 former fire and emergency service chiefs covering every fire service in Australia, every state and territory, including former directors-general of Emergency Management Australia. So, look, I'll be speaking today about the bushfire risk; how it's being driven by climate change caused by the burning of coal, oil and gas; about the additional threat of bushfires in the sensitive Pilliga that this project will introduce; and contend that this project is far too risky to proceed because of its affect on local and global risks to life, property and the environment.

But climate change is the result of being an increase in extreme weather events, which in turn is increasing the frequency and severity of bushfires in Australia and also worldwide. Established and undeniable scientific findings about the effects of climate change on bushfire risks and natural disasters - other natural disasters are now well known internationally and are now readily observable. Worsening extremes were graphically demonstrated in California in 2017 when around 10,000 homes were destroyed; the following year, 2018, when around 20,000 structures were destroyed and about 100 people lost their lives; then, of course, in Australia, Black Summer 2019/20, where around 4000 structures were destroyed, not including thousands of buildings and outbuildings.

Fires are burning in countries now where they were formally rare or non-existent, such as England and Greenland. Australian bushfire seasons have lengthened significantly ..... higher temperatures and a trend of decreasing rainfall has increased flammability and availability of fuels and that in turn increases fire intensity and rates of spread. In most parts of Australia, the annual accumulated forest fire danger index is increasing. The number of very high, severe, extreme and catastrophic fire danger days are increasing. In many parts of Australia, bushfire ignitions as a result of lightening from dry thunderstorms are increasing, particularly in Tasmania and it was a big feature of this last fire season also in Queensland, New South Wales, Victoria, South Australia.

The frequency of pyroconvective events and fire-generated storms are increasing hugely. Between 1978 and 2001, only two known events, two possibles; about 45 in this last fire season and 15 others under investigation. Now, these storms drive extreme fire behaviour and kill people, including firefighters, as they did this season. This is where convection from unusually intensive bushfires creates storms, their own weather systems and a massive escalation in fire behaviour. Fire seasons across Australia whose onset historically had been sequential across the country now have - happen simultaneously and overlap.

That affects the ability to share firefighting resources across borders, reducing firefighting capabilities. They're increasing - our fire seasons are increasingly overlapping with those in the northern hemisphere, which is worrying, because that's where we get our large firefighting aircraft from and increasingly they're not available at critical times, which is why one of the reasons the New South Wales Government purchased its own heavy water bomber, but that's only one. Disruptions to and increases in the incidents of positive phases of major climate drivers, such as the Indian Ocean Dipole, Southern Oscillation Index and the Southern Annular Mode are leading to more extreme weather and bushfire conditions.

Areas that have never burned intensely before, such as ancient Gondwana Rainforests and subtropical rainforests burned freely in 2016 and 2018 in Tasmania, 2018 in Queensland and 2019 and 2020 in Queensland and New South Wales. It's unclear whether that forest will ever regenerate. 2019 was the hottest, driest year ever recorded in Australia. The New South Wales bushfires destroyed more than 11 times more homes than ever lost before in this state, the previous worst losses being 222 homes in 2013. Nearly twice as many people lost their lives in New South Wales compared to the previous highest number in 1968/69, where 14 people lost their lives.

5.4 million hectares of New South Wales was burnt and up to 21 per cent of eastern Eastern Broadleaf Forest and up to 18 million hectares Australia-wide. About 417 people lost their lives due to the effects of bushfire smoke. Climate change has been proven to be caused by an increase in atmospheric levels of greenhouse gases, particularly CO_2 caused by the burning of coal, oil and, yes, gas. Gas is a fossil fuel. It is not clean. That is a fallacy. And you've heard from experts why it's not viable as a transition fuel to build a bridge between now and when governments finally wake up to the urgent necessity for large-scale renewables.

I have to congratulate Environment Minister, Matt Kean, in New South Wales for pushing for that to happen. Why we do this as well, I have no idea. The mining and transportation of gas releases methane, a more potent greenhouse gas than CO_2 and, of course, the burning of gas releases further CO_2, the principal gas driving climate change. Gas projects like that proposed for Narrabri drive climate change. It's a very simple and undeniable relationship. Additional global warming is going to make the bushfire problem even worse over the years and decades. On the basis of increased bushfire risk due to increased emissions alone, this project should not proceed or be approved.

Bushfire and natural disaster risks and threats to life and property will continue to escalate until temperatures stabilise and eventually reduce under a zero emissions scenario. All possible - all fossil fuel projects contribute to climate change. Creating new projects when we know the consequences is unconscionable. The Pilliga is unusual, because the nature of vegetation means that it can burn explosively with very rapid rates of spread under very high, severe and catastrophic fire danger conditions. But when conditions moderate, for example, at night, because when we

do most of our backburning, because of the relatively ground - low ground-fuel loads, it can be really difficult to ignite backburns.

So that means that firefighting in the Pilliga is very resource intensive. The use of expensive plant and equipment, including bulldozers, graders and firefighting aircraft is necessary. Because the region is sparsely populated, firefighting resources are relatively scarce. And the strong reliance on volunteers from the RFS, many of whom have pointed out that they strongly oppose this proposal, and may be unwilling to place themselves at risk fighting fires caused by or threatening mining operations. Shallow gas line infrastructure, including plastic pipelines can be prone to damage from heavy earthmoving equipment used in fire line construction or even hinder or prevent construction of strategic advantage lines during a fire.

Breach of a gas line in fire conditions could have serious consequences. The prevailing wind during major fire events in the Pilliga has been from the west or northwest. Proposed mine infrastructure will be to the east of the highway and there's no escape routes to the east. Volunteer firefighters are likely to be expected to place themselves at risk trying to protect mine works and workers in areas they would not normally consider entering under severe bushfire conditions. As identified by Forest Corporation New South Wales, mining activities will introduce potential ignition sources into a particularly fire-prone landscape. The Rural Fire Service raised several concerns, including the possibility of coal seams catching on fire.

Flaring of gas during windy conditions could result in fires if dry vegetation is blown through the flame zone, then into bushland, which is not an outlandish scenario. The proponent estimates - the proponent's estimates of the risk of bushfire from the project activities being one fire in 1000 years, as pointed out by Forest Corporation New South Wales appears to have no basis whatsoever. Maybe a dart - thrown at a dartboard. I don't know. As previously explained, the landscape is becoming increasingly flammable due to climate change. Bushfires throughout Australia are regularly started by sparks from works such as welding, grinding and cutting, faulty equipment or workplace and road accidents.

Forest Corporation pointed out that a number of mining activities could lead to additional ignitions. Proponent estimates of increased bushfire seem to have no factual basis and are considered by many to be baseless or farcical. Previous fires in the general location burnt vast tracts of land, such as in 1997; 2013 in Coonabarabran, where 52 homes were destroyed; and the Sir Ivan fire in 2017, which resulted in pyroconvective storms and lightning that started new fires. On the basis of escalating fire risk alone, this project should not proceed. In summary, climate change is exacerbating the risk of devastating fires in New South Wales, Australia, around the world and we just had our most unprecedent fire season ever, the worst losses ever and things can only get worse.

The mining transportation and burning of gas is contributing to climate change. New fossil fuel projects are totally out of step with tackling climate change, as you have

heard from scientific, economic and engineering experts already. Project approval should be denied on the basis that it will contribute directly and indirectly to increasing threats to life, property and our increasingly fragile environment. Thank you very much.

MR O'CONNOR: Thank you, Greg. We've heard from others - firefighters that there's an increasing danger in terms of putting firefighters into the situation of a bushfire in the Pilliga where there is gas infrastructure, because of potential methane leaks, etcetera, and - and just the consequences that might have. Do you want to comment on that at all?

MR MULLINS: Look, it's a definite risk and, as I said, they're fairly shallow pipelines, plastic pipelines ..... all goes over those well ..... firebreak. It's quite - quite possible that they could be crushed and burst. So you'll have a leak of gas. There's - methane is highly flammable, of course. Depending on concentration, whether there's an ignition source, it could create quite serious problems and be a serious risk to workers and to - of course, to volunteer firefighters and firefighters from Forest Corporation, fire and rescue, national parks, so I - to me, it's not a risk that I'd be prepared to put people into.

MR O'CONNOR: Thank you.

PROF BARLOW: Can I just ask a quick question.

MR O'CONNOR: Yes. No, go ahead.

PROF BARLOW: Yes. Mr Mullins, you know, you've got an enormous experience in firefighting and fires. Is there any way in ..... that you could envisage that, you know, this flaring activity could ever be safe in such a forested area?

MR MULLINS: Look, I'd have to say yes, but the - the consequences of that would be massive clearing of a sensitive environment, removing all fuels upwind for massive distances, so that nothing - no dead vegetation could flow through the flaming zone and that flames can't bend over in high winds. Radiation levels would have to be looked at, etcetera, so I don't think it would be practical to eliminate that risk. At any rate, it could be done, but at massive environmental cost and, again, I just can't see how any of that can be justified.

PROF BARLOW: Thank you.

MR O'CONNOR: And thank you, Greg, for your presentation.

MR MULLINS: ..... thank you.

MR O'CONNOR: We move to our next speaker now.

MR BEASLEY: Next speaker is Andrea Broughton from Artesian Bore Water Users Association of New South Wales. Can you hear me, Ms Broughton?

MS A. BROUGHTON: I can. Thank you, Commissioner.

MR BEASLEY: Please - please go ahead.

MS BROUGHTON: Thank you. Can you see - - -

MR BEASLEY: We can.

MS BROUGHTON: You can see the slides.

MR BEASLEY: I can see an email.

MS BROUGHTON: You can see an email. Okay. Well, that's not ..... please. Sorry.

MR BEASLEY: It's all right. It's not personal.

MS BROUGHTON: No. It's not. It's yours. Sorry. I won't be a minute.

MR BEASLEY: I think we've got it now. Is that Narrabri Gas Project Presentation?

MS BROUGHTON: ..... that is ..... that is indeed.

MR BEASLEY: Okay.

MS BROUGHTON: Right. I do want to just - sorry. I won't be a minute. Okay. Good afternoon, Commissioners. As you know, my name is Andrew Broughton and I'm a hydrogeologist from GSI. I am representing the Artesian Bore Water Users Association and I thank you for allowing me this opportunity to present to you. I'm going to discuss my concerns around the conceptual model Santos has used to develop their impact analysis. Our three main concerns are with the conceptual model and the quality of the data used and the numerical model. Santos has claimed to have used conservative assumptions in their model.

However, firstly, they have oversimplified the modelling of the aquitards, separating the coal seams and the Great Artesian Basin. They've represented the aquitards as thick homogenous and naturally continuous layers of low hydraulic connectivities mostly taken from literature. These quotes show an example where Santos measured vertical hydraulic connectivities for the aquitards that were more typical of poor aquifers. Subsequently, I understand they adopted literatured values for aquitard connectivity instead of using the measured values. There could be two orders of magnitude difference between the literature and the actual hydraulic connectivities.

This could mean Santos may be using more than 100 times more water than they will be licenced for, but we wouldn't see this for decades. We know that the performance of these aquitards will have a significant effect on drawdown in the Great Artesian Basin. I do not believe the numerical model is sufficiently realistic to make predictions for the Narrabri Gas Project site. I understand CSIRO measured conductivities in the laboratory on core samples retrieved from 96 ..... including four aquitards. CSIRO concluded that Santos' literature-derived conductivities were within the range of possibilities, but this could be up to two orders of magnitude.

However, nothing replaces in situ measured hydraulic connectivities from modelling actual hydraulic conditions. Where is this data? Secondly, the Pilliga sandstone aquifer, which is up to 250 metres thick, is modelled by Santos as a single layer of a constant temperature. In practice, the Water Expert Panel state there is a significant temperature gradient between the deep and shallow Pilliga aquifers. Santos should have used variable temperature-controlled heads in the model for the Pilliga sandstone aquifer, as was recommended by the Water Expert Panel. The Water Expert Panel has said that the differences in temperature may increase the drawdown in water levels in the shallower aquifers.

So Santos' oversimplistic model could be underestimating the impact of the CSG development. And, thirdly, after 10 years, Santos has still not constructed a spatially and ..... effective groundwater monitoring bore network to provide the baseline dataset to monitor the effectiveness of their aquitards and to inform the groundwater model. The water expert panel stated the current piezometer network is not sufficient. With this overly-simplistic modelling of the aquitards, the model predicts that extraction of 1500 megalitres a year of saline water from coal seams will only pull 60 megalitres of water a year from the shallow aquifers in 200 years' time.

But the actual water loss and the actual pressure loss depends on the actual characteristics of the aquitards. Santos has had a decade to gather enough real data on this, but has still not produced it. Santos should be required to supply the deeper hydrogeological data. My next point is that despite groundwater model condition B37, Santos are not required to achieve a class 2 and 3 numerical model. The numerical model that Santos has used in their impacted predictions is only a class 1 model. The Water Expert Panel has recommended that Santos be required to upgrade the model to a class 2 and 3 transient model based on ongoing monitoring ..... three years

But condition B37 only requires Santos to include all reasonable and feasible measures to improve the model to meet the requirements of a class 2 and class 3 conference-level model as soon as is reasonable and feasible. Meanwhile, Santos has said they are unable to calibrate for transient conditions and so drawdown effects on the Pilliga sandstone aquifer will not be measured for decades, if not centuries. Hence, Santos will argue that it's not reasonable or feasible to get to a class 2 or 3 model. For these conditions to have any meaning, they need teeth. In conclusion, the Narrabri Gas Project groundwater model is weak.

Santos has not supplied enough actual hydrogeological measurements from geological layers. The literature from the Great Artesian Basin could be much higher. Therefore, the groundwater monitoring program is critical due to drawdown-led time effects, 10 years can pass and it will be too late to mitigate the drawdown effects on the GAB and groundwater users. This will also affect Santos' groundwater licence for GAB tanks. Thank you.

MR O'CONNOR: Thank you, Andrea, for that presentation. Next speaker, please.

MR BEASLEY: Our next speaker is Melinda Wilson from the Western Sydney Direct Action. Ms Wilson, can you hear me?

MS M. WILSON: Yes, I can.

MR BEASLEY: Please go ahead.

MS WILSON: Thank you so - thank you very much for allowing me to speak today. My name's Melinda Wilson. I am here representing Western Sydney Direct Action against the Pilliga gas project. Our group is organised and been a part of longstanding vigils outside Santos' Sydney office, so I would like to share this short presentation. There are peer-reviewed studies attached that I am unable to read in my short five-minute allocated time, but there are links to them, so they will form part of our submission against the Pilliga gas project. So if I can share my screen. Can everyone see - - -

MR BEASLEY: We see the - some pictures of protesters.

MS WILSON: Yes. Okay. So I'm going to ..... the presentation. Thank you. Our communities say no to the Narrabri Gas Project. In February 2020, a New South Wales legislative council committee found the government had not implemented 14 of the 16 recommendations made by the chief scientists in 2014 to protect against risks of the ..... industry ..... effects ..... pose a serious threat to clean air, clean water and safe, sustainable ..... and sustainable climate for the ..... of the health ..... methane, carbon dioxide and water and ..... salts and naturally-occurring heavy metals and other constituents ..... from the coal seam are brough to the surface along with ..... fluids. Leaks, spills and disposal methods of this toxic waste are all problematic.

These impacts are well documented, as is the escalating research on the impacts on human health in Australia and abroad ..... emissions that are normally invisible to the naked eye are actually now visible when you see a FLIR gas camera .....

VIDEO SHOWN

..... homes in the Narrabri gas field area. A peer-reviewed health study exploring the determinants of health and wellbeing in communities living in proximity to coal seam gas development in regional Queensland ..... CSG activity and health in Queensland stated there were issues raised relating to the environmental effects on freshwater sources and also the study ..... evidence of broader health concerns arising from nearby CSG development ..... will be in the Narrabri Gas Project. Studies prove CSG is a health risk for children. The peer-reviewed study Examination on Child and Other Adolescent Hospital Admission Rates in Queensland, Australia, a comparison of coal seam gas, coal mining in rural areas showed the largest effect size was for blood immune disease in five to nine-year-old children in the CSG area, which was a 467 per cent increase compared to the rural area with no mining activity.

There is huge community opposition to this project. No one wants CSG in the Pilliga. There is no social licence. Santos' EIS attracted 22,721 submissions, which is 98 per cent of people against the Narrabri CSG project. Parliament is also divided ..... CSG in New South Wales with a moratorium ..... and only 38 to go ahead, so ..... a margin two votes, which prove our government are still very undecided about coal seam gas mining and the safety of it. 850 CSG wells in the Pilliga forest would put further pressure on endangered plants and native species. We need to preserve their habitat. While a lot of these species will become extinct, at least ..... animal species, including the glossy black kangaroo, Squirrel Glider, koala, Pilliga mouse and rufous bettong live in the Pilliga, which is the largest remaining area of native forest west of the Great Dividing Range.

Around 1000 hectares of threatened koala habitat may be destroyed for the Narrabri Gas Project and the koala population is now in decline. This began with the Narrabri Project was first established in 1998. Since then, there has been a fivefold drop in koala population. Santos still can't explain how the company will dispose of around 42,000 tonnes of salt per year that the project will produce ..... the Artesian Basin is being put at risk by the Pilliga CSG project. In 2014, Santos contaminated ..... in the escalation phase of the Narrabri Gas Project ..... was contaminated with uranium at 20 times higher than safe drinking water guidelines.

Now, there's a peer-reviewed study that you can actually ..... read. Australian insurance companies say they will no longer cover farmers for public liability if they have coal seam gas infrastructure on their property. Farmers could lose their industry accreditation in the event of a spill or gas infrastructure failure. This not only affects producers who currently have CSG infrastructure on their properties, but the many on whose gas exploration is ..... for future development. Two recent scientific journals highlighting how methane, which is emitting from coal seam gas wells, presents a growing threat and yields an estimated global warming of 4.2 degrees by the year 2100.

The Narrabri Gas Field will add more methane greenhouse gases into the atmosphere, which is 86 times more potent than CO_2. Australia's self-set ..... goals are weighted by the World Resources Institute as insufficient. It's not consistent with

holding long-term warming to under two degrees Celsius, let alone 1.5 degrees needed to ..... climate change. So our group is just saying that we're totally against the Narrabri Gas Project and we support farmers and our country cousins in stopping it from going ahead. Thank you very much.

MR O'CONNOR: Thank you, Melinda, for that presentation. Next speaker, please.

MR BEASLEY: Next speaker is Don White from Green Shareholders. Mr White, can you hear me? You might have to just speak up a bit, please. Thank you.

MR D. WHITE: Is that better?

MR BEASLEY: Yes. That's good.

MR WHITE: Is that better?

MR BEASLEY: Yes. Thank you. Go ahead.

MR WHITE: Good afternoon, Commissioners. I'm speaking to you this afternoon from Darkinjung Country and I would like to acknowledge the traditional custodians of this country and, indeed, the whole continent and pay respects to elders past, present and emerging. I personally am an engineer. My profession has made it possible to burn coal and gas since the days of the industrial revolution, but we as engineers and society in general did not realise the effect this would have in raising CO_2 levels and, indeed, climate change occurring through the changes in the atmosphere generally. However, we do now realise that burning coal and gas is not a good thing.

So we need to stop it immediately and, as a country, we've made some commitments to do this. And we do not need any more coal or gas fields. I speak on behalf of the Green Shareholders organisation today. What we do need is to source our energy from renewable resources. So this project should be refused. We're also extremely concerned about water ..... penetration of the Great Artesian Basin is bound to cause problems, because a percentage of well holes will always leak. The coal seams are about a kilometre deep, as I'm sure you've heard a number of times now. Below the forest, where there's an outcropping of the Pilliga sandstone, which is a crucial, sudden recharge area for the basin.

The Department of Planning is downplaying the importance of this area as a recharge area and claims there will be no significant impact, but in reality there's not enough information for them to make this claim. I think I had heard Andrew, the previous speaker, making a similar point. Contamination of the underground water is bound to occur, as we've seen in the past, and so this project should be rejected on these grounds alone. Water from underground is a problem too. This area was initially laid down under the sea and it's extremely saline, so water brought up from underground contains a lot of solid or salt waste, which would become solid. And this is laced with heavy metals, which will need to be disposed of.

Experience shows that tailings dams are problematical and prone to damage in flood situations. The New South Wales Government's approach seems to be approve the gas fields and - first and trust Santos to prepare a strategy for ..... or disposal of this waste before development. But as the EPA has pointed out, councils who run disposal facilities do not - are not required to accept Santos' waste. We heard from the previous speaker a bit about biodiversity. It's the largest temperate woodland in eastern Australia and Santos basically proposes to industrialise 95,000 hectares of it, clearing close to 1000 hectares in small fragmented patches for the pads and the connected lines, which go all over the place, which will endanger several ecological communities.

There's only limited surveys been done for the assessment, and the Pilliga once hosted one of the most important koala populations in New South Wales. But that species is now on an extinction category in this area. With so much habitat and lives lost in the recent bushfires, it's critical to the survival of the koala that its bushland habitats be spared industrialisation. You've also heard Greg Mullins talking about the bushfire threat. The chief scientists made 16 recommendations in 2014 to guard against the risks of the coal seam gas industry. In February 2020, a legislative council committee found that the government had fully implemented only two of the recommendations and half of the recommendations have not been implemented at all.

So what confidence does this give us in the industry as a whole? I'm conscious of time, but I do think there's no reason for Santos to need to pursue this project at Narrabri. Many of the more progressive energy companies have given commitments to become carbon neutral by 2030 or '40. This is likely to become either a stranded asset or one which Santos wishes to on-sell. We certainly don't need the gas, and I heard Bruce Robertson making this point to you while I was waiting to speak. And there's absolutely no reason why this project should be approved. So thank you for the opportunity to talk to you today, and I trust you will agree with the contention of Green Shareholders and reject this project.

MR O'CONNOR: Thank you, Don, for your presentation. Next speaker, please.

MR BEASLEY: Next speaker's Chris Gambian and Liz Hadjia from Nature Conservation Council of New South Wales. Can you both hear me?

MS L. HADJIA: Yes.

MR C. GAMBIEN: We can.

MR BEASLEY: Yes. Both - you can proceed, but one at a time.

MS HADJIA: Yes. Affirmative. I'd like to acknowledge that we are presenting today on the land of the Gadigal People of the Eora Nation and pay my respects to their elders past, present and emerging. I'd also like to acknowledge the Gomeroi traditional custodians who land this proposed project will be built on. Thank you for

the opportunity to speak today. As the peak body for nature in New South Wales, the Nature Conservation Council strongly opposes the Narrabri Gas Project and urges the IPC to reject this project due to the catastrophic impact it will have on our communities, nature and climate. The Pilliga is the largest temperate forest we have left in the state.

It holds enormous cultural significance for the Gomeroi, the traditional custodians, and is protected by indigenous law. The project would desecrate the Pilliga, turning it into an industrial gas field that will poison groundwater, carve up the forest with the roads and pipelines and endanger koalas and other threatened species. There has been large-scale public opposition to this project. Yesterday, NCC handed over the - to the IPC a petition with 8716 signatures from our members and supporters opposing the project. On top of this, the Department of Planning received nearly 23,000 submissions, the largest number of submissions ever received on a state-significant project in New South Wales.

An overwhelming 98 per cent of submissions were against the project. Under the EP&A Act of 1979, the public interest stands alone as one of the nine matters a consent authority must consider when making a decision on a project. If a department still thinks a development is in the public interest, despite a record number of submissions opposing the question - the project, sorry - my question is what would it take for a New South Wales decision-maker to actually reject a project on the grounds it was not in the public interest? It is common knowledge locally that the New South Wales National Party lost the seat of Barwon at the 2019 state election to the Shooters Party, in part because the National Party supported a Narrabri Gas Project and the Shooters opposed it.

The farming and rural communities of the Narrabri District rely heavily on irrigation water from the Great Artesian Basin. Many irrigators in the Narrabri region are understandable concerned about the potential for the large amount of water extracted from the coal seams to contaminate the water they rely on for stock, domestic or irrigation purposes. If enough voters in a previously relatively-safe seat vote the National Party member out because of their support for this project, doesn't this warrant a rejection of the project based on public interest alone? The public has a clear view of what is and isn't in its interests and overwhelmingly you have been told that the public do not want this project to be involved - approved. This cannot go unnoticed by the IPC. Thank you for your time. I will hand it over to Chris to speak more.

MR GAMBIEN: Thanks very much, Commissioners. Proponents of this project - of this project has told you that it's needed to shore up the gas supply in New South Wales. They tell you that the gas supply is critical for jobs in energy-intensive industries. I don't want to leave you with the impression that we are indifferent to concerns about jobs or manufacturing. We are not, but there is a risk that the broad desire to protect jobs might lead to an assumption that any project, irrespective of the potential pitfalls and costs to the project should be beyond reproach. It has not been the practice of IPC to take that approach in the past, and it should not be now.

Earlier this year, the New South Wales and Commonwealth Governments signed a bilateral agreement in relation to energy generation in New South Wales. That agreement requires that 70 petajoules of new gas be supplied into the east coast market. Now, as you heard earlier, 50 petajoules or 43 per cent of the New South Wales' annual gas consumption is residential and commercial. This demand is almost completely substitutable through electrification and efficiently upgrades. Governments around the globe are taking note of the financial and environmental benefits of switching gas appliances to efficient electric ones.

An ever-increasing number of cities and regions are looking to wean off gas as part of their strategies to reduce greenhouse gas emissions and to help households and businesses cut their energy bills. These upgrades are not pie in the sky. They are existing commercial technologies, could be rolled out through simple changes to existing energy efficiency programs and, in most cases, will reduce energy waste and energy bills. Paying bodies in New South Wales urgently need to include consideration of demand-side measures, rather than focusing entirely on gas production and supply. That is to say nothing of other, less impactable gas projects that can more comfortably meet the goal for gas in a bilateral agreement.

You've been also told earlier in these hearings that this project will not lower energy bills. So the project is neither essential in terms of gas supply or desirable in terms of price. So, well, why not go ahead? Because the consequences for the long-term interests of people in New South Wales are extraordinary and far outweigh any benefits that may be derived from extracting this gas. The safety of groundwater, the impact on agricultural land, the destruction of important ecosystems in the Pilliga forest all line up as the price we'll all paid for the profits the mining company may extract from this particular project. New South Wales needs jobs, no doubt.

New South Wales needs manufacturing, no doubt. We accept that. We also need food, water, biodiversity and a massive reduction in carbon emissions. The energy sector is in the process of transformation. The manufacturing sector needs to be in a process of transformation and we support both of those transformations, which is why we ask you to reject this proposal. Thanks very much.

MR O'CONNOR: Thank you. Okay. That's - no further comments. That's your submission.

MR GAMBIEN: Thank you.

MR O'CONNOR: Will you file that in writing to the commission?

MR GAMBIEN: Sure.

MR O'CONNOR: Thanks for your time. Our next speaker, please.

MR BEASLEY: Next speaker is Harry Creamer who - I think you already looked like you were speaking, Mr Creamer, but we couldn't hear you.

MR H. CREAMER: Okay. Can you hear me now?

MR BEASLEY: We can. Start again.

MR CREAMER: Yes. Thank you ..... and others attending. You may be familiar with the quote by Victor Hugo, the French novelist:

Nothing is more powerful than an idea whose time has come.

In contrast, the Santos Pilliga Gas Project is an idea whose time has come and gone. It's at least 10 years too late. Too late for effective long-term integration into Australia's changing energy systems, too late for private sector investment and too late for a safe climate. 10 years ago, gas peaking plants were considered useful to complement renewable energy, because it can be turned on quickly to generate electricity. Yet, as far back as 2012, energy in ..... were saying that gas is not a transition fuel we should be investing in.

Now, we have powerful hydro storage schemes, like Snowy 2.0, and advanced battery solutions like the Tesla Hornsdale site in South Australia, and this is definitely not the time for a new large-scale gas project. While burning gas results in 50 per cent fewer carbon emissions than coal, the life-cycle emissions from gas are greater. The drilling and extraction of gas from wells and its transporting pipelines all result in leakage of methane. Methane has 100 times the warming impact of CO_2 over a 20-year timespan, making it a far more potent greenhouse gas. And it only takes 2.6 per cent methane leakage from production to make burning one tonne of gas generate nearly twice the emissions as burning a tonne of coal.

Some USA gas fields have fugitive emissions as high as 17 per cent, 170 times that claimed by the industry. There is no safe limit level of methane emissions. Australian reporting of unconventional gas fugitive emissions lags behind best practice and beset by a number of weaknesses, including lack of baseline measurements, reliance on predetermined emission factors and gaps in reporting of emissions. In February 2019 in the Land and Environment Court, Chief Justice Brian Preston handed down his decision in an appeal by Gloucester Resources fighting the landmark rejection by the IPC of its bid to build a new coalmine near the town of the same name.

The judge concluded that an open-cut coal mine would be in the wrong place at the wrong time. Explaining his insistence on it being the wrong time, Justice Preston said the mine and its toll would increase global emissions at a time when we urgently need a rapid and deep decrease. He said there must be a carbon budget, the total amount of emissions that can be released if the Paris Climate Agreement targets are to be met. A carbon budget can be applied to both nations and globally. It is the amount of coal, oil and gas measured in tonnes of emissions that we can mine, produce, transport and burn for a given predictable global and local temperature rise.

Human activities have released approximately 1475 giga-tonnes of CO_2 from safe storage in the ground since 1850, at the start of the Industrial Revolution. We've already used up two-thirds of the global carbon budget. Australia's fair share of the remaining carbon budget is 10 giga-tonnes of carbon dioxide. I use the word "fair" in a moral sense. If we don't do our fair share, we are being freeloaders, free riders, laggards, shirking our duty to make a fair contribution to tackle climate change. At global emission rates currently, with no new fossil fuel projects, in 10 years we will have consumed all of what's left in the budget to stay within the so-called safe limit of two degrees of warming.

Therefore, if new fossil fuel projects are allowed, existing operations will have to be closed as new ones open, but there's little likelihood of that happening, so we have to control what we can and that is to reject new projects. Difficult as it is, it has been done before. We should not take risks with the climate that we would not take with roads, bridges, buildings, cars, aircraft. A safe climate is absolutely critical to our survival on so many counts. We should listen to the experts, as we have done during the COVID-19 crisis. This means taking the best of available climate science advice, which says the world has to halve emissions by 2030 and reach zero emissions by 2040, not 2050, to stay within the two degree limit.

This needs a sustained effort to reduce emissions by around four per cent every year to 2040 starting now. Australia's energy sector must carry the greatest share of emissions reduction, because it has the easiest, lowest-hanging fruit. The technology exists.

MR O'CONNOR: Can you please wrap up now. Thanks, Harry.

MR CREAMER: Just getting there. There are three zero emission energy resources waiting to be scaled up from the current 24 per cent of national electricity generation. All of the uses for Pilliga gas - domestic, light industrial, heavy industrial - can be replaced with existing and emerging technologies using the electricity generated from renewable sources. For these reasons, Commissioners, please reject the proposal.

MR O'CONNOR: Thank you for your presentation. Next speaker, please.

MR BEASLEY: I think we have Elizabeth Dark from Climate Change Balmain-Rozelle. Can you hear me, Ms Dark?

MS E. DARK: Yes, I can.

MR BEASLEY: Go ahead. We can hear you.

MS DARK: Thank you. I'm speaking from the land of the Gadigal People and pay respects to them and to the Gamilaroi of the northwest. Climate Change Balmain-Rozelle is an independent community organisation in Sydney with over 1000 supporters. We promote local and national action to reduce fossil fuel use and

increase adoption of renewable energy. Sorry about that. We believe that expansion of coal seam gas extraction in New South Wales would militate against the global effort needed to meet the challenges of global warming and that the Santos' project would also have a devastating effect on water resources of our continent and on the Narrabri area.

Here is the Pilliga as I know, with my personal connection to it as a birder. Can you show the first six slides, please, now. Just quickly. Just run right through them. Yes. These are just some of the birds that I've seen in the Pilliga. There's a turquoise parrot hiding in there. That's glossy black cockatoos, speckled warbler. That's it. Thank you. Our submission is in two parts, but the primary message is production and combustion of Narrabri gas would continue to climate change and we believe that's unacceptable. If Australia is to meet its commitments under the Paris Agreement, if the world is to keep global heating under two degrees C, we need to decrease our use of fossil fuels.

Total greenhouse gas emissions from the Narrabri Project could be 127 million tonnes of carbon dioxide equivalent or five million tonnes a year, ie, a nearly one per cent increase in Australia's emissions annually. CSG, which is largely methane, is a significant greenhouse gas with emissions at both the extraction and on the burning for energy. While it typically remains in the atmosphere for less time than CO_2, methane is many times more potent. At extraction, fugitive emissions can exceed three per cent, meaning the combined effect of leakage and from burning is worse per megawatt hour than the carbon dioxide produced by burning coal.

Estimating fugitive emissions is difficult. Globally, the amount of methane produced has been underestimated. The journal Nature recently published a study showing methane emissions from fossil fuels are 25 to 40 per cent higher than previously understood. Unless these are substantially reduced, the world could experience three to four degrees of global warming before the end of this century. Researchers have singled out rapid growth in gas exploration in Australia over the last decade as something that must be addressed to give a chance of limiting warming to two degrees.

Australia is already feeling the effects of global heating. The summer bushfires showed what can happen. The commission must consider the contribution of CSG expansion to a change in climate and reject it on the grounds of intergenerational equity. Part 2 of our submission shows how approval of the project would reduce the trend away from CSG mining in New South Wales. This is an abbreviation of what is in our full submission, but AGLs Camden plant will close by 2023. CSG extraction has been ruled out in the Northern Rivers and rejected for Hunter and Gloucester areas. Last year, the UN Environment Programme concluded that we need to begin a wind-down of gas production.

Further investment in gas, as previous speakers have said, is likely to become a stranded asset as the export market shrinks. Reportedly, Origin Energy is set to wear over $1 billion in write-downs as a result of a collapse in global gas prices, which has

been touched on already as well. Now is the time, we believe, to develop renewable electricity storage projects, including batteries and pumped hydro, while expanding clean, renewable energy production. So, to conclude, our formal submission continues with - with other sections, but I won't go into those now. Could you please show the last two slides. Thank you. If this project proceeds, the Pilliga shown here in winter and spring will be irreparably degraded, no longer the place I and many others cherish with up to 95,000 hectares of it seriously compromised.

And the next slide, please, too. Thank you. This project is not in the public interest. We believe that the long-term negative impacts of the gas project outweigh any economic benefits and we urge the commission to reject the proposal in its entirety. Thank you.

MR O'CONNOR: Thank you, Elizabeth. Our next speaker, please.

MR BEASLEY: Next speaker is Julie Lyford, who's coming from Groundswell Gloucester, coming to us from her car, it looks like. Can you hear me?

MS J. LYFORD: Yes. Internet problems at home, so - - -

MR BEASLEY: Okay. Please go ahead.

MS LYFORD: Okay. Thank you for the opportunity to present regarding the devastating social impacts arising from the ongoing Narrabri Gas Project. I am a former community palliative care nurse, a previous Local Government councillor for 17 years, a previous mayor of Gloucester, currently the chairperson of Groundswell Gloucester and a member of New South Wales connected communities for social justice, campaigning for stronger social impact frameworks in coal and coal seam gas-affected communities. Fracking for coal seam gas started in Gloucester in 2004 and ended with AGLs withdrawal in 2016. The strong parallels in social impacts are the reason I am presenting today.

In 2012, I wrote an opinion piece in the Newcastle Herald called Collateral Damage in Country Communities. It was about a local farming family struggling to deal with the onslaught and bullying from the fossil fuel industry. Here is a small part:

> *He sits at the well-worn, much loved family kitchen table, head slumped in his capable and weathered hands. The contract in front of him, the emotional weight of it the final straw. Quietly, the tears run down his face. His wife sits in silence trying to fathom the strength to speak and make sense of the nightmare that has consumed their lives and those of their neighbours for the past eight years.*

End quote. That was a real issue, and a nervous breakdown ensued. We experienced major social impacts of depression in our community, people who were on suicide watch and hospitalisations from stress and despair.

When conservative communities long loyal to government and industry realise that they have been betrayed by the very institutions that should be protecting their livelihoods and environments, when deep trust is lost, the catastrophic social impacts are profound. We are sick of government decision-makers ignoring the distress and decline in the mental and physical health of those impacted by such a toxic, risky and unwanted coal seam gas industry. Santos have no social licence. 22,700 formal objections and 96 per cent of northwest New South Wales community say no to gas fields. This is an indictment on Santos and the New South Wales Government audacity.

The systemic failures as outlined this week and in submissions, along with the lies and collusion with government departments well-known in the Gloucester community continue to force ordinary citizens to have no choice but become experts about this toxic industry in their communities. This is a massive social impact that robs people of time, emotion and productivity. It cuts the heart and soul out of normally caring, compassionate and connected communities. They are places of kindness, generosity, culture and they support the farming communities our nation relies upon. What happens to people, communities and civil society when a gas industry invades their home and places?

Let me tell you the strategy, learnt firsthand from attending the 2015 Gas Industry Conference in Sydney. Decision with community consultation. Their playbook is callus in the extreme. They explicitly stated regarding how to influence local communities, amongst other appalling strategies, (1) communities are black boxes to peered into and worked out. Finance their sport teams, schools, RSLs, social clubs; (2) set up an industry group - Advance Gloucester was ours - to label opponents of coal seam gas as anti-jobs and anti-prosperity; (3) landholders and farmers, there are two types. Those who want the money, easy, and those who don't, ask about their health, kids' education, stock cattle issues. Find their weak spot. Their words, not mine.

We all know this strategy. Again, this behaviour causes mental anguish and despair. The health, ecological, social, economic and financial risk that Santos is playing Russian roulette with are too devastating to ignore. If this project goes ahead, there will be many thousands of citizens who will hold those decision-makers personally, morally and ethically culpable for the destructive legacy Santos and the New South Wales Government will leave to their children and the future. No one has the right, especially in a position of power, to betray the protection of country, culture, community and vital ecosystems. The community's anger is palpable.

The distress of fighting this toxic Santos gas field proposal continues to cause major social impacts and affects every aspect of daily life. Families feel the conflict and wear the stress. Workmates disagree and stop talking to each other. Friends go apart as the industry wedges the community. Communities lose their heart and soul as the fight to save their land, water and future becomes all-consuming. We lived through the social impacts of AGLs gas field proposal for over eight years. It was devastating. Our mental health and sense of wellbeing in our community was .....

impacted, as is very obvious in the Narrabri and affected communities fighting the Santos proposal. Please refuse the Narrabri Gas Field Project. The social impacts are just too great and the damage that this will cause will be everlasting. Please do not allow this to proceed. Thank you.

MR O'CONNOR: Thank you, Julie, for your presentation. Next speaker, please.

MR BEASLEY: The next speaker is Charles Rue from Columban Mission. Can you hear me, Mr Rue?

MR C. RUE: Yes. I can hear you okay.

MR BEASLEY: All right. Go ahead. We can hear you.

MR RUE: Okay. Thank you. I'm a Catholic priest and have postgraduate degrees in both environmental and theological studies. Having often visited communities around the Pilliga district, I'm concerned about the risks linked to coal seam gas expansion plans, negative impacts on the social and economic life of local communities, negative impacts on local and downstream ecological life. Coal seam gas puts them both at risk. I was brought up on a farm near Canowindra, New South Wales. I valued the town's vibrant community life and the land itself as a long-term economic base of that life. I joined with other young farmers ..... sheep and wool at the local tech college to develop better farming methods.

These had multiple benefits; ecological, economic and social. However, this balance was fragile. For example, misguided irrigation projects sent many farmers broke, allowing absentee owners to amalgamate farms. Today I'm concerned that coal seam gas plans will disrupt the hopes of communities around Pilliga while primarily benefiting an absentee investor. Also, coal seam gas technology needs to be put in the global context of lowering greenhouse gas emissions to slow climate change. Economically-viable alternative energy sources are available, allowing planners to leapfrog old technologies like coal seam gas. As a priest, I'm encouraged by the 2015 document of Pope Francis on care for earth as our common home.

He says pollution of waters, biodiversity loss and an accelerating climate change all have human causes ranging from ignorance to greed, to promote the common good, he calls for action as a human task and a spiritual vocation. His analysis states that the different spheres of life, ecological, economic and social, including religion, must respect each other and cooperate in care for earth as our common home. So, Mr Chairman and panel members, I ask you to give great weight to protecting local human communities and to caring for the ecological health of the land. The impact of coal seam gas production puts them both at risk. Thank you.

MR O'CONNOR: Thank you, Charles. Next speaker, please.

MR BEASLEY: I don't know who it is. John Gregory from Birdlife Northern New South Wales. Can you hear me, Mr Gregory?

MR J. GREGORY: I certainly can. Thank you.

MR BEASLEY: Good. Go ahead.

MR GREGORY: Thank you. May I have the first slide, please.

MR BEASLEY: We can see that.

MR GREGORY: Thank you very much. Good afternoon, gentlemen. My name is John Gregory. As the introduction said, I am representing Birdlife Northern New South Wales. The reason I am presenting to you today and I've written a submission is the fact that I visited the Pilliga in October last year and as a result of that visit I wrote to several members of Parliament, one of whom, Gurmesh Singh, followed up with meeting with me and, as a result of that meeting, he forwarded the documentation I presented to him to Matt Kean, who also then onforwarded it to Rob Stokes. Rob Stokes wrote back to Gurmesh, referencing my concerns, on 3 June and essentially my written submission and this distillation, which is this presentation, is a direct result of the letter I got back ..... that Gurmesh got back from Rob Stokes.

Can we have the next slide, please. The key issues, as far as I'm concerned, are (1) the economics of this project are flawed. Despite the fact that I'm representing Birdlife Northern New South Wales, my background is ..... and I - the more I looked at this project and looked at the ..... the more I saw economically it doesn't make sense. I also believe that Santos is unfit to manage a project of this sensitivity and, finally, I believe the project would cause environmental and ecological damage and, sadly, potentially permanent damage, which is the nature of this coal seam gas industry. The next slide, please. The way I consider the economics are flawed, a number of experts, Pegasus Economics, Oakley Greenwood, Australian Financial Review argue that the lack of gas in the eastern gas region was directly caused by Santos.

Santos is now using this looming gas-supply shortage as a reason why the Pilliga coal seam gas project should proceed. BAEconomics, they're the consultancy firm that Rob Stokes referred to in his letter, argue that the project is justified for two main reasons: (1) royalties flowing to the New South Wales Government and, secondly, local employment both during the construction and ongoing phases of the project. And, to be fair, this is in line with government guidelines. Personally, I think those guidelines are very, very narrow, but so be it. Next slide, please. In terms of the impact on gas prices, everything I read suggests the Narrabri Gas Project would provide certainly additional gas to New South Wales, but Narrabri gas by its very nature is going to be quite expensive gas.

$7.4 per gigajoule is the sort of out-of-ground cost and delivered to Sydney, a minimum of $9 per gigajoule. Some people say up to $9.40 per gigajoule. And in terms of the Australian energy market, this ranks the Pilliga gas field at 41 out of 51 potential gas fields across Australia. The current average cost of production in eastern gas region is $2.91 per gigajoule, with current, most expensive gas at 4.9

gigajoules - dollars per gigajoule and that's from the Otway Basin. There are also eight undeveloped projects in the Bowen and Surat Basins, which could provide the equivalent of 53,000 petajoules of gas, with an average rate of production of cost $5.91 per gigajoule.

All of this is pointing to the fact that gas coming out of the Pilliga would be expensive. So the summary of that is this project would not help to reduce gas prices. No matter what Santos says, it doesn't make ..... can't help to reduce gas prices. Next slide, please. Another argument is around the impact on electricity prices. Because the - this project would not impact wholesale gas prices, thus it cannot impact the gas-power generation prices in the National Energy Market. According to the ACCC, the rising cost of gas is a driver of Australia's current electricity affordability issues. The Australian Energy Market Operator in 2019 forecast gas consumption for GPG generation to reduce as renewals grow. So it's not going to impact electricity prices at all.

MR O'CONNOR: John, if we - - -

MR GREGORY: So - - -

MR O'CONNOR: - - - could please wrap up now. We're running out of time.

MR GREGORY: Okay. Economic conclusion. The Narrabri Gas Field is relatively small and I believe this project is being viewed through state, rather than national - from a national perspective. Just a few words on the Santos entity. I believe that Santos has significant prior form in environmental issues. The disaster that was caused in Indonesia. 50,000 people displaced. There's already been spills in the Pilliga. All of 850 wells in the Pilliga are predicted to fail over the course of their life. And I have witnessed firsthand the damage caused by one spill in the Pilliga. And .....

MR O'CONNOR: You might have to move on very quickly to the birds, John, if you want to say anything about environmental issues, because you're well over time now.

MR GREGORY: Okay. So I guess the one thing I'd like to say on the environment is about groundwater impacts. The Queensland Government has conducted three studies in the Surat Basin and Bowen Basins. And - - -

MR O'CONNOR: Look, I'm afraid we have run out of time there, John. You're welcome to send your submission to us. Obviously, it has already been through the hands of several politicians, but we - I don't know if we've got a hold of it, so if you would be good enough to send it to us, we'll then be able to take it into consideration.

MR GREGORY: Thank you.

MR O'CONNOR: Thank you. That's the final speaker for this session. We'll have a break and we'll resume at 4.05. Thank you. 5.05. Sorry. 4.05. Thank you.

RECORDING SUSPENDED [3.48 pm]

RECORDING RESUMED [4.04 pm]

MR O'CONNOR: Welcome back. As you have probably noticed, we are running quite a bit overtime this afternoon. As such, we will not get through all of today's scheduled speakers. We have been in touch with a number of people registered to speak towards the end of today and have been able to reschedule them till tomorrow morning. We have, therefore, brought our start time for day 5 forward to 8.30 am. Just repeating, our revised start time for Friday, the 24th of July is not 9.30 am. It 8.30 am. Thank you. We will have our next speaker.

MR BEASLEY: I think our next speaker is Justine Smilie from Hornsby Shire Climate Action Group. Can you hear me, Justine?

MS J. SMILIE: Yes, I can.

MR BEASLEY: Please, go ahead. We can hear you.

MS SMILIE: Thank you for the opportunity to address the commission today. I would like to acknowledge that I am speaking on the lands of the Dharug and Guingai peoples. I represent the Hornsby Shire Climate Action Group which is a community organisation with 210 members and supporters. We wish to express out strong opposition to the Narrabri Coal Seam Gas Project. Whilst we support the traditional custodians, rural, and agricultural communities who are directly impacted by the proposal, we wish to highlight the risks that this project poses to our local environment and residence. Our primary concern is the impact this new fossil fuel project will have on climate change. This is the most critical issue of our time and it will have a devastating effect on biodiversity and the frequency and severity of natural disasters in our area.

There is broad scientific consensus that if the most extreme impacts of climate change are to be avoided, urgent steps must be taken to limit global heating. If we continue the current trajectory, experts say our world will be hardly recognisable, and that currently, there is a very high risk that most of the world's ecosystems will be heavily damaged or destroyed and extreme weather events will become more frequent. The Hornsby Shire is located on the north-western fringe of Sydney and approximately two thirds of this area is national park and bushland. We are particularly susceptible to natural disasters. Analysis of more than 14,000 storm related events found that Berowra Heights, which is located to the north of our shire, was the worst affected suburb in the state. Berowra was ranked sixth.

Whilst the area was fortunate to have escaped the recent catastrophic fire season, the majority of our residents live within five kilometres of natural bushland and the risk of future fire events to property and life can not be overstated. The impact of climate change on the severity and frequency of natural disasters is well documented. And the IPCC has reported that there will be an increase in the frequency and duration of heatwaves, precipitation, and the intensity and duration of drought. Our group is extremely concerned about the implications this has for the viability of our local community. The economic and social impact of more frequent fire and storm events on the communities like ours must be considered when assessing the merits of any new fossil fuel project including the current one.

Our area is biologically diverse and includes 34 native vegetation communities, two of which are critically endangered. The CSIRO lists climate change as one of the five major threats to biodiversity and has indicated that it is likely to lead to very significant and widespread ecological impacts by 2030. According to the CSIRO, changing temperature, moisture availability, and fire regimes will lead to changes in the vegetation and see a dramatic contraction of wet and dry sclerophyll forests in Eastern New South Wales including our own Hornsby area.

Again, we urge the commission to consider the broad implications of approving a project that will exacerbate climate change and directly result in dramatic constriction of endemic habitats in New South Wales. We also wish to raise the issue of intergenerational equity. Our members take very seriously the duties we owe to future generations, and we consider it is imperative that the current generation take into consideration the impact our use of natural resources will have on the sustainability of the planet's ecosystems. As has been outlined by the many experts that have addressed the commission, CSG poses too great a risk to the environment and is inconsistent with the principles of ecologically sustainable development including the precautionary principle and the principles of intergenerational equity.

It is very clear on the science that if the most severe impacts of climate change are to be avoided, no new fossil fuel projects can be approved. This SCG proposal will generate carbon dioxide emissions which equate to approximately 5 million tonnes per year. In addition, the project will mobilise methane which as many speakers have said, is a highly potent greenhouse gas. Professor Will Steffen has outlined that there is no provision in the Carbon Budget for this project. We are heading right into the red. There are many grounds on which this project should be refused development consent. To allow it to proceed is to breach our commitment to the international community and our responsibility to future generations. Hornsby Shire Climate Action Group urges the commission to consider the impact this project would have on climate change and the direct and indirect consequences for our current and future communities and many others like us in New South Wales. Thank you for your time this afternoon.

MR O'CONNOR: Thank you, Justine, for your comments. Next speaker, please.

MR BEASLEY: That doesn't look like Margaret McDonald, but just at a guess. Is that – can you hear me, Mrs McDonald?

MS M. MCDONALD: I can hear you.

MR BEASLEY: Excellent. I can hear you. We all can. So please go ahead.

MS MCDONALD: Okay, then. Thank you very much. Dubbo Environment Group was founded this year and it consists so far of 18 members from our local region. Our group is extremely concerned about climate change and deeply frustrated by Australia's lack of effective action over the past two decades. The Paris Climate Agreement was instigated to limit the increasing global temperature to below two degrees centigrade by the end of the century. The pledges it followed were planned to achieve world Net-Zero Emissions by 2050. But on the 18th of July, last week, Professor Lesley Hughes from the Climate Council said on the Farmers for Climate Action Summit that we need to achieve Net-Zero Emissions by 2040 to limit temperature increases to below two degrees.

2050 is too late. We need to increase our drawdown actions threefold, and we need to halve our emissions by 2030. This is what Professor Hughes has said, and she also said that two degrees higher temperatures mean increased fire danger and fire events which create their own weather events as occurred last summer. It means even more frequent and more extreme weather events, and 20 to 40 per cent reduction in current river flows in the Murray-Darling Basin.

Dubbo's future climate has been analysed by ANU researchers who predict that the city of Dubbo will have no winters by 2050 and an average temperature four degrees higher if emissions continue unabated. Parkes, New South Wales, our federal electorate, has been singled out as one of five Australian electorates to be most affected by climate change. Records from the Bureau of Meteorology clearly show: (1) that New South Wales' average temperatures have already risen well above 1.5 degrees in the last two years; (2) that the drought of 2019 was the most severe by more than 50 per cent of previously recorded low rainfall events, and that no two years of such low levels have ever run concurrently since 1900.

Dubbo has suffered conditions not experienced before in living memory during the last summer season of very low rainfall and very high temperatures. Days of above 40 degrees centigrade followed one another with regularity. Dubbo's water storage at Burrendong Dam dropped to one per cent. Severe water restrictions were enforced over a five month period. During this time, thousands of city trees died. Replacing them is not only extremely costly, but impossible in the short-term. I, personally, had two 40 year old trees die in my own garden.

The New South Wales government has released their Net-Zero plan stage 1: to reduce emissions by 35 per cent by 2030, compared to 2005 levels. The goal is to reach zero emissions by 2050. According to Professor Hughes, this goal is salacious. Coal seam gas is a fossil fuel. Australia is the third largest exporter of fossil fuels. A

drug dealer is considered a criminal for the harmful consequences of his actions to mankind. Australia has the largest resources for renewables anywhere in the world and is no less morally bankrupt than a drug dealer for opening up new fossil fuel industries when there is no need.

Professor Hughes said that we needed a period of time to transition away from gas, but that we do not need more gas. Any new gas infrastructure will lock in the industry for many decades to come. Thank you. That's my submission.

MR O'CONNOR: Thank you, Margaret, for your comments. Next speaker, please.

MR BEASLEY: Hello.

MS MCKENZIE: Am I on next?

MR BEASLEY: Yes, you are. Please, could you introduce yourself.

MS MCKENZIE: I am.

MR BEASLEY: Katherine McKenzie, all right.

MS MCKENZIE: I can.

MR BEASLEY: Sorry about that. We can hear you. Please, go ahead.

MS MCKENZIE: Okay. Good afternoon, Commissioners. Thank you for giving me an opportunity to speak. My name is Kathy McKenzie. I currently live at Putty, but I grew up on the Pilliga Road near Coonamble. I have written a submission objecting to this project. Previous speakers have addressed my concerns better than I can. So I want to talk about what coal seam gas does to communities and to people.

Over the last few days, it's been wonderful to see how my old and new friends have evolved from quiet, conservatives, to a knowledgeable, unstoppable force of opposite to coal seam gas in New South Wales. I understand their pain because I know what it feels like to wake up every morning with a sickening knot in my stomach. That feeling of uncertainty about my future in the place where I choose to live, the powerlessness, the anger at government, and at myself for being so naïve to think that political corruption happened overseas not in Australia.

I have lived at Putty in the middle of the world heritage Wollemi and Yengo National Parks for eight years with no mains power. I'm no hippy. I would never have moved here if I couldn't have had all the luxuries I had in Sydney. A coal seam gas test well was drilled 500 metres from the national park and 20 kilometres from my home in 2011. A local landowner familiar with the problems in the Pilliga raised the alarm. Having recently sold my business, I researched the gas industry. Nothing I read, then or now, has convinced me that coal seam gas is good. The risks are staggering and yet, our government still wants this to happen.

In 2014, the licences over our area was cancelled along with many others, but the gas industry have divided our community between those who bought land near national parks assuming it would never be industrialised, and a small number of people who believe the gas industry's promises of jobs and higher land values. The roof between these two groups remains today. The following year, my brother who lives near Coonamble, became increasingly concerned about gas drilling in the Pilliga and the potential contamination of the Great Artesian Basin. By now, I knew nothing was sacred to our government. I had totally lost trust in them to protect national parks, the Great Artesian Basin, or the Great Barrier Reef.

I delved into the European history of the Basin, which revealed that since 1878, successive state and federal governments had seriously mismanaged this amazing resource by not listening to independent scientists and not conducting comprehensive studies. Has anything changed? No. I have listened to scientists. I have toured the Pilliga with Santos and with locals. I've seen the damage Santos doesn't want you to see. I've toured Queensland, near the Queensland gas spills where an ex-Santos employee from the conventional gas sector was the first, but not the last to say that the cowboys in the coal seam gas side of the business had ruined the company's reputation.

I could never understand how coal seam gas started until I ended my tour in Brisbane, with a heartbreaking interview with Simone Marsh, the environmental scientist who assessed Santos EIS for the Gladstone LNG project. If you haven't heard Simone's story, Google her. It was after this interview that I vowed to stop this industry's expansion into New South Wales, and I, and along with many others, will. I'm a fifth generation Australian. I don't pretend to have the deep connection to country our indigenous people have, but the older I am, the more I understand it. I love my country, and I always obey its laws, but it if this project is approved, my trust in our system of government will be completely broken.

I and many other law abiding citizens will be forced to break the law to save our country. We shouldn't need to do this. We should be doing something productive or constructive like working, volunteering in our communities, or helping out our families. Please, restore my trust in the system we have in place to protect our environment, and, please, make me proud to be an Australian again. Thank you.

MR O'CONNOR: Thank you, Katherine. Our next speaker, please.

MS FRANCIS-COAN: Panel and observers - - -

MR BEASLEY: Our next speaker is Sinead Francis-Coan. Can you hear me, Sinead?

MS FRANCIS-COAN: I can. Good afternoon.

MR BEASLEY: Good afternoon. We can hear you. So go ahead.

MS FRANCIS-COAN: Thank you. Good afternoon, panel, and observers. I would like to acknowledge that I speak to you today from the land of the Awabakal people and pay my respects to elders past, present, and emerging, and to any indigenous Australians among us today. Today, I come before you to express my strong opposition to the Narrabri Gas Project. While those present will be aware of a wide range of reasons that this project should not go ahead, today, I plan to emphasis the flaws in the arguments presented in favour of the project and demonstrate that it has no social licence to operate.

In the assessment report produced by the New South Wales Department of Planning, Industry and Environment, it states that the Narrabri Gas Project:

> *Has been declared a strategic energy project because of the crucial role it could play in strengthening energy security and viability in New South Wales.*

The report also states that the project:

> *Would produce up to 200 terajoules of gas a day for the domestic gas market over a period of at least 20 years.*

Since this project was approved by the DPIE on the 12th of June, on the 10th of July, the New South Wales government announced plans for a second renewable energy zone, also in Northern New South Wales, that, according to it's own website, would generate 8000 megawatts and have the capacity to power 3.5 million homes. We do not need this risky gas project.

The economic implications must also be considered. The assessment report states that the Narrabri Gas Project:

> *Has a capital investment value of 3.6 billion and will create 1300 jobs during construction and 200 jobs during operations.*

In contrast, the planned renewable energy zone would support 2000 construction jobs and 1300 ongoing jobs and come with a renewable energy capacity valued at 12.9 billion. The numbers speak loudly for themselves.
To speak briefly to the matter of the security of domestic gas supply, there is no guarantee in the assessment report or other documents the gas source from the Narrabri project could not be used for export which does not at all address domestic gas needs. Further to this, an approved 250 million dollar gas import terminal in Wollongong throws further doubt on the viability of this Narrabri project.

My concern about the Narrabri Gas Project stems as much from what we do know as what we don't know. The assessment report makes numerous references to the lack of knowledge of deeper geological substrata of the affected area. The risk appears to be largely brushed off in the report, but the people of New South Wales are not willing to take this risk. We also don't have details of what will happen with the tonnes of toxic salt as we've heard, resulting from the CSG extraction. This project

relies on a pipeline that has also not yet been approved. My alarm is further raised by a system where Santos would be largely self-reporting on many of these areas of concern.

We see in communities in Gloucester and Bentley, even the Hunter Valley wine community, all come together to oppose coal seam gas projects in their local areas. It is no surprise then that 97, 98 per cent of all submissions to this IPC also oppose the project. What strikes me is the diversity and nature of those who would express their opposition to unconventional gas in the Pilliga and around New South Wales for years. Many of these people have not and still do not identify as activist – sorry – as activists. And these people have simply felt compelled by the risk presented to their way of life and what they hold dear. Rarely do we see farmers, scientists, urban, rural, and indigenous communities all standing together in opposition to a project for common and varied reasons.

These groups have been alerted to the risks associated with unconventional gas by learning from first-hand experiences of communities in Queensland, the US, and around the world, where CSG projects have left these communities socially, environmentally, and economically devastated. On the 3rd of June this year, the Legislative Council of this state passed a moratorium on CSG activity. One aspect to this moratorium was a lack of scientific rigour in both assessing and mitigating the risk of projects like the proposed Narrabri Gas Project.

Australia cannot approve new fossil fuel projects and still meet the criteria of the Paris Agreement that we are signatory to. In New South Wales, we have legal verdicts such as the case of the proposed Ricky Hill Mine that uphold this acknowledgement. This alone, for many New South Wales citizens prevents a social licence to operate. The Narrabri Gas Project does not stack up socially, economically, or environmentally, and is a risk we can't afford to and don't need to take. Thanks for the opportunity to address you all today.

MR O'CONNOR: Thank you, Sinead, for that presentation. Our next speaker.

MR BEASLEY: The next speaker is Melinda Mills. Can you hear me, Melinda?

MS M. MILLS: I can. Can you hear me?

MR BEASLEY: Yes. Go ahead.

MS MILLS: My name is Melinda Mills. I am a veterinarian and farmer located west of Tottenham. Our multigenerational, sustainable farming business produces wheat, barley, canola, lupins, and sheep to feed Australians and the world. I will give you a brief overview of my written submission, where more documented factual detail can be found. I am directly affected by the Narrabri Gas Project as I own one of the properties for the proposed Western Slopes Pipeline to come through. It is of no benefit to me to have the Narrabri Gas Project or the Western Slopes Pipeline

pushed upon me, to cause huge disruption and decrease in monetary value to our farming business. We cannot safety coexist together.

My experience so far with dealing with the APA pipeline company has been of intimidation, bullying, harassment, with APA trying to divide our community, not respecting private property or landholders' local knowledge, and disrespecting our community. Our representative on the farcical Narrabri Community Consultative Committee has had a similar experience with Santos. There has been no openness, transparency or any meaningful answers to questions causing him to withdraw his participation in the Narrabri CCC.

The department's assessment report has incorrect stated:

> *The Narrabri Gas Project would not result in any significant impacts on people or the environment.*

And has failed to consider the enormous social ..... not just in the local Narrabri Shire Council area itself, but also the neighbouring shires of much further afield. None of these other shires seem to be considered by Narrabri Gas Project in its social impacts despite the flow-on effects that will happen in these other areas. Water, air, traffic, and noise pollution don't respect property or shire boundaries. The department's assessment report has said:

> *Santos will only be developing wells and infrastructure on privately owned land with the agreement of the landholder.*

Landholder agreements with Santos give no meaning to anyone that is forced to host the infrastructure including pipelines for this project. Linear agreements for pipelines, for example, will not be under a Landholder Agreed Principles of Land Access agreement. Pipelines will be forced upon people with no recourse action.

In April 2019, the Permanent Peoples' Tribunal Advisory Opinion, PPT, has recommended that all unconventional gas exploration be banned. The PPT stated:

> *That any laws regulating this industry had been has been largely symbolic in substance and procedure despite any initial instrumental intention and has been unenforceable.*

Unconventional gas extraction is a major contributor to climate change. The PPT condemns those countries that have revoked bans on CSG due to the overwhelming evidence and catastrophic impacts on the environment, social and cultural. CSG is not a bridge fuel and is incompatible with minimising climate change. The serious rights violations suffered by people and nature are accompanied by little, if any, economic benefit to those communities, while the profits go to the corporations and other benefits to the complicit state officials.

The industry is being driven not by necessity, but the desire for profits by mega-corporations with the complicity of government and others who believe it will bring benefits to them, and tough luck if there is collateral damage. Only those small numbers with vested interests and monetary gains support the Narrabri Gas Project. The vast majority of people who will have to bear the burden of this project, understand the long-term ramifications and intergenerational equity of the project, are totally against it. The Narrabri Gas Project fails on every level: social impact, economically, biodiversity, greenhouse gas emissions, insurance, the Chief Scientist's recommendations, and ruining the GAB forever.

The accumulated scientific evidence against the Narrabri Gas Project is enormous and beggar's belief, we are still arguing the same ridiculous argument that it's about jobs, gas shortage, and economy. Santos pays little tax, no royalties, will certainly not be around in the future to clean up the mess which the taxpayer will have to foot the bill for. It is common knowledge that there is lack of political will to regulate the industry and there is revolving doors with politics and the mining industry to collude and get these projects approved. It has been proven there is no gas shortage and, in fact, a global gas glut. The world is moving away from gas into renewables. The Narrabri Gas Project will do nothing to drive down gas prices.

It's a myth that the Narrabri Gas Project will create lots of long-term jobs as the gas industry is too volatile to sustain long-term jobs. Long-term jobs isn't 20 years, but it's intergenerational. It is robbing jobs from other sustainable industries like agriculture. The direct and indirect harmful cost of CSG for the sacrificial communities that have to host it long-term isn't worth any amount of jobs, when you have sustainable long-term jobs in renewables without the risk to water and harm to people's health and lives. There is realistic alternative energy and other solutions that are economically undercutting gas. The Narrabri Gas Project should not be developed and be refused developmental consent. This is the wrong time and the wrong place for this project.

If the government spent as much time subsidising and investing in renewable energy as it does in propping up the unsustainable gas industry, we would be a world leader in renewables. Surveys undertaken by communities surrounding the Pilliga Forest spanning an area of over 3 million hectares have declared they're gas field free with an average of 96 per cent rejecting the Narrabri Gas Project. And this is factual surveys not fabricated numbers from social media. 35 councils in New South Wales oppose the development of CSG. Another 14 councils have declared their concern about CSG. In conclusion, I ask the IPC, which side of history would you like to be remember on, the side that listened to the people's wishes and made a real change, protecting our future for the generations to come, or that caved to the wishes of big business and corporate greed. Over the last 10 years, and especially, the last four days, the people have continually said no to the Narrabri Gas Project, however, you now have the power to stop this project once and for all. Thank you for listening.

MR O'CONNOR: Thank you, Melinda. Next speaker.

MR BEASLEY: The next speaker is Ian Watson. Can you hear me, Mr Watson?

MR I. WATSON: Yes, I can.

MR BEASLEY: Please, go ahead.

MR WATSON: Thank you for the opportunity to present this afternoon. If I could just share my screen. Has that come up?

MR BEASLEY: Yes.

MR WATSON: I've worked as a labour market researcher for the last 30 years and have looked at the project and have looked at the project from this perspective. My assessment is that it shouldn't go ahead because from an economic point of view, it's not viable and there are alternatives in employment. Many of these arguments you've heard already that there's a global oversupply of natural gas and the long-term downward trend in prices. And, of course, we know that there's been a price fall since 2019, before COVID. If we look at this graph which shows that trend, you'll see the long-term trend. You'll see that in 2020, the fall has continued, and those grey areas are recessionary periods in the US, and they are always associated with a very steep drop in prices. So we should anticipate that the price falls for the first – start of 2020 may even continue.

This seems to be the perspective of industry commentators and here are a couple of quotes from them:

> *The shock of the Coronavirus downturn is expected to be felt in the energy industry for years to come.*

And another commentator:

> *What's the floor? Frankly, we have no idea. We haven't seen prices like these ever before.*

Now, in that cost-benefit analysis, Santos worked on the assumption of $8.70 a gigajoule. And while they looked at a number of scenarios, they concluded that if there was a fall of 30 per cent, the project would not breakeven. We're seeing prices well below 50 per cent at the moment, and likely to fall further. And you've heard plenty of evidence today about what prices in Eastern Australia are looking like.

So what are the implications of this? I would suggest to you that the project is not economically viable unless there's a public subsidy. And if there is to be a public subsidy, that should surely be a matter for debate amongst the public to see if they approve of their public money being spent in this way. Santos, themselves, seem to be aware of this. In 2017, when they readmitted the Narrabri project to their core operations, to they're core assets I should say, they told investors it would be a low cost operation, and this was to assuage their concerns and to improve the commercial

outlook. I would ask, what does a low cost operation mean? Is CSG on the cheap compatible with what the Department of Planning has asked for which is international best practice to protect land and water, resources from any adverse impacts in perpetuity.

If we turn now to the employment issues, the EIS makes numerous projections, and my experience has been that these EIS projections are often inflated, and a better way to judge what's likely to happen is to look for a comparable real-world situation. Now, I've looked at Queensland. I've looked at the Surat and Bowen Basins, and the employment in the LGAs for the coal seam gas industry there, and the figure I come up with is 14.7 workers per million cubic metres of output, that's in 2016. Now, if we apply that ratio to the Narrabri project, we end up with 131 long-term jobs for the Narrabri region, not the 200 that is in the EIS. And we need to remember also that there are 50 jobs already there, so that's a nett gain of 81 jobs. And the encouraging and positive aspect is that there is alternative employment.

We've already heard mention this afternoon of the renewable energy zones, the Central-West Orana REZ and the New England REZ, which have just been announce this month. The Central-West one has been oversubscribed ninefold by investors. Clearly, it's a very attractive option for them. Together, these two projects represent $17 billion dollars in investment and nearly 2500 construction jobs. If we look at where that's located, we can see that it's just to the south of the Pilliga in the Narrabri area. And we also know that the New England one is to the east. So, therefore, the Narrabri region is well positioned to benefit from the skilled blue collar employment that will emerge in those projects. And we need to also consider the economic spinoffs.

There is going to be a need to upgrade the national electricity grid. And, of course, there's the prospects for the renewal of regional manufacturing. You may be aware of Ross Garnaut's work which points to the cheap electricity that's going to flow from renewables and the possibilities this opens in energy intensive industries: aluminium, clean steel, silicone. We also need to be aware that there's a future prospect for hydrogen fuel cells. So there's a lot of employment in Australia's regions from this.

When it comes to Narrabri, an obvious candidate would be a revitalisation of regional textile industries which would involve work for artisans and designers as well as blue collar work. Narrabri being a cotton town, and with cheap electricity, it stands to reason that textile has a good chance of being renewed. The diverse employment outcomes are far greater with seeing a renewal of regional manufacturing rather than a continued focus on resource extraction. Thank you very much. I should say that I have written a detailed submission and I will be submitting this.

MR O'CONNOR: Good. We look forward to receiving it. Thank you, Doctor. Next speaker, please.

MR BEASLEY: The next speaker is Rhonda Bourne. Can you hear me, Ms Bourne?

MS R. BOURNE: Yes, I can.

MR BEASLEY: We can hear you, so go ahead.

MS BOURNE: Well, good afternoon, and thank you very much for this opportunity to speak today. I am strongly opposed to the Narrabri Gas Project. I speak as a concerned citizen, a parent, and a grandparent. I want to speak out against this destruction of our environment and all for very little short-term gain. As a retired science teacher, I have a lifelong passion for wanting to know how things work, how the natural world works, and how ecosystems work, and, hence, I have a respect and a concern for the conservation of our land, our precious water resources and air quality.

I first came across information about CSG some years ago when I was writing an assessment task. I could not believe what I was reading: the destruction of land, water tables, aquifers, the dumping of hundreds of thousands of litres of toxic waste, the leaking gas wells, and they all leak sooner or later, methane coming through farmers' kitchen taps, methane bubbling out of rivers, methane coming out of falls. Several years ago, I spoke to a farmer from the Narrabri region who was very upset by the destruction of the farming and grazing land he had and by the drop in the quantity and quality of the bore water caused by CSG exploration and extraction. He said how the government just doesn't know the devastation it causes. Well, I realised then that the government does know, that they just don't care.

Well, Commissioners, I am here today to tell you that the people of Australia do care, and we want it stopped. We're here to implore you to do the right thing and protect our land, our water, and the habitats of our plants and animals. We know that the burning of this fossil fuel is driving climate change, and market investors and insurers are turning away from fossil fuels. There are alternatives to this gas, cheaper, renewable forms of energy, which are rapidly coming online. And there are three times more jobs in these renewable energy sectors than in the fossil fuel industry.

We are very concerned at what we see as the influence of the fossil fuel industry on the decision making processes of our governments. There is a list of former parliamentarians who are now lobbyists for the fossil fuel and gas industries. And previous executives of these industries who are now advisors to government. You only have to look at the appointed members of the COVID Coordination Committee to see this. What we are witnessing now is almost a frenzy of destruction to extract as much fossil fuel including CSG as possible while there is still a market for it.

Commissioners, I will outline what we stand to lose if this Narrabri Gas Project goes ahead, and remember, this is all for very short-term gain, for about 20 years or so. We will lose the Pilliga Forest, the last temperate forest in New South Wales which

has extraordinary conservation value. It's integrity will be destroyed by 850 wells, roads, pipelines, infrastructure. This is the land of the Gomeroi people, whose culture is across the whole area of the forest, the fragmentation of which will break their custodianship of the land. They can't continue their culture without country. To destroy this forest represents a real colonialist attitude of taking control of their land. You destroy their culture and you destroy the people.

The Pilliga is also home to 35 threatened fauna species including the koala. Without active intervention, koalas will be extinct in the wild in 30 years, having lived in Australia for 25 million years. I went out this week and I bought this little guy for my granddaughter. I have a baby granddaughter. I thought she would like to see what koalas looked like. Otherwise, when she's an adult, when she turns 30, the only koala she is going to likely see is in a glass cabinet beside the thylacine in the Australian Museum, just down the corridor from the dinosaurs. Now, if we don't actively preserve what koala habitat we have left, we are actively participating in its extinction.

The other point to make is that the gas wells in the Pilliga represent a persistent fire risk with their flares up to 30 metres in height. And they continue to flare on the days of a total fire ban in our recent, horrific bushfires. So we can expect more fires in the Pilliga.

When these wells are decommissioned, they will continue to leak. We don't expect the concrete and steel plug to last for hundreds and thousands of years. They will be leaking long after Santos is no longer in business, and I am so sad about this. I actually experience grief that this last beautiful forest could be lost forever. The recent interim report from the review of the Australia's Environment Protection and Biodiversity Conservation Act has announced that Australia's environment is in an unsustainable state of decline and the laws set up to protect unique species and habitats are ineffective. Our iconic landscapes are not being protected. Well, this is evidence of this.

We also stand to lose the Great Artesian Basin and the alluvial aquifers which will be depleted and contaminated. And the recharge zone will be compromised. The water in the GAB is 2 million years old, so that tells you how slowly it's going to recharge once it's depleted.

MR O'CONNOR: Could you please wrap up now, thanks, Rhonda.

MS BOURNE: Yes. I didn't hear a bell. We will lose productive farmland. This is the first of seven gas fields proposed by Santos. If it goes ahead, in 20 to 30 years, we will have an industrial wasteland reaching to the Queensland border. We'll lose our water and land due to the toxic salt waste. We will lose the health of the residents. The only thing we have to gain from this gas field is an increase in temperature, in global temperature, which is just a disaster. This, in conclusion, this project represents a huge risk. It can't be insured. It can't be underwritten. The poor landholders hold all the risk on this project. Finally, I implore you to conserve

the Pilliga Forest, the Great Artesian Basin, the land and the water. Please reject this project. Thank you.

MR O'CONNOR: Thank you, Rhonda. Next speaker.

MR BEASLEY: I don't have a name. .....

MR HANN: Susan Park.

MR BEASLEY: Thanks. Ms Park, can you hear us?

PROF S. PARK: Yes.

MR BEASLEY: We can hear you now, so please, go ahead.

PROF PARK: Good afternoon to the Commissioners and to the counsel assisting. And thank you for the opportunity to speak today concerning the Narrabri Gas Project development application. My name is Susan Park. I'm a professor at the University of Sydney, specialising in global environmental governance and accountability, particularly in relation to the environmental and social impacts of extractive projects.

I would like to draw attention, the Commissioners' attention to a submission to the IPC on behalf of the Sydney Environment Institute which is a multidisciplinary research institute at the University of Sydney. The submission is co-authored by experts from the University of Sydney and RMIT in the fields of energy law, the social and environmental impacts of resource developments, groundwater impacts of unconventional gas, as well as experts from the commercial energy industry and civil society. All of the contributors have provided information to the submission on a pro bono basis.

I would like to speak to two of our submission's central claims that critique the Department of Planning, Industry and Environment's Narrabri assessment report. First, that the Narrabri Gas Project will result in significant impact on people and the environment, and second, that the Narrabri Gas Project will not contribute to gas security for New South Wales. The basis of our submission is that any determination by the IPC should necessarily be informed by evidence and take a risk based approach to determine whether the Narrabri Gas Project is in the public interest.

Our submission interrogates the evidence provided by DPIE in its assessment report, recommending the approval for the project. We document flaws in the department's assessment process for providing robust evidence that it will not result in a significant impact on people and the environment, and that the Narrabri Gas Project will contribute to gas security for New South Wales. The first flaw is that DPIEs assessment does not provide robust evidence that it will not result in a significant impact on people and the environment, although, my statement here focuses on the social impacts. DPIEs assessment report relies almost exclusively on a review by

Professor Deanna Kemp of Santos's own social impact assessment and takes the view that Professor Kemp's review constitutes support for the project.

Our concern is not whether Professor Kemp's work was a desk review. Our concern is that Professor Kemp has not actually undertaken an assessment of the social impact merits of the case, nor was she commissioned to do so. In our submission, we reference correspondence between Dr Lawrence of the University of Sydney who is a co-author of our submission, with Professor Kemp. We detail Professor Kemp's concerns that the department has misconstrued her advice to the department and misinterpreted it as giving the project a green light, when Professor Kemp has stated that her advice in no way constitutes recommending an approval of the project.

There is sufficient evidence outlined in our submission where we rely on evidence provided by Gemma Viney and Dr Alison Ziller, also contributors and co-authors to our submission that suggests that the social impacts in the short and the long-term will be unmanageable, specifically, pertaining to: social conflicts over the proposed gas project, loss of rural livelihoods, impacts on Aboriginal people, and the impacts of the Narrabri community as an already socially disadvantaged community. Second, DPIE argues that the Narrabri Gas Project is in the public interest on the basis that it will contribute to gas security for New South Wales.

DPIE relies on the proposed unconventional gas development proponent, Santos, providing all the gas from the Narrabri Gas Project to the domestic market, and agreed to accept a condition to this effect on any Petroleum Production Lease granted for the production under the Petroleum (Onshore) Act of 1991. However, this statement refers to gas being reserved for the Eastern gas market as a whole, and this indicates the proponent will not be committing its gas sold to New South Wales in the first instance. Moreover, the DPIE recommended conditions make no mention whatsoever of this commitment to the domestic gas market or recommend a condition to compel Santos to reserve gas domestically if the project is approved.

DPIE cannot rely on the project providing increased domestic gas supply as the proponent has no corporate or financial motivation to do so, and there is no legally binding agreement currently in place requiring it. Thank you for your time. Our written submission explores the issues raised in my presentation and our environmental impact concerns in further detail.

MR BEASLEY: Sorry, Susan, can I just ask you, the correspondence you mention from Professor Kemp, is that – who's that between, Professor Kemp and – who's the letters to and from?

PROF PARK: .....

MR BEASLEY: Pardon? I couldn't hear you.

PROF PARK: Dr Rebecca Lawrence at the Sydney Environment Institute.

MR BEASLEY: Right. Is Professor Kemp going to send in anything to the Commission herself, regarding this?

PROF PARK: Not to my knowledge.

MR BEASLEY: All right. Thanks.

MR O'CONNOR: Thank you, Professor, for your presentation.

PROF PARK: .....

MR O'CONNOR: Yes. Thanks. Next speaker, please.

MR BEASLEY: Next speaker is Christopher Sheed. Mr Sheed, can you hear me?

MR C. SHEED: Yes, I can hear you. Can you hear me?

MR BEASLEY: Yes. Go ahead.

MR SHEED: Thank you. Thank you for the opportunity to speak. I acknowledge the Birpai people, the traditional owners of the country on which I live. And I pay my respects to their elders, past and present, and I thank them for their ..... My name is Chris Sheed. I'm 67 years old, English by birth, and an Australian citizen for nearly 40 years. I have worked for the last 20 years as a program manager for an Aboriginal owned and operated not-for-profit charity. I hold an Honours degree in ecotourism and natural resource management. And in 2000, I received an Order of Australia for services to conservation and the protection of .....

I would like to respond to, and I quote, "the five factors in favour" of the Narrabri Gas Project identified in the DPIE final assessment report. I quote:

> *First, it is a relatively small project compared to coal seam gas development in other jurisdictions, with up to 850 gas wells to be drilled over 25 years, compared to the over 6800 wells that have been drilled in Queensland over the last decade.*

A project so small should not be allowed to compromise the integrity of such an important remnant woodland as the Pilliga. To protect the ..... habitat to Australia's threatened species and the refuge for a ..... of wildlife that is declining elsewhere. Again, I quote:

> *Second, there is a limited scope for cumulative impact with the Narrabri Gas Project, as it is the only coal seam gas project in the region.*

I have been following the ..... uncertainly of the Pilliga gas field saga for the best part of the decade. During that time, I have witnessed the appalling destruction of the Leard State Forest, an important actual remnant native woodland almost adjacent to

the Pilliga Forest for an open cut coal mine. Now, we see the Pilliga Forest, a larger patch of remnant forest also under threat of destruction by a gas field. The destruction of the Leard and, possibly, the Pilliga, are, by any account, cumulative impacts.

Again, I quote:

> *Third, the Gunnedah Basin where the Narrabri Gas Project is located has fundamentally different geology and hydrogeology compared to several other jurisdictions with coal seam gas development, and these differences substantially reduce any risk to land and water resources.*

I'm sure others more schooled in the science of geology and hydrogeology have addressed this during the ..... I quote:

> *Four, the sights ..... 4.54.38and surrounds comprise predominantly the Pilliga State Forest and broadacre grazing land. And Santos has committed to only undertaking project related activities on privately owned land with the agreement of the landholder.*

If private landholders were allowed to reject gas wells on their property, the public should have the same right to reject gas wells in the Pilliga Forest, a public asset. Lastly, I quote:

> *Fifthly, the New South Wales government have introduced strict, regulatory controls to coal seam gas development which would be applied to the Narrabri Gas Project.*

I refer the Commission to report number 42, The implementation of the recommendations contained in the New South Wales Chief Scientist's Independent Review of Coal Seam Gas Activities in New South Wales, published by the Legislative Council of New South Wales in February this year, some six years after the Chief Scientist's review of coal seam gas. I quote from paragraph 2.214 of report number 42, which states:

> *The evidence before this inquiry now establishes clearly, that of the 16 recommendations, only recommendations 14 and 15 have been, arguably, fully implemented by the New South Wales government, leaving 14 recommendations that have only been partially implemented or not implemented at all.*

And this is six years after the Chief Scientist's report. I will leave the issue of renewable energy to others, but I will mention methane, a colourless and odourless and highly potent greenhouse gas. There is rapidly now, using satellite evidence, that unseen fugitive emissions of methane from coal seam gas operations worldwide are becoming a major contributor to greenhouse gas emissions. We have become a disposable society. We are prepared to dispose of everything unless constrained.

Humans have demonstrated time and time again that they will take the lot if allowed. In terms of the natural environment, nothing is really treasured, nothing is sacred. A couple of weeks ago, Rio Tinto was caught out deliberately destroying Aboriginal cultural heritage, but this is nothing new. Greed prevails, allowing company profits and shareholder dividends to trump the earth and often the peoples' best interests.

MR O'CONNOR: Christopher, could you please wrap up now?

MR SHEED: ..... wildlife and entire ecosystems to sacrifice for short-term gain. I've watched my generation and our generations clashing at ..... You have the power to stop this CSG wrecking ball, but I do not, and I beg you to use that power. Thank you.

MR O'CONNOR: Thank you, Christopher. Next speaker.

MR BEASLEY: Next speaker is Dot Wasson. Can you me, Dot?

MS D. WASSON: I can.

MR BEASLEY: Dot are you there?

MS WASSON: Yes.

MR BEASLEY: Okay. We can hear you, so you can go ahead now.

MS WASSON: Okay. Good afternoon, panel. My name is Dorothy Wasson, and I live in the local area. And my objection to this development is the total lack of viability of Santos's plans to dispose of the 85,000 tonnes of toxic salt waste that they admit that they will produce each year. World demand for industrial salts in 2017 and 2018 increased only three per cent, and most of this increase was in China. Since then demand for this has plummeted internationally. Domestically, the average Aussie household uses less than two kilograms of bicarb soda per year. And this is the market that Santos tried to use to justify its waste usage after fracking. So this leave a massive 85,000 tonnes of salt each year to be disposed of in Northern New South Wales.

First, let's picture what 85,000 tonnes looks like. It's about 3000 semitrailer loads. And if this was spread out, it equates to 5000 average household driveways, six inches or 200 mil thick with salt. If approved, Santos would not be the only producer of toxic salt waste in the north. The coal seam gas industry in Queensland currently produces 28 million tonnes of this hazardous waste each year from the Surat Basin alone. Their efforts to dispose of this toxic mass have been spectacularly unsuccessful and often criminal.

Efforts to creatively dispose of this toxic mass are frightening. It's been dumped into town recycling tips. It's been dumped into feedlots. It's been used in irrigation. It's been sprayed on roads. It's been buried in tombs. And has been fed into town water

sewerage lines, to name a few. In all of these, there has been court action, environmental degradation and protests by nearby residents and water users. And there have been multiple instances of this toxic waste being intentionally mismanaged and incorrectly classified. Now, why would Santos's waste be any different when they're using exactly the same company to dispose of it? Thus, to add another 85,000 tonnes to this already massive problem is irresponsibility raised to an art form which I pray you will avoid. I finish by asking you to make a decision that will benefit your grandchildren and their children. Thank you.

MR O'CONNOR: Thank you, Dot. Next speaker, please.

MR BEASLEY: We have John Alden. Mr Alden, can you hear me?

MR J. ALDEN: Yes, I can hear you okay.

MR BEASLEY: Please, go ahead.

MR ALDEN: Okay. Thank you, Commissioners, for the opportunity to speak to you. My name is John Alden. I'm a retired structural and forensic engineer who has spent much of the last 30 years investigating and remediating engineering failures. I've lodged a submission which I uploaded last night in which I have voiced my strong opposition to the project. I'm not directly affected by the project, but as for everyone in the state, I am indirectly affected by it. There are many reasons for my opposition to the project, and I refer to my submission for the detailed ..... and relevant references.

Given the limited time, I would like to briefly touch on just one of these reasons. This involves the risk of overreliance on the assumptions, assessments, and assurances of proponents which invariably incorporates some degree of bias in favour of the project. The classic example of this is the interrelated Curtis Island LNG export project with overreliance on proponents' presentations resulting in two major errors, namely, approval of the project at full scale which was six LNG trains and the decision not to impose domestic gas reservation. As a consequence, the project scale exceeded the available economic gas supply with gas which should have been available for the domestic market vacuumed up and exported through Curtis Island. This resulted in an entirely artificial domestic gas shortage which has pushed up Eastern Australia's domestic gas prices to extreme levels being ..... the most expensive in the world.

This is an absurd situation from a gas exporting jurisdiction. The only one without some form of domestic reservation. In the words of Rod Sims, Chairman of ACCC:

> *It is a mess that we are in: the companies that are closing down and the trouble this is causing for Australian manufacturing and Australian jobs. The current situation is simply unsustainable for the East Coast economy. Importantly, the Narrabri project is right at the top of the cost curve and, hence, will do nothing to lower gas prices.*

And I'm sure there have been a lot of speakers on that issue. The Institute of Energy Economics and Financial Analysis had this to say about the project in 2017:

> *The industry is aiming to free up the cheapest supply available in Australia to sell into the international market while fobbing off high cost CSG onto Australian households and businesses.*

The conundrum at the heart of the Narrabri project is that it is only commercially viable if extremely high gas prices, which are economically unsustainable for Eastern Australia, are, in fact, sustained. In the medium to long-term, this simply won't happen. Either government will act to relieve the burden on the economic, such as by reservation or the economy will desert gas as an available energy source, the process of which is already in ..... What this means is that in addition to the multiple high-level risks associated with the project which others have spoken about, we must add the risk of commercial failure and/or abandonment of the project and all the attendant problems that this leaves for the public purse to resolve.

I refer to my submission for the details of the many other major risks that have led me to conclude that there are overwhelming reasons for the project proposal to be rejected. Thank you very much for your time. I finished a little bit early. I hope that's okay.

MR O'CONNOR: That's fine, thanks, John. We'll certainly look forward to your submission. Next speaker.

MR BEASLEY: I think we have Kwame Tsey on the phone.

MR K. TSEY: Hello, Commission. Thank you very much for listening to me today. I'm calling you today from Nymboida in Northern – in New South Wales. Now, my community was majorly affected by the recent bushfires and we lost all our properties. Now, the reason I bring that up is climate change. Climate change is making our natural disasters much worse, much bigger. Many firefighters have spoken about the – you know, the ferocity of fires this year, and it was something that no one, none of them, had ever seen before.

Now, coal seam gas mining contributes directly to climate change, not only to environmental impacts such as, you know, the poisoning of the Great Artesian Basin or the potential to poison to that. I'd also like to talk about diseases, and how climate change, you know, actually makes the current diseases we have much worse. On a recent opinion piece by Fiona Armstrong from the School of Public Health and Bioscience, suggests that climate change and COVID-19 are very much connected. And lots of scientists have actually been talking about this for quite a while, that if we don't change our ways, you know, our diseases are going to get much stronger and the current – you know, current crisis we're in with COVID-19, I think just shows a bit of that.

Again, something like COVID-19 has really shown us that what we really, truly need to do is support our farmers and not to be supporting gas companies right now. Now, a lot of our farmers, especially those that living out towards Narrabri and places like that, have, you know, been through years of drought as most of Australia has, and, you know, droughts, fires, and, you know, it's just not right ..... lands are now, you know, being taken over by coal and gas companies.

I believe that future generations will look back at how we currently generate energy and the destruction of how we generate energy, and I believe they will not forget – forgive us for the ill health we have created to their planet. I believe they will not forgive for the ongoing correlation between the ill health of the planet and, you know, the global pandemics that I imagine. I think Australia has an opportunity to become a world leader in renewable energies. We have endless sun over this country every single day, and I think we should take that step instead of going for destructive energy. Thank you very much.

MR O'CONNOR: Thank you, Kwame. Next speaker.

MR BEASLEY: Next speaker is Cathy Goswell. Cathy, can you hear me?

MS C. GOSWELL: Yes, I can.

MR BEASLEY: Good. Go ahead, thanks. We can hear you.

MS GOSWELL: Thank you. Good afternoon. My name is Cathy Goswell, a committee member of BirdLife Australia, Southern New South Wales branch. Unlike many of the speakers you've already heard from, I'm not a resident of the Narrabri area. I am a resident of urban Sydney. But I have a deep and abiding love for our country for its natural landscapes and for its unique flora and fauna, particularly, its native birdlife and their habitats. Although we don't live in the local Narrabri area, many of us volunteer our time to assist conservation through citizen science such as bird surveying and actions such as tree planting bush care. And we also travel, and we have relatives and friends in the area. We have connections.

I object to the proposed project and ask that your commission to deny approval for the Narrabri CSG project due to its significant environmental impact on the Pilliga Forest and the threatened birds listed under state and federal legislation which currently depend on it. I'd like to share a few slides taken by BirdLife members which illustrate this. The Pilliga Forest is a globally recognised, key biodiversity area. It is 500,000 hectares of rare, intact, temperate eucalypt woodland. Value comes partly from the size of the in tact remnant despite the variety of land tenures involved, both private and a variety of public owners and managers and despite a history of logging.

Key biodiversity area is a global concept of the International Union for Conservation of Nature. IUCN has set a global standard to identify sites contributing significantly to the global persistence of biodiversity. Sites much quality by meeting one or of 11

criteria which after independent scientific review and submission of documentation, are confirmed as qualifying. The Pilliga Forest has qualified with the trigger species being the Painted Honeyeater and Diamond Firetail. Over 200 other bird species have been recorded for the Pilliga. And there are also irregular records of the federally listed, critically endangered swift parrot and Regent Honeyeater.

The Pilliga was spared the impact of bushfires in the summer of 2019/20 which have created obvious displacement of species such as the Glossy-Black Cockatoo and the forest may even be more important in South Eastern Australia now as a fire and drought refuge. The IUCNs submission stated that the whole Pilliga is important for woodland birds. The woodlands support the largest population of Barking Owl and other declining woodland species in New South Wales. Woodland bird populations are continuing to experience rapid decline within South Eastern Australia with more than 40 species threatened with extinction. Here are several of the birds that would be involved.

The project will destroy the shelter, feeding, and breeding habitat of many of Australia and New South Wales' most threatened birds, tipping them further into risk of extinction. The Federal Parliamentary Interim Report into Australia's formal extinction crisis presented last year concluded the status of biodiversity in Australia is generally considered poor and deteriorating. And the destruction of remnants such as this, in the Pilliga Forest, are the reason for that. The installation of up to 850 new gas wells on up to 425 new well pads and the construction and operation of gas processing and water treatment facilities will be devastating to the woodland.

The amount of clearing for well sites, gas processing and water treatment facilities, water and gas gathering pipelines, power and communication lines, access roads, wildlife buffer zones, will not only result in the direct loss of the habitat of woodland trees, shrubs and groundcover, but will result in significant fragmentation of the remaining habitat with its ..... effects. It will result in the creation of vast kilometres of edge effect, allowing access by pest species such as foxes, cats, goats, pigs, deer, and native noisy miners, recognised as a key threatening process for many native bird species.

MR O'CONNOR: If you could wrap up now, please, Cathy.

MS GOSWELL: .....- - -

MR O'CONNOR: Could you please wrap up? We're running out of time.

MS GOSWELL: - - - yes – access to weed species and increasing wildfire risk. The significant remnant woodland of the Pilliga Forest and its state and federally listed threatened birds are an under-recognised source of sustainable tourist income for the region. Interstate and international birdwatchers currently visit the area to experience the unique birdlife and the rare, intact habitat it supports. Please listen to the independent societists. Please listen to the community. And thank you for the opportunity to present to you today. Please reject the Narrabri Gas Project.

MR O'CONNOR: Thank you, Cathy.

MS GOSWELL: Thank .....

MR O'CONNOR: Our speaker, please.

MR BEASLEY: Our final speaker is – for today is Stephen Perry. Mr Perry, can you hear me?

MR S. PERRY: Yes, I can.

MR BEASLEY: Excellent. You can go ahead now, sir.

MR PERRY: Thank you. Good evening, Commissioners. Thank you for the opportunity to speak. I am speaking to you today, objecting to the Santos Narrabri Coal Seam Gas Project as the water from the Great Artesian Basin is my life and livelihood. I cannot get my head around how anyone could think of jeopardising this water source. I am a sixth generation grazier on the Marthaguy, between Warren and Quambone. I run a sustainable business of beef, cattle, sheep, and wool, meeting accreditations in using responsible standards. For the grazing industry to be a viable enterprise, it is solely reliant on water.

For me, this water is the water from the Great Artesian Basin. Without it ..... is no longer any past, present or future. The Santos Narrabri Gas Project model is based on how little is known about the deep aquifers they will dewater for short-term gas supply. There are no guarantees that this gas industry will not adversely impact prime agricultural land by depleting the aquifers and by contaminating ground water reserves. My model is based on 186 years and still counting, of sustainable, profitable prime agriculture, with good clean water needed to continue to produce food and fibre for the world. So I believe I have the knowledge and expertise passed down from my ancestors in how to look after and pay respect for the land we live on, so that it can continue to be viable for hundreds of years for generations to inherit, not just 20 years of what appears to be short-sighted profits, to then leave the mess for future generations to repair.

I am one of the privileged who can feel the dirt run through my fingers and be able to drink and wash my face with plentiful, uncontaminated water. I am fearful that this will be taken away so easily. And I know that if we lose this liquid gold that flows out of the ground, then it makes it impossible to fulfil my dreams and goals. Even though we have encountered the worst drought, we are still able to supply Australia and the world with our produce all due to the fact that we have clean, reliable water. We have survived droughts, fires, and floods, but the biggest threat to our region will be the development of the coal seam gas industry.

Santos plan to depressurise the aquifers, removing 37 and a half billion litres of water over a 20 year period. This will then, coupled with the irreplaceable damage by drilling through Northwest New South Wales would by far outweigh the gas industry

in relationship to profitability and jobs. I am fearful that this will be the start of gas fields being established over a much larger area. So is this why so much is being invested into the proposed Western Slopes Pipeline which sits close to my property? We are able to coexist with renewable energy sources, but we'll never be able to coexist with the gas industry. Stock need and require a peaceful existence, using the best animal practices which is a requirement for clean, green environment, unlike the gas industry with its dirty fossil fuels. One thing I am a hundred per cent sure about is that we can all live without gas, but no one or anything can live without water. So, finally, I ask, who has the answers? I believe it is in the generations of the past, present, and future. I hope there is a future with clean air and water, something I believe we all have a right to. Finally, I ask, who is responsible when it has all gone terribly wrong? Thank you for your time.

MR O'CONNOR: Thank you for your presentation, Stephen. That concludes day four of this public hearing. Thank you to everyone who presented today for their engagement in this consultation process. Our questioning of a number of the subject matter experts has caused us to run over time, such we have not been able to get to all the scheduled speakers today. We apologise for any inconvenience this may have caused. We have brought forward our start time tomorrow to 8.30 am to listen to the views of those who missed out on presenting today. As usual, a transcript of today's proceedings will be made available on the Commission's website. And just a reminder, that the Commission will accept written comments from members of the public up until 5 pm on Monday the 10th of August 2020. We look forward to your company at the earlier time of 8.30 tomorrow morning. Thanks again.

MATTER ADJOURNED at 5.21 pm UNTIL THURSDAY, 24TH JULY 2020