

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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## Introduction

Arrow Energy (Arrow) has proposed construction of the Arrow LNG Plant in the Curtis Island Industry Precinct at the south western end of Curtis Island, approximately 6km north of Gladstone and 85km south east of Rockhampton, off Queensland's central coast.

The key features of the project are:

- an LNG facility on Curtis Island, a staged development producing up to 18 million tonnes per annum of LNG
- an approximately 9 km long feed gas pipeline from near the Gladstone City Gate traversing Port Curtis in a tunnel
- marine logistics facilities on Curtis Island and the mainland
- dredging of selected areas in Port Curtis and the riverbed at the mouth of the Calliope River to provide access to marine facilities on Curtis Island and the mainland.

Arrow lodged the draft Environmental Impact Statement (EIS) for this project in December 2011 and it was approved by the Coordinator-General for public review and comment between 16 April and 28 May 2012.

During the public review period Arrow held a series of community information sessions to provide further information on the Arrow LNG Plant and the EIS. Questions and answers from those sessions were captured by JTA Australia and are presented in this document.

The purpose of these meeting notes is to reflect the questions asked and answers provided during the community meetings. The notes are based on a written record and include some paraphrasing and summarising; every effort has been made to preserve the integrity of the discussions. To ensure that valuable information is shared throughout the Gladstone region, these notes summarise questions and answers asked across all sessions.

Please note, any references made to a final investment decision (FID) are based on the premise that Arrow is aiming to present a FID submission to its parent companies by late 2013. This date has not changed. The FID is taken by Arrow's parent companies, Shell and PetroChina, considering a range of factors.

The Arrow LNG Plant community information sessions were held from 15-19 May 2012 at:

- Gladstone (evening) 15 May 2012, 5.30pm-8.45pm
- Mount Larcom 16 May 2012, 5.30pm-8.45pm
- Gladstone (day time) 17 May 2012, 10.00am-1.30pm
- Calliope 17 May 2012, 5.30pm-8.45pm
- Curtis Island 19 May 2012, 10.00am-1.30pm

## How to read these notes

Questions and comments from the audience are in bold type. The unbolded responses are from Arrow staff. Additional information may have been included to provide further context or explanation; this information is italicised following the answer.

If you have questions or comments about the project or the meeting notes, please contact the project team during working hours on:

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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## ***Commonly used acronyms***

APLNG	Australia Pacific LNG Project (ConocoPhillips/Origin Energy)
BTEX	benzene, toluene, ethylbenzene, and xylenes
C3MR	propane pre-cooled (C3) mixed refrigerant (MR) liquefaction process
CQU	Central Queensland University
CSG	coal seam gas
DEEDI	(former) Department of Employment, Economic Development and Innovation
DERM	(former) Department of Environment and Resource Management (now called the Dept of Environment and Heritage Protection (DEHP))
DTMR	Department of Transport and Main Roads
EIS	environmental impact statement
EPC	engineering, procurement and construction
FEED	front end engineering design
FID	final investment decision
FIFO	fly-in, fly-out
GAWB	Gladstone Area Water Board
GLNG	Gladstone LNG project (Santos, Petronas, Total and KOGAS)
GPC	Gladstone Ports Corporation
HDD	horizontal directional drilling
HTD pipeline	hydraulic tubing drain pipeline
ICN	industry capability network
LNG	liquefied natural gas
Mls	millimetres
MOF	materials offloading facility
MSQ	Marine Safety Queensland
PCIMP	Port Curtis Integrated Monitoring Program
RO	reverse osmosis
QAL	Queensland Alumina Ltd
QGC	Queensland Gas Company
QCLNG	Queensland Curtis LNG project (QGC and BG Group)
TWAF	temporary workers' accommodation facility

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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## Gladstone (day session)

Date:	15 May 2012	
Venue:	Leo Zussino Building, CQ University	
Presenters	Leisa Elder, Vice President, Community and Sustainable Development	Arrow Energy
	Gerard Coggan, EIS Strategic Advisor	Arrow Energy
	Barton Napier, Senior Principal	Coffey Environments
Facilitator:	Jan Taylor, Principal	JTA Australia

### 1. How are you going to manage water supply and waste management disposal, food supply and emergency management?

In terms of water and sewage, there are a couple of options in the EIS although we're not too different to any of the other proponents before us. In terms of the potable (or drinkable) water for Arrow's use on the island, the current option is extraction of water from Port Curtis for reverse osmosis (RO) and generating the potable or processed water which will ultimately be demineralised for use in the LNG plant. The brine will be discharged back into Port Curtis. Sewage from our construction camp and from operations in the LNG plant will be treated through a tertiary sewage treatment facility, and discharged back out into the harbour.

The other option coming to the fore right now involves the Gladstone Area Water Board (GAWB) providing potable water to the island via horizontal directional drilling (HDD) from RG Tanna out to Hamilton Point. Additional to that is the Gladstone Regional Council (GRC) providing the opportunity for sewage discharge to return from the island via the same pipeline route. Arrow is looking at both those options in the EIS.

### 2. So would that pipeline route be part of the tunnel or different to the tunnel?

Separate to the tunnel. The tunnel provides some opportunities given it is four metres diameter; this allows for the approx one metre diameter gas pipeline and leaves other opportunities for communications lines and water to a lesser degree. However, that's not what we're looking at. It's primarily around the options I've just presented to you.

Water was supplied to the island approximately one and a half weeks ago, but the ongoing project is continuing with GRC and GAWB.

Food will be taken across to the island from the mainland. Obviously the primary demand for that will be from the construction camp. We've gone into a lot of detail around waste management in the EIS,

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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right down to batteries, x-ray films and the discharging of other putrescibles<sup>1</sup>. I can't recall the volumes off the top of my head, but everything will be coming back off the island and we will need to make sure there are appropriately qualified contractors to remove the waste and take it to the nominated facilities.

For emergency response, we will have a medical facility on the island where we would expect most of the routine medical queries to be dealt with so that we don't put any strain on the local facilities in Gladstone. In the event of a major emergency or accident involving multiple people, the two options available are to take people to medical facilities either by boat or probably by helicopter. We set criteria in our tender for the engineering, procurement, construction (EPC) contract which will involve minimum response times and level of care, and those criteria will be approved with the relevant Australian authorities and will also meet all the international requirements that companies like Shell work with for people on its sites. We'll specify that in our tender and as part of our tender evaluation of EPC contractors they must advise how they will meet those criteria. At the moment I understand the three proponents working over there are using the helicopter service that comes in from Rockhampton and they've each got their own helipads over there, so I'd imagine we'll have a similar system but with a boat as well coming across to the island.

### **3. Is the technology going to be similar to the other proponents?**

No, our process is different to the other three projects. We're using a process called C3MR which is a propane and a mixed refrigerant process. It's a process that Shell has used all around the world. It's in operation in many countries including Darwin in Australia. It's not a significantly different process to what the other three LNG plants will be using. It involves a two stage cooling process for us and the other proponents are using a cascade technology which has a three stage cooling process. Both of those processes are used all around the world. Because we're using a different process, the actual tenderers and contractors bidding for our project will likely be different to the current contractor working on the other three projects. That's because their contractor, Bechtel, predominantly builds the cascade technology. The technology that we use is on the open market and more contractors can bid for it so we will have different consortia bidding for our project. Bechtel builds the cascade press under licence from ConocoPhillips.

### **4. Will you be generating your own electricity using the gas turbine generators?**

That's one of the options that we've considered in the EIS. We've also considered the option of importing power from the mainland, as well as a combination of those options such as partial burning of gas and gas turbine generators on the island plus partial power import.

### **5. You're going to be a lot closer to the residential area of Gladstone than the other three; what are your noise and light conditions? We've heard a bit about your light conditions, but what are your noise conditions? Or don't you know yet? Don't you know if you're going to have any turbines?**

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<sup>1</sup> Solid waste that contains organic matter capable of being decomposed by microorganisms and of such a character and proportion as to cause obnoxious odours and to be capable of attracting or providing food for birds or animals.

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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We do. The EIS assumes four trains in operation and there are two processes which were put forward. One was what we call an all-mechanical option which involves power to the plant for electricity generation through gas turbines, and it's all gas turbines driving the compressors in the refrigerant process. That's an all-mechanical option and represents the worst noise signature from the plant. The EIS also models an all-electric option which basically uses electricity from the grid to provide power to the plant and drive the compressors. The EIS also looked at a hybrid option which is a mixture of those options involving some of the auxiliaries with grid power and then gas turbines on the compressors for efficiency.

The worst case is the all-mechanical option but the air emissions would be met well within the guidelines because unlike the Gladstone air shed issues on the mainland (with the range behind it), being on the southern part of the island means we are more exposed to the south-easterlies. There isn't the turbulence off Ship Hill and the range so you're getting very high dispersion which means air quality won't be an issue for the plant. As for noise, the Arrow LNG Plant is the closest to Gladstone so we have had to look at some noise attenuation. This involves the normal sort of attenuation used around gas turbine intakes to achieve the noise criteria at the nearest sensitive receptors which includes the closest island and then communities particularly around Yarwun which are more impacted than Gladstone. The noise assessment found that with the appropriate standard attenuation used on compressors and gas turbine intakes we would achieve the guidelines set at those sensitive receptors.

## **6. Have you any idea of the reading? What's the decibel range?**

The project criteria, which were set based on the Department of Environment and Heritage Protection's (DEHP) (formerly DERM) Guidelines, say the project should run between 28 and 33 decibels depending on where you are in proximity to the plant and what source you're dealing with. We meet that range which is pretty quiet.

## **7. Is that about the level of a purring cat?**

Something like that.

## **8. In terms of the cumulative impacts, the other LNG projects in their EISs have looked at the human or social aspects; does Arrow plan to do a similar study considering not only its individual plant but also looking at the sum of all the preceding LNG projects?**

The answer is yes. The EIS Terms of Reference required a cumulative impact assessment which means Arrow has had to assess the impact of the other three LNG projects as well as other projects in the region that might influence the dynamics in Gladstone. They include things like the Boulder Steel proposal, the Aldoga multi-nodal proposal, and the expansion at Rio [Tinto Alcan Yarwun] that's underway at the moment. When we looked at social impact, we looked at what the peaks were during the LNG projects and what information we could glean from that. There's a lot less information about when Aldoga and Boulder might commence.

We also looked at the history of local versus imported workforce based around the experience of previous projects like the Boyne Island Smelters, the initial Yarwun development, and Rio Tinto. We

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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compared the history of workforce estimates with the actual workforce reality when those facilities were built, and on the basis of that research we came up with the 5 to 20% which underpins it. That's the best estimate we have based on available information about what will be the cumulative impact within the social context. All the other EIS studies looked at the cumulative impact too.

It was pointed out to us today that they're somewhat incomplete and we would agree. The reason is we only have publicly available information to work from so we work from information available in those other EISs and the supplementary information published in them.

**9. You mentioned your Engineering Procurement and Construction (EPC) contractors and their accommodation but it's not just the guys who wear the Bechtel LNG shirts, it's a whole host of other contractors who also move to the area. Are they part of your assessment of the accommodation impact?**

No, we don't take that into account because it depends on the contracting strategy of the principal contractor once appointed. We take into account the raw workforce numbers. When we talk about EPC, we're talking about supervisory or managerial EPC, so there will be the core workforce on the island and then the Arrow and EPC supervising, managerial and support services which will be people living in the Gladstone community.

In terms of the total numbers of our construction workforce, the assessments include those people. In relation to the management of those subcontractors, the EPC contract will have requirements regarding how it is to manage its workforces and that will include subcontractors working for them.

**10. So there will be 3,500 people at the peak of the project?**

Yes, that's correct. That is everyone we are going to require for the project.

An example of what's not included in that peak would be if a restaurant opened up as a result of all the extra people in town; the restaurant staff wouldn't be included but certainly all the people working on the project, whether it's a subcontractor or a sub-sub-contractor, is included in that number.

**11. You mentioned road upgrades; how are they going to be done? Will a sum of money go to the Queensland Government and it identifies the intersection and pays a contractor to upgrade it? There's an intersection at Fisherman's Landing that's already problematic and with additional traffic going through there it's likely to come loose. Is that one of the intersections you've identified and, if it is, how will that upgrade actually be implemented?**

There are state-controlled roads and there are local government roads. In terms of state-controlled roads, we're working with the Department of Transport and Main Roads (DTMR) and the old DEEDI (now Department of State Development, Infrastructure and Planning) to work out the cumulative impact assessment of all the LNG proponents on state-controlled roads in Gladstone. There's a scope of work being identified through that process in terms of what roads require upgrading and the

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

---

management measures to be implemented. The other proponents and Arrow will fund DTMR to do that work but won't physically do the work.

## **12. So will that money be tied to a particular intersection; it won't end up in Rocky or Brisbane?**

No, my understanding is the money we are contributing is attached to a specific scope of work to address particular intersections and roads associated with our projects to manage the impacts.

When we directly adjoin any roads, for example on the north side near Calliope River, if there's any upgrade work required by our road adjoining that main road section (although in this case it's a council road that we join onto), we would do the upgrade work associated with it. Besides the cumulative work across Gladstone, anything we directly access for a specific site (e.g. the tunnel) would also mean we upgrade that intersection.

**Comment: I have a couple of comments. I'm a council worker and there have been a lot of accidents lately, both major and minor, and we are flat out getting to the sites to set up signage or traffic control to alleviate or divert traffic. Everybody is in such a rush in town now that there's very little courtesy on the roads; we can have all the flashing lights we like but people just will not move. I know you can't just pump money in and produce a four lane road in two weeks. However, we see the results of this on the ground.**

**The second point, contractors are taking up local accommodation which in this town runs between \$400 and \$1200 a week. Some of our council workers are travelling from Miriam Vale or Bororen or out near the Biloela Range, and they're even renting homes or buying homes as far away as Gracemere to drive to work every day. They are accidents waiting to happen because we've got individuals and families that cannot afford it, especially council workers. They cannot afford the rental squeeze because there are not just LNG contractors in town in accommodation, there are other contractors competing for these accommodation units too.**

We recognise housing is an issue in Gladstone and it's something we've heard about several times before. In terms of our EIS, particularly the social impact assessment and the social impact management plan, we understand that we are going to be bringing people into a community that already has stresses in relation to the cost of housing for everybody. We've also made commitments around contributing towards social and emergency housing funding commitments within the EIS. A really important part of what Arrow needs to do is to develop an integrated housing strategy which will look in more detail at how we are going to manage our workforce.

The majority of our workforce will be based in construction camps on Curtis Island but we do have the managerial workforce where we've identified something like 380 beds (during construction) that will be company-facilitated housing. Our integrated housing strategy needs to look at what that housing will look like. It also needs to look at what strategies Arrow might implement to address some of those direct housing numbers that we produced before. We recognise it's a big issue in the Gladstone community and we are all working together to see what can be done.

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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- 13. I realise you're on the tail end because the other proponents initiated the pressure in the first place, and you're yet to come.**

As part of the social impact assessment you can see there is a really big peak, or heading towards it. Arrow's peak is well after the peak of the other proponents.

- 14. Are you going to join the LNG partnership in relation to housing?**

We will once we've taken our final investment decision (FID) on the project. However, we've been working with the other three proponents to be a part of the housing group once we know our project is approved.

- 15. In regards to fly-in, fly-out (FIFO) people are they going to be concentrated on the island and then fly straight out again once they finish. Or are they going to fly in during week days and then perhaps leave when work is over? You tend to see the FIFOs out in the clubs; they create drama and don't really care because they don't live here. How are you going to manage that behaviour?**

During the main construction, the workforce will be housed on the island although temporary workers' accommodation on the mainland is a possibility. However, the intention is for workers not to have direct access to Gladstone so they will be in camps which are fully self-contained and have the facilities they require.

We're acutely aware of the need for a code of conduct for our staff and subcontractors, and you'll find that is an EIS commitment. It will be included as part of staff induction and indeed I suspect it will in some way be built into the EPC contract. Arrow obviously has standards and expectations not only how Arrow staff conduct themselves but also how our contractors behave. That will be a requirement of working on the project.

- 16. Does Royal Dutch Shell have any interest in the LNG project or Arrow in particular?**

In August 2010, a joint venture owned by Royal Dutch Shell (50%) and PetroChina (50%) purchased Arrow, so Arrow is now a privately owned company of Shell and PetroChina.

- 17. There was a concern that some proponents with accommodation on Curtis Island have appointed an entertainment officer for after-work activities, and plan to bring the workers as a group into Gladstone. We've noticed in the time we've been here an increase in fights and drugs. It's something to be aware of.**

We've talked about the code of conduct, but I think another thing which is really important is Arrow's policy around drugs and alcohol. Arrow has a zero tolerance policy and there will be random drug and alcohol testing for the workers.

- 18. If you decide to go ahead with this scheme, and everything runs to time, when is your dredging likely to start?**

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

---

We won't start any dredging until we've taken a final investment decision (FID); that's our base case. If the worst case happened in that we didn't take the FID if we haven't actually started any dredging, we're not leaving a residual impact on the community for something that's not going to go ahead. We're very conscious of waiting until we've made a decision to go ahead before we actually do that work. If we take the final investment decision then it will happen in 2014 over a year or so.

**19. It was indicated there were two options for the materials offloading facility (MOF) on Curtis Island, either Boatshed or Hamilton Point; what will influence the decision as to which one is chosen?**

Currently our preferred option is Boatshed Point and that is the option Arrow is moving forward on. We kept South Hamilton Point in as an option in the EIS but we're primarily looking at the Boatshed Point option.

**20. So why did you include a second option then?**

It was the timing; we hadn't made final decisions within the EIS process and if we did find any fatal flaws with any of the options we needed alternatives.

There are a number of constraints Arrow has imposed on itself at Boatshed Point as it's retaining the headland for the vine thicket community within it. When Arrow did that, it challenged the engineers to produce a design that worked with the potential constraint. Like anything, when there's uncertainty you need to have some options. The engineers are now progressing through that design and it's looking like a good option for Arrow in terms of its engineers coming up with a good solution which factors in some of the constraints the EIS team has imposed.

One of the reasons we looked at Hamilton Point South was that initially there was a desire to utilise and share the (Santos) GLNG materials offloading facility on the northern side of Hamilton Point. If that was unavailable, there was an option to build a MOF at Hamilton Point South and construct a dedicated haul road to the Arrow site. There are pros and cons. Boatshed Point has a shorter haul road access but the issues pointed out earlier have to be addressed. Hamilton Point has issues in terms of gradients for Hamilton Point south, and constructing the Arrow haul road back to the GLNG haul road; there are also some technical and commercial difficulties around utilising not only the GLNG MOF but also the GLNG haul road, which is why Boatshed Point remains the preferred option.

**21. You showed a slide earlier which indicated that if you were looking from Auckland Point you would be able to see the tanks at the plant. Is there any option to use colour and texture to try to screen those out in some way so they fall into the background rather than paint them with a white finish?**

That's not white paint, it is concrete. They are big concrete tanks which present some challenges in terms of maintenance. Painting concrete is not as straightforward as painting the side of your house, as it requires maintenance after two to four years. Also, they're not small; they're 45 metres high, about 60 to 80 metres wide and typically are not painted. I've asked about concrete dyes and there

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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are some issues around integrity. We will be using colour pallets where we can e.g. on the administration buildings, and we'll be looking at options to get those to blend in as much as we can.

**Comment: UNESCO was recently in town to see the World Heritage Area. One of the reasons it's a World Heritage Area is because of its aesthetic values, so you ought to try to consider those aesthetic values.**

We've certainly considered them in the EIS but there are some challenges engineering-wise. One of the good things for Arrow is that its infrastructure is not sitting above the landscape (Ship Hill sits behind the LNG Plant and the infrastructure doesn't sit prominently above that). Other than that, we've made some changes to configurations but it is difficult.

**22. You mentioned the potential to dredge the Calliope River mouth, and that there would be a need for ongoing maintenance dredging; were you talking about the mouth or the whole of the dredging program? And if it's just the mouth, does that mean we're looking at a dredge permanently based in Gladstone?**

With regards to maintenance dredging, our current modelling tells us we will need to dredge about 10,000 cubic metres a year, which in dredging-speak is not a lot. The obvious thing to do would be to integrate it with the other maintenance dredging that's done around the harbour itself. We've not come to any arrangements yet, but I think that would make sense given the amount of dredging is pretty minimal. There's a small amount of maintenance dredging, particularly around Boatshed Point, which we will need to maintain and the maintenance dredging around our swing basins will be taken care of through the Gladstone Ports Corporation (GPC) itself. We won't have a dedicated dredging vessel based in Gladstone for maintenance dredging because we'll leverage the opportunities that are already here.

**23. Once all the plants are up and operational, will there be four separate wharves on the mainland with separate areas, or will you all get together and have a ferry service?**

GPC has certainly given some direction to the proponents that ideally they'd like all of us to work together. However, during construction it's a very busy period for everyone so we will all have our separate facilities then. In the long-term, numbers decrease and the number of movements per day are fairly minimal so there are some opportunities to consolidate together into one spot. Where that would be we aren't too sure at this stage. I guess each proponent has probably got an opinion on where it should be i.e. probably where it currently is, but we're certainly under some pressure to eventually all come together.

**24. In regards to when you're increasing the shipping in the local harbour, this place is really built around everybody having their tinny out on the weekend. Are you going to introduce exclusion zones and are there specific routes that ships will take that no-one can really go near?**

Gladstone has the highest number of boats per capita of anywhere in Australia so that's well understood. In terms of construction traffic, we have to work with the Harbour Master and Marine Safety Qld (MSQ) to put our plan in place; the plan needs to be agreed with the other proponents

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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and the regulators will be MSQ and GPC. We'll work with the constraints we're given. There will be LNG carrier movements in and out with about a half hour gap between them coming in and going out. You can still cross the channel at that point in time; the gap is to give the LNG carriers the ability to stop, based on a 12 knot speed, but it has nothing to do with recreational craft being able to cross the channels.

In terms of exclusion zones, there will be a permanent exclusion zone around the LNG jetty in a radius of about 250 metres from the centre of the jetty. That's for the safety of everyone. Even when an LNG carrier is not in there, we need to make sure that if there is any residual LNG or gas in those lines no-one is at risk, so there will be a permanent exclusion zone there. That won't stop recreational boats travelling up and down the inner channel. There are no exclusion zones around the LNG carriers. There won't be an exclusion zone around the MOF, but obviously when there are big ships coming in and out, common sense should prevail.

**25. You've got upstream feeds at Bowen and Surat Basin, are you looking at the Galilee Basin?**

No, not in the Galilee Basin.

**26. Is the construction roster a dayshift roster or day and night?**

Because we haven't yet been out to tender for the EPC contract, we don't have a fixed rotation pattern. It is possible there will be work going on 24 hours a day but we need to be cognisant of noise restrictions associated with working at night time so it will be a limited type of activity at night but on LNG plants it is quite normal to work 24 hours a day.

**27. Will the construction camp be a dry or wet camp?**

This is a very topical debate on these projects around the world. We haven't yet made a final decision on it but it is likely to be a wet camp given the fact we're encouraging people to stay on the island and have their own recreational facilities. That's normally done in a very controlled manner with a token system enabling you to have two or three drinks in an evening event. It's not like a mad party town. Staff still need to present to work with an alcohol level of zero.

**28. What are the international workforce numbers expected to be?**

We're extremely hopeful that we can get most of the workers from within Australia, particularly as we're going to start approximately two years after the other projects and hopefully can benefit from the training and skills that people have gained on the other projects. People are aware there is a skills shortage in particular areas in the resource and construction industry around Australia and overseas people are being recruited for that. The Federal Government introduced the Enterprise Migration Agreement system about eight months ago and the LNG industry is working through it to see if it will work for our projects. As far as the Arrow project is concerned, there is no final decision on that yet so I guess we'll keep all options open; however, our goal is to have Australian workers as much as possible.

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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- 29. Was there an impact on turtles and dugongs last year? The Calliope River, where you base most of your mainland activity, is a significant area for dugongs and turtles, particularly because of the hot water outlet from the power station. I know you were proposing particular vessel types, but how else are you going to accommodate and manage potential impacts that might be caused by all the vessel activity which will be generated in that area?**

We know we will have contact at times with dugongs and turtles so we have looked at ways to manage our impacts e.g. propeller guards. However, the most significant issue is reducing the number of vessel movements, then lowering the speed; there's some work underway in the port environment to reduce the speed within the harbour from 25 knots down to 15. The other aspect is the size of the vessels and there's a point at which you can optimise vessel size with the movements and that's what's being worked through now. Aside from that, if the dugongs and turtles come into contact, a propeller guard will possibly prevent mortalities but it may not prevent injury. The real issues are around vessel frequency; improvements can be achieved through vessel size and the rationalisation of the movement of materials to and from the island. That's where the mitigation will be most focussed although there will be some displacement of dugongs and turtles because of the change in the tide regime across the bar.

- 30. With the pipeline coming into Gladstone, can there be an off-take for local industry?**

The pipeline to Gladstone is a high pressure transmission pipeline. It's unresolved yet whether there will be a connection with what's called a gas gate for the domestic supply market in Gladstone. One of the issues is the pressure reduction and whether that will affect the LNG Plant; it is feasible, but it would be in relation to those commercial gas supply arrangements.

- 31. Is it being considered commercially or is all the gas for export?**

Arrow sells gas into the domestic market and any opportunities within that domestic market would be considered on a commercial basis. So if there was an opportunity in Gladstone, Arrow would have to look at how that would work commercially because there is a significant cost involved in reducing pressures from that high pressure gas pipeline down to a pressure that can be used in industry; it would have to be a commercial arrangement.

- 32. If you have a four metre tunnel going across the harbour, and there's going to be a one metre pipe located inside, what's the additional capacity there for? I assume a second pipe at some stage for a second train or can you get away with one?**

No we can get away with one pipe. The size is to provide access for construction and we're also considering opportunities to take power across to the island from the mainland so it had to be an appropriate size to consider power, communications and other services.

- 33. It's for infrastructure, not for transit?**

The tunnel is not being designed as a regularly accessed tunnel. It won't have regular maintenance within it as it is being designed so that people will very rarely go into it.

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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- 34. You mentioned before about the upkeep of the river mouth and the upper channels, around 10,000 cubic metres of dredging materials; what is that based on as far as rainfall? During the last two years we've had in excess of 400mm, and last year 300mm, but in previous years in Gladstone next to nothing really. We had a ten year dry spell and then two years of rain. Is that averaged over a ten or fifty year period?**

The silting part of the maintenance dredging is associated with the hydrodynamic modelling which was done by WBM for Arrow. WBM has done a lot of the modelling within the harbour; in terms of the level of detail and the data sets that are used, I can't answer that, but we're happy to take that question away for a later response.

*Clarification: Rainfall data (based on 50 year average) was used as an input parameter for the modelling of sediment deposition. Sediment deposition models are used to inform the estimates of maintenance dredging required to ensure that channels remain navigable.*

- 35. I'm not worried about the technical aspect but I am curious on the rain period that was used?**

Typically, for most of those modelling scenarios we use a longer period to get a realistic average of the rainfall events rather than a short period of two to three years.

The company we used to do the modelling was WBM and it is well known within Port Curtis and the Gladstone area. It has built up its model over a number of years and projects, with Western Basin being the most recent. Its depositional rates within the Port Curtis catchment are well known for the amount of settling, and that knowledge is basically being used to estimate the volume required for maintenance dredging.

- 36. I know Arrow is using a stack flare, but one of the other LNG proponents is proposing a ground flare. Given the sensitivity of the issue why haven't you proposed a ground flare operation?**

We have looked at it. My understanding is that ground flares take up a lot of real estate in terms of square metres. Even though the site is 280 odd hectares, once Arrow places the LNG trains, safety zones etc then it is really stretched for space. There are two options. One is to go laterally across the ground with the ground flares, which basically look like a big barbecue. If you take off the tops of the barbecue, you've got your burners alongside which is what a ground flare looks like in very simple terms. However, to be able to get the volume out through those smaller nozzles, you need a bigger area which is why Arrow has decided to go up. The flares are about 110 metres above ground level and that height is needed to get out the same volume of gas. There are also radiation zones, heat radiation zones, which you need to maintain for the protection of staff. In short, we did not have sufficient land to be able to do a ground flare.

- 37. How frequently do you think there will need to be flaring in the commissioning phase and then in the operational one?**

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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My understanding is that initially, for about two to three weeks, there will be some sort of continuous flaring. You will see a pilot light approximately a metre high going continuously and then every four years or so there will be some maintenance flaring. We're looking at various strategies to try to minimise that flaring, particularly during the summer period around the nesting time for the turtles. On the odd occasion there is what we call an emergency flare i.e. an upset in conditions in the LNG Plant when we have to vent the gas. It tends to be around 15 minutes with a flame of about 12 metres plus above the facility. It's in our interest not to flare because it's gas that we're not converting to LNG, we're just burning it and sending it up the spout, so we want to minimise flaring as much as possible.

The flare itself will be a triangular scaffold type construction similar to a crane, but vertical, with about five smaller stacks off it. It's not one massive pipe, there are about four, and they relate to various parts of the LNG train. Think of it as a large Bunsen burner i.e. a big fire through a funnel.

**38. When you look at the sky at night, you see QAL and the port glowing. Are we going to see four new industries all glowing as well? Are you looking at everyone getting together to shield it from the view of the mainland otherwise all we see are lights when we look out into the harbour?**

The answer is yes, you are going to see industry on Curtis Island. There is a range of treatments Arrow is looking at in terms of the types of lights to use to minimise some of that impact. That will be more effective in some areas of the plant than others, but there are some areas that must be well lit for safety reasons. However, Arrow is looking at downcast lighting and other options to minimise the light spill into the environment.

There is a visualisation within the EIS of a simulated night lighting; that will give you an idea of how it sits within the dark backdrop posed by Curtis Island itself.

**39. It is quite dark at night when you look now.**

It is, and it's going to change.

**40. What type of dredging operation would it be...cutter suction, backhoe, trailer suction dredge?**

It will be a combination of cutter suction and backhoe. The backhoe will be around the materials offloading facility (MOF) sites and the LNG jetty sites with the possibility of cutter suction at the jetty site and for the Calliope River dredging.

**41. And it was indicated earlier that all the dredge materials go into the Western Basin?**

That's our aim.

**42. But if it's backhoe, I would have thought it's more likely to go somewhere else. Won't you have to drop it and then suck it up again?**

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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Our current intention is to dump all our dredged spoil into the Western Basin reclamation area. However, some of the work we will be doing on sediment characterisation will further inform (based on the nature of that material) whether it all goes in there or whether there are alternatives. In the EIS we talk about other alternatives being offshore disposal and other approved sites, so we're not talking about licensing a new site but looking at using currently licensed sites.

**43. If you have potential acid sulphate soils and the project is going to be so well advanced by the time the dredging commences, will the site have the appropriate storage units to handle that material?**

Part of the work we're doing here is to understand in more detail what those acid sulphate or potential contamination issues are, and how they could be managed, so that's the consultation we'll be having with GPC.

**44. I know you need to have a flare for emergency release but are there alternatives that can be put in operation here? I know there are alternatives to take it off tap and use it for other purposes in other areas of the world?**

In principle, we don't have an alternative for flaring as it's used in what is really an emergency situation; that's our escape route. We've already had a lot of discussions about how we can minimise flaring and merge with the upstream and downstream to use what we have in the pipeline and to manage various scenarios on the site itself, all handling emergency shutdown. The train design gives us a lot of flexibility to maximise turn-down so we can manage a lot.

**45. Are you giving thought to your emergency service plans to make sure you've got a commonality of standards with the other proponents re your fire fighting facilities on board vessels? Have you also given consideration to ensuring they are in common when you actually put this in place with your contractors? Some emergency water vessels have equipment designed for one style of wharf and the same often applies to the medical equipment on board (e.g. stretchers) and the fire fighting equipment.**

Most of those issues would typically be addressed in our detailed design stage which we'll go into at the end of September. They will be part of the bidding process when the design stage starts and finishes in the middle of 2014. To a certain extent we will have learnings from the other three projects; as you are aware from some of our meetings we are very keen to tap into any of those experiences and feed them into our detailed design.

There are two parts in answer to your question. During the construction phase, those matters will be looked after by the Engineering, Procurement and Construction (EPC) contractor in the establishment of the infrastructure. The second part is the ongoing operational phase; I will be on your doorstep and other people's doorstep because there is a need to have a common emergency response resource within Gladstone. I've started talking in other locations where we have a common emergency response process. Each site essentially has its own fire-fighting and ambulance services on site as far as I understand, so the commonality issue across the sites is something that has to be looked at long term.

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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I can already see that access from one site to the next will be the biggest issue. It is being discussed but is still on the drawing board in terms of a common access corridor amongst the four sites. At this stage the thinking is that it's not required although it probably needs more work.

**46. While I know that being a Gladstone based business doesn't give you a right to access the projects that are going on, I wondered if Arrow was going to reuse those standard government procedures such as the Industry Capability Network and all the standard projects or whether you're going to do something more? Because you've made a comment about actively seeking local suppliers, are you going to do something more than the other three have done in their procurement cycles?**

We are at an early stage of the process regarding procurement. We have been hearing similar feedback to what you've given i.e. in some cases local businesses feel like they haven't had appropriate opportunities. We are going through the normal channels, ICN that you mentioned and various others, but we are developing our program for local participation in particular at the moment so we can hopefully incorporate your feedback and that of others into our planning for the future.

In June last year we ran a business and procurement workshop where we brought representatives together from a range of different sized businesses in Gladstone as well as some of the business networks. They spoke about some of the issues about getting work on some of these larger projects and we talked about some of the things that Arrow might do. Arrow will also be developing a local industry participation plan as the project moves forward; this will help crystallise our thoughts about integration with the community on those issues of local participation.

Arrow will have a consortium of companies bidding for its project so it won't be one single company like Bechtel that will win the project. Arrow has insisted on a requirement that there be a strong Australian partner as part of any consortium which potentially could be one additional improvement Arrow will make; hopefully that will filter through to Gladstone businesses.

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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## Mount Larcom

Date:	16 May 2012	
Venue:	Mount Larcom Public Hall, Mount Larcom	
Presenters	Gerard Coggan, EIS Strategic Advisor	Arrow Energy
	Barton Napier, Senior Principal	Coffey Environments
Facilitator:	Jan Taylor, Principal	JTA Australia

**47. Are all the proponents using the same loading facilities?**

No they won't be using the same loading facilities. There will be four LNG jetties to load the carriers plus the materials offloading facilities so there is no sharing of infrastructure of the marine facilities.

**48. I calculate five carriers a week with the number of 240 ships a year.**

No, 240 vessels over 365 days is a bit over two a week. It's basically every second day.

If all the plants develop to their full capacity then it will be four times what I have just said. If you multiply that by four ( assuming all the other facilities develop to their full capacity of four trains, although already two of them have suggested they are only going to go to two trains), you're going to get four times that traffic.

**49. That's what I was just saying, it's a fair bit of traffic.**

To put it into context, it's about 10% of the total harbour traffic which is small in comparison to the harbour traffic in general.

**50. Have you got any other slides showing the visual impacts so I can see them altogether?**

The closest plant you will see is Arrow's because the others such as Santos are sitting in behind Ship Hill. The QCLNG plant is sitting in behind the coal terminal and APLNG is in behind that. Ours is the most visible from Gladstone.

**51. Projected coal movements in Gladstone by 2020 will mean one ship will leave every 20 minutes through that channel. That doesn't even meet GPC's own safety standards because there is supposed to be half an hour between them. What about the 250 metre safety zone around the ships?**

I can't comment on projected coal movements but what I can say is that if all projects go to full capacity, we're looking at LNG contributing about 10% of the total movements within the port. There is a range of safety requirements including half an hour between the ships, which is based on a 12 knot stopping distance; all the safety requirements will be implemented.

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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The only exclusion zones we have are located around the actual LNG jetty so in terms of safety zones there are none around the LNG carrier coming in or going out of the harbour; the usual boating rules apply. The safety zones around the LNG jetty itself apply whether or not there is a carrier being filled.

**52. Is your company associated with the gas projects in Malaysia? They have an 18 kilometre safety zone; that is a total safety zone, nobody is allowed in it, not even the local fisherman. Why is it 18 kilometres in one part of the world, and 250 metres here in Gladstone?**

Our exclusion zones are based on international safety standards, and I can assure you that all the required safety standards are being met by the project. The reality is this project will meet state and national shipping requirements.

**Comment: I don't agree; you're the only place in the world that doesn't meet them.**

**53. With your on-site medical services, what level of service will you have...a nurse or a doctor?**

During the construction phase we'll have self-sustaining medical facilities on the island so the two and a half thousand people who are working on the island won't be coming into Gladstone and using the general medical facilities that local people will use. In the event of an emergency we would definitely have to take people from Curtis Island to medical care. The other three proponents have a helicopter service which travels down from Rockhampton.

Arrow will set minimum criteria for various potential scenarios and the level of care. It would expect the contractor to develop an emergency response plan to respond to those criteria. We want to be as self-sustaining as possible on the island and not take up local facilities.

**54. Is Boatshed Point being left in place as a buffer zone for your plant and the others, and will it hold in case of a tsunami?**

It's not there as a tsunami buffer. As part of the EIS work has been done in relation to tsunamis and tidal surges. In the early design part of the project work was done looking at what levels might be induced by a flood surge, whether by a tsunami or something else. The plant elevation on site is designed to be built well above those flood surge levels. When you read the EIS look at the site, design criteria and flood surge; the critical infrastructure is designed to be above those levels. I think the lowest bench is about 10 metres Australian height datum which is about 11 or 12 metres above sea level there.

**55. Would that have survived the tsunami in Japan recently?**

I can't answer that question but the modelling was done on the basis of a long-term flood surge.

**Comment: I would suggest when you are a grandparent don't allow your grandchildren to live in Gladstone. Grandparents are all recommending their grandchildren clear out of this environment; it is not healthy.**

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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**Comment: moving away from the negativity, Arrow's Brighter Futures program has already had an impact on this community. Last year there were three organisations from this town which benefited from the fund, including the Show Society, the swimming club and the Mt Larcom Bowls' Club. I want to thank you for that; even though we're only small we have benefitted from Brighter Futures so Arrow Energy is being a good corporate citizen. I commend you on that, thanks.**

**56. What will be the number of permanent employees after construction?**

At the moment we're looking at 200 permanent staff. We'll contract out maintenance and shut down activities. We expect about 200 to 250 support contract staff on a routine basis and then we have shutdowns. Shutdowns will be up to about 500 or so.

**57. What about office admin staff in town?**

Originally we were looking at having an admin building in town. However, when you start looking at office space and support staff, it becomes much more cost effective to look at putting everybody on the island. That's something that's got to be worked on because it's a bit hard nowadays to get office space.

**58. Are you required to dump acid sulphate soils out at sea?**

There is no formal requirement in relation to the disposal of acid sulphate soils. What we will need to do is develop a dredge management plan to identify how we are going to manage and dispose of acid sulphate soils. One of the options for disposal is to treat the soil and dispose of it in reclamation areas. Reclamation areas can be designed with specific cells to manage acid sulphate soils. Another option is to dump it at sea.

**59. Please don't take the cheap one which is to dump it at sea. That is what's happening at the moment and 100% of our acid sulphate soil is going to sea. A little bit of it is going into the reclamation area, but not much. You need to be a good corporate citizen and do the right thing. The trouble is that the harbour will be messed up long before you get there. One other question, who is the major investor in Arrow?**

Arrow is owned by a joint venture which is 50% owned by Shell and 50% by Petrochina.

**60. The fly-in fly-out workforce from overseas, is it paid the same wage as Australian workers or is it paid according to what might be received in the country of origin and the money is deposited into bank accounts in that country?**

The Australian Government is different to others in that it's a requirement foreign workers must receive the same minimum wage as Australians. The government has two programs, the 457 visa program for foreign workers to come in to fill skill shortages and in the last eight or nine months it has introduced Enterprise Migration Agreements which are for major projects above \$2 billion with more than 500 staff to enable the proponents to bring in foreign workers (although they must be paid the same wages as Australians).

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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- 61. Our community is really noticing traffic and transport impacts, and has been for some time. We are coping the impacts but can't blame you for that. However, how are you going to manage the cumulative impacts of all the other projects once you start? Is there something you can do now?**

At the moment, the Queensland Government through the Department of Transport and Main Roads (DTMR) and also the old DEEDI has been doing a cumulative impact assessment on the impacts all four LNG proponents will have on state-controlled roads as that's probably the most significant traffic impact in this region at the moment. That study will also look at the pipeline routes and the upstream development in the Surat Basin, and has identified a range of work that needs to be completed to manage some of those impacts. Funding is being provided by the LNG proponents to DTMR which will carry out that work. Arrow's contribution to that hasn't been finalised yet as it hasn't yet finalised its logistics plans nor has it taken a final investment decision (FID). Arrow will continue to participate in that forum but it will not contribute until it takes FID. However, we will probably start to see things rolling through from DTMR sooner rather than later.

- 62. Take care with the Department because two weeks ago it was in this hall still working off figures from 2009. The departmental representative had nothing more recent than 2009 when we weren't picking up bodies all over Gladstone, so if that's the best it can do, take care.**

DTMR has been using current data sets so it's been based on the logistics plans of the current proponents as well as Arrow's projected ones.

- 63. Regarding health services, is everything set in stone or could Arrow put pressure on the Campbell Newman government to build a better hospital instead of flying a helicopter to Rockhampton for health services? When I first came to this area 63 years ago, our hospital was better than it is today. Could we get that hospital upgraded with a bit more pressure from Arrow?**

I think local people would have more chance of exerting political pressure to have the hospital upgraded than Arrow will. Arrow does understand some of the issues in Gladstone around medical services and it's looking at how to manage its activities to minimise any impact but I don't think it can help much with pressuring government.

- 64. To my knowledge, Arrow is the only proponent that has done community consultation. Isn't community consultation compulsory or have the others just not done it?**

As part of the EIS process community consultation is compulsory and in fairness to the other proponents they have conducted consultation in the Gladstone region although I don't know where or when. However, Arrow has an interest in what's going on in Gladstone as well as potential impacts and we're happy to be out here talking to you.

- 65. Have you thought about housing people in town rather than on Curtis Island and having your medical facilities in town so other people can use them? If you live in the town, all the money could be spent here.**

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

---

Arrow is not in the business of providing medical facilities. The facilities we are going to provide onsite are to service Arrow's workforce and reduce impacts on the local Gladstone medical service. If Arrow has serious incidents it can't manage on its own site, it will have to use medical evacuation services plus facilities in Rockhampton and Brisbane although hopefully that will never occur.

There are always two phases to the project, the first is construction which is the high-risk part that the EPC contractor has responsibility for. Arrow sets the standards but it's the EPC contractor's responsibility to deliver as part of its contract management. Once Arrow is operational and its permanent workforce is in the community it will engage with the community to see what it can do in the longer term.

**66. If a fast train is established by 2018, could Arrow possibly lift its level of workers from 5% coming from the local area such as Bundaberg, Gympie, Agnes, 1770? Bundaberg has really high unemployment, it's very hard to get a job in that area. Could that be a possibility?**

The definition of local employment is being able to commute on a daily basis from where you live to work on the project. We would classify Bundaberg as FIFO so we'd be bringing people in to live in the camp and then sending them back to Bundaberg. There are opportunities for some of the skilled work we do. We will focus around Gladstone initially but due to very low unemployment in the region we might have to look further out for some of those opportunities.

Arrow is very focussed on looking at opportunities to recruit people locally and when we say 'local' we're not only saying in the region here but also regionally in Queensland, then Australia, and then potentially international.

Because of the health and safety focus on the project Shell has high expectations in respect to transportation. The policy hasn't been fully developed yet but there will be a health and safety policy that will outline how people will be expected to drive; that will include a radius distance for what is considered safe driving in terms of access to the site. There is the possibility of starting bus services, as they do in Qatar, for trips that take approximately 90 minutes in each direction of travel so that the workers are not then driving themselves but that is for the longer term. We don't want people to drive long distances; the expectation is that you will live within a reasonable distance from the site if you drive. I don't know about the train situation here but if trains could deliver people in a reasonable amount of time, then trains are eminently acceptable forms of transport. Once the plant is operational we will have processes like duty systems with an expectation people will be able to head onto the sites in a very short period in the event of something going wrong, for maintenance or any other the situation.

**67. What arrangements have been made with the police to manage whatever happens on the island because there are going to be incidents?**

We have a no-tolerance policy and if workers don't abide by the rules they're out. In terms of safety in the camp, it will be a wet camp with a token system to limit alcohol consumption on the island. People are there to work and earn money, and that's the big stick we have. If they don't behave themselves, they're out

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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There will be site security and a certain amount of discipline will be expected. If there is criminal activity the police will have to be involved but in general these things don't happen because people know they'll lose their jobs. There is security on the island but there is the possibility something could happen as has happened in other locations in the world. If criminal incidents do occur on camp, then it will be the same as anywhere else in Australia, the police will have to be involved.

Everybody who works on the project has to sign on to a code of conduct which is about how you behave when you're on the island as well as representing Arrow in the community. If you breach that code of conduct there will be disciplinary action which can mean you lose your job.

**68. What will be Arrow's policy when it comes to fly-in, fly-out from the airport; will there be cars or buses from the airport?**

It will be buses.

**69. Can you tell us how safe it is with all this gas about? There's going to be a lot of gas coming out of all these wells, isn't there? What's happening down there?**

In terms of how the gas comes out of the ground, the Walloon Coal Measures are in the Surat Basin and what we need to do is pump water out of the Measures to release the pressure. It's not as if there's a big gas reservoir or hole down there, the gas is absorbed into the coal seam and what holds it there is water pressure. When we pump the water out of the coal the gas is released from the coal and flows up through our wells. It's not like a reservoir down there where we take the gas out of it and it leaves a hole and has the potential for collapse, so it's not like coal mining. There is potential for very small subsidence but there are requirements on all the projects to monitor this and Arrow is working with the other three proponents using satellite technology to baseline subsidence in the region and then look at the potential for correction.

**70. Do you frac?**

We don't frac in the Surat Basin in our Surat Gas Project area but we do frac in the Bowen Basin.

**71. What happens to the water?**

We pump the water out and it gets sent to a treatment facility which at the moment uses a reverse osmosis (RO) process. From that RO plant we get two streams, brine stream and fresh water. Arrow is looking at an integrated water strategy in the Surat Basin i.e. looking at how we contribute to the water balance within the Basin so we can get opportunities like substitution of allocations. This is where Arrow supplies water to the current rainwater users in lieu of them taking their allocation out of the ground. What we're hoping to do is manage the water cycle in the region. We are also looking at injection of water, particularly in relation to how we manage some of our impacts on the aquifers. We also use water for coal washing and feedlots, and different purposes like that. The core of our water management is around substitution of water.

**72. What is the quantity of salt that you will be producing?**

It's about 125,000 tonnes per annum.

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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**So with the four projects there will be one million tonnes of salt produced per annum?**

That sounds a little high; I will have to check it.

*Clarification: It is estimated that Arrow Energy and the three other proponents would each produce approximately 300,000 tonnes of salt per year for an approximate period of 25 years.*

**73. Where does the salt go?**

Arrow's base case is using a regulated, licensed landfill which has specific environmental controls in place. What we'd like to do is beneficially use that salt so Arrow is working with the other three proponents at the moment on potential trials for getting actual product out of the salt, whether it's table salt or soda ash. Given the volumes Arrow has it's a possibility we could be in a position where we can economically use that brine stream and beneficially use the salt.

**74. There have been earthquakes in America caused by water taken out of the coal and pumping it back down.**

I think the issue you are referring to in the US is a process called capitation which is part of another way of doing hydraulic fracturing where they basically pulse water and another product at high pressure down a hole. I think there have been issues around some seismic activity but that's not relevant to the way Arrow works.

**75. If Arrow is the best of all the proponents and most of your competitors have been here before, could it work with the Shut the Gate crew and set up a deal for 10% of your return. That 10% is considered a fair and equitable return in all societies.**

In terms of Arrow's approach to land access, Arrow has been working very hard on voluntary access agreements. One of the earlier slides showed that Arrow has 400 agreements in place, 270 in progress and nothing in the Land Court. In relation to what the access and compensation arrangements look like, Arrow is very conscious that it needs to add value to the properties it is working on so Arrow realises it has to do more than just compensate the occupants. It's working through a process with all its stakeholders in the Surat Basin about what does that value look like. Arrow has several committees in the Surat Basin, one specifically relating to intensively farmed land where some of these issues are being considered. It's something Arrow recognises it needs to work on but I can't comment about any sort of numbers.

**76. Last year we were out west and saw what was happening out there at the gas mines and I felt really sorry for those people. A lot of those properties have been in the family for generations and they have a lot to accept with these people coming on, plus the roads, the vehicles, the destruction of their life. I felt sorry for those properties out there. We're probably sorry about what is happening around us here and we're feeling it, but those people out there are also feeling it and I felt so sorry for a lot of them.**

Arrow recognises it has an impact on the daily lives of property owners. Arrow's impacts can range from physical impacts in relation to farming enterprises but it's also around issues affecting amenity. Arrow is looking at how it accesses these properties and the location of wells in respect to the

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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house. It's also addressing issues around how to identify people coming on to their properties with, for example, identity cards for the contract workforce. Arrow is also looking at implementing permits in some areas to determine when contractors can and can't go on people's properties; there's a whole range of things it's looking at. Arrow is working with its community representatives around what needs to be in place to address some of those issues.

## **77. What about weed control?**

We recognise that weed control is a very important issue. We have control procedures in place around washdown certification of Arrow equipment; we have people trained in that certification and it's being implemented in the Surat Basin as we speak.

## **78. You only need one person who doesn't do the right thing and all your work has gone out the window.**

In the Surat Basin Arrow has to provide certification for every vehicle going onto a property, and for each time. If mistakes are made and we take weed infestation onto a property, it's Arrow's responsibility to work with that landholder to sort the issue and that may include compensation.

## **79. Weeds on vehicles are only a very small part of the problem. If you disturb the ground when you install the pipe in the ground or scratch around areas you will get noxious weeds. It's not just to do with the vehicles and the machinery it's to do with every inch of that pipeline as well as the areas used for maintenance.**

We have capabilities in pipeline easement rehabilitation to return those areas to the same as neighbouring areas. It's not always going to be weed-free because we can't have a weed-free pipeline if it's right next to a large weed infestation on a landholder's property. But we are accountable in terms of returning that pipeline easement to the same as the area around it.

## **80. Do the bore holes that extract gas only work vertically or can they work on an angle?**

They can work on an angle depending on the type of coal seam so we are looking at doing some trials later this year in the Surat Basin on what we call pad drilling. Rather than having one hole every 800 metres on a grid, we may have one larger pad which could have up to eight or nine holes. What we'd be doing is angling those holes although it depends on how the coal is formed in the ground as to how successful that is. In the Bowen Basin where there are different types of coal we already use horizontal wells; however, we're also looking at doing some work in the Surat Basin around pad drilling and angle holes.

## **81. Does that mean you could lower your impact by having an easement and working off that easement left and right, or as you say via one large pad? That sounds like a good idea to have one easement and go left and right for a long way.**

An easement is a land access tenure; we will be trying to work with landholders to identify locations on their properties that are appropriate for coal seam gas wells so there may be an opportunity to increase our spacing by using pad drilling.

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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## Gladstone (evening session)

Date:	17 May 2012	
Venue:	Leo Zussino Building, CQ University	
Presenters	Gerard Coggan, EIS Strategic Advisor	Arrow Energy
	Barton Napier, Senior Principal	Coffey Environments
Facilitator:	Jan Taylor, Principal	JTA Australia

**82. Have there been any preliminary findings in terms of the disturbance of acid sulphate soils in the Harbour and what that means to the marine ecosystem in reducing oxygen and other issues?**

No, we haven't done any studies on that topic because the primary method of dealing with acid sulphate soils is to treat them before they become an issue. One of the advantages of this project is that there is very little acid sulphate soil to deal with. We encounter acid sulphate soil when we sink the tunnel shaft down through the unconsolidated sediment in the mud flats; there is about six to eight metres of material we need to go down through to get into the rock substrata. The tunnel will be about thirty to forty metres below the harbour and is drilled into the bedrock to make sure it is maintained in a stable medium so the only time we interface with acid sulphate soils is through that six metres. That constitutes about a couple of hundred cubic metres of acid sulphate material, so it can be effectively neutralised and dealt with at that site. The laydown areas next to the tunnel launch site include pads for the treatment of acid sulphate material.

**83. So it's not a generalised release of acid sulphate soils?**

No, but having said that there is acid potential material on the floor of the harbour in Calliope River based on the original geologic structure so we may encounter some there. The detailed geotechnical program that's underway now will do a lot of sampling; it will identify how active that material might be and then identify appropriate management measures.

**84. Is the back of Hamilton Point and the Boatshed Point area a gazetted environmental area?**

No, it's not part of the environmental management precinct. There is no environmentally protected area within the footprint of our project.

**85. In the EIS it talks about how your project is 18 months behind the other three so the demand and impact on housing will be less and the need should be assessed at that time; how is that going to be assessed? Is there an assessment model that you will use? There is nothing in the EIS committing you to a process that's rigorous in terms of what you will assess.**

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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That work will be done in consultation with the Coordinator-General who will regulate the project. Some of the complexity is in relation to the timing of our project in relation to the others but it also relates to other projects in the Gladstone region because when they come on may have a direct impact on what our housing impact is likely to be on the community. In the EIS we talk about less than 3% of rental housing availability as a trigger to put in additional mitigation around housing. We recognise we will need an integrated housing strategy that looks at it. The impact assessment we have done looks at what we believe is the worst case scenario and identifies the number of houses we may need to facilitate; it also makes commitments regarding how we're going to house some of our management staff on the mainland as well. We will be working with the Coordinator-General and the Gladstone Regional Council on it.

**86. Has there been a figure or percentage cost identified in terms of your net social investment in Gladstone?**

No, we don't have a number, and the reason we don't is because through the EIS process we identify impacts and mitigation measures. Once we have identified those impacts, mitigation measures will have to be put in place to manage them. Once we fully understand them we will be able to go into that level of detail for costing. At this point in time we don't have any indication of that detail.

**87. The concern is that it's an at-time process and will be developed over time and in the future. Is there any consideration that with things happening in two years' time you should be doing something now?**

If you look at the social impact assessment process Arrow has been through as part of the EIS, it does look at the impacts Arrow is going to have on future growth, housing and services. It is considered as part of the EIS process.

**88. How does the offset strategy for loss of habitat work?**

Under legislation and policy we are required to offset unavoidable losses. The offset requirement is based on the conservation value of the asset that's lost so if you have an endangered ecosystem it will attract a multiplier. If you destroy two hectares of a particular ecological community then you have to offset another two hectare times whatever that multiplier is. It varies between state and commonwealth legislation e.g. commonwealth legislation for an endangered ecosystem requires a multiplier of ten so if we destroy two hectares we have to find twenty hectares of an equivalent ecosystem.

**89. And do you purchase that?**

There are several ways we can do it. There are various classes so it's not just twenty hectares we have to find because it depends on the condition of what we are going to use as the offset. If we start at one end of the spectrum (which is what we call recruitment) where we plant that species on a vacant block of land or former farm land and try to bring it back to an ecosystem, that attracts the least value. So you might have to have a hundred hectares to achieve the twenty hectare requirement because it will take a long time to reach what we call 'remnant status'. If we work at the

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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other end of the spectrum (which is what we usually target), we find a degraded ecosystem that might have been subject to grazing or other uses or weed invasion, then you basically lock that up and protect it ideally via putting a covenant on it, like a Trust of Nature or put it into a Crown Estate and then we have to manage that for up to ten years plus and exclude cattle and threatening processes like weeds and erosion to enable it to rebuild its diversity and structure consistent with that ecosystem in its natural state; by doing that you achieve what is called remnant status. That's usually achieved in around ten to fifteen years. When the system is robust enough it becomes self-supporting and is mature, although it is recognised that maturity might be in a hundred years in some of the dryer climates. The point of the legislation is to get the vegetation to where it is largely self-sustaining. Now we understand the magnitude and order of those impacts the job ahead of us is to identify potential offset sites, decide how we deal with the land and what kind of covenants are required to return it to remnant status.

## **90. So will that also be for the eucalypt forest?**

Yes, and for marine seagrasses impacted as well as other species out there. Queensland legislation requires an offset for all vegetation removed. For the seagrass bed, ideally you would find a seagrass bed that is distressed and then bring it back to health and manage it as a conservation asset.

## **91. Is that detail made available somewhere so that we can see how Arrow is going to manage the offsets?**

It's not in the EIS but we will report on it in the EIS Supplementary Report. Typically you won't see all the detail because it's often related to commercial arrangements with landowners. While it might be relatively benign in this area, on other projects I've worked people working with proponents and communities to do offsets and convert land to conservation assets raise a whole lot of other issues, such as conversion of farm land to conservation assets and feral pests (a really emotive issue) so you will find governments require us to publish an outline of how offsets are being delivered, to demonstrate to the community that it is possible and can be delivered even though the fine detail will be confidential.

In a previous session we committed to making that information as publicly available as possible. However, because of commercial arrangements we might not be able to identify exact properties, although we have committed to showing how we went through the offset process. That will start to occur after the final investment decision.

## **92. How long is the construction camp going to be on Curtis Island and what happens to the temporary accommodation when construction is finished?**

The camp is going to be designed for about 2,500 people and will be progressively built over the first year of construction and will be occupied once it reaches its maximum capacity. It's a temporary camp and will be there for the construction of the LNG facility. Typically we would decommission it or pull it down after construction. The plant is a two-stage development so we would need to understand how close together stages 1 and 2 will be so we would know whether to keep the camp there or reduce it in size to something smaller and more manageable. There is no intention to keep it

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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there for the long term as it takes a lot of time, money and effort to maintain the camp, particularly if there's no one in it. We generally would decommission it after construction is completed.

**93. We're already having an issue with childcare availability and school places, is that being addressed as well?**

Arrow is not in the business of providing education or childcare but it does understand these are issues. If Arrow thinks it needs 90 houses then that is how many families it expects to bring into the region in association with construction of the project. It also expects to bring 130 people into the region during the operation of the LNG plant. Arrow is working with the state government to appropriately communicate the numbers and demographic of the expected workforce so that appropriate planning can be done for the region.

**94. Over what period of time will you dredge the Calliope River?**

Dredging will be one of the first cabs off the rank for the project and maintenance dredging will be required annually due to the sediment coming down the river; we're talking about 10,000 cubic metres per year. Arrow's intention is to use that dredging facility for both construction and then long term operations; the design life for the LNG plant is around 30 years so we'll be using the Calliope River for that period.

**95. So you'll be dredging that channel for the next 30 years?**

We will dredge the channel and then maintain it which will enable us to take our vessels in and out of the Calliope River at all stages of the tide during the life of the project and the LNG plant. The final depth is to be decided, but it will be charted and published.

**96. What level of water is that going to affect in the river itself? Given that the water runs in and out, you're going to have a lot more running out than now?**

The studies show it will affect low water by a maximum 0.8 of a metre for a small number of times per year. The typical impact on water levels will be a lot less than that. The water level is only impacted on the low tide, the high tide is unaffected. Further work is being undertaken to look at these impacts.

**97. With the proposed road network infrastructure for the other proponents, when is that likely to be started and will it be finished prior to your commencement?**

Arrow's been working with DTMR and DEEDI and the other proponents on the cumulative impact assessment for state controlled roads. At present Arrow doesn't have any detailed logistics data so the assessment at this point uses data from the other three proponents. My understanding is they're close to finalising that with DTMR in terms of the exact scope and timing of that work, although I can't confirm the proposed works. Once we have our detailed logistics plans we will be feeding that back into DTMR; the cumulative model will be rerun and then there will be a scope of work associated with that. Arrow will have to fund what is included in our scope of works for delivery by DTMR. We don't have enough detail yet to know the exact timing of the works.

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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- 98. I heard you say the impact on various infrastructure and services in Gladstone was going to happen after the other three projects were developed so your impact would be an extension rather than a multiplication? Do we assume from that there is some degree of cooperation amongst the four proponents on Curtis Island in terms of coordinating your works, or are you all operating as individuals?**

There is a range of forums where all the LNG proponents come together to consider their potential impacts and the coordination of activities across the projects. Even though Arrow hasn't taken its final investment decision, it has been an active participant in those forums and is starting to see some money rolling into different programs now that the other proponents have started their projects. Arrow's money won't start rolling until after we've taken a final investment decision although we're an active participant at those forums.

- 99. When is the final investment decision (FID) going to happen.**

Towards the end of next year, the end of 2013,

- 100. Does that mean nothing will happen until then?**

It means there will be no start to construction. At the moment we're going through the approvals process and getting all the plans in place that we need to deliver the project, and we're going through engineering and design which still require some geotechnical investigations to be undertaken to inform those approvals and our design. We won't be starting construction, which includes dredging, clearing and everything on the island, until we've taken FID which is the point where our parents (Shell and PetroChina) would say yes, we want to invest the money to develop this project.

While we haven't taken FID, we are involved and have funded some of the skills and training projects e.g. the Queensland Minerals and Energy Academy. We've committed funds to determine what we can do to build some of the skill requirements in this area. While we haven't yet made FID, we have funded those things that haven't required significant funding, like basic skills and training information. We have invested in the community already, and we will continue to do that regardless of the FID. There are some commitments we have already made in terms of infrastructure, such as the instrument landing system at the airport, so we have given a commitment that if we take FID we will be involved in funding items like the airport, Gladstone Foundation and the housing company. Our plans take those into consideration and we understand those community impacts.

- 101. Is FID a term that is used as a technicality? Is it a *fait accompli* that the FID will actually be made at the end of 2013, or are there some of the approvals that we are discussing, such as our reaction to the EIS, that may actually affect whether FID is taken or not?**

Absolutely, for Arrow to take the final investment decision, it must have its EIS approved. If the government chooses not to approve the project then Arrow won't be able to take FID. The final investment decision is a point in time where the company decides it's happy with the business case

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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developed for this project, and that would include having the EIS approved, and then it moves forward to decide on that investment.

**102. Is the CSG end of the project all signed off? I ask because the Queensland Water Commission (QWC) is handing down a report today on water and it includes CSG impacts. Does that mean all bets are off for the project if the QWC says you'll contaminate the aquifer?**

I spoke before about the Surat Gas Project which is one of our upstream projects whose status is currently at the same stage in its approval process as the LNG plant. We've had an EIS for the Surat out in the public arena. That EIS closes on 14 June for comments and Arrow must get approval for it just as it does for the LNG Plant. Today the QWC is releasing a report on the cumulative impacts on water. Based on Arrow's initial look at the work done by the QWC, the work done by Arrow on the Surat EIS is actually predicting a slightly greater impact than the QWC which is good because it demonstrates Arrow has taken a conservative approach to how its modelled the potential water impacts.

All the modelling we've done so far is on the basis of no mitigation so that hasn't been included in the modelling to date. There's a range of mitigation we're looking at in the Surat Basin. Substitution of entitlements is where we'll treat the water pulled out of the aquifers and then give it to current irrigators who are pulling water out of the aquifers on the understanding we will give them their entitlement and they won't draw that from the aquifers. This way we allow some of those aquifers to recharge without adding additional stress on them. The other thing we're looking at is to run some trials later this year using re-injection into aquifers to manage impacts. We are confident that through the adaptive management framework the government is looking at we can manage our impacts and have the EIS approved.

**103. You were just saying you would give the water back to the farmers. Are you charging the farmers for that water, and how do they irrigate?**

The idea is that Arrow could minimise new irrigation; instead it would supply water to current irrigators who have an entitlement to draw water from the ground water aquifers (the primary aquifer out there is the Condamine Alluvium). In terms of the commercial arrangements associated with how that will happen the detail hasn't been worked out yet but we envisage the cost to the farmers will be no more than what they're currently paying for their entitlements.

**104. Will you need new infrastructure to get it from your site to their land and will there be a dam or a reservoir?**

There's a lot of infrastructure in the Surat Basin to help manage the water so we'll be looking at how we can integrate with the current infrastructure; there may be a requirement for Arrow to do some work, e.g. put some pipelines in place, to allow delivery of that water.

**105. In the Surat Basin where water is being offered back to the farming community, do you have any idea of the long term, or the actual term, that farmers will be able to take advantage of the water you've extracted? I assume there must be a life to that so if**

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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**they alter production to incorporate an injection of water that they perhaps previously didn't have access to, what's the life for that change in production?**

We're not looking at providing additional water to what they currently use. Arrow is looking at substituting the current entitlements i.e. not increasing the volume of water they have for additional irrigation within the region. We want to maintain the water balance as much as we can so that, for example, if the landholder has an allocation for ten megalitres a year out of the Condamine Alluvium then the agreement will be that we provide ten megalitres a year.

There's work being done to look into the issue of diminution of water over time. Because irrigators won't be drawing as much water as they currently do from the aquifers, Arrow will investigate how that will allow the current groundwater resource to recover; it is doing work around making sure that once Arrow is finished, and isn't able to supply water anymore, that irrigators will then be able to draw that water from the aquifers.

**106. I may be under a misapprehension but it sounds like there's a natural balance of the amount that Arrow will be extracting, and the amount that the farming community is currently drawing off the aquifers. I thought there would have been a huge imbalance there, and that Arrow would draw off much more than it could expect to allocate.**

That's actually not the case. In terms of the water balance, the amount of water that's going to be drawn via CSG is a very similar amount to what is currently drawn by the farming community.

**107. Will that be the conclusion the QWC's assessment will be delivering today?**

I'm not sure of the full detail of the QWC Report. It is releasing its groundwater model which will look at the cumulative impacts on the aquifers in the Surat Basin and will nominate cumulative impact areas. It will also nominate one of the CSG proponents to be responsible for 'make good' agreements in each area. These are areas where there may be an impact on groundwater users as a result of the work of some or all of the proponents; to ensure a landholder doesn't have to try to deal with Arrow, QGC, APLNG and Santos, there will be one company nominated for the landholder to deal with in regard to make good agreements.

**108. When you're talking about extraction, can you give us a brief outline of how Arrow gets its gas out of the ground? We hear about fracking and other methods, how does Arrow do it?**

It's a little different in the Surat and Bowen Basins so I'll talk about the Surat first and then I'll explain the differences in the Bowen. In the Surat Basin our coals are quite near to the surface and very permeable. We drill a vertical hole down, pump the water out and then the gas desorbs from the coal's surface and floats. We're also doing a range of work at the moment to look at better techniques such as pad drilling which means instead of using our traditional grid network (which is where we put holes approximately every 800 metres in a grid) we're looking at the possibility that we might be able to put up to eight or nine holes on one pad, using angle holes. Typically in the Surat we use vertical holes, but we're looking at the possibility of using angle holes. In the Surat Gas Project area we don't frac; fracking is essentially a stimulation process so that after you have drilled

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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the vertical well, you put high pressure water down the hole to fracture the coal and make it more permeable to allow you to pump the water out and then get the gas out. We don't need to frac in the Surat Basin.

The Bowen Basin is a little different because it has deeper and tighter coals. We do use fracking in the Bowen Basin to stimulate the coals to enable us to pump the water out. The interesting thing about the Bowen Basin is that there's about 10 to 20% of water in the Bowen as compared to the Surat so there are a lot fewer water issues there. Also in the Bowen there are very large, thick coal seams; we're able to use horizontal wells as well which means we drill a vertical well, then drill a horizontal well down along the coal seam, connecting to that vertical well.

Typical chemicals that are used in fracking are sand, guar gums (which are used in food manufacturing), acetic acid, and other commonly used chemicals. We don't use any BTEX-based chemicals although you may have heard about them in the media over the last couple of years. BTEX chemicals are typical of chemicals used in fracturing shale gas in the United States, but they are not allowed in Australia.

**109. Is there a process by which gas exploration companies can access gas within the precincts of a National Park?**

No.

**110. That's interesting, because a month ago I was in western Queensland travelling through some National Parks and was given some brochures on them; there was a footnote which said to stay away from exploration wells in western Queensland.**

It could have been state forests. There is the capacity for us to work within state forests under quite tight conditions from the state government. But in terms of the National Parks or category 1 nature conservation areas there is no capacity for us to work in those areas.

**111. Is there some way for Arrow to supply small towns along the way and Gladstone in particular with gas? I think Arrow already supplies gas to a subsidiary or another company to supply gas into New South Wales. Is there any plan for Arrow to supply townships along the way?**

The simple answer is there's no current plan to provide gas to townships. Arrow is operating within the domestic market in terms of the supply of gas. Is there the possibility that opportunities will come up for Arrow to supply significant gas loads in regional areas or Gladstone? Yes, but it would have to be a commercial arrangement. Arrow would have to look at all the issues associated with that as it's very expensive to take gas from a high pressure pipeline down to a pressure that can be used in the home; you need to have a significant number of people to justify that sort of cost, and there would need to be a business case associated with it.

**112. Last year your CEO said Arrow would consider taking it from the backburner.**

We'll check it.

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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**113. What effect will the lights and the glow from the LNG plants have on the dugong and turtles in the harbour?**

It's recognised that a certain light will distract turtles and dugong, predominantly around when they're nesting, or particularly when the turtles are hatching and moving out to sea which is when they're most vulnerable. The plant will have to be lit for safety reasons but Arrow's looking at a number of ways to reduce that potential impact; the first is downcast lighting to reduce what we call light spill. The other idea is around the actual light source used; the idea is to choose a light spectrum that's outside what the fauna see, and what they're attracted to. Those are the major initiatives we're looking at to try to reduce that initial impact.

**114. There is an island with a golf course which is lit at night; it's apparently affecting turtles up to 20km away from the island.**

There is some ongoing work being done which is focussed on looking at what the potential impact of that light source will be on the turtles on the east coast of Curtis Island.

**115. Are you going to do some spatial and temporal studies on turtles and dugong, and will you use the results of the studies to actually make the decision about your mainland launch site? I've read that that part of the EIS is lacking because you don't know where the animals are.**

No, we don't.

**116. We're on the fourth EIS relating to that. None of them actually did any spatial or temporal surveys of the animals. Yes, we all know they're in the harbour but the question is where they are. It looks as if some of your decision making processes suggested in the EIS don't have the full information.**

The answer is no, we haven't done that specific work; we've relied on a lot of the research done in the harbour by CQU and others in identifying that. It's well known that these sea grass beds here are a major grazing ground for the dugong, and the turtles move up and down the harbour in response to that feeding, but in answer to your question, no.

The issue then becomes how does Arrow deal with that; it's why, irrespective of where they're congregating, we have to deal with situations we may encounter with vessels. The measures that we're looking at include putting propeller guards on the vessels; that won't stop injuries, but it might stop fatalities. We're also looking at logistics such as the size of the vessels, the frequency, and their speed, which is probably going to be the most effective means of trying to minimise the impact on those particular fauna. We received advice in an earlier session this week about possible aggregations of turtles and dugong living in the Calliope River itself so we will have a look at that.

**117. What impact does dredging have on the seagrass in that area?**

The modelling on the dredging shows we'll have a minimal impact on the sea grass. What happens with the Calliope River is that the shear stresses induced by the dredging will tend to push out into

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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the harbour. There will be some backwash, but most of it will push down the harbour. When we talk about sea grass it's really an indirect or temporal impact depending on the tide condition and wave direction.

## **118. What about the impact on Boyne Island and Farmer's Point on Facing Island?**

No, it's not expected to get anywhere near that. The plumes modelled around the dredging are localised. If you look in the EIS you'll see the results of the hydrodynamic modelling for the dredging of river sites is localised with the exception of the Calliope River. Because it's a river, we'll see it spilling out into the channel because of the relative depth differences there.

## **119. With the waste from the construction camp and the plant itself once it's operational, will you treat the waste on the island or on the mainland?**

There are two options in the EIS. One looks at extracting water from Port Curtis, running it through a reverse osmosis (RO) plant to provide potable water as well as demineralised water for the LNG plant and construction activities. Out the back end of that comes a brine stream which is discharged back into the harbour through a diffuser around the tip of Boatshed Point. Off the top of my head I think it's about 300 cubic metres an hour. To treat sewage onsite the current option is to have a stand alone water treatment facility to cater for all waste streams, from trade waste all the way through to sewage, tertiary treatment, and then discharge back into the harbour. The other option relates to the fact that the Gladstone Area Water Board (GAWB) has put in a pipe across from the RG Tanna Coal Terminal to Hamilton Point to supply water to the LNG facilities. That presents Arrow with great opportunities to utilise that water rather than water from the RO plant. There is also the Gladstone Regional Council option of sewage coming back through a Horizontal Directional Drilled (HDD) pipe along that same alignment to the sewage treatment plant in town. It provides Arrow with a great opportunity.

## **120. My question follows on from the explanation about the lack of data around dugong and turtles. It sounds as if data needed to compile the EIS has yet to be collected, and I think I heard the Coffey representative say it will be collected as time goes on. But if the EIS is accepted as it is now, and subsequently gains approval, do we progress down the track of collecting the data subsequently and maybe reaching a point of unavoidable loss which then means offset strategies? I don't understand how the EIS is a legitimate check.**

When you read an EIS, it's a study of a point in time. The EIS, via some of the specialist contributors, identifies areas that require additional work. Some of that work will need to be done prior to the government considering approval for the EIS, and it will be presented within a supplementary report. An EIS Supplementary Report can be requested by government to deal with three things: issues we've identified where further information is required to gain approval; any project changes described in the EIS; and it's also to respond to submissions from the general public and government agencies. There'll be a range of work done as part of the supplementary report, and it will be recorded. There's also identification of further work needed to inform post-approval work. While there may be sufficient information to seek an EIS approval, and then move to

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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further approvals, more detailed work will be required to inform those post-approvals, and they will be required prior to approval of plans such as the dredge management plan.

- 121. Regarding the dredging of the Calliope River, I'm a recreational fisherman and I usually depart from where the ramp is around the powerhouse. I've fished in that area for a number of years; I've often seen dugong near the RG Tanna Coal Terminal and near Wiggins Island. Once you dredge that, it's going to have an effect on them.**

We have received that feedback in the session we had here Tuesday and it's something we'll have to look at in more detail within the supplementary process.

**Calliope**

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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Date:	17 May 2012	
Venue:	Calliope Community Centre, Calliope	
Presenters:	Gerard Coggan, EIS Strategic Advisor	Arrow Energy
	Michael Lampp, EIS Project Manager	Arrow Energy
	Barton Napier, Senior Principal	Coffey Environments
Facilitator:	Jan Taylor, Principal	JTA Australia

## 122. Are your staff based in Brisbane?

Mostly, but we have staff in Dalby in the Surat Basin, Moranbah in the Bowen Basin and three in Gladstone which will increase if the project goes ahead.

## 123. When will you start the LNG project?

If we get approval it will start in 2014 after we take the final investment decision which would be at the end of 2013.

## 124. How are you getting all the water you need for the LNG plant?

Our base case is to take water out of Port Curtis and put it through a reverse osmosis (RO) process to remove the brine and use the clean water stream for the plant. The other option is to use the pipeline recently opened by the Gladstone Area Water Board from Gladstone to Curtis Island.

## 125. Do you use much water in the plant?

It is closed circuit which uses about two to three megalitres a day (and brine discharge is about 300 cubic litres an hour). We won't use the water for cooling the gas.

## 126. Do you already sell gas? Are the other three companies involved in the domestic market?

Yes, we sell gas into the domestic market. The other three proponents, Santos, Origin and QGC, also sell gas into the domestic market.

## 127. Will the tunnel be large enough to walk through? Will you be backfilling?

You could walk through the tunnel as it will be four metres in diameter. However, there won't be open access as it is for maintenance purposes only. Construction will involve conventional tunnelling like tunnel boring for roads.

## 128. What are the tunnel foundations like?

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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We have done some drilling but we still need to do more geotechnical investigations. The tunnel will be approximately 40 metres below the sea floor in competent rock<sup>2</sup> and it will be concrete lined.

## **129. Who will build it? Will it be Bechtel?**

No, it won't be Bechtel. Due to the size of the project it will be an international consortium and one of the stipulations will be that the consortium must have a senior partner which is an Australia company.

## **130. How did Bechtel get a monopoly on the other projects?**

It's related to the technology. Bechtel is licensed to build the ConocoPhillips Cascade technology which the other three plants will be using. Shell uses propane pre-cooled (C3) mixed refrigerant (MR) liquefaction process (C3MR) technology which Bechtel doesn't typically build.

## **131. I didn't think you could compress or liquefy CSG.**

Because it's methane we can. We don't use a compression process and it's not under high pressure. We cool the gas and turn it into a liquid, which can be done at -161° Celsius so the LNG plant is essentially a big fridge. It isn't the same method used by the other companies but it is similar. C3MR means it is a propane and mixed refrigerant. We don't need a lot of propane so it would probably be shipped in twice per year.

## **132. Does it go down in volume as it freezes?**

Yes, it reduces to about 1/600<sup>th</sup> of its original volume.

## **133. When will your dredging start?**

It will begin in 2014 at the start of the project. We will probably start with backhoe dredging around the MOF area of Boatshed Point

## **134. Are the workers going to be fly in fly out (FIFO)? Will they be Australian or overseas workers?**

The 2500 workers on Curtis Island will primarily be FIFO and they will come from both Australia and overseas. At this stage we are trying to determine where they will come from. Our LNG plant construction will be ramping up as the others start to ramp down so we can capitalise on that but to get the skillsets we require we may need to look overseas. We anticipate there will be somewhere between 5-20% of local workers (which is defined as living within 50km of the Gladstone region). It is cheaper for us to use local labour but we will need to look overseas to get certain skill sets.

## **135. Will the FIFO workforce be single people?**

They'll be employed as single people so families won't be coming with them.

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<sup>2</sup> Rock that, because of its physical and geological characteristics, is capable of sustaining openings without structural support.

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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## **136. Do you find there are problems with that kind of environment?**

There are the usual challenges with having so many people in one place and having them work on a rotational basis. The facilities are usually of a good standard and include recreational facilities such as a gym and pools. There will be a wet (allowing alcohol) mess, it won't be a dry camp. We will have restrictions around drugs and alcohol, and we will use a token system to limit the number of drinks that workers can have. However, all staff will have to present with a zero alcohol level when they turn up for work because Arrow has a zero tolerance policy with respect to drugs and alcohol.

## **137. Older people in Gladstone are finding the cost of living difficult with rent, food and oil prices. It's a real problem.**

We acknowledge in our EIS studies that displacement of people to places like Miriam Vale and Gracemere has been occurring. We have made commitments to help ease the pain and once we get closer to taking our final investment decision we will inject money into where we think it is needed.

## **138. What will be the impact on the hospital and emergency services?**

We recognise there will be some stress on the health system. The construction camp on Curtis Island will be self-contained in that it will have its own medical facilities. If there is an emergency then we might use a helicopter to transport people to Rockhampton Base Hospital. We are also working with the other proponents in relation to an emergency response so there will be a helicopter/boat evacuation process if necessary and a clinic on the island. We have been working with Queensland Health, Qld Fire and Rescue, and Education Queensland to let them know as early as possible how many people are coming into the region so that we can assist them with their planning.

## **139. When will they build the bridge access?**

We don't know if it ever will be built. The corridor has been preserved and is still in the Gladstone Ports Corporation 50 year plan. The bridge holds no advantage for us because we couldn't attach a gas pipeline to it. It would also be expensive to build and some island residents don't want a road going to the island.

## **140. How will Calliope River be affected by the floods after the dredging?**

By removing the bar in the river we will actually be helping to reduce flooding upstream because it will facilitate river flow, particularly upstream. It's the bar that causes the water to back up and flood the area.

## **141. Is anyone looking at building a new marina? People can't moor in the public marina because it's been taken over by industry.**

There aren't any plans that we are aware of but we've certainly been made aware of the congestion in the marina.

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

---

**142. What is happening with the racecourse and the temporary workers accommodation facility (TWAF) 7?**

There are restrictions on the use of the racecourse. It is perhaps too difficult to put accommodation on there so we might use it for parking and then bussing workers to the jetty.

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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## Curtis Island

Date:	19 May 2012	
Venue:	Curtis Lodge, South End, Curtis Island	
Presenters:	Gerard Coggan, EIS Strategic Advisor	Arrow Energy
	Barton Napier, Senior Principal	Coffey Environments
Facilitator:	Jan Taylor, Principal	JTA Australia

**143. Do you require tugs to accompany the vessels all the way down? Will there need to be more tugs?**

Yes, we will need to bring in more tug boats. We are in the process of ordering two more tugs which will be specifically for the LNG escort so Arrow won't have any effect on tug usage in the harbour.

**144. When the boats are going through does that mean we can't cross the harbour?**

During the actual transit through the harbour the LNG ships will follow the same rules as for any other ships. The Gladstone Ports Corporation (GPC) tries to keep a 30 minute separation between the ships. If you want to cross the harbour and you see a ship coming then wait for the tugs and you'll be fine.

**145. What is PCIMP?**

The Port Curtis Integrated Monitoring Program is coordinated by Central Queensland University and the LNG proponents and other harbour users contribute to it. CQU is used because it has the most detailed information on the harbour so we can draw on its experience. We have not only categorised the sediments but also visited and confirmed the categorisation before it was fed in to the assessment.

**146. How tall is the flame tower?**

It will be 110m high and the tanks will be 45m high.

**147. How big will the flame be?**

There will be a constant pilot flame one metre high, although if it is inventory gas then it could be up to twelve high during upset plant conditions but only for a short period of time.

**148. How often would that happen?**

Very rarely as flaring typically only occurs during upset conditions i.e. if the LNG train trips. As the plant is commissioned you will see it for a period of two to three weeks. When routine maintenance occurs there will be some flaring, however, maintenance is scheduled every four years or longer.

**149. Will each LNG plant have a tower?**

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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Yes they will have elevated flares, with the exception of one of the four proponents whose plant will use a ground flare. Ground flares need a lot of room and the Arrow plant simply won't have the room. Not only do you need a lot of space for the flare, you need a lot of space for the safety hazard zones around it. With the elevated flare you change your safety zone profile because you take the hazard up into the atmosphere. When you put it on the ground you need a much bigger area.

**150. In Karatha there is a flare off, a big one and a small one. The small one is so noisy it sounds like a jet turbine. Is that going to have the same effect here? The small one there is very noisy, the taller one has a flame but not much noise.**

Our flare will be the equivalent of the taller flare. The other type of flare is a liquid burner flare which is very noisy. Karratha has condensate in its gas supply which also gets flared off sometimes. In order to stop it smoking steam is injected into the top of the flare to get a good mixing at the top of the flare to stop the smoke. It has quite a noisy pilot too.

We have no liquid flare on this facility.

**151. What level of noise pollution will actually be coming from the plants?**

There will be occasions when you hear the plant; that's simply when you get what we call worst case atmospheric conditions. Being on the coast you're less likely to have those but there will be the odd occasion when you get them. Worst case conditions are when you have a cold air temperature inversion in the atmosphere so the sound bounces off it and comes back to you. Over the line of sight, noise should be attenuated over the distance but the air inversion makes it bounce back down, a bit like my voice is bouncing off this roof. When you have a temperature inversion with a very gentle breeze, that's when you get the most significant propagation of noise and also you get the most ideal conditions for gas to move towards you from those stacks. When we do the air quality and noise modelling we use those worst case conditions to actually determine whether we are compliant in those conditions. For 95% plus of the year you will never experience those conditions. The most noise-affected people are those on the islands.

We comply with noise levels, including even the background noise which is already slightly elevated in the harbour because of waves, traffic, the RG Tanna coal terminal and other facilities (not including construction noise). There is an elevated background noise on the harbour already and when we take that into account we are compliant with the guidelines for those islands.

**152. When you say islands, which islands do you mean?**

Witt and Tide Islands. Our noise contribution is up to 33 decibels at Witt Island. By the time the noise gets to South End, it will be close to current background noise levels but I'm not going to stand here and say you're never going to hear it because there will be those worst case conditions when everything will align and you'll hear it.

**Comment: On very rare occasions, like when we're on the back beach, we hear the industry noise from time to time. It's only occasionally and it's nothing to get upset about.**

**153. All we will see is the top of the flare, is that right?**

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

---

Yes, about ten metres of flare and a one metre high pilot light in general. You will see a soft glow from the lights but it won't be like looking at RG Tanna. That's why we use downcast lighting.

**154. What is the timeframe for the terrestrial and marine ecology surveys?**

There will be three or four months of site surveys not only looking at mangroves to see what happens if they are exposed, but also site surveys to characterise them and make sure we know what we're dealing with. A lot of that work has already been done. We investigated the Calliope River as part of the EIS, but the investigations didn't fully consider the impacts of the maximum change of 0.8m to the low tide water level as a result of the dredging so we're going back to validate the investigations to fully understand what's going to happen. One of the beneficial impacts of that is that it will ease flood waters going in the Calliope River and allow a greater volume through the bar during a flood event.

**155. The other major issue in town at the moment is workers taking up parking places all over the town. For us here on the Island it is impossible to find a park outside the Curtis Ferry Services to come over here. Those issues should have been addressed by the other companies a long, long time ago, and no doubt by the time you fellows get going it won't be quite the same issue as there won't so many workers then.**

You're absolutely right and we have identified those problems. One of the forums we are involved with involves Queensland Police and the GPC. Strict rules are being initiated to make sure the owners of those vehicles are prosecuted. It is a great concern to the police as well as to us. We are working with them to make sure there are designated car parks and strict rules re ferrying people to the island to try to avoid this parking problem.

**156. Can you email a submission to the Coordinator-General (CG)? How do you sign it?**

Yes, you can. You can email the CG and just put your name to it. All the email addresses and fax numbers are in the Executive Summary. If you do want to make a submission please make sure it's in by that date for it to be considered. Once the submissions are received the CG looks at them and then provides a copy to Arrow for a mandatory response. That's what the process is for the Supplementary Report. If you have concerns in relation to the project, there's a hotline, email address and information on the website.

**157. Where are the 25 people you mentioned earlier going to be on Curtis Island?**

There'll be approximately 20 people from Coffey Geotechnical and they'll start in June. They are going to stay at the hotel plus a few houses Alan is organising at South End.

**158. How will they access the plant? Will the track between South End and the site be opened up for them?**

Yes, they will use 4WD vehicles.

**159. The other proponents told us there's no road to the plant through here. Is it a road? It ought to be a track. Now you are utilising it for access from here to there.**

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

---

It's only short term access for the geotechnical investigations. When the project is in the construction and operation phases there won't be any direct access between the plant and South End.

**160. There are people living and working on the island who have to go by boat around to the site. Why couldn't they access it via the track like you guys are doing?**

That hasn't been in our plan.

**161. It has always been a bone of contention that people working on the plant have to go all the way into town every day, catch another boat, and then come back here. Now you guys are going to access it temporarily through the back, so why not make it a road?**

I think others would disagree with you.

*Clarification: the response refers to the sensitivity around workers travelling through the Environmental Management Precinct (EMP).*

**162. Can all proponents join together to establish a lookout on Ship Hill? There's a temporary track we can access. You've got your security gate and fences so all the gas plants will be secure, but Ship Hill is an overview of the gas plant, so what are the chances of getting a lookout and having the thicket cleared?**

I was part of the discussions with DEEDI around the development of the environmental management precinct and that idea was put forward. For security reasons a number of the proponents expressed their concern about having something so close to the back of the LNG plants; there was concern about the ability for someone to take advantage of such a strategic point. Having said that, discussions are ongoing and the intention is ultimately to have tracks through the environmental management precinct. Lookouts are certainly on that list but whether they directly overlook the back of the LNG plants is another thing.

**163. According to the *Environmental Management Precinct Report* Ship Hill is for public use.**

It's certainly not proposed to exclude people from walking around. The discussion I was privy to was around the development of quite a substantial structure for a lookout. I've no doubt there will be tracks going up to Ship Hill, but I think in terms of making it easily accessed by foot or car so that there are only five steps up to it, that's not the case.

**164. How do you come to an arrangement regarding offsets? The reason I ask is that GPC has had a big ad in one of the QantasLink magazines about offsetting Balaclava Island for damage done in the Port Curtis area. Having said that, it is using Balaclava Island for works. I have asked the other LNG companies where their offsets are and I've received no answers.**

In terms of offsets, the idea is to protect the same type of ecosystem that you have impacted somewhere else. There are a range of ways you can do that, such as through covenants or

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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purchasing land. Sometimes the community won't hear about the details, for example when we are putting covenants on people's private property. Sometimes those property holders want to keep that as a confidential arrangement between us and them. Arrow has committed previously that when we have taken the final investment decision and we do put offsets in place we will make that information publicly available. We might not be able to tell you exactly where but we will tell you how we have offset. Arrow's strategy is to look at all the offsets from this project but also from our upstream projects, look at all the environmental values that will be impacted and we will look to work with the government to find out how best to do that.

**165. It still seems to be this little hidden thing; we have to trust that the company and the government are doing this to protect the environment. My understanding of offsets is that you must have land that is of same value or better to be protected. We don't know where the offsets are because of confidentiality. For all I know it's just a whole lot of words but nothing actually happens.**

The way it works is that when you clear vegetation the conservation status of it determines the amount you have to replace. If you clear an endangered community and it's commonwealth-listed it is affected by a multiplier. However, it's not just five hectares via a multiplier of ten, it relates to the state of the other vegetation. At one end of the spectrum which we call improvement is where we actually plant trees. Obviously they're not an eco-system when we plant them and we've got to plant a lot more of them to try and get a similar amount. At the other end of the spectrum we find what we call an area of degraded vegetation like a bank of mangroves, and then you manage it so it comes back to health. The way the offset strategy works is that you get various credits for what you're doing, and so you have to do a lot more if you're planting, because you've got to get it back to what they call remnant status which takes about ten to fifteen years. That doesn't mean it's mature, it just means that it's got to the point where it is self-sustaining and then it might take fifty years or one hundred years before it can be called mature for an eco-system, but in around ten to fifteen years you've got a fair bit of a structure and you've got most of the weeds out and the vegetation will continue on. If you're at that spectrum you've got a lot of work to do, if you're at the other spectrum, you've got less work to do. And you're right it's life for life, that's the way both commonwealth and state policies have worked.

What we have traditionally done is what we call the landscape approach. I could go out and find a patch of Red Gum in the middle of a paddock and put a fence around it to protect it. That way I've protected the Red Gum but its eco-system value is pretty low. Instead, what we tend to do is look for landscape approaches, where you look for the majority and hopefully all of the communities that are affected – because it's not just Red Gum, it's any vegetation – and then you try to look for wherever you'll get landscape value. If you look at another project I did, the client bought a creek system that had been degraded and partially cleared for farming and actually returned that to its former native vegetation and basically linked two major blocks of native vegetation and created a continuous wildlife corridor. It didn't have one life for life, but the eco-system value for that was enormous for the flora and fauna in the region. Some of those negotiations are quite commercial and confidential in terms of what you're doing with the land, so sometimes you won't see a lot of

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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that. But we have to at least outline that it can be achieved and the types of ways that it can be achieved.

**166. It's still the honour system.**

It's hard, but having been through a few of these I can assure you it's not a whitewash, you have to actually do the work. There are significant management plans, significant financial commitments and they are pretty hard to negotiate.

**167. Do the federal or state governments check that you're actually doing what you have to do?**

You have to do a report as an annual return as part of any offset. You have to report on the progress of the offset, set the performance criteria for the offset, that is, how it will return to remnant status, and you have to report that performance each year. Then in some jurisdictions, although I'm not sure about Queensland, there's a review at five or ten or fifteen years, and the reason for that is you don't see much for the first years so there's no good reviewing it; you've got to allow it to establish then in five years you start to see some change, at seven years you're looking for it to be going in the right direction and around the ten plus years, you get a sign off and that's when the government will sign off that it is achieving remnant status and it can move on then. It's a lot of work to get there.

**168. With regards to the Red Gum forest that is going to be destroyed as part of the process of the plant being constructed; does the beautiful timber just get wood-chipped rather than it being put to use as furniture or something like that?**

There's a requirement in Queensland that you assess what they call merchantable timber. Once we move down the track of some of those permits you have to assess merchantable timber and if there are merchantable quantities (i.e. it's not just an individual tree for furniture) then typically you would have to get a contractor to harvest it. I don't know whether that's the case on this site. It is a typical requirement. You've got to have quality and quantity.

**169. So who decides whether it's merchantable?**

Department of Forestry usually.

**170. I notice that your tunnel goes across the harbour and you inferred that it would be quite a considerable size, but is there any movement with that to be connected with the common users infrastructure corridor?**

It won't be connected to the corridor. It comes out on Hamilton Point, the common infrastructure corridor there. The current plan is just to have the gas pipeline in it, but we're also looking at other utilities such as communications to come across, but it won't be an access tunnel. People will not be able to access the site via the tunnel.

**171. So you'll have just gas pipes and services.**

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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Correct, and it will be four and a half metres in diameter. And that's going to go 40 metres under the harbour, in competent rock, not marine sediments.

## **172. How long is that going to take?**

Three years. We feel it's a much better environmental solution than actually laying it in the seabed.

## **173. You're saying it's not accessible, so what happens if you've got a problem, how do you maintain it?**

We're designing it to have anything that's maintainable in the actual shafts of the tunnel, so they can be lifted out at both ends of the tunnel. There will be a shaft that goes down that first 20-30 metres, so most of the equipment will come out of that. Everything will be designed so that it doesn't have to be maintained. It would be a very, very rare occasion that anyone would have to go into that tunnel, so we're certainly not planning on people going in there.

## **174. But wouldn't you have to have some system to maintain the tunnel? Just say Gladstone has a tremor or the pipe cracks like it has been when some of the other proponents have been laying their pipework. What happens if the unthinkable happens?**

Of course we do risk assessments. We have what we call an intelligent pig which means you send the device through the line and is pushed along by the gas, and it measures the internal properties of the pipe which includes corrosion and it also measures cracks or anything else that could potentially be there. That's done on a regular basis. What we are also including in the design is an external robot, hopefully which will be built as a module and that will track the pipeline with cameras and lights allowing us to do an external inspection of the pipeline. The plan is that the pipeline will be routinely inspected at the right inspection intervals and we also do the same thing externally and if we see something strange, then we will do the necessary risk assessment to send people down there. But as far as I'm concerned that's a confined space and we don't normally want to send people down there unless we've done all the proper risk assessments and got all the right precautions in place. That's the way we're going to manage the pipeline.

## **175. How big is the pipeline itself.**

It could be up to 48 inches. The tunnel is four metres in diameter.

## **176. What's it lined with?**

It's a concrete-lined steel tunnel, it's not supposed to have any leakage whatsoever. It slopes from one end to the other so we just have a low point drain away, so for me the potential issues would be water leakage and then we would be looking at whether the pipeline's integrity is right and if the condition is okay we could possibly send people down there to patch the tunnel if that was really an issue. But if there was really something wrong with the pipeline itself then we would shut the pipeline down, de-pressure the pipeline and repair it. I've done that on pipelines elsewhere where we've had to shut the pipe down because people were trying to repair it.

# Arrow LNG Plant

Community Information Sessions 15-19 May 2012

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**177. Will you have electricity running through the tunnel as well?**

At this stage the tunnel has been designed to take electricity but at the moment we're not going to have it going through the tunnel. One of the concerns is that if you have electricity cables they will need routine inspections which then impacts on the need to minimise the number of people going down. We will probably need some fibre optic cables to carry communications through as well.

**178. Are the historical yards a part of your precinct?**

Yes, and they're all going to be lost. However, they're recognised as locally significant so we have to make a full record and have it formally documented under heritage legislation so that it's available for future generations.