GOT panel session – Woodside Energy

Environmental Responsibility, Using Technology to Mitigate Risk
October 2016
This presentation contains forward looking statements that are subject to risk factors associated with oil and gas businesses. It is believed that the expectations reflected in these statements are reasonable but they may be affected by a variety of variables and changes in underlying assumptions which could cause actual results or trends to differ materially, including but not limited to: price fluctuations, actual demand, currency fluctuations, drilling and production results, reserve estimates, loss of market, industry competition, environmental risks, physical risks, legislative, fiscal and regulatory developments, economic and financial market conditions in various countries and regions, political risks, project delay or advancement, approvals and cost estimates.

All references to dollars, cents or $ in this presentation are to US currency, unless otherwise stated.

References to “Woodside” may be references to Woodside Petroleum Ltd. or its applicable subsidiaries.
Agenda

- Woodside and our global operations
- Woodside and Collaborative Innovation – FutureLab
- Technology to mitigate environmental risk
  - Seismic acquisition in environmentally sensitive areas; Scott Reef, Australia
  - Pluto reservoir CO2 tree planting offset
  - Reducing the site impact at Karratha using world first modularised LNG train for LNG5
  - Low impact LNG development: Grassy point floating nearshore barges
  - Plant of the Future – an ultra compact LNG plant concept

Gas and Oil Technology – Unconventional Resource Development

14 October 2016
Woodside and our global operations

*Subject to satisfaction of conditions precedent*
Woodside and Collaborative Innovation – FutureLab

Cisco Internet of Everything Innovation Centre (CIIC)

RiverLAB

Woodside Innovation Centre

SMEs
CSIRO
NERA
Chevron
water energy research alliance
GE
CISCO
Woodside is committed to managing our activities to minimise adverse health, safety and environmental impacts, incorporating a right first time approach to quality.

Co-investment finance model

Science for decision-making, long term research programs, transparency, data sharing, dissemination of scientific findings to wider community

>20 year collaboration

AIMS’ commitment is to undertake research that addresses real needs and provides impartial, authoritative advice, and that supports both the protection and sustainable use of our marine heritage, now and into the future.

WOODSIDE – Australian Institute Of Marine Science (AIMS) Partnership
Seismic acquisition in sensitive environments

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<tr>
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<th>Key results show no significant effects</th>
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<tr>
<td><strong>Fish behaviour</strong></td>
<td>No lethal effects</td>
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<td>Low level behavioural responses, return to normal feeding behaviour within 20 minutes of survey vessel passing</td>
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<td><strong>Verification of specific acoustic impacts</strong></td>
<td>No temporary or permanent shift in hearing threshold (TTS, PTS) recorded</td>
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<td>Cumulative sound exposure level (SEL) as high as 190 dB re 1 µPa²</td>
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<td>No damage to other organs, including hair cells</td>
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<td><strong>Fauna mortality and coral damage</strong></td>
<td>No fauna mortality observed that could be reasonably attributed to air gun emissions</td>
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<td>No stress or damage to corals</td>
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<td><strong>Fish abundance and diversity</strong></td>
<td>Underwater visual census and baited remote underwater videos used to cover range of habitats and species</td>
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<td>No significant effect of the seismic survey on abundance or diversity detected</td>
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Baseline and Monitoring studies:
- Remote oceanic reef systems
- Submerged shoals in proximity to offshore assets
- Fringing reef systems – WHAs Ningaloo and Shark Bay

Environmental Approvals – characterisation of the existing environment
Independent scientific expert opinion
2016 Western Australian Bleaching Response Task Force

- >40 scientific publications
- Scott Reef book
- Fact sheets
- Input to Sustainable Development planning
- Developing better industry approaches to mitigation – WAMSI Dredging Node

- Postgraduate studies support
- Coral Reef Research Fellowship
Pluto Reservoir CO2 Tree Planting Offset

The 25 million trees were planted at 11 properties in WA and 16 in NSW, across a total of 17,125 ha of marginal arable land. CO2 Australia owns some of those properties and Pluto LNG has arrangements with the landowners of the others.

The first trees were planted in 2008 and 2009 as part of a $25 million agreement over 50 years with CO2 Australia. A $75 million extension to the program began in 2009 and planting finished last year.
Reducing the site impact at Karratha using world first modularised LNG plant for train 5

- Modules were made in the shipyard where waste was recycled
- Less site personnel reduced local impacts to environment and community
- A more compact plant required less local site disturbance
Low impact LNG development: Proposed Grassy Point floating Near Shore LNG

- Minimise onshore facilities
- Reduction in site labour requirement
- Eliminate need for dredging
Plant of the Future – Next Generation LNG train

- 60% reduction in train footprint (compared to Pluto LNG)
- Smaller overall site footprint
- 60% reduction in site labour

Stage 1 Membranes: 6 m²
Stage 2 Membranes: 6 m²
CO₂/H₂O molecular sieve units: 45 m²
Air coolers: 70 m²
Compressor: 50 m²

Area of major components: ~130 m²

Estimated total area: ~200 m²
1. Woodside understands the environments we operate in
2. We develop this understanding through collaborating with scientific institutions
3. Industry-Science partnerships are mutually beneficial
4. Woodside has experience in CO2 sequestration with tree planting
5. Our innovation programs for an LNG Plant of the Future are aimed at reducing local impacts and improving affordability of LNG; a clean burning, lower carbon transition fuel