Meg O'Neill
Chief Operations Officer
Woodside Energy Ltd.

AmCham
Monday, 29th July 2019

CHECK AGAINST DELIVERY

Good afternoon. I would like to begin by acknowledging the traditional owners of the land upon which we are meeting, the Whadjuk people of the Noongar nation, and paying my respect to their Elders past, present and emerging.

It is a privilege to speak today at AmCham, an organisation that promotes international trade and commerce and a strong relationship between America and Australia.

Those are things that Woodside values also. As you may be aware, we pioneered the LNG export industry in Australia, dispatching the North West Shelf's first cargo from Karratha 30 years ago this month. We are also celebrating a milestone closer to home – 35 years of supplying domestic gas from the North West Shelf to households and businesses in WA.

Today we operate around 6% of global LNG supply, providing our international customers with safe, reliable and clean energy.

We are now pursuing growth plans that will make a major contribution to the economy and energy supply in this state for decades to come. The demand will be there – but there is fierce global competition. We know we need to have a razor-sharp focus on costs and reliability.

Today I'd like to talk about the technology and innovation that is transforming our operations and will help us to remain competitive globally as we progress those growth plans.

I'll also talk about how Woodside is innovating to create a market for LNG fuels and the real progress we are seeing on that front as the global shipping

industry prepares for the International Maritime Organisation's January 2020 deadline for cleaner shipping fuels.

But first, let me give a brief overview of our Burrup Hub growth plans and what they mean for Western Australia and the nation.

Those growth plans involve developing 20 to 25 trillion cubic feet of gross dry gas resources from the Scarborough and Browse fields through Woodside-operated Karratha Gas Plant and Pluto LNG Plant in northern Western Australia.

To put that in context, that's slightly more than the entire volume of gas processed through the North West Shelf since it started production in 1984.

We are at a crucial phase in those plans. We have already started front end engineering and design activities on Scarborough, targeting a Final Investment Decision next year. Work is underway on the design of a second LNG train and a domestic gas plant at Pluto. We are engaging with contractors and local suppliers to discuss the opportunity this presents for local industry.

For the Browse fields, early engineering work is underway on a development that features two Floating Production Storage and Offtake units, connected by 900km of subsea pipeline to the North West Shelf's Karratha Gas Plant.

We also propose to build a pipeline linking the Pluto and KGP plants, creating an integrated 7-train LNG production centre on the Burrup Peninsula.

Economic consultants ACIL Allen estimate that the economic activity associated with the Burrup Hub can support the creation of an average of 4,000 full-time equivalent jobs per annum nationally over a 40-year time-frame, with almost half those jobs located in northern Western Australia.

Total direct tax and royalties payments over that timeframe are estimated by ACIL Allen to add up to $82 billion. And the flow-on effects include boosting Australia's Gross Domestic Product by $414 billion between now and 2063.

We are making progress, but we face stiff competition: new LNG projects are planned or proposed in Qatar, Mozambique, Canada, Russia and the USA.

We are competing on timing and costs. It is essential that we are innovative to ensure our projects are ahead of the curve.

When I started at Woodside last year, I knew this company had a reputation for being a global technology leader in our industry. That sounded promising, but I wanted to see evidence of the uptake of technology in operations.

I've got to say: what I have seen in the past year has convinced me that Woodside really is at the forefront of a new way of doing things in LNG production, applying advanced data science and robotics to improve the way we run our facilities.

The key has been integrating our technology and digital teams with our site team so there is a collaborative effort to devise practical solutions… solutions that combine the creativity and skills of our tech team with the know-how and hands-on experience of our operators…. solutions that our operators will use because they have had input and can see how the technology enables them to do their jobs better.

We're already seeing tangible value creation from that integration of technology and operations. Perhaps the most significant impact is the increase in capacity of the Pluto LNG train. The original nameplate capacity of the plant is 4.3 MTPA. In 2018, we demonstrated sustainable capacity of 4.9 MTPA. This was a remarkable outcome, which was achieved through a whole range of optimisation projects, including ensuring we had the right software model to understand the constraints in the facility, so we systematically could work through them.

Anyone who has been to an LNG plant will know it is a very complex organism. There are multiple points in the liquefaction process where limits can be reached either due to equipment or procedural factors. The complexity is a challenge, but it's also an opportunity: if you have the tools to deeply understand how a facility is operating, you can identify and avoid potential future problems.

You can also look back on previous operating conditions and find ways to remove any barriers to optimal performance. That's how we've managed to lift the capacity of the Pluto facility without building any new equipment.

But of course, we do propose to build a second LNG train, or production facility, at the Pluto site. This gives us the chance to think in a different way about the design of this new facility, reimagining the operating model and harnessing new technology to optimise performance.

Today I'd like to give you a sneak peek at some of the technology that we are currently trialling at Pluto that we think has the potential to be a real gamechanger in operations in our industry - and potentially also in others.

This is not pie in the sky. We have already moved from proof of concept and are mobilised in a pilot program at Pluto.

Our goal is to build what we call Intelligent Assets. We are installing a data-driven digital nerve system at our operating facilities that will capture, analyse and make use of all available data to enable better decision-making and operations.

This approach supports the simultaneous reduction of costs and risk whilst improving reliability and production performance. We aim to make *things* work harder so that *people* can work smarter.

When our tech team was thinking about a name for this pilot program, one word kept coming up in conversations as they tried to describe what it involves. That word is FUSE - and it has stuck. Let me explain why.

What we are working on fuses technologies and data to create an intelligent asset, which can sense, provide insight and take action in a continuous feedback loop that learns and improves over time.

It will make more sense when you see the demonstration of it – and I'll take you through that in a moment. But first, let me stress that our vision has our skilled operators and maintainers at its core. The technology frees them up from observational reporting and manual task completion to add value through business-critical, data-driven decision making.

Now let's take a look inside an early version of the pilot program, which is based on a portion of the Pluto facility. [show the demonstration footage]

Welcome to the virtual Effluent treatment plant at Pluto.

We have deployed 120 smart sensors in the trial site to constantly monitor and relay a variety of real-time data about plant performance.

When we started this project, the cost of wireless sensors was prohibitive – at around $30,000 to purchase and install a device. So our tech team set out to design, prototype and certify our own sensors. The cost is now down to less than $300 (and we've challenged the team to keep going!).

These smart sensors provide a wealth of data that was not previously available at this high frequency and fidelity. In fact, there is so much data that operators are not physically able to review it all, so we are drawing on analytics from data science to process and understand it.

We also needed a tool to visualise the data. This led to the creation of what you can see on the screen, which is referred to as a 4D "digital twin" of the site. It's a spatially referenced virtual replica of our facilities with embedded real-time data analytics related to conditions and performance.

Within the FUSE system, data from sensors plus the insight from analytics can lead to action. The action will depend on the situation – but it could for instance be deploying an autonomous robot to shut a piece of equipment down or isolate a valve to make it safe. This is of particular relevance as we seek to eliminate the need for people to enter hazardous environments. Or the action might be the system autonomously raising a notification or work order.

As I already mentioned, it's about sense, insight and action.

Our operators can SENSE conditions in the plant by accessing real-time data from all relevant sources. They can be given INSIGHTS on what the sensed data means through results from machine learning and other analysis. And they can be presented with a list of what ACTIONS to take, or perhaps what actions have been taken.

This demonstration has spatial and temporal components. You can see and hear what happened in an area, then slide back and forward in time to compare. The ability to go back in time allows for incident root cause analysis.

Perhaps a pump shut down unexpectedly last night at 10pm – you can dial back the clock and go and have a look at that pump – and you can then hear the valve next to it making a high-pitched screeching, which could be a clue to why the incident occurred.

A pump can learn from other pumps too – if a similar pump in similar conditions failed in the same way, the Intelligent Asset will suggest the remedial actions used previously. This is the next step. Ultimately, the goal is to have situational awareness. Knowing what is going on at any point in the asset, understanding what is happening and predicting what is going to happen next.

We're on an exciting journey, here. Pluto is already a very high-performing facility. There are quarters where it runs at 100% reliability. Very few plants in the world run at that level. The technologies we are pioneering now will ensure it retains that world-leading position.

But for now, let's leave Pluto's digital twin and talk about what happens with some of the LNG that the plant is producing.

Innovation is not just about gadgets and widgets and gigabytes. It's also about new uses for our product and new ways to provide it to market.

In this year of historic milestones for Woodside it might be tempting to just rest on our laurels and feel complacent about our record – 65 years since we first listed as a company, 35 years of domestic gas supply and 30 years of LNG exports. But complacency is quite simply not an option, given the competition we know we are up against and some of the challenges we face.

We know we need to be strategic and ambitious. And there is no better example of this than how we have in recent years worked to support the emergence of a market for LNG fuels

We have not done this alone. And we have not yet reached our goal. But we are seeing some promising developments. This is a story that is much bigger than Woodside. It's about Western Australia grasping an opportunity to take advantage of international developments to derive both economic and environmental benefits from its natural resources.

Almost three years ago, the International Maritime Organisation agreed that from January 2020 all ships would be required to use lower-sulphur fuel. That is, fuel with a maximum sulphur content of 0.5%.

The IMO's objective was to reduce the health impacts of air pollution from shipping, which is blamed for hundreds of thousands of premature deaths each year from lung cancer and cardiovascular disease. The IMO has since indicated it will also impose future controls on greenhouse gas emissions from shipping.

The start of the lower-sulphur era in January 2020 will create upheaval for global shipping. But for Western Australia, it creates opportunity. This state has world-class LNG supplies close to the busiest bulk commodity trading route in the world, shipping iron ore exports to Asia.

Soon after the IMO's ruling, an industry coalition was formed that would lay the vital groundwork to facilitate LNG fuelling of commodities exports from Australia by designing the vessels that could ply those routes.

The Green Corridor Joint Industry Project involved the major mining companies – BHP, Rio Tinto and Fortescue - along with Woodside and shipping industry partners. Together we developed a design of LNG-fuelled bulk carriers capable of supporting iron ore exports to Asia.

Now BHP is taking this opportunity to the next step, announcing just two weeks ago the world's first tender for LNG-fuelled transport for up to 27 million tonnes of its iron ore.

It's a significant move and this tender will no doubt be hotly contested. Woodside has already been working towards this for some time. We took delivery of our own LNG-fuelled marine support vessel, the Siem Thiima, in 2017 and have been preparing the infrastructure to enable LNG fuelling of bulk carriers at their home port.

These ships will deliver to many ports across north-east Asia, but they will always come home to the Pilbara, which is also home to significant LNG production. So they don't need to waste time and fuel diverting to find LNG elsewhere in the region.

Last week, consultancy Energetics reported that "well-to-wake" lifecycle greenhouse gas emissions for iron ore carriers operating from the Pilbara

would be reduced by up to a third by using LNG from Woodside, rather than heavy fuel oil.

This could yield greenhouse gas savings of up to 5.8 million tonnes of carbon dioxide equivalent per year if all iron ore exports from the Pilbara were shipped using Pluto LNG. That's equal to taking 1.8 million cars in Australia off the road. Emissions of sulphur oxide and particulate matter would be reduced by more than 95% and nitrogen oxide by an estimated 85%.

The environmental prize is large – and so is the size of the economic prize. The potential market for LNG as a marine fuel is vast.

WA's Minister for Regional Development Alannah MacTiernan put it well at a Marine Fuels Institute roundtable last week when she said this was an opportunity to "drive emissions down but still have a vibrant economy".

If all shipping from the Pilbara transitioned to LNG, it would be around 4 million tonnes of LNG fueling. It's potentially a very significant new market and would create a new industry in WA that could grow to a fleet of bunker vessels with hundreds of new high-skilled long-term jobs. This is an opportunity to demonstrate industry collaboration at its best, using Australian LNG to fuel Australian resources exports.

I've been asked recently if our Burrup Hub growth strategy is contingent on the market for LNG fuels taking off. It's not. We know there will be enough global demand for LNG to soak up supply from both Scarborough and Browse.

The LNG Fuels opportunity is an adjacent opportunity. You might say it's the cherry on top – and it's a blindingly obvious market for WA to try to capture, with the potential for a whole new industry and the jobs and investment that brings. And now is the time to be going after that opportunity.

Today I hope I have given you some insight into the opportunities Woodside is chasing, both in how we produce gas and how we provide it to customers. I've worked around the world in this industry and I can assure you that the culture of innovation at Woodside right now really gives the company an edge at a time when producers everywhere are racing to deliver the next wave of LNG. Thank you. ENDS