Meeting of the Roundtable for O & G Projects, 25th September 2015

Global liquid petroleum cost curve US$/#bbl

Average Breakeven US$/#bbl

A$25 to 35 = US$18 to 25 per bbl oil lifting cost range, Cooper-Eromanga basins

Source: http://www.rystadenergy.com/AboutUs/NewsCenter/PressReleases/2015-will-be-extraordinarily-tough-for-oil-companies
South Australia has a **BAN** on all oil, gas, geothermal energy and gas (including greenhouse) storage operations **UNTIL** potentially significant risks, risk mitigation strategies and residual risks are established and after **EFFECTIVE CONSULTATION** with potentially affected people, enterprises and organisations.

This is achieved with **STATEMENTS OF ENVIRONMENTAL OBJECTIVES (SEO)s** resolve that operations- and region-specific risks are reduced to as low as reasonably practical and meet community expectations for net outcomes.

Thereafter, SEOs are approved and operators give **NOTICE OF ENTRY (NoE)** with sufficient project details to enable stakeholders to make informed decisions whether or not to object to land access.

Every potentially directly affected person, enterprise and organisation is given **NoE** can be a show-stopper with disputes resolved in court. ~15,000 NoEs since 2000 without a single instance of court proceedings.
Vision for Nirvana: Centuries of safe, secure, competitive energy supplies that meet community expectations for net outcomes

To reach the vision

• Simultaneously attain trust with investors and the public
• Gain community consent for (locally) unfamiliar activities BEFORE IT IS PERSONAL – before approval sought for on ground activities;
• Potentially affected people and enterprises get timely information to enable informed opinions;
• Convene roundtables & deliver roadmaps to inform: the PUBLIC, GOVERNMENTS, AND INVESTORS, - enable/attract welcomed projects. Clarify what the future may bring.
• South Australia’s Roadmap for Unconventional Gas
Conclusions:
Descend cost & ascend productivity curves to be competition without harm
Regional sharing of costs mitigates the tyranny of distance for remote operations

Informed by a Roundtable of: industry; governments; peak bodies for protecting environments and aboriginal people; research institutions & a few individuals. Now >700 members

Now the Roundtable for Oil and Gas Projects with 8 working groups to inform potentially affected people and enterprises while enabling cooperation amongst competitors.

Strategic actions:
• Demonstrate where the net present value of cooperation (JVs for JVs) exceeds the value of go-it-alone planning / investment;
• Local businesses given a ‘heads-up’ to use competence to build capacity to compete (local skin in the game)
Top priorities:

- Legal frameworks provide certainty and simultaneously meet community and investor expectations for outcomes
- Trustworthy, people implement and regulate projects
- Environmental sustainability
- Manage supply-chain risks (people and facilities)
- Bolster understanding of risks, risk management and rewards
Recap 8 Working Groups

#1  Training
#2  Supply hubs, roads, rail and airstrips for the Cooper-Eromanga basins
#3  Water use in the Cooper-Eromanga basins
#4  SA-Qld 'wharf to well' corridors for the Cooper-Eromanga basins
#5  Cost-effective, trustworthy GHG detection
#6  Suppliers’ Forum
#7  Use gas for transport and heavy equipment
#8  NEW – Sharing Information
Implementation of 125 Ranked Recommendations in the Roadmap

116 OF 125 (93%) implemented, Implemented in part, or in progress
<table>
<thead>
<tr>
<th>#</th>
<th><strong>Progress Implementing Recommendations Since Oct ‘14</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>• <strong>Fit for Purpose Licences.</strong> PRLs and PPLs with minimum expenditure requirements given timely commercial flexibility when Brent oil &lt; A$70/bbl</td>
</tr>
</tbody>
</table>
| #2 | • **Fit for Purpose Training:** Tonsley Onshore Petroleum Centre of Excellence started training in Nov. ‘14. Fluid flow was added in May ‘15. Gas flow to follow in ’15.  
• 2nd supplier’s study tour of shale gas facilities in the USA in 1Q 2015 |
| #3, #23, #53, #58 & #82 | • **Environmental Protection:** O&G operations impacts on water are being assessed by the National Centre for the Groundwater Research and Training (NCGRT) and peer reviewed by the CSIRO and the Office of Water. Interim draft findings will be provided today  
• Draft *Hydrogeological Risk Assessment - Oil and Gas Development - South East* has just been peer reviewed by the NCGRT and is expected to be released in 2015.  
• U of Adelaide experts will confirm leading (effective) practice risk management for well integrity, including cementing practices and identify gaps in peer reviewed studies.  
• DSD sponsored ASTE conference in September 2015  
• Roundtable Working Group #8 will form and focus on sharing information  
• A NICNAS report on the chemicals used during fracture stimulation is underway. |
<table>
<thead>
<tr>
<th>#4</th>
<th><strong>Elucidate experience</strong>: To end Aug ‘15, 798 wells had been fracture stimulated in SA - all safely without deleterious impacts.</th>
</tr>
</thead>
</table>
| #6, #32, #47, #49, #60, #74 & #114 | **Inform people, policy makers, industry**: Updated FAQs for petroleum operations the SE.  
**Whole-of-State G’ment submission to the SA Parliament’s NRC inquiry into fracking in the SE of SA**  
**Continue to participate in regional fora that enable information sharing. Focus now on the SE of the State**  
**Support for ATSE’s 2015 International Unconventional Gas Workshop, 22-23 September 2015,**  
**Support research into, water, cementing, GHG monitoring and reservoir prediction**  
**Instigating Working Group #8 – for sharing information – its web-page will have links to trustworthy, peer-reviewed literature and trustworthy rebuttals to unsupported claims**  
**Cooperate with the Commonwealth’s Oil, Gas and Energy Resource Industry Growth Centre.**  
**Support organisations such as The Norwood Resources (through DSD) and the Conservation Council (through DEWNR) to balance public discourse** |
| #7, #8, #9, #13 & #84 | **Seal the Strzelecki Track**: The State G’ment has submitted a proposal to Infrastructure Australia. An update will be provided today. For some details –See:  
[http://www.dpti.sa.gov.au/infrastructure/content/strzelecki_track_upgrade_and_sealing_project](http://www.dpti.sa.gov.au/infrastructure/content/strzelecki_track_upgrade_and_sealing_project) |
| #15, #31 & #52 | • **Enable efficient exploration investment.** Cooperating with the USGS and Geoscience Australia (GA) to understand conventional and unconventional reserve and resource potential.
  ✓ Early joint SA-GA outputs published, September 2015 with insights provided today.
  ✓ Outputs from the USGS expected in 2015/16 |
| #17, #29, #109 & #112 | • **Enable efficient infrastructure investment.** Signed MoUs with the NT and Qld to underpin consistent, efficient and effective regulation across jurisdictions.
  • Commissioned analysis of optimized pipeline connections from the NT to Eastern Australia (next slide) |
| #18 and #96 | • **Enable competition in services:** Special Facilities Licence granted to KJM for Cooper Parks.
  • Special Facilities Licence granted to Rossair – preliminary site survey completed. |
| #41, #64, #79, #89 & #111 | **Foster efficient markets**
  • Cooperating with ACCC investigation
  • Backing gas trading hubs.
  • Commissioned a review of gas supply: demand for eastern Australia Preliminary findings today |
Relevance of Moomba to Cost of Gas Delivered to Sydney

Options

- Black Tip & Mereenie to Sydney via Moomba
  - owing to less pipeline distance to Sydney, roughly $1.40/GJ lower delivered cost to Sydney

- Black Tip to Sydney via Mt Isa
  - higher cost gas to Sydney

- Mereenie to Sydney via Mt Isa
  - Higher cost gas to Sydney

Steve Mackie’s (Santos) mud map
OBJECTIVE: Safe, secure and competitively priced natural gas

Gas price parity (per FERC Sept 2015 LNG & 0.71 US$/A$ on 16/9/15)
US$7.45 to US$7.85 = A$10.49 to A$11.06 per gigajoule (GJ) for LNG in Asia
- A$1/GJ for LNG vessel shipping
- A$2 to A$4/GJ for LNG production in Gladstone, Qld
- A$2/GJ tariff per 1,000 km gas pipeline Moomba to Gladstone
A$3.49 to A$6.06/GJ is one benchmark for gas price parity at Moomba’s gate

Approx. 15% of Brent oil (~US$44.75/barrel = A$63.03/barrel) for LNG ex-Gladstone
A$9.45/GJ for LNG ex Gladstone
- A$2 to A$4/GJ for creating LNG in Gladstone
- A$2/GJ tariff per 1,000 km gas pipeline Moomba to Gladstone
A$3.45 to A$5.45/GJ is gas price parity at Moomba’s gate excl’g LNG vessel cost

Buyers and sellers need to share uncertainty on oil price and forex

Comparative advantages delivered from local energy supplies
Longford – Mount Gambier ~A$0.45/GJ pipeline tariff
Moomba – Mount Gambier ~A$1.50/GJ pipeline tariff
Katnook to Mount Gambier ~A$0.06/GJ + add’l security of competing gas supplies

South Australia
Department of State Development
### What is the rig count in SA?

#### O&G FTEs in SA?

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Petroleum Employees</th>
<th>Oil $(Brent)</th>
<th>FTEs per $ oil</th>
</tr>
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<tbody>
<tr>
<td>2005</td>
<td>1350</td>
<td>54.42</td>
<td>24.8</td>
</tr>
<tr>
<td>2006</td>
<td>1275</td>
<td>65.15</td>
<td>19.6</td>
</tr>
<tr>
<td>2007</td>
<td>2100</td>
<td>72.47</td>
<td>29.0</td>
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<tr>
<td>2008</td>
<td>1100</td>
<td>96.85</td>
<td>11.4</td>
</tr>
<tr>
<td>2009</td>
<td>1275</td>
<td>61.49</td>
<td>20.7</td>
</tr>
<tr>
<td>2010</td>
<td>1450</td>
<td>79.51</td>
<td>18.2</td>
</tr>
<tr>
<td>2011</td>
<td>1350</td>
<td>111.26</td>
<td>12.1</td>
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<tr>
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<tr>
<td>2014</td>
<td>2625</td>
<td>99.02</td>
<td>26.5</td>
</tr>
<tr>
<td>2015</td>
<td>1750</td>
<td>57.63</td>
<td>30.4</td>
</tr>
</tbody>
</table>

**Average over 11 years:** 20

>2000 jobs per US$ per bbl change in West Texas crude oil. Greater drilling investment in the USA vs Australia is a factor.
Fact checked answers to FAQs

• FAQ Sheet – Unconventional Gas and Oil in the South East of South Australia

• Whole-of-government submission to South Australian Natural Resource Committee Inquiry Into Unconventional Gas (Fracking)
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Barry Goldstein
Executive Director
Department of State Development
South Australian State Government
**Cooper – Eromanga Oil and Gas Plays**

**Oil – Conventional Plays, Eromanga**
Structural and structure-stratigraphic traps, sandstone reservoirs, coal & shale source. 50% success finding avg 2.5 mmbo recoverable in the term 2002-14. More to come.

**Gas – Conventional Plays, Eromanga**
Structural and structure-stratigraphic traps, Coorikiana sandstone reservoirs, coal & shale source. An emerging play.

**Oil & Gas – Conventional Plays, Cooper**
- Structural and structure-stratigraphic traps, sandstone reservoirs, coal & shale source (6.5 TCF produced – more to come)

**Dry-Wet Gas Unconventional Plays, Cooper**
- Deep self-sourcing coal
- Mixed reservoirs (coal, shale, sandstone, siltstone) with coal & shale source
- Tight sandstone/siltstone
- Self-sourcing shale

**Hundreds of TCF natural gas potential from aggregate of all unconventional plays**
Deep Cooper Basin Coals: Enormous Generation and Reservoir Capacity

Patchawarra Formation
Cumulative Coal Thickness

Toolachee Formation
Cumulative Coal Thickness

Senex's Paning 2:
Single 63,000 pound proppant fracture stim. in Toolachee coal (~2900m). Up to 90,000 scf/d, over 4 days.

Santos, Beach, Origin JV
CO₂, Gas Wetness & Generated Oil and Gas. SA Cooper Basin

- Est’d cumulative hydrocarbons generated in the Cooper Basin.
- Largest contribution from Toolachee and Patchawarra coals & coaly shales.

Courtesy Lisa Hall, et al, 2015
Patchawarra Coal – Hydrocarbons Expelled and Retained

Courtesy of Lisa Hall, Geoscience Australia
Top Ranked Roadmap Recommendation – Fit-for-Purpose Petroleum Licences and Tenure

Winner’s Curse?

Know your market!

- Market benchmarks (bids/farm-ins) define contestability
- State get’s a multiple of exploration + appraisal investment while industry gets secure tenure on regional plays
- Development costs in eligible expenditure tallies for PRLs when the price for Brent falls below A$70/barrel

\[ y = 16418e^{-0.03x} \]
\[ R^2 = 0.6809 \]

Average for High Bids: $4,435 per sq km per year

$4,500 / km\(^2\) pa