



## ***Darwin – Origin Energy***

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**05 February 2018**

***Darwin Convention Centre, Darwin***

***Speaker: Dr. David Close and Mr Alexander Cote***

Hon. Justice Pepper: When you're ready gentlemen, if you can please state your names and who you're appearing on behalf of, thank you.

Dr. David Close: David Close from Origin Energy.

Alexander Cote: Alexander Cote from Origin Energy.

Hon. Justice Pepper: Thank you. Yes, when you're ready.

Dr. David Close: Thank you very much Justice Pepper and panel for the opportunity to present this morning, primarily the release of draft final report. We'd like to acknowledge the fairness of the draft final report and the clear position taken by the panel on a wide range of issues. Many of the recommendations in the report align with Origin's approach to development, including stakeholder engagement, cultural heritage protection, environmental monitoring, and project execution. In our recent submission to the draft final report, we have not sought to comment on all recommendations. Where we have not commented, we either accept the recommendation in principle, or we consider it's possibly not helpful to comment until there is further policy detail as to how legislation would give effect to the recommendations if they're ultimately accepted, maybe enacted.

These recommendations that will require a more detailed understanding of policy proposal and operating environments will need careful consideration at the time to be effective. Where we have made responses to specific recommendations, that's typically where we consider the level of prescription exceeds the level of knowledge we currently have as to the issues that may be faced and the details of any risks. We look forward to the opportunity to contribute positively to a robust, collaborative reform process to ensure fit for purpose, objective based legislation that enables responsible development of onshore gas in the Northern Territory. Today, Alex and I will speak to full specific and distinct yet related subjects. Regulatory reform, aquifer protection and well design principles, strategic assessments and land access and insurance once more.

So firstly to regulatory reform. We note that the highest number of recommendations in the draft final report are in chapter 14 on regulatory



reform. Origin certainly supports a rigorous and comprehensive regulatory and legislative framework for the Northern Territory in preparation for the potential onshore gas industry expansion. And much of this reform potentially will be to legislate what is currently in regulation, and in many instances we posit that it's therefore accepted industry practices would be very appropriate to be legislated. While the process is underway, which is likely to take a number of years, it's critical that existing legislation and regulation remain in force to allow the review process to be thorough and comprehensive without causing undue delays to the exploration appraisal activities and baseline studies that are going to be needed to inform the potential for a viable onshore gas industry in the Northern Territory.

We support the panel's recommendation that legislative reform should be mature prior to the final approval of any large scale onshore gas development in the Northern Territory, however we consider it's not necessary for the reform process to be final and complete prior to the granting of approvals for small scale exploration and piloting or the approval of production licence, which in itself is simply a permit instrument and grants no authority to undertake development activity. We've suggested in our written submission several instances of the term 'production licence' be replaced by something to the effect of authority to develop and produce to remove any ambiguity between permit management, tenure types, and activity approvals.

Moving away from the tactical detail to some of what we think are important objectives of the legislative reform, be to ensure that assessments of developments or activity with the potential to impact the environment are comprehensive, rigorous, and risk based, but don't involve unnecessary duplication and do insure a really clear accountability, and the assessment process is efficient to ensure productivity's maximised by all parties. During the reform, careful consideration will be required regarding the continuous and ongoing responsibility of states and what may be covered under Commonwealth legislation. This will be particularly relevant to water management and provisions that could become mandatory whether appropriate or not if the EPBC water trigger is mandated for all unconventional gas projects. Equally, the objectives and requirements of a SREBA type process will need to be designed to complement rather than partially replace or duplicate existing requirements such as comprehensive Northern Territory EIS requirements or Commonwealth EPBC requirements. And once there is more detail about how the SREBA would be implemented very keen to have the chance to look into that further.

Critical elements that are designed to prevent adverse environmental impacts should be applied to all industries and not selectively in our view. Applying them selectively will not achieve the objective of being holistic and inclusive of cumulative impacts, and we think that applies broadly to a number of recommendations that we entirely support and agree with, but if applied purely to the onshore gas industry will not achieve their effect of understanding potential cumulative impacts that multiple industries could introduce into an area. Specifically, in relation to the recommendation 14.32 of the draft final report regarding the option one or option two that is



detailed in the report, we make the following observations: that both options provide positives and come with different types of risks that will need to be managed. Of the framework options described, we see the most positives in aspects of option two that would create some kind of one stop shop approach, although we suggest that the regulator must be responsible for all petroleum operations in development, not only unconventional operations for practical reasons.

**6:00**

Hon. Justice Pepper: But you realise our terms of reference are strictly directed towards onshore or shale.

Dr. David Close: Right, so that'll prevent making-

Hon. Justice Pepper: Correct.

Dr. David Close: -broader recommendations.

Hon. Justice Pepper: Correct.

Dr. David Close: Okay.

Hon. Justice Pepper: Which is why we've been very careful in our terminology. There would be no, I'm sure disagreement, and I'm sorry to butt in-

Dr. David Close: No no, of course.

Hon. Justice Pepper: It's one of the rare times that I've done so, but in case you go down a tangent, there would be I think no disagreement here from this panel. It obviously would be ideal if the government looked more broadly at all extractive industries, but our terms of reference limit us strictly to onshore shale.

Dr. David Close: Okay, that's a helpful context and a good reminder. So I think that's probably given in due course during legislative reform that last point then.

One point regarding the characteristic key components used in proposed regulatory reform agency, which already stipulates water environment and geology as well it should, there was a bit of a lack of recognition of petroleum operation disciplines such as drilling and completions, production operations, instrumentations and facilities engineering, and process safety that we think perhaps could be more clearly articulated. And what these, the lack of sort of recognition, this point does highlight a potential issue with dual regulators which option one might provide for where either both regulators must sustain expertise in these areas or the legislation must attempt to create a seamless handoff at some accountability boundary. Which can be difficult to implement we know, so we recognise why you put two options in there and we can see positives in both, but that broad skillset is one that we recognise as a potential gap.



One other point regarding the appropriateness of either of the options in the regulation is that, the quote in here, "The extreme remoteness of many sites and the dispersed nature of unconventional operations will create increased risk on the regulatory framework." We would contend that large conventional fields, for example the Cooper Basin, the Western Canadian Sedimentary Basin, face very similar geographic challenges and are remote, large, and dispersed similar to what potentially in the Northern Territory, depending on where it was in the Northern Territory, could be, and that the regulators in those jurisdictions are effectively ensuring compliance. A small point.

Importantly, both options discussed in the draft final report allow for an objective based approach to regulation, which we believe will lead to the best overall outcomes. And however, as Origin has previously submitted, we do accept a prescriptive minimum may be appropriate in certain circumstances. But in general, prescriptive legislative requirements are very unlikely to be optimal across the entirety of the Northern Territory with such a range of physical geographies, geological variations, and climate patterns. And for example, a few examples of this, enclosed water tanks for storage may not be appropriate for all environments all the time and therefore we see that shouldn't be mandated. Anyways, we'll talk in a bit more detail to this. Pad space in prescription, particularly when we find that a linear rather than area basis could potentially decrease overall efficiency of a development and require a greater overall footprint. If minimum spacing is prescribed, an area based approach, which we presume, and it was a presumption that it would achieve the same objectives of the panel, is preferred as it recognises the asymmetry of pad spacing associated with the fact that wells are drilled directionally off a pad.

Finally on prescription, the requirement for all environmental baseline and monitoring data to be made public in real time we consider overly prescriptive. But in stating that, we do accept and support transparency in reporting as an objective principle. What we would suggest is that appropriate disclosure and reporting should be fit for the purpose of the project, environment, potential receptors and data type. And specifically to ensure quality and easily interpretable results, regular reporting is likely to have higher public benefit than a continuous stream of data that has not had any quality assurance or interpretation. We do accept the requirement for independent audit or to make sure the full raw data are available by request might be required to ensure prohibitive data collection and reporting. But in terms of interpretability and use by the public, regular reporting of high quality is preferable to a continuous stream of digits that are pretty difficult to interpret for most people in the public domain.

As the current largely objective based act, base and base directives can be introduced as required and this could assist with the swift implementation of selected recommendations to allow activity to recommence if the current moratorium is lifted following this scientific inquiry. By continuing exploration and appraisal activities under the current act, operators in the Northern Territory government can continue to acquire baseline environmental and geological data as envisaged in the draft final report.



These data will be critical to ensure development projects, if ultimately proved viable through exploration, appraisal and piloting, can be progressed responsibly and without undue timing pressure on environmental stays and approvals. So we would like to keep going with the activities we've got proposing.

A little bit more on timing which we've touched on a couple of times. We wanted to comment on the timing of regulatory reform project progression and estimating time to project ramp up, if it is successful in the exploration phase, and where the approval of production licence falls in that process, and some comments that relate back to section 14.3 and the flowchart in the draft final report. The flowchart admits a sufficiently substantial number of key steps that we thought we'd comment on it to give a bit more basis to why it would take such an amount of time after a production license's been granted before any serious activity would commence. We're currently in the NA phase as we've spoken about and the activity that's currently proposed is exploration appraisal activity.

It will take a number of years of that type of activity to inform an optimal piloting strategy, which will also likely be multiyear. At some point during the exploration appraisal or piloting phase, it's likely that the exploration permits that we operators currently hold will transition to either retention licence, which come with certain tenure conditions, or a production licence if sufficient confidence can be justified to the regulator. And if you do get a retention licence and want to proceed at some point in the future, it transitions to a production licence on application. Once a PL, production licence, is confirmed there are still many key steps, each which likely take multiple years to conclude but some of which can be progressed in parallel.

And some of these activities, substantive activities, include detailed field development planning, detailed project planning and costing, pre-front end engineering and design i.e. pre-feed, and then feed work. That's critical, and there would also be negotiation of production agreements with traditional owners, negotiation of compensation and access agreements with pastoral leasees, heads of agreement and ultimately gas sales agreements with pipeline companies and gas buyers that will be critical commercial negotiations that would likely be very substantive. Environmental impact statements, including any necessary EPBC referrals, social impact assessments, all of which if successfully completed support a final investment decision which would then be followed by contract tendering, review and award, which would likely be a substantial amount of time for the project ramp up.

Ultimately, final regulatory approval and outline of conditions once all of those pieces of the puzzle are in place. So then substantial underground activity could occur. So at least, and it's difficult to predict, but we would say at least three to seven years after the grant of a PL in almost all realistic scenarios before you would be ramping to allow or consider a large scale development activity as per our previous submissions.



So I think the point of this, partly, is again relating back to production licences which can occur and be granted quite early in a project life. Part of the Northern Territory tenure management system rather than some kind of final project sanction, and they need not be linked to regulatory reform timing. Just continuing with the regulatory reform and compliance piece, in addition to the extensive discussion of potential future models of regulation in the draft final report, there's also an extensive discussion regarding the schedule as a regulatory tool and also industry compliance with regulations ... Excuse me. For example, a quote from section 14.3, "The schedule has been described as an ineffective regulatory tool." I would like to talk through the process of the approval of the Amungee NW1H hydraulic fracturing stimulation in 2016 to both show Origin's compliance, but also illustrate that the existing act, schedule and other regulatory guidelines, provide for a comprehensive approval process for individual or small scale activities.

In section 14.7 of the draft final report, the following is stated: "But the requirements of the petroleum environment regulations can be readily circumvented by gas companies. An example of this was Origin's Amungee NW1H well." So as I read the draft final report and sort of soaked in that really, found a bit confronting frankly, because the above statement suggests that Origin attempted to circumvent relevant regulations in its application. I can personally attest that this is categorically not the case, and I want to be able to discuss or ever intentionally or even considered that we were circumventing any regulations. And I'll go a bit further into detail and provide some more detail in our written submission.

Origin was formally advised by the CEO of the Department of Mines and Energy directly to our managing director in Sydney, so straight to the top of our corporate structure, that existing environmental management plans or EMPs such as Origin's EMP for the hydraulic fracture stimulation which was submitted substantially before those regulations were introduced in July 2016 would be considered current plans as far as the new regulations were concerned and there would be a window up until December 1st of 2017 under which current plans would continue to be valid such to provide a time to transition to the new regulations. And we, from the date of that letter, had confirmation that our applications would be assessed against the current regulations and were very clear on that and continued down that path.

It is worth knowing that we voluntarily or at the request of the DME provided the information required to bridge the gap between the preexisting and updated regulations, primarily providing full disclosure of all additives in the stimulation fluids and providing a summary EMP for public release on the DME website. We had absolutely no issue complying with those changes even though obviously it was a somewhat voluntary process because the old regulations didn't require it. The timeline of approval under the current act of regulations demonstrates that it's very difficult to change regulatory requirements overnight, and of course if there's some reason they are manifestly unsound and for safety reasons you would expect overnight compliance we'd change, but in this instance where it was mostly



around reporting and changes of approach, we'd consider that it was very normal to continue under the EMP that we had been drafting and finalising for some months rather than immediately in the space of a day in the middle of an operation to transition to some different regulatory requirement. It was not because the previous ones were manifestly unsound for safety or environment reasons.

The process of approval for the hydraulic fracture stimulation ran for many months before the final approval, and it should be known drilling of the well was approved and executed previous calendar year, so it was a multiyear process in totality. External approvals required review by the Department of Mines and Energy at the time, other territory government departments, and the environmental protection agency. And this of course is all additional to the extensive internal reviews and assurance that is undertaken by Origin as a matter of course. I would point out that the final approval was also conditional on a successful pressure test, which was reviewed by the department prior to the final approval. So even at that final step, there is "If your pressure test exceeds these requirements, then you have met the conditions to proceed with the activity."

And we do recognise the broader intent of this section of the draft final report was to point out that the current acts allow some discretion to be applied broadly and that could erode public confidence in the regulator and its processes, however we believe this point can be made without impugning Origin's reputation and we respectfully request that the suggestion Origin circumvented regulations is reconsidered in the panel's final report. With that I'll pass to Alex, who's going to talk a bit further about drilling codes and practise and specifically category nine wells in the draft final report.

Board Members: Thank you very much David.

Alexander Cote: Thank you for allowing me to speak today. I would like to discuss recommendation 5.3. recommendation 5.3 reads that "In consultation with industry and other stakeholders, the government develop and mandate an enforceable code of practice, setting up the minimum requirements that must be met to ensure the integrity of onshore shale gas wells in the NT. This code must require that all onshore shale gas wells, including exploration wells constructed for the purpose of production testing, be constructed to at least a category nine or equivalent standard with cementing extending out to at least the shallowest problematic hydrocarbon bearing organic carbon rich or saline aquifer zone."

Firstly, let me say that Origin supports a code of practise setting out minimum objective based well design standards. As noted by Origin and reiterated by the panel in the draft final report, the most effective way to ensure this objective is to require that the surface casing is set below the aquifer and that the top of cement is above the shallowest hydrocarbon bearing zone. Origin in principle would support the development of a code of practise that would ensure such risk mitigating well design requirements are in place for all new oil and gas wells. Origin does not agree with the



panel's recommendation that all future shale gas wells be designed to a category nine standard. This is overly prescriptive and requiring an individual standard across all wells may not be appropriate for all targets and all basins.

The aspect of this recommendation that Origin does not agree with is the fact that category nine wells need to be constructed with an intermediate casing string. The need for an intermediate casing string for the Beetaloo wells is not driven by well integrity considerations such as preventing fluid migration. The need for an intermediate casing string is driven by safety and operational factors during the drilling phase. The most important consideration is ensuring a sufficient kick tolerance. Secondary considerations include ensuring adequate hull stability, minimising differential kicking, and addressing directional drilling concerns. The Beetaloo wells drilled by Origin required an intermediate casing string due to our internal well construction requirements specifically around the need to maintain an adequate kick tolerance for each well based on the respective target depths and predicted formation properties.

Although Origin's exploration wells to date in the Beetaloo have met the category nine definition, it is possible that other targets such as the Kallang formation could be effectively drilled and fracture stimulated with a different casing configuration while still maintaining redundant barriers and meeting Origin's internal drilling and completion standards.

David has given several examples of how prescriptive and objective based risk mitigating frameworks may lead to different outcomes in his earlier section. I'll provide an additional example of where I believe an objective based framework would result in a more optimal result than prescriptive one would have. As stated several times, all of Origin's wells drilled in the Beetaloo, Kalala S1, Amungee North West 1 and 1H and Beetaloo West 1 meet the category nine well requirements outlined in the draft final report. Prior to drilling these wells and as a part of Origin's groundwater risk assessment, Origin considered the risk of cross flow between two shallow potable aquifers across the permits. This risk was reviewed in detail as the NT objective based regulations prohibit aquifer cross flow regardless of environmental consequence. This particular portion of the risk assessment has drawn media attention of late and has been interpreted as Origin willingly accepting the risk of aquifer cross flow between shallow potable and deep saline aquifers.

This is not true. Firstly, the risk was concerned with the cross flow between shallow potable aquifers. Secondly, this risk only exists in certain areas within the Beetaloo basin. Lastly, the risk matrix that was commented upon by the media reflects the risk without the implementation of the final controls employed at Beetaloo West 1. The risk of aquifer cross flow between shallow potable aquifers is only present in the southern portion of Origin's permits. As such, the well design used at Kalala and Amungee did not account for this risk. Had the same well design been used at Beetaloo West 1, there would've been a risk of cross flow between the freshwater Cambrian and the freshwater cretaceous aquifers. To mitigate and





ultimately eliminate this risk at Beetaloo West 1, casing while drilling was employed which allowed the constant setting of casing while drilling and sustained an annulus pressure preventing cross flow between aquifers. A standardised prescriptive category nine well may not have addressed this risk properly.

As forementioned, all wells were designed to category nine standards but only the Beetaloo West 1 design managed to eliminate the risk at hand. This is another example of how objective based regulations will allow operators and regulators to better address regional and area specific risks and we'll submit further documentation to this extent. To summarise, a code of practise that sets out minimum requirements to ensure the integrity of onshore wells in the Northern Territory, whether they are targeting unconventional or conventional reservoirs that include a level of prescription regarding casing and cement placement in relation to aquifers and hydrocarbon zones is supported. However, requiring all wells to be of category nine and therefore have an intermediate casing string is not.

I will now move to some of the integrity testing considerations that were discussed in 5.1. Origin also supports the requirement of integrity testing prior to hydraulic fracture stimulation through pressure testing and CBL, cement bond locks. Origin believes that the focus of this recommendation should be on the confirmation of integrity at high pressures prior to hydraulic fracture stimulation. Once the wells on production, that is, post hydraulic fracturing, operating pressures are much lower and the best diagnostic tool for a loss of integrity is constant surveillance, not discreet testing. Therefore, the focus should be on monitoring the casing annulus pressures to ensure that firstly, there is no methane or pressure where it is not expected by design, and secondly that all required maintenance is completed to design and schedule. This process of monitoring and surveillance is continuous, and allows for the rapid response to any issue with well integrity and complements the requirements to undertake well head and component maintenance and integrity testing. This is something Origin already does on our Beetaloo wells as part of our internal well integrity management system.

I will now discuss a few things in relation to water management. Firstly, again, Origin supports the majority of the recommendations regarding water usage and water monitoring presented in the draft final report. There are two points that I would like to discuss with you in relation to water management. The first is regarding water allocation and the second is around the requirement for enclosed tanks. As the panel notes on page 326 of the draft final report, it is forecast that even in a high activity scenario such as ACIL Allen scale scenario, the gas industry will be a minor user of water relative to other users in the Northern Territories. To ensure the panel's recommendation regarding a holistic understanding of aquifer recharge, water usage, and strategic water allocation plans are effective, we consider it critical that all water users are captured by the panel's recommendations.



We suggest that WAPS must be pan-industry and not just include in scope the rate and volume of water extraction by gas companies and that regarding make good provisions, there is a greater clarity that only draw down resulting from gas company extraction is a trigger for a gas company to trigger the make good provisions on a gas company.

Hon. Justice Pepper: Again, I can only repeat what I said before, which is that our terms of references limit what we're looking at.

Alexander Cote: Yeah, and understood.

Hon. Justice Pepper: Okay.

Alexander Cote: As currently stated, any reduction in water level would be assumed to be in scope for a make good provision. And again, understand the point that you just made. Origin also support the principle of transparency with regards to baseline and monitoring data availability as recommended by the panel. The monitoring program and monitoring wells within the program should be fit for purpose, site specific, and designed in conjunction with the WAP and SREBA that will be required under the recommendations. There will likely be reporting requirements under the WAP and or SREBA, and these would be preferred to prescriptions regarding real time and publicly available, as there will likely be practical challenges to real time streaming of large volumes of uninterrupted and uncollated data directly to the public. We therefore request the panel to maintain an objective or outcome based focus for the monitoring recommendation.

We also request that an appropriate offset distance is recommended rather than mandated, and again, this should be fit for purpose. For existing bores on pastoral stations, compensation for use of an existing bore or a request for a new bore should be agreed through the land access negotiations.

Lastly, I would like to discuss recommendation 7.11, and in particular the requirement for enclosed tanks to be used to hold all wastewater. Managing wastewater is fundamental to successful operations in any shale gas development, and Origin supports collaborating with stakeholders to holistically manage wastewater. This recommendation seems to be in part driven by what BHP is currently undertaking in the Permian basin. Firstly, what is suitable for the Permian may not be the correct solution in the Beetaloo. Secondly, I wouldn't consider BHP's practices necessarily to be industry leading, and would refer the panel to the recent JPT issues for a more robust overview of industry leading practices in the Permian basin with regards to water management.

We suggest that it's premature to prescribe universal standards given the diversity of the environment, project phases, and site-specific requirements that operators could face across the Northern Territory in exploring or developing unconventional gas. Existing EIS processes or the panel's proposed SREBA process will provide fit for purpose and site specific conditions that are appropriate to the operating environment. Specifically, to prescribe that all wastewater must be stored in enclosed tanks is, in our



view, unnecessary and increases the risks elsewhere. At different project phases, evaporation may be the primary means of reducing the volume of wastewater that requires transport. The land transport of large volumes of would engender different risks than the evaporation of wastewater from above ground.

Double lined ponds were used successfully by Origin at Amungee Northwest 1H, and have been used successfully in similar environments across Australia and internationally. Much of the ability for companies to recycle large portions of flow back water is thanks to the successful construction of double lined aboveground storage ponds such as in areas like the Marcellus and the Montane. The risk of overtopping can be managed, and we concur with the panel's observations in the draft final report on page 139 that design must be based on the maximum probable precipitation event coupled with an appropriate wet season maximum operating level. The amount of free board required, a function of previous and forecast rainfall events, frequency, intensity, and duration, will be different in the Amadeus basin relative to the northern McArthur basin in the northeast of Arnhem Land. And therefore, the risk profile will be different.

Origin supports that for environmentally hazardous wastewater, double lining and constant monitoring of wastewater ponds is a reasonable prescriptive minimum, but proposes the requirement for all tanks being enclosed is not a reasonable prescriptive minimum. Thank you very much, and I'll hand back to Dave.

Dr. David Close:

Thanks Alex. A couple of pretty brief sections to summarise with finally. First on strategic assessments, which relates partly to some of the previous discussions Alex has introduced, we certainly agree that strategic and regional assessments are important and clearly a good practise based on experience in Australia over the five or more years, and we support the principle of their implementation. Assessments such as a SREBA will be critical to informing many aspects of multiple recommendations in the draft final report if ultimately accepted. Particularly relating to water, but also reporting and broader environmental baseline data requirements. The details of exactly how a SREBA will interact with existing environmental approvals and other EIS and or EPBC processes will be important to ensure the process is efficient and beneficial.

And we also note that a SREBA may not be the most appropriate mechanism to complete all baseline assessments. Certainly regional industry wide assessments are suited for many environmental aspects such as public health, groundwater and air quality, however other aspects will likely be more suited to targeted, localised assessments that will most likely be impacted through specific infrastructure placement decisions or factors that aren't necessarily regional such as terrestrial ecology, surface water, fire risk, and so there may need to be a degree of differentiation between what is optimally assessed regionally and what is optimally assessed on a local proponent scale.



In addition, we'd suggest a socioeconomics assessment that will provide key data if it is localised to a notional project area and a more detailed project scope, and it's likely to be unavailable when a SREBA would be most beneficial early in a project, so there may be some differentiation again there. But again, we certainly support the overall principle and the idea of collaborating with all relevant stakeholders and we suggest that for it to be most effective at scope is the key, environmental aspects of groundwater, greenhouse gas, air quality, and public health. And we think that such a program could be implemented effectively by an independent body with support of the Government and industry, and there's a lot to be worked out in the detail of such models.

Moving briefly to land access and particularly insurance as it does come up consistently as we've observed out of the last 12 months, we'd like to make some brief comments on the land access section in the regulatory reform chapter of the draft final report. Recommendation 14.5 regarding a legislated land access framework is supported by Origin, and we've stated that previously. We're comfortable with that, we know that coexistence between pastorals and the gas industry is possible. It's happening every day in our Queensland operations. Origin concurs that agreements should be appropriate for the phases of the project. i.e likely exploration or exploration appraisal may require a separate agreement to development and production, accept that principle.

Origin has entered into land access grants with all pastoral SEs in the Northern Territory where it's undertaken work as per the current DPII regulation. In these agreements, Origin's public liability insurance is explicitly detailed. However, in addition and what has not always or hasn't traditionally been our compensation and land access agreements is that Origin also carries further third party environmental insurance as well as comprehensive control of well insurance. These insurance provisions, which along with our contracted i.e the land access contract commitments to compensate for any impacts or losses associated with activities ensure the landholders can be confident that Origin is comprehensively ensured for any unforeseen event.

This has been an issue repeated numerous times by opponents of industry, and therefore we wanted to take this opportunity to share publicly that Origin does hold environmental insurance for impacts that don't have a specific and clearly identifiable immediate cause, and there are of course insurance companies that have these policies and make these policies available to resource companies. And it may not have been stated on the record previously, so very keen to make it very clear today. And we can provide more information if there's any specific information requested.

We would request that the panel support the continuation of the existing regulatory process for land access agreements to be negotiated until such time as a comprehensive legislative review is completed that we'll presume will include land access legislation. The current regulations have worked successfully across the Northern Territory with operators and landholders, and there is no evidence to suggest in cannot continue successfully until



legislation is updated. Without such a continuation, the critical data required from exploration appraisal and baseline studies won't be available.

So in closing, we again commend the comprehensive nature of the draft final report and the research and consultations that underpin it. The report maps a potential pathway forward for the Northern Territory Government to establish the necessary framework for a responsible, well-regulated onshore gas industry if exploration and appraisal ultimately prove successful. We support the efforts to keep legislation and regulation objective based to promote innovative ways of achieving impacts and agree that in some instances, prescriptive minimum standards are a necessary complement to such regulations. We look forward to the opportunity to contribute positively to a legislative reform process while continuing exploration and appraisal and baseline data acquisition in the Beetaloo Sub-basin basin if the moratorium is lifted following the completion of this inquiry. And of course, we do that in consultation with host traditional owners and impacted landholders. Data from the exploration activities and baseline studies will inform a thorough assessment of environmental and social risks and allow preventative measures and mitigation planning to be developed.

And for the benefits to the local traditional owners, pastoralists and broader Northern Territory community has to become clearer and be more clearly articulated than it can be today in such an early project phase. Such activity will remain small scale for a number of years and can be successfully undertaken under the existing acts and regulatory regime. And ultimately, if a project is able to successfully proceed, then gas production from onshore Northern Territory could support Australia's domestic and export gas requirements and contribute to our decreasing reliance on more carbon intensive fossil fuels as the Australian economy transitions to a low carbon future supported by renewable energy storage and responsibly developed natural gas.

I'd like to thank you all for your time, and of course we're happy to take any questions the panel might have.

Hon. Justice Pepper: Thank you. Yes, I'll start this way and work my way down this time. Yes, Dr. Andersen?

Dr. Alan Andersen: Yeah, I have, thanks very much for your presentation. So I've got a couple of questions for Mr. Close. And the first one refers to the draft recommendation in our report about mandating a minimum distance between well pads. And of course, the context of that is addressing public concerns about an industrialisation of the landscape and you know where we're coming from. And so I've heard what you say about the importance of having objective based versus prescriptive based regulation, and I see where you're coming from there. The problem here though is when the objective is so highly subjective, which amenity is as we talk about in the report, it makes it really difficult to not think about having some sort of prescription. And you said in both your written report and today about if there were



some prescription you'd prefer sort of an area based approach rather than a distance based approach, so I've got a couple of questions related to that.

And one is, so we've put out a figure of two kilometres and you talk about how that might unduly interfere with operations if there's some sort of geological anomaly or something like that. Could you give us some examples of how that might play out given that you can have wells coming from two places?

Dr. David Close:

It's very possible that two kilometres might interfere with a pad placement in a development, and it's possible that we could, not fully knowing what the layout of the pads may be in any given geography, that we wouldn't know what consequences may flow from that. And I think would be potentially manageable. The example that we referred to is if for instance there's something near the surface that prevents you drilling both directions where there was some sort of water course or sinkhole system in the carbonate and limestone or so forth that you don't want to drill directionally through or if there is some uncertainty on the location of faults, you want to set both the directions of drilling away from an offset from that location. You may way go with two pads to be more confident about avoiding other risks that are discussed throughout the report, and then of course we're aware when we do this planning, so in that instance there may be.

And they're exceptional ones we're coming up with but I guess the point being that if it's a strong recommendation then you must show strong cause as to why you would ever not comply with it, then you would be able to make a case to say "Well in this instance, the overall risk mitigation is most effectively done by what we're proposing here and we don't think, because in this instance it's away from the road, it's unlikely that occurring also in a place that directly impacts amenities," so you manage the combination of amenity, geo-hazards, prescription around pad spacing to provide a holistic overall minimal footprint, and so it is very likely to be able to comply with that two kilometre without impacting most notional design developments, but there could be instances where if it was mandated, there's no flexibility, the unintended consequences may be an increased other risk which was not the original intent of the prescription.

Dr. Alan Andersen:

And then your preferred option of having an area based, could you clarify what would you use as the area? So if we're talking about an X number of wells per area, the whole development area, you mean the whole-

Dr. David Close:

Yeah, well if we take the two kilometres spacing, somewhat logically it sort of defines a four square kilometre surface footprint. If you could have two kilometre that direction and this direction, so in fact that would be equivalent in my mind unless you're thinking about differently to a four square kilometre prescription, that would be much, that would be more likely to be manageable because we do have an asymmetry to the amount of surface area or subsurface area to be more specific that we cover, because our wells will likely drill out to three kilometres in a specific direction but unlikely drill out three kilometres in the opposite direction because that would be a very inefficiently drilled pad. You'd spend a lot of



time drilling at a high angle through overburden, not target, so more drilling time, lower productivity, less time in the reservoir for the same amount of surface footprint, so we tend to drill much further in this direction than we do drill out to maximise the overall efficiency of the development.

So there's a natural asymmetry. We don't, there have been some propositions that it's a spider type, we just go in any direction. It's a very clear bi-directionality of almost all unconventional pads. Certainly in the stress environment we anticipate in the Northern Territory there will be a strong bi-directionality to our drilling, and therefore we will have a greater distance in one direction than the orthogonal direction so a surface area, which I would assume meets a similar amenity and avoids over industrialisation would have a higher density in one direction than another, so that's what we're trying, I'm not sure if that's a clear description but that's what we're trying to get across.

Dr. Alan Andersen: Thanks for that. And then my second question is to do with weeds. And so in your written submission, you expressed some concerns about the recommendation of having a dedicated weeds officer. And one of the issues we've discussed and talked about in our report is that weeds are going to be a particular issue for development throughout most of the NT landscapes because they're so largely undeveloped, so few weeds in them, and there's going to be an awful lot of traffic coming from outside potentially bringing weeds in. And so that's why we've put as a draft recommendation about the need to have a dedicated weeds officer, because the areas are so extensive that unless you have some very intensive monitoring, you're just not going to pick up weeds before they cause a problem. And so in your written submission, you talk about it'd be much better just to leave it to the management plan and have it more objective based. But I just want to ask you, what situations could you imagine where you wouldn't need a dedicated weeds officer to play that role?

Dr. David Close: Yeah, it's the specificity of it is possibly maybe just where there's a break between what we consider ... Because I think it's an absolutely vital thing to be considered, and again I know it would be area dependent and there are some areas where on our permits there are already weed issues that have been there for some years. There is already a lot of cattle traffic, movements, car movements and so forth, it's not an area that's undeveloped. So in some areas, it will have a different risk profile than others. We would consider that basic hygiene around HSE to be the responsibility of every staff member, particularly when you put it on a safety. There is, although we have HSE dedicated officers every single person is trained and informed about safety considerations to do with our operations with critical environmental where it is also very much a environment of speaking out about it, trained and know how to be compliant.

So I suspect there would be many people that in their position descriptions would have a responsibility of ensuring compliance with any specific conditions related to weeds, but the specificity of having ... So maybe it's a second hat on a roll as a HSE advisor or the many roles we would have



ensuring compliance with conditions, but it's struck out as a departure from the overall objective based recommendations around needing to achieve a goal, as to be prescriptive about a role. And so we made specific comment on it because of that level of specificity and not because we disagree with the fundamental principle of ensuring that weeds are managed effectively. Is that ...

Dr. Alan Andersen: Thank you.

Hon. Justice Pepper: Yes, Dr. Ritchie.

Dr. David Ritchie: Thank you Mr. Close. I heard you say that where you've not commented specifically on our recommendations that you've either accepted them or would like to wait and see how they might be implemented before commenting. Is that a reasonable interpretation of what you said?

Dr. David Close: Yeah, that's what we're trying to say, yeah.

Dr. David Ritchie: Can I take you through just a couple just to just see which category they fall into? Because just to say chapter 11, are you waiting to see how a specific recommendation like that you be required to get authority certificates to implement it, or would you say you support that?

Dr. David Close: Sorry, I missed the key element of your question there. Would we ...

Dr. David Ritchie: The question is that there are some recommendations that are very specific. One of them is that you be industry required to get authority certificates for work. Is that one of the recommendations that you feel is kind of, you're okay with, or is that one of the ones that you're waiting to see how it might implement? And my point being it's a pretty straightforward recommendation.

Dr. David Close: Yeah. I mean, we do it as a matter of course and don't anticipate changing that. There's a space of, particularly with NLC and the AAPA where we think it's most appropriate for the existing body to have strong representations to probably provide feedback. We certainly don't have any, we didn't specifically comment, we don't have any in principle disagreement with it.

Dr. David Ritchie: I guess it's that you said you either accept it or you're waiting, my question-

Dr. David Close: Yeah, no we're not waiting on further policy.

Dr. David Ritchie: Okay, so you're happy. I'm looking just to be able, as we finalise to be able to say. If you say you're okay, I'll write down, "David Close, said he's okay with it... (crosstalk)

Dr. David Close: With our NLC or AAPA counterparts, we haven't consulted with them on that specific chapters. We would probably defer to them, but we have no internal issue.





- Dr. David Ritchie: But I mean, this is just, this is not something that you would be, I mean it's not, it's just a requirement for doing something that you're already doing. I'm starting with that one because it's an easy one.
- Dr. David Close: Okay.
- Dr. David Ritchie: Now, the next one which is our recommendations that the Sacred Sites Act be amended to make it clear that it also applies to features that are under the ground. How do you feel about that? Will you think that's okay or are we waiting to see how it might be?
- Dr. David Close: Apologies that Stephanie couldn't join us today, and this is an area of her expertise. We have had some conversations with other counterparts. In our experience relating with our traditional owners, there is no anticipation that it stops at the surface. They can, I think there's a communication about a holistic current view of sacred sites, so I don't, in my observation there isn't a gap so that would be my comment that it currently that traditional owners feel that's the case.
- Dr. David Ritchie: Okay. Is there anything in that chapter then that you would definitely say you're feeling that has to be kind of we have to wait and see about, and I would like to explore what bit of it you would like to see about, or could I say for instance that you're pretty comfortable with all the recommendations?
- Dr. David Close: Yeah, certainly by and large comfortable with the pretty detailed review we have provided only very recently on Friday, a written response, it's literally one and a half pages of commentary mostly discussing it. So there will be a little bit of detail that's required, there's a little bit of overlap between potentially environmental versus social that we weren't entirely clear on, but we didn't see any fundamental issues that we're going to submit further detailed responses on at this point.
- Dr. David Ritchie: And on that basis, just to be again clear, you'd be quite comfortable with talking in the consulting communities over the next couple of weeks that I can say we've had Origin energy before us this week and that they've said, broadly speaking, in fact not broadly speaking, quite specifically speaking they'd be comfortable with all the recommendations we've made in that chapter?
- Dr. David Close: Yeah look, if I can double check my internal notes to make sure I'm not contradicting anything we put in our submissions, there are a couple of specific comments we put in there. And let me come back to you, back to the task force this afternoon with an email to really nail that question.
- Dr. David Ritchie: Okay. Thank you ... I think we'd agree that there is a number of our recommendations that could be more broadly applied to other industries. The chair's made it clear that that's beyond our limit to do. Specifically though is Origin's support of those recommendations, the one that you refer to as being more broadly applied, dependent on them being more broadly applied then?



- Dr. David Close: I don't think so. There always needs to be a standing point for any sensible reform and I think having valuing a commodity, which water can be in this kind of sense, is a sensible approach to making sure it's used efficiently and effectively, and I think as a principle I think we support that. In a lot of jurisdictions, we already operate under that way, so water is one where ... And again for weeds, it would obviously not achieve our goals of limiting weed transference if only a subset of vehicle movements are caught. And there's a large number of very sensible recommendations, particularly related to protecting the environment or minimising the impact of any kind of development that have broad application, but I recognise your point. It's difficult for you to comment or impossible for you to comment specifically on that.
- Dr. David Ritchie: I think again, just to be clear about where ... We've had a number of submissions about the lack of transparency in the way that the gas industry works. It could be read, if it's not clear that you actually support them in their own right, that you are not by broadening the application you're in fact inviting a broader based opposition so that you will in fact in effect hide behind a more broad opposition to some of these things. Would that be, I mean, how would you like to respond to that if that gets put to us in community meetings?
- Dr. David Close: Right. Well I guess a comprehensive approach to water allocation plans seems whether it's sandalwood and I don't want to call out, create issues with any particular industries, there are many industries that will use water resources. And all users should be held arguably equally to account to how it's sustainable for that water use to be justified and the regulator to use that information and to still communicate that information effectively. So certainly we've no intent that our use would be obscured by others. Happy for any kind of lump split that makes sense based on experts' best approach to it. Is that ...
- Dr. David Ritchie: No that's good, I'll put it another way, okay, that you would be happy for us to assume that you would be a champion of these reforms to other industries. You can accept them and would champion them in the interests of the environment in the Northern Territory community in general?
- Dr. David Close: Well, we recognise a trade off that some current water users, that're not under a water allocation plan may seem...
- Dr. David Ritchie: I am talking more broader
- Dr. David Close: Yes, we would champion it if it's appropriate... in a holistic sense
- Dr. David Ritchie: Hold on you say if it's appropriate, that is very much qualifying it quite massively.
- Dr. David Close: Right.
- Dr. David Ritchie: I think what I'm asking you is we have some very specific recommendations, they are in black and white. You've put to us that if you haven't commented



on them there that you accept them unless in certain circumstances the sort of devil's in the detail, how are they going to be implemented, which we understand. More broadly, you've said to us that a lot of the recommendations more generally would actually improve the way the industries are assessed and approved if they're adopted more broadly. My question was do you, would you champion that approach across the Northern Territory Government, or is it more likely, and this will be put to you by others, that you will seek to in fact water them down?

Dr. David Close: So I certainly don't see any reason that Origin would seek to water anything down. If I can be a little bit of latitude just for a second why it's difficult, because we have other stakeholders and landholders, traditional owners that may have a different view about what are resources to them and what they're currently allowed under existing regulations to champion a total transition to that because we're okay with it would be a bit naïve of us in terms of a holistic view about what the broader community of stakeholders in the community want. So from a pure perspective, I don't think there's any qualification required that a sensible allocation of water ensures sustainable yields and recharges that take into account allocated water given. If there's an unintended consequence to an existing stakeholder, I don't think I'm in a position to put Origin on my own viewpoint or their viewpoint forward to say I would champion against their current interest. I'm not trying to weasel words or caveats, just I don't know what may come from me championing something like that for instance.

Dr. David Ritchie: No, I understand that. But you were the one that put to us that they should be more broadly adopted, and I'm trying to explore the basis of that submission. You could've said to us "We accept them as an industry" and not talked about what might or might not be applicable to others, and seeing that you did. I'm just trying to explore how applicable and how much you would champion that particular approach taken by government.

Dr. David Close: As the general, we would certainly be supportive of the general principle applying to ensure the objectives are achieved, and on a case by case basis they make exceptions that warrant extra considerations. It does sound like I'm (cross talk) ...

Dr. David Ritchie: So you kind of more broadly, I mean I just think that that statement that ... My feeling having talked to you in this exchange is that it's more probable that you were seeking to expand, by talking about more broadly, you were in fact signaling that there would broaden the opposition to some of these recommendations. That's my feeling.

Dr. David Close: I think that's an observation that there may be opposition to that intent that it's intended to capture unconventional gas and ensure that that water usage is very carefully monitored and does not impact, but it doesn't, but there are probably existing interests that would suggest it shouldn't expand beyond that. So I think you're right that it could broaden opposition to the recommendation potentially. That's a ...



Hon. Justice Pepper: I think what Dr. Ritchie is trying to say politely which I'll say bluntly is that are you trying to basically suggest that any licensing and payment with respect to water should apply to the Northern Territory Cattleman's Association?

Dr. David Close: That's a difficult ... Certainly aren't here to create difficulties for other industries if they will consider such an imposition to be a difficulty. And there probably are members that do.

Hon. Justice Pepper: We are not recommending that. Our remit is only onshore shale.

Dr. David Close: Yeah, and I think if it does proceed, let's say new industries like sandalwood or expansion of mango into areas where it's not currently existing, would have to apply new water allocations. I'd say at a minimum going forward to preclude, and I know it's not in your remit, it would not meet our objectives of understanding what sustainable water take is on an annual basis if we're taking such a small overall use. And so we wanted to get it on the record and make it very clear that we don't object to that recommendation that our usage should be, but as the government read this and take it and consider what as a consequence it may mean for other industries that it should be considered to apply broadly so we get the objective, not simply added regulation that doesn't meet an objective, which I don't think is an overall productivity or environmental protection benefit.

Dr. David Ritchie: Okay, thank you.

Dr. Vaughan Beck: Dr. Close, different tack. You noted in your presentation today and also in your submission that you've raised concerns about public disclosure of data, in particular related to quality assurance and interpretation of data, and you've requested that as an alternative the regular and routine reporting of data. I do note that in southeast Queensland there's already reporting of data in terms of PM 10 2.5 ozone, nitrogen oxide, carbon dioxide, which is already online. And I presume that Origin is already a participant in providing that data. So I'm wondering why on one hand you're involved in online data and now during your presentation today, you're raising concerns about the disclosure of that data.

Dr. David Close: So thanks for that question. Good to elaborate. There's certainly in Queensland a number of instances there are large amounts of data that are continuously publicly disclosed, there's an excellent hydro-geological monitoring network that Origin reports consistently and there's a standard format and it's a very efficient process that works well. Similarly, for a limited number of air quality stations, it's a continuous reporting for a limited subset. So it's certainly not all data, and is it on a one second basis or a one-minute basis or a one hour basis? The proposition that it's all real time continuously just going into the ether could, for the number of parameters we measure for, most of which will not change in 100 years like the pH and so forth. So we can put that out as an eight-bit data point every second and create a volume of data.



So I think the objective is to make sure the information is available to people who want to be able to observe that data either in real time or on a regular basis, and we absolutely agree with that. My concern would be that all data is continuous in real time creates other propositions about, particularly in a remote area, about getting data out. We'd have to build an entire ... Not asking for sympathy around having to build telecommunications infrastructure, that's a reasonable expectation, but to how those things would interact. So it's not, again we absolutely in the condamine seeps example, we have voluntarily put data on the internet available real time about what level of gas coming out of the river which is and various other instances.

So as a philosophy, very much support transparency and it is in the detail of exactly how it gets legislated. It'll be important that we don't unintended, we're not trying to dump data on people such that they can't do anything with it. And that was intended to be sort of the tact perhaps we haven't communicated it very well.

Dr. Vaughan Beck: Thank you for that clarification.

Hon. Justice Pepper: Just picking up a theme that Dr. Ritchie asked you about, so I assume that because there's been no mention in your submission in relation to the recommendations about sort of greater access to justice in particular open standing provisions and civil enforcement that you are in favour of those.

Dr. David Close: Yeah, I think the only comments we made in our submissions were that there should be some clear guidelines around timing that would mean that projects aren't indefinitely delayed or vetoed by...

Hon. Justice Pepper: You say vetoed, what do you mean by vetoed?

Dr. David Close: So if it's not clear about any kind of timeframe to resolve issues, new issues can be raised to create an effective veto by delaying any kind of project sanction on specific activities. So if continuous submissions relating to the Amungee NW 1H proposition 2016 were considered and the government were required to consider each of them as they in turn, would they still be able to provide an approval which meets all the requirements of the legislation? So I think that was our fear, that we may create such a volume of an avenue that a high volume of submissions could derail otherwise valid applications.

Hon. Justice Pepper: We're not talking about submissions, we're talking about the ability of citizens' groups to challenge decisions made by the government in relation to permits approvals, licences, in court. So you're in favour of that?

Dr. David Close: There's certainly, there are various viewpoints that have been in internal discussion. We didn't see any reason to comment specifically on it. So we think that there are positives to allowing that. We think there could be practical challenges to it.



Hon. Justice Pepper: What practical challenges? Bearing in mind that I come from New South Wales, I'm a judge of the land and environment court still, and we have open standing so I'm just curious what challenges would that present?

Dr. David Close: I think ... on balance not a deep expert in this area to speak to it and I'm happy to try and find the people in Origin, we do have people in this space that could speak more detail. And I think on balance we didn't comment because we do see that overall in terms of the direction industry is moving that it's likely that will be where we land. And so I don't think we have any reason to make any specific commentary on it. And so I guess yes on the principle that we generally support if we haven't commented on it specifically. If and when it was legislated with greater detail, and maybe it doesn't require legislation, I don't know how that would be enacted as a recommendation if it's accepted by the courts. Beyond my first year law expertise.

Hon. Justice Pepper: With great respect Dr. Close, there's a lot of ifs, there's a lot of where appropriates, there's a lot of well we need to see more detail. I think we're entitled to know and certainly possibly the Northern Territory's entitled to know exactly where you stand on many of our recommendations. So again, I'll press you in perhaps some ways that Dr. Ritchie didn't, which is that where you have not specifically commented upon a recommendation in your submissions, can this panel assume that you are otherwise in principle in agreement with them?

Dr. David Close: I don't think categorically you can assume that, because we don't think that in all instances there's enough detail to know that we should provide specific commentary rebutting some of that recommendation. And I think until they are more fully articulated, we won't be in a position to say that. So there are some clearly specific examples that were drawn out and submitted in our submission. That does not mean that all of the other ones we think if taken word for word as they are would be overall beneficial to the objectives that ... I think we have a very shared agreement on objectives and we don't necessarily know how that brief recommendation that might be one or two sentences, the detailed legislation that would be required to enact that could take many guises. And without knowing what that would take and what that would practically mean, and it could mean many things in different environments, I think it's really quite difficult to expect us to be able to make detailed comments saying yes we accept or don't accept without, we would have to go through and say we need further information on these.

And there are many, many that we just say accept, accept, accept, accept. We'd be happy to provide you our internal sort of summary of where we just say accept, accept, accept, because there are as I said many dozens of those, but not all fall into that category.

Hon. Justice Pepper: We'd certainly, if there's a list of at least those you do definitely accept we would certainly appreciate that. That would be as a matter of clarification. This is first point. Second point is that ... I've got three points, so the second point is that again, we've had lots of presentations now from lots of people,



particularly from lots of industry people. We've gone to lots of consultations remotely and up and down the spine where one of the critical things that people talk about is the need for the creation of jobs, local jobs, local long term jobs in aboriginal communities and non-aboriginal communities. We've had lots of great motherhood statements about what a great idea this is from gas companies, but most of the submissions, in fact almost all of the submissions have been pretty scant on detail, perhaps with the exception of Central Petroleum.

We would really like to see some examples of how there can be the creation of jobs and long term jobs and training opportunities, not just high-level motherhood statements from you, from Santos, from other companies as well. I'm putting that out there on the assumption that others are watching.

Dr. David Close: Right. So I would comment, I can see why Central would've provided a far more substantive and detailed response to that specific question. We in the area where our permits are, there are some, what we'd call, there are locals, but most larger towns are quite some distance away. We haven't done a detailed plan of what it looks like and where employees come from and who drives from where, how many are local based that aren't currently a local population. I'd love to give a more satisfying answer and make some solid forecasting, I think (crosstalk)-

Hon. Justice Pepper: Well we're not looking even necessarily for forecasts, we just want some examples of some programs that could be implemented, some ideas, something more concrete than yes we all agree and that's what we should strive for.

Dr. David Close: So in our, Origin publishes a sustainability report on an annual basis, our FY17 sustainability report talks about the directly employed people from the local community. 157 people from the local community, which is 20% of our regionally based workforce. There are a number, I can find out the exact number, a number of apprentices that are being trained through the various regional centres where we have operations. We have institute regional buy programs and we are increasing the amount of materials we buy locally so we can report to that, and our sustainability reports will continue to report on those objectives. We have transitioned our workforce from standalone people camps outside of the towns into local towns, measuring the knock on impacts to the local economy aren't trivial, but we anticipate they will continue. And we are spending hundreds of millions to over a billion dollars each year in totality in southwest Queensland.

I certainly hear the request, and we'll talk to colleagues and see if we can come up with some tactical supporting material if that's what you're asking for.

Hon. Justice Pepper: Thank you, just illustrations of examples of where these programs have been implemented, ideas, how this would work obviously in the Northern Territory context bearing in mind where this development, if the government lifts the moratorium, might take place. That was the second thing. The third thing is that you said that there was, you suggested that the



term 'production licence' in the report should be replaced because it was ambiguous. That was a term that was deliberately chosen, so how do you say it's ambiguous?

Dr. David Close: So the production licence, is it considered, the way it reads in context was it was approval with some kind of development.

Hon. Justice Pepper: Yes.

Dr. David Close: It's also used in the permit management system as a kind of tenure that we apply for as distinct from exploration permit, and it does come with certain rights to apply for production activities, but in and of ... We arguably would have sufficient data in our Amungee NW1 area to apply for a production licence, but we would have all those steps articulated to go from having a PL, which gives some level of tenure certainty, it gives you a 15-year window to proceed to development I think is the timeframe, instead of a five-year window under an exploration permit to continue with your E and A activities, and then certain relinquishment requirements kick in. So in that sense, we may apply for a production licence if the moratorium is lifted and we have further confidence that that is an area where you would ultimately propose a production activity, but that would still be many years of processes that we would go through continuing with piloting, continuing to gather data, continual of commercial arrangements, make sure the project is confident to be economic, social impact assessments, environmental impact statements.

So as of now, a production licence is something that we talk about purely as a tenure instrument. We don't talk about it as an approval. And so obviously our advice can be taken for what it is, we just found as I read through it that I wasn't sure it meant to be that the production licence as a permit instrument should be delayed in being granted until these certain number thresholds should be met or if it's just the approval for a large scale project that should be delayed until those thresholds are met. So most reasonable readers will understand in context, but those less familiar with Northern Territory tenure operations may find it ambiguous.

Hon. Justice Pepper: Yes, Professor Hart.

Prof. Barry Hart: I have an initial question relating to the category nine, your feeling that that's too prescriptive. When you read out recommendation 5.3, you did note that we said category nine or equivalent. What's wrong with the or equivalent? Does that not cover the situations that you pointed out?

Alexander Cote: So really the issue with the category nine, if equivalent simply means that we satisfy the key recommendations that you put in there which is make sure that surface casing is put beneath your aquifer and the cement tops, I fully agree with that. The category nine, I think anything over category seven or eight off the top of my head based off the table would've had an intermediate casing string in there. So it's really around the notion of having ... So if you're targeting something at 1400 metres versus 2400 metres, the need for that intermediate casing string changes. So it's just whether we're,





the intent was to stipulate that all wells need to have an intermediate casing string, which all category nine wells would require, or the main design principle which is around cement and surface casing.

Prof. Barry Hart: We might need to clarify that, but my assumption of the 'or equivalent' was that the regulator would take those situations into consideration.

Alexander Cote: Okay. Maybe it's just the way I initially interpreted, but if it's really, the crux of it is around the couple of points that you stipulated prior to the category nine, then Origin fully supports those principles.

Prof. Barry Hart: We were looking for, and that table is very instructive, and we were looking for something that was flagging very, very good codes of practise. So that was the main thing, we'll have a look and see whether that needs to be ... The other one, can I just, a few questions relating to your disagreement, your dislike of closed tanks. I can understand a number of your points, but have you thought about a hybrid system? Yes, there's some advantages in open ponds in the dry season, particularly if you want to get rid of some of that water. Well, down in your area it's near enough to three metres a year evaporation, so perhaps about 1500 during the dry season, so there'd be some advantages there. But the wet season is a concern.

Alexander Cote: So again, it really comes down to what phases we're talking about. So in an exploration phase where we have a one off well, the number of truck movements along to bring in the closed tank storage system that is suitable for handling the amount of water that we need to deal with I think becomes problematic in an area that's as remote as the Beetaloo is. Once we start moving to a phase, if the Beetaloo ever moves to a phase where there's much more fixed infrastructure, hybrid systems become a much more viable place. It's just when we're dealing with one off wells, some of those systems will lead to other risks. If we're at the same time trying to minimise truck movements to a site, how do we balance those two risks in consideration?

So different systems have their different advantages. I wouldn't be surprised if some time in the future we are using a mix of systems, but early on during the exploration phase I think the ... When you also consider the number of ponds that we would have on a well site that we were stimulating in the exploration phase, initially you'd have the entirety of the water that you'd need which would be fresh water stored in those ponds. By the time we're done our operation, if we've planned out everything correctly we should've used all our fresh water. We're going to have the storage onsite will be much, much, much greater than the amount of water that we expect to get returned from flow back.

So the ability for us over short periods of time during a production test, during exploration, to manage the water levels in these ponds should be relatively straightforward. The amount of free board that we should have in any of these ponds should be great, because we should only be recovering over the course of the test anywhere between 20 to 40, at this point in time we'd expect between 20 and 40% of the total volume that we would've initially pumped.



Prof. Barry Hart: I mean, making the distinction between exploration and then the whole fracking operation for a pad, 10 wells et cetera et cetera, I still can't get my head around what the wastewater management system would look like there. Because that's going to occur over 10 wells at least a year, probably more.

Dr. David Close: So the fracture stimulation period is smaller, because you'll be doing just on the period of time before we handle it, it would be not a single operation at that point because you're on a pad, you can be using your fracture stimulation equipment far more efficiently. The fracture stimulating multiple wells can do far more stages per day. So I wouldn't anticipate the fracturing if it was a 10 well pad to take a year. It would be a matter of one to three months.

Alexander Cote: Yeah, so I did note that in..

Prof. Barry Hart: For 10?

Dr. David Close: Yeah. North America achieved it.

Alexander Cote: So I did note that in the actual report, there was an assumption made by the panel that wells are fracked sequentially, we do one well and then you move to the next well and so on. That's not how we conduct our operations, because we will be running wire line in one well bore, and once we're done the wire line operations and finished pumping in a certain well you begin your pumping operations in the next well on a specific stage while doing the wire line work required to prep the next stage on that well. So you sort of move back. If there's a set of four wells that you are stimulating, you'd be starting at well one then going to two three four, going back to one two three four, so you sort of go back and forth between the wells.

What I can do is there were a few very good articles that were published in the SPE's publication of the Journal of Petroleum Technology recently on somehow companies there have their holistic wastewater management strategies that they have employed there, which will give you a sense for, they'll have dedicated ponds that are specifically wastewater, how they then allow solids to settle out and re-blend with freshwater ponds in order to create the right blend that they require..

Prof. Barry Hart: And reuse.

Alexander Cote: ...for subsequent wells, yes. So I will create a photocopy of that and pass it on, because I believe that may answer some of the questions and observations.

Prof. Barry Hart: That would be good if you could, appreciate that. Just take me up your point about holistic. I think we asked you some questions previously and also Santos and Pangea about have you guys had any discussions about getting some sort of, if indeed there's a need for a treatment plant, where there in fact is some capacity to do a combined treatment plant, has that gone any further?



- Dr. David Close: Not at this point. I think if the moratorium lifts in the next proponents successfully to take the next stage of getting some level of technical certainty, that as you go into that detailed project planning phase we talked about further, areas where you can collaborate, certainly front of mind to operators for various reasons, there's hard capitalist reasons of efficiencies and there's also the minimisation of impact. So we meet with other industry colleagues to discuss various matters, but we haven't done any detailed planning on how we would collaborate on project planning. We'll have to see which proponents proceeding and which area they're proceeding in. If we can co-use infrastructure, I'd say there's a very strong case to do so.
- Prof. Barry Hart: Yeah, okay. Just following up the non-sequential nature of a pad, is there any correspondence between pad one, pad two, pad three, pad four, or are they all separate?
- Alexander Cote: The pads themselves will more or less, they'll be separate. So you won't ...
- Prof. Barry Hart: So there's no interchange of wastewater?
- Alexander Cote: No, unless you have multiple, a frack spread will only be on one pad and will stay on that pad until it's done. What you would, some areas, and again don't know what the best strategy for the Beetaloo is of yet, there will be some infrastructure. So quite often your water facilities will be a centralised infrastructure and you will run...
- Prof. Barry Hart: That's what I was getting at.
- Alexander Cote: ...pipelines or waterlines from the central infrastructure to your pad, which will minimise ... So I believe you've seen some of the photos at Amungee, and we actually set up a whole bunch of ponds.
- Prof. Barry Hart: Three.
- Alexander Cote: In a future world, if you're in the development, likely you'd only have one pond to make sure that you had enough water...
- Prof. Barry Hart: You're talking about fresh water pond or ...
- Alexander Cote: Yeah, so let's say you had a freshwater pond on the ... You'd have a single pond that's then fed from your central facility.
- Prof. Barry Hart: Or field, yeah.
- Alexander Cote: That is sort of where the future would go.
- Prof. Barry Hart: Okay.
- Alexander Cote: So there would definitely be the opportunity for shared, centralised infrastructure even within a single field.



Prof. Barry Hart: Thank you.

Hon. Justice Pepper: Dr. Jones?

Dr. David Jones: A question I think to Dr. Close first about geo-mechanics. One of our submissions suggested that the US analogues for example might not be as good an analogue for the Australian context because of different sorts of stress regime, and this could severely impact on the efficiency of hydraulic fracturing and hence well spread and density of wells and other things like that. Could you comment on that particular assertion?

Dr. David Close: Yeah, I think we're happy, we speak about it as a technical, an element of understanding the overall system is understanding what the stress regime is, and many basins in the US are what we'd call a passive basin setting, and that's all to do with the differentiation of vertical stresses versus primary horizontal stresses. And there are stress regimes that are not optimal for hydraulic fracture stimulation and there are instances in Australia that do have that stress regime-

Dr. David Jones: I specifically raised that submission, yeah.

Dr. David Close: Yeah, we have now data from the Beetaloo basin, from the wells, from the image logs, that's the data source that we use to get a lot of our stress information, that shows we aren't in the type of regime that would not be optimal. That's a reverse stress regime, that's the term that you used. We do not, we now have data, so this is not a do not believe statement. We have data that supports we're in a structure to normal stress regime and would anticipate that we could effectively fracture stimulate these wells, and that therefore we would not for any reason be able to efficiently ... If it was reversed stress regime, you would probably never proceed to development because you may not be able to create an effective fracture stimulation and produce gas, so it's a self-correcting mechanism to some extent.

Dr. David Jones: So I'd gathered that from my reading of previous publications, but I just wanted to get it from the horse's mouth as it were just for implicit clarification.

Alexander Cote: It's very unlikely you would've had a successful production test, because you can still place a job potentially in a reverse stress regime. You might have significantly higher treating pressures and the like, but to be able to produce for the given number of stages that we're able to execute at Amungee, permeability in shales is very low to begin with. Permeability in shales in vertical directions is essentially nonexistent, which means in a reverse stress regime, the majority of your fracture is orientated horizontally and essentially the productivity would be very, very low in such a circumstance.

Dr. David Jones: It's good to get that reassurance to make sure that we can cover all from that particular submission. Second question is a follow up on category. Clearly well integrity is a really serious issue for all of us from the point of view of potential for environmental contamination, and that was the intent of that recommendation was essentially for environmental protection. What



category wouldn't you go below for example in terms of that kind of level of base assurance without local mitigation and things like that?

Alexander Cote: So again, it really depends on where your target is, but if you take a look at the work that would've been done in that study where that table originally came from in Colorado, I believe if you take a look the category six well is I believe equivalent to the category nine except without the intermediate casing string. In my mind, that should be the minimum level, because that essentially meets the requirement that the panel and Origin has suggested that we need to make sure that top of cement is above that shallowest hydrocarbon bearing zone, it's very important to also identify where those shallow hydrocarbon bearing zones are and to make sure that we are satisfying the requirement of ensuring that surface casing is set deep enough to properly isolate the potable water access.

Dr. David Jones: Certainly most issues with methane excursions seem to have been not accounting for those shallow hydrocarbon zones and not cementing in the correct zones.

Alexander Cote: I would agree with that.

Dr. David Jones: Just on the topic of methane, one of our submissions suggested that, okay, we might be saying that methane, they say it's not that toxic at low concentrations, and I think we can accept that. But if you like, the fly in the ointment that was raised was, what is the possibility of methane carrying other volatile organic substances up with it? And so introducing an extra environmental stress that methane itself wouldn't have.

Dr. David Close: So we have a good database of gas from the Valkerrie formation in particular has a very low capacity to carry any other kind of volatiles, it's very much a dry methane gas with a small amount of CO<sub>2</sub> like nitrogen. We've done very detailed analysis of the gas and flow back fluids and submitted that in our emails, risk assessment, there's no evidence on what we concluded in there that we wouldn't be able to design an appropriate handling system for.

Dr. David Jones: We're particularly concerned about the effusion of emissions in the sense that once it gets to the surface, it is just methane we have to worry about, or even in the ground, or is it something that's come up with the methane? We accept that water carrying is not likely to occur, but methane being highly buoyant will certainly carry things, will certainly rise.

Dr. David Close: Yeah I mean, we haven't seen evidence, I think it is a very mobile gas. Most other, the ability to take any kind of volatile material is very unlikely given that there are no other mobile ... I mean we see gas production for 30 years plus, we obviously, if we have solids management you would know about it in advance if there was any other material that required processing. It would not be something that would be likely to catch you by surprise.



Dr. David Jones: Well for example, the analysis of the gas that came up in production tests, could you provide us with some of that trace compositional data just so that we can actually rule off from that one?

Dr. David Close: Yeah, and we've certainly submitted to the department as part of our submissions, and if we haven't submitted it to the panel we have no reason not to so we can.

Hon. Justice Pepper: You don't have to do anything, but we're asking for it. Thank you.

Alexander Cote: The composition of the fugitive emissions, if there were ever to be any, should be identical to what we're seeing at the separator during a production test.

Hon. Justice Pepper: Any further questions? Yes, professor Priestly.

Prof. Brian Priestly: I actually have two questions. One I guess relates to your preference for objective based regulation as opposed to prescriptive regulation, particularly as it relates to setback distances and to the onsite storage of wastewater. The setback distance that we recommended of 1600 metres was based primarily on evidence from the United States on health impacts around the gas field sites and the distance from those facilities. It seems to me that if you then, it's a balancing act. If you have onsite storage in open ponds, the likelihood of volatile organic substances going offsite is enhanced. If you use evaporation as a management tool, you're then also talking about offsite transport of more concentrated wastewater. So it's a bit of a balancing act in terms of how you estimate those risks. Do you have any comment on that?

Dr. David Close: A couple of things. With say setback distances may differ for different types of activities. In the US, particularly in some cities, there is a lot of gas processing and gathering that goes on in quite high population areas. So what an appropriate setback distance for gas processing utility with tens to hundreds of terajoules a day going through it versus a single wellhead may be quite different, and I think that probably needs to be considered. We have observed similar or have looked at literature on health impacts, and I think it's certainly an area that needs more study and we would agree a science based approach to what an appropriate setback distance is. I think my reading was in the absence of hard data to support what the right distance is, we would go down a path of recommending this and so more work required, we certainly don't object to the concept of setback distances from the areas of population.

We are fortunate in many areas of the Northern Territory that it is relatively remote, you are unlikely from an amenity or any other perspective to be limited by setback distances that are pretty reasonable.

Prof. Brian Priestly: Yeah, we've also noted that some of the risk assessments that have been done in Australia for example have not always considered some of these offsite pathways to the full extent that they should be, and that's something that we've recommended and that's come out of the national



recommendations as well. The other question I have really relates to the comparisons between coal seam gas industry and the shale gas industry in relation to flare activity. We've felt that some of the experiments coming out of Queensland for example was that some of the health impacts were very likely to be associated with flaring activities. Do you envisage that the flare activities for your industry would be different than that of the CSG?

Dr. David Close:

It is difficult, it would depend on a number of variables. Distance to pipelines, degree of success in early exploration, how quickly you can obviously get gas inline and into a market where there's a user as your goal, and you do it as early as possible. So there could be differences, they could follow a similar path. They're very efficient processes when we look at detailed studies into flaring. The efficiencies of modern flare stacks with hydro-gas components are remarkably efficient, so we'd certainly be interested in any evidence that there's contra-health outcomes associated with flaring. As far as I'm aware, we don't have good data or any evidence to support that and so I'm interested in looking at that if it exists.

So detailed project planning and understanding of the resource will come before we're able to do detailed analysis of what percentage of gas might be flared during different phases of the project.

Prof. Brian Priestly:

Okay, thank you.

Hon. Justice Pepper:

Thank you very much gentlemen for coming this afternoon, or today, now this afternoon, and we look forward to the receipt of the additional information you've promised.