1. Welcome & Introductions
2. What brought us together?
3. Agenda
4. What’s been done?
5. What’s next

Meeting of the Roundtable for O & G Projects
23rd October 2014

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Barry Goldstein,
Executive Director – Energy Resources
Department of State Development
South Australian State Government

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**Gas in the “Lower 48” USA**

*Ted Beaumont, President AAPG (July 2012 Explorer pp 3)*

.....outside North America, industry is just beginning to explore resource plays.

.....organic matter, maturity and brittleness

.....the USA is now producing more gas than ever

**Australia leads in using CSG as feedstock for LNG**
Natural gas and oil in unconventional rock-reservoirs

EIA / ARI 2013

Technically Recoverable Shale Resource Estimates

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Gas (TCF)</th>
<th>Oil (Billion Bbls)</th>
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<tbody>
<tr>
<td>1</td>
<td>USA</td>
<td>1,161</td>
<td>1 Russia 75</td>
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<tr>
<td>2</td>
<td>China</td>
<td>1,115</td>
<td>2 USA 48</td>
</tr>
<tr>
<td>3</td>
<td>Argentina</td>
<td>802</td>
<td>3 China 32</td>
</tr>
<tr>
<td>4</td>
<td>Algeria</td>
<td>707</td>
<td>4 Argentina 27</td>
</tr>
<tr>
<td>5</td>
<td>Canada</td>
<td>573</td>
<td>5 Libya 26</td>
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<tr>
<td>6</td>
<td>Mexico</td>
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<td>7</td>
<td>Australia</td>
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<td>Russia</td>
<td>285</td>
<td>9 Pakistan 9</td>
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<td>10</td>
<td>Brazil</td>
<td>245</td>
<td>10 Canada 9</td>
</tr>
<tr>
<td>11</td>
<td>Others</td>
<td>1,535</td>
<td>11 Others 65</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>7,795</td>
<td>Total 335</td>
</tr>
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</table>

Fast follower criteria outside North America

- The right rocks (liquids rich better)
- Markets
- Supportive investment frameworks
- Trusted regulatory frameworks
- Pre-existing infrastructure
- Two ends against the middle – descend cost & ascend productivity curves
Overview – Oil and gas onshore and offshore South Australia

- 4 Cooper CO2013 blocks attracted aggregate $103 million work program bids (Senex x 2, Strike, Bridgeport)
- Western Flank oil play in the Cooper-Eromanga continues with 50% success in finding avg. 2.5 mln bbls oil
- $510 million accelerated investment with enhanced tenure terms
- Huge potential for gas in unconventional reservoirs in the Cooper Basin
- Encourage results from Otway Basin exploration (Beach/Cooper)
- Bight Basin attracting the majors – massive investment
- Frontier basins’ plays include:
  - Conventional oil and gas
  - Unconventional regional plays
Vision for Nirvana: Centuries of safe, secure, competitive energy supplies that meet community expectations for net outcomes

To reach the vision

• Potential risks to social, natural and economic environments are reduced to as low as reasonably practical (ALARP); and meet community expectations for net outcomes BEFORE IT IS PERSONAL – before approval sought for land access;

• Affected people and enterprises get timely information describing risks and rewards to enable informed opinions;

• Convene roundtables to deliver roadmaps for projects to inform: the PUBLIC, GOVERNMENTS, INVESTORS, AND REGULATORS and in doing so – enable/attract welcomed oil and gas projects.

• South Australia’s Roadmap (Dec. 2012)

465+ members in SA’s Roundtable for O&G Projects
Search words: **DSD & Unconventional Gas**

Informed by a **Roundtable** including: industry; governments; peak bodies for protecting environments and aboriginal people; research institutions and a few individuals. Now under the auspices of the **Roundtable for Oil and Gas Projects**

6 working groups to enable 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.
Priorities to foster sustainable, profitable projects roundtable and roadmap for unconventional gas

Top priorities to build trust:

• 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
## Top 5 of 125 Roadmap Recommendations

☑️ = significant progress

<table>
<thead>
<tr>
<th></th>
<th>Recommendation</th>
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<tbody>
<tr>
<td>1</td>
<td>Deploy fit-for-purpose licence terms and conditions</td>
</tr>
<tr>
<td>2</td>
<td>Enable fit for purpose skills</td>
</tr>
<tr>
<td>3</td>
<td>Use water wisely</td>
</tr>
<tr>
<td>4</td>
<td>Communicate effectively to demonstrate the efficacy of managing environmental risks</td>
</tr>
<tr>
<td>5</td>
<td>Regulation simultaneously meets public and investor expectations for net outcomes</td>
</tr>
<tr>
<td></td>
<td>6th – 10th Ranked Highest Recommendations</td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>6</td>
<td>Bolster public understanding re: hazards and risk management via FAQ on web ✓</td>
</tr>
<tr>
<td>7</td>
<td>Pave roads between Moomba and Qld</td>
</tr>
<tr>
<td>8</td>
<td>Pave roads between southern ports &amp; Moomba</td>
</tr>
<tr>
<td>9</td>
<td>Water crossings more passable</td>
</tr>
<tr>
<td>10</td>
<td>Streamlined approvals for imported equipment - especially road and wiring regulations</td>
</tr>
</tbody>
</table>
Recap 5 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
Add Agenda here (inserted pdf – multiple pages as necessary)
Implementation of 125 Ranked Recommendations in the Dec ‘12 Roadmap

• Many of the recommendations are for evergreen action
• Industry options for competition vs cooperation (JVs for JVs) are subject to industry positions, though g’ment will assist.
Top (#1) recommendation - Provide fit-for-purpose licences

- Giant gas ('00s of TCF) resource potential in unconventional reservoirs
- 52% post-3D success rate 2002-14 for oil exploration in western flank of Cooper – Eromanga (avg. 2.5 mmbo find size)
- Oil plays: 10 operators for 25 companies
- Gas plays: 8 operators for 16 companies

Petroleum Licence Operators

- Ambassador Oil & Gas Ltd/
  Outback Energy Hunter Pty Ltd
- Beach Energy Ltd
- Bridgeport Energy Ltd
- Discovery Energy SA Ltd
- Drillsearch (513) Pty Ltd
- Terra Nova Energy Ltd
- Linc Energy Ltd
- PNC Australia Pty Ltd
- Santos Ltd
- Senex Energy Ltd
- Strike Energy Ltd

- Oil well
- Gas well
- Western Flank proven oil play
- Gas pipeline
- Gas and liquids pipeline
- Liquids pipeline
- Coongie Lakes control zone – no access
Case Study – Petroleum Retention Leases for Oil

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

Winner’s Curse?

Know your market!

y = 16418e^{-0.03x}
R² = 0.6809

$4,500 / km² pa
Key Matters Considered in the Implementation of Fit for Purpose PRLs

• The #1 priority defined by the Roundtable for Unconventional Gas is the appropriate recognition of the life-cycle for finding, appraising, developing and producing resources. Fit-for-purpose licenses terms now manage resource project life cycle. This is equally relevant to all mineral and energy resource sectors. **Grouped Petroleum Retention Licences (PRLs):**

  ▪ Avoid 18 -24 months delay in exploration/discoveries after: intermittent relinquishments; call for bids; bids; negotiation of land access agreements; and grant of successively smaller PELs;
  ▪ Accelerates investment at contestable levels through renewal terms in ways not achieved with PELs;
  ▪ Delivers investment, jobs, production and royalties, sooner - clearly in the interest of the people of South Australia;
  ▪ Industry as a whole has greater investment efficiency;
  ▪ Attains competitive levels of investment without the perverse outcome of ‘winner’s curse’ bidding;
Grouped Petroleum Retention Licences – PRLs (continued):

- Have a competitive array of enterprises in the South Australian Cooper-Eromanga:
  - 21 companies under 10 operators in the western flank oil play
  - 16 companies under 8 operators in multiple deep gas unconventional reservoir plays;
- Have negotiated levels of investment benchmarked with guaranteed winning bids for oil and with even stronger investment for deep gas plays (that are more expensive to explore and appraise);
- PRL investment is a multiple of what would otherwise be attracted through surrender of smaller areas for re-cycling through work program bids;
- Greater levels of ‘guaranteed’ activity drive more extensive contracts and efficiencies;
- Nurtures small enterprises to become medium to large in size enterprises;
- Attracts secure investment at a time the State needs stronger investment;
- Overcomes a looming issue: Ever-smaller licences attracting bids that too easily stretch the financial competence of ASX IPOs and private capital raisings. The foible of financial competence of bid parties is real;
- Certainty of tenure makes PRLs more valuable than PELs – underpinning capital raisings, farm-outs and M&A – an excellent net economic outcome;
- Farm-in’s and acquisition remain options to get-in
- Underspends result in proportional relinquishments for re-cycling at 5-yr junctures
Recommendation #2: Manage the risk of a shortage of skills and people

Evergreen responsibility of industry and government. **Implemented in part through:**

- Industry and the State Government’s Department of State Development (DSD) under the auspices of **Roundtable Working Group #1**
  - Santos, Beach Energy and Senex Energy are working with the DSD and TAFE SA to establish an Onshore Petroleum Centre of Excellence (OPCE) training facility at Tonsley, co-located with the new State Core Library (More on this later in the agenda)
  - A South Australia State chair for unconventional reservoir research has been established at the University of Adelaide – complimented with funding for international expert lecturers, the State Chair in Petroleum Geology, funding for the CO2CRC, and funding for the State Chair in Geothermal Energy at the University of Adelaide.
  - Suppliers’ study tours of oil and gas facilities in the USA in 2014 will be leveraged-on in another tour in 2015 under the auspices of the Industry Participation Office.

- User-pays fees to sustain the competence and capacity for trustworthy regulations. Enabled by popularity of PRLs. ..After providing $s for time-writing for upstream petroleum regulation by DSD, DEWNR, EPA, SafeworkSA, and Health – still cut PRL fees by 20%
3rd and 4th Highest Ranked Recommendations
- Use water wisely

Evergreen responsibility of industry and government. Implemented in part through:

- Industry and the State Government’s Department of State Development (DSD) under the auspices of **Roundtable Working Group #3**
  - Santos, Beach Energy, Senex Energy and Drillsearch have shared their historical and forecast water production and use in the SA-Qld Cooper-Eromanga basins. DSD called for tenders and provided $ support for a water balancing model. CSIRO and DEWNR providing peer review.
  - Independent expert scientific research review of international oil and gas operations impacts on water to decipher what are significant versus insignificant risks to water resources
  - Regional water studies in the Otway underway and more planned

- Demonstrate safe conduct through outcomes: No evidence or realistic expectation of fracture stimulation resulting in the contamination of fresh water supplies or damaging induced seismicity in the far northeast of South Australia where 717 deep petroleum wells and a few geothermal (hot rock) wells have been fracture stimulated through August 2014 (next slide)

- Regulation must be trustworthy to ban anything everywhere until it is clear all significant risks posed to social, natural and economic environments can be managed to meet community expectations for net outcomes
Separation of fracture stimulation in the Cooper Basin from fresh water supplies

No evidence or realistic expectation of fracture stimulation resulting in the contamination of fresh water supplies or damaging induced seismicity in the far northeast of South Australia where 700+ deep petroleum wells and a few geothermal (hot rock) wells have been fracture stimulated.

Number of fracture stimulated stages in 717 fracture stimulated wells in the Cooper Basin to end Aug.’14
5th, 11th and 12th Highest Ranked Recommendations –
Ensure legislation, regulation, policies & programs are trustworthy, efficient and effective

Evergreen responsibility of government. **Implemented through the leading practice South Australian Petroleum and Geothermal Energy Act 2000 (PGEA):**

- South Australia’s *PGEA* defines the *environment* as: land, air, water, soil; plants and animals; social, cultural and heritage features; visual amenity; economic and other land uses.

- Activities cannot start without an approved SEO in place.

- SEO’s set standards for outcomes from operations

- SEOs are objective-based, transparent drivers for risk management and the protection of environments.

- ‘Owner of land’ means all people and enterprises potentially directly affected by activities, entitling them to notices of entry, the right to dispute entry (in court) and compensation.

~ 14,000 notices of entry for operations issued – without a single person or enterprise taking up their rights to take the matter to Court ($E^2$)
Vision: Centuries of safe, secure, competitive energy supplies that meet community expectations for net outcomes

- Potential risks to social, natural and economic environments are reduced to as low as reasonably practical (ALARP); and meet community expectations for net outcomes BEFORE IT IS PERSONAL – before approval sought for land access;

- Potentially affected people & enterprises get timely information describing risks & rewards to enable informed opinions (2x’s: post-research and pre-notice of entry);

- Convened roundtable to deliver a roadmap to inform: the PUBLIC, GOVERNMENTS, INVESTORS, AND REGULATORS and in doing so – enable/attract welcomed oil and gas projects.
5th, 11th & 12th top recommendations – Aspiring to attain regulatory Nirvana via Statements of Environmental Objectives (SEOs)

- South Australia’s *Petroleum and Geothermal Energy Act 2000* defines the environment as: land, air, water, soil; plants & animals; social, cultural & heritage features; visual amenity; economic & other land uses.

- Activities cannot start without an approved SEO in place.

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Vision for Nirvana: Centuries of safe, secure, competitive energy supplies that meet community expectations for net outcomes

To reach the vision

• Potential risks to social, natural and economic environments are *reduced to as low as reasonably practical* (ALARP); and meet community expectations for net outcomes **BEFORE IT IS PERSONAL** – before approval sought for land access;

• Potentially affected people & enterprises get timely information describing risks & rewards to enable informed opinions (**2x’s: post-research and pre-notice of entry**);

• Convened **roundtable** to deliver a **roadmap** to inform: the **PUBLIC, GOVERNMENTS, INVESTORS, AND REGULATORS** and in doing so – enable/attract welcomed oil and gas projects.
Productivity Commission concluded: One-Stop-Shops are the most efficient regulatory approach when well managed without ‘CAPTURE’

“Recommendation – Establish lead agencies”

South Australia is widely seen as a model for other jurisdictions to emulate”.

“With appropriate governance, experience in South Australia suggests that such an agency can achieve an appropriate balance between enforcing legislative provisions and expediting approvals”.

23
Infor..._function of regulators through:

- timely stakeholder engagement jointly by DMITRE-PIRSA-DEWNR-EPA (reading off the same evidence-based pages)
- area- and activity specific SEOs (prepared by PGE Act licence holders) and the SEO approvals process to inform potentially affected people and enterprises.
- published the Roadmap for Unconventional Gas Projects in South Australia in December 2012 – and sustaining the Roundtable that informed that Roadmap – to keep the information-flow at the leading edge of evidence/objective based decision-making;
- publish accounts of the PGE Act and stay contestable;
- routinely update answers to frequently asked questions (FAQs) for historical and potential upstream petroleum operations to inform the public. (refer to papers and see: http://www.petroleum.dmitre.sa.gov.au/__data/assets/pdf_file/0003/218109/FAQ_South_East_Unconventional_Gas_and_Oil.pdf)
### 7th, 8th, 9th & 10th Highest Ranked Recommendations – Improved transport, supply-chain depots, heavy vehicle road and wiring regulation

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Progress to mid Oct 2014</th>
</tr>
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</table>
| #7, #8 & #9 Paved, wide roads more passable year-around | More under Agenda Item #6. Implementation in progress through Roundtable Working Group #2.  
- Options for improving roads from ports to operations in the Cooper-Eromanga basins established in dialogs involving the State Government, key operators of petroleum licences in the Cooper-Eromanga basins.  
- Load modelling enabled with equipment lists for wells construction for deep gas in the Cooper Basin ([Appendix 2a and 2b of the Roadmap for Unconventional Gas](#)) |
| #10: Streamline heavy vehicle road and wiring regulations | More under Agenda Item #7. Implementation in progress through Roundtable Working Group #4  
- Queensland and South Australia State governments cooperating to enable wharf to wellhead transport corridors without extraneous regulation. Discussions also involving the National Heavy Vehicle Regulator. |
Progress on recommendations #31 & #52
Updated CO₂ and Gas Wetness Maps, South Australian Cooper Basin
(Epsilon, Patchawarra, Tirrawarra, and Merrimelia Formations)

<table>
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<tr>
<th>% CO₂</th>
<th>Barrels of Propane + Butane (LPG) per MMcf Gas</th>
<th>Barrels of Condensate per MMcf Gas</th>
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Patchawarra Absent  Patchawarra Absent  Patchawarra Absent
Offshore Bight Basin Commonwealth Waters

$1.2 bln guaranteed 2011-16 + $1.1 bln non-guaranteed 2017-20

BP & Statoil
EPPs 37 to 40

CHEVRON
EPP44 & EPP45

SANTOS & MURPHY
EPP43

BIGHT PETROLEUM
EPP 41 and EPP 42
Key Conclusions

1. Huge potential in unconventional reservoirs in the Cooper. ~$3.5 bln investment 2014-19.

2. Huge potential offshore in the Bight Basin. ~$2.3 Bln investment to 2020

3. Trustworthy regulation / regulators

4. The Roundtable for Oil & Gas Projects will continue to expedite fit-for-purpose outcomes to benefit all South Australians
Barry Goldstein,
Executive Director – Energy Resources
South Australian State Government