Australian LNG  
State of the Nation

RISC Conversation Series  
25 August 2015  
Presented by Martin Wilkes
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Let’s get to know each other

Who are you?

1. A student or associated with the University
2. Someone not associated with the oil and gas industry
3. Someone already working in the oil and gas industry
4. Someone associated with RISC

55%
24%
15%
6%
Let’s get to know each other

What is your impression of the oil and gas industry in general?

1. Favourable
2. Neutral
3. Unfavourable
Let’s get to know each other

What is your impression of the oil and gas industry in Western Australia, compared to your previous answer?

1. Better
2. The same
3. Worse

48%
38%
14%
Let’s get to know each other

If you are a student or someone not associated with the oil and gas industry, are you thinking of, or would you consider, working in our industry?

1. Yes  
2. No

1. 84%  
2. 16%
Let’s get to know each other

If you are a student or someone not associated with the oil and gas industry, have you heard of RISC before today?

1. Yes
2. No

1. 45%
2. 55%
Liquefied Natural Gas

**Major LNG Export Countries 2014**

- Qatar: 78 MTPA
- Malaysia: 23 MTPA
- Australia: 16 MTPA
- Nigeria: 13 MTPA
- Indonesia: 11 MTPA
- Trinidad: 11 MTPA
- Algeria: 9 MTPA
- Russia: 8 MTPA
- Others: 8 MTPA

**Major LNG Import Countries 2014**

- Japan: 87 MTPA
- South Korea: 28 MTPA
- China: 25 MTPA
- India: 13 MTPA
- Taiwan: 13 MTPA
- UK: 10 MTPA
- Spain: 8 MTPA
- Mexico: 5 MTPA
- Others: 11 MTPA
An Australian LNG Tour
Australia’s LNG areas

- **CARNARVON BASIN**: NWSV, Pluto, Gorgon, Wheatstone, Scarborough
- **BROWSE BASIN**: Ichthys, Prelude, Browse, Sunrise, Abadi, Bonaparte, Sunrise
- **BONAPARTE BASIN**: Bayu Undan, Abadi, Bonaparte
- **SURAT/BOWEN BASIN**: QCLNG, GLNG, APLNG, Arrow

**Major Australian cities**
- Perth
- Karratha
- Broome
- Darwin
- Gladstone
- Brisbane
- Sydney
- Melbourne
- Adelaide
- Sydney

**LNG source gas basins**
- QCLNG, GLNG, APLNG, Arrow

Source: Department of Mines and Petroleum, RISC research and analysis
## History of Australian LNG

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<thead>
<tr>
<th>Year(s)</th>
<th>Event(s)</th>
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<tr>
<td>1963</td>
<td>Woodside awarded &gt;370,000km² of NWS acreage</td>
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<td>1971-72</td>
<td>North Rankin and Torosa (Browse Basin) discovered; Goodwyn discovered</td>
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<td>1980-81</td>
<td>WA State Government agrees to underwrite domestic gas with take or pay contract and building DBNGP; Gorgon discovered</td>
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<td>1984-85</td>
<td>Domestic Gas supply starts form North Rankin A; NWSV signs agreements to supply LNG to Japan</td>
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<td>1989</td>
<td>LNG Shipments begin to Japan</td>
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<td>1995-96</td>
<td>Goodwyn A platform starts up; Perseus field discovered next to North Rankin</td>
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<td>2002-04</td>
<td>NWSV agrees LNG contracts with China</td>
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<td>2004</td>
<td>NWSV Train 4 start up: Darwin LNG Start up</td>
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<td>2007-08</td>
<td>Pluto FID; NWSV Train 5 start up</td>
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<td>2009</td>
<td>Gorgon FID;</td>
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<td>2010-11</td>
<td>QCLNG; GLNG; Prelude: APLNG; Wheatstone; Ichthys FIDs</td>
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<td>2012</td>
<td>NWSV 3500th Cargo; Pluto Start up</td>
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<tr>
<td>2015</td>
<td>QCLNG Start up</td>
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</table>
Browse Basin LNG

Source Gas
- LNG Facility – under construction
- LNG Facility – planning

Source: RISC
Bonaparte Basin LNG

- Bayu Undan
- Sunrise FLNG
- Barossa/Caldita
- Evans Shoal
- Abadi FLNG
- Bonaparte FLNG

Source Gas
- LNG Facility – operational
- LNG Facility – under construction
- LNG Facility – planning

From Ichthys

Source: RISC
Surat/Bowen Basin CSG-LNG

Gladstone/Curtis Island LNG facilities
- QCLNG
- APLNG
- GLNG
- Arrow

Source Gas
- LNG Facility – under construction
- LNG Facility – planning

Source: RISC
Current and proposed CSG-LNG facilities at Gladstone

Sources: EIS submissions, RISC estimate for Arrow
## Australia’s LNG projects overview

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Not including:
- PNGLNG (PNG 6.6MTPA – FID December 2009 start-up May 2014)
- DSLNG (Indonesia 2MTPA - FID January 2011 for end 2014 start, now 2015)
The USA is coming...
## US LNG projects overview

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- **FID**: Final Investment Decision
- **Expected First Production**: Expected date of first production
- **Planned FID**: Planned date of final investment decision
- **Proposed First Production**: Proposed date of first production
What the News has been saying

High-cost Australia may miss $180 bln LNG expansion wave

Chevron finds huge cost blowout at Gorgon: report

BusinessDay

Australia’s LNG sector booms amid concerns

Triple whammy sparks $5bn blowout for BG’s Gladstone project

Santos Reports $2.5B Increase in GLNG Price Tag
What have they been comparing?

AUS Gorgon
- 3 Trains
- Greenfield Island location
  - 2km Jetty into the Sea
  - Breakwater
  - MoF
- Class A Nature Reserve
- >10% CO₂
- Carbon Capture and Storage
- Upstream subsea development
- Some Liquid HC Content (Condensate)
- Domestic Gas Plant

USA Sabine Pass LNG
- 2 Trains
- Existing Import Terminal
  - Jetty and offloading facilities
  - LNG Storage Tanks
  - Connection to gas grid
- Industrial area with good access
- <1% CO₂
- No upstream content
- No Liquids

Is this a fair comparison?
We now have other projects to compare

<table>
<thead>
<tr>
<th>QCLNG</th>
<th>Corpus Christi</th>
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<tbody>
<tr>
<td>Greenfield location</td>
<td>Greenfield locations</td>
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<tr>
<td>Small Jetty into sheltered water</td>
<td>Small Jetty into sheltered water</td>
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<td>Island location</td>
<td>River location</td>
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<tr>
<td>Near industrial area (but no road access)</td>
<td>Industrial area with good road access</td>
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<tr>
<td>2 Trains</td>
<td>2 Trains</td>
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<tr>
<td>2 Storage Tanks</td>
<td>2 Storage Tanks</td>
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<tr>
<td>No liquids</td>
<td>No Liquids</td>
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<td>No upstream content</td>
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Is this a fair comparison?

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<th>QCLNG</th>
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<td>~A$19 bln Total</td>
<td>No upstream content</td>
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<td>~A$11-12 bln Downstream (in a period of ~parity)</td>
<td>US$11.5 bln</td>
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<td>~50 months from sanction to first LNG</td>
<td>Planned 42 months execution</td>
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<td>Most significant delays pre-sanction</td>
<td>Significant approval delays pre-sanction</td>
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Cost of Supply – Key Issues

Distance impacts Shipping Costs
Cost from US Gulf coast is significantly higher than Australia

Condensate production can generate significant additional value for some projects

Assumes LNG sold at energy value parity to condensate
Cost of Supply comparison to N. Asia

![Cost of Supply comparison to N. Asia](image)
Applying recent pricing mechanisms to historical data shows that for most of the past Decade HH indexing would have been more expensive (to Japan) than oil indexing.

HH at $4/mmBtu results in a gas price of ~$10.00/mmBtu in Japan, which is roughly equivalent to an oil price of ~$65/bbl.
LNG Market

- Global LNG Trade
- LNG Consumption Asia
- Spot and Short Term
- 5% Growth
- 3% Growth

MTpa

Issues for Australian LNG

- LNG from Australia is relatively high cost LNG
  - This may not be true for mature projects (e.g. with contracts coming to an end).
- Proximity to Asia is an advantage that mitigates against high initial costs

- By 2018 Australia will be the largest producer of LNG in the world
  - LNG will be the second largest export earner for Australia
- Production from current projects will require continued investment to maintain production

- New large scale greenfield LNG projects are facing increased complexity, but will still need robust pricing
  - Innovation and Ingenuity will be required in the face of continued low oil prices
- Project expansion (brownfield expansion) has significant potential advantage because infrastructure is already there.

- Each project is unique
What about FLNG?

Development of FPS facilities

Cumulative number


Source: International Maritime Associates Inc./GIIGNL, BP and BG Group/LNG Journal and IGU
What about FLNG?

Development of FPS facilities / LNG short term market

Cumulative number / market size (MTPA)

Source: International Maritime Associates Inc./GIIGNL, BP and BG Group/LNG Journal and IGU
What about FLNG?

Development of FPS facilities / LNG short term market / FRSUs

Cumulative number / market size (MTPA)

Source: International Maritime Associates Inc./GIIGNL, BP and BG Group/LNG Journal and IGU
What does this mean for you?

- The Australian LNG industry will be employing people for the next 40+ years
- It will require ingenuity, innovation and new ways of working

You’ve heard my views....
What does this mean for you?

What is your impression of the oil and gas industry in general?

1. Favourable
2. Neutral
3. Unfavourable

80% 14% 6%
What does this mean for you?

If you are a student or someone not associated with the oil and gas industry, are you thinking of, or would you consider, working in our industry?

1. Yes
2. No