

Status Update on recommendations from Roadmap for Unconventional Gas Projects in South Australia

Recommendation	Issue	Progress since last report
#1	Provide appropriate licences and licence conditions	Holders of PRLs and PPLs with minimum expenditure requirements given timely commercial flexibility After the price for Brent crude oil fell to below AU\$70 per barrel in January 2015, DSD wrote to all holders of relevant PRLs to allow development investment to count towards minimum expenditure commitments in the balance of 2015. The price fell again to below AU\$70 per barrel in August-September 2016, so the flexibility will be extended to (at least) the end of 3Q16. This recognizes a lower level of certainty that full-cycle development investment will reap returns sufficient to underpin ongoing exploration and appraisal investment.
#2	Commission fit-for-purpose training facilities	The State's largest oil and gas producers Santos, Beach Energy and Senex Energy have cooperated with the State Government and TAFE SA to establish an Onshore Petroleum Centre of Excellence (OPCE) training facility at Tonsley, co-located with the new State Core Library. The facility provides a fully immersive simulated oil and gas production environment to be used for technical training, including safety, environmental and sustainable operational principles and key maintenance activities. Pilot training commenced in November 2014. The official opening and training was undertaken in February 2015. Fluid flow facilities for training were added in May 2015. Gas flow (using air) training equipment will become fully operational in 2015 The MIPO-led oil and gas supplier's study tour of shale gas facilities in the USA in 1Q 2014 and a second tour was undertaken in 1Q 2015. The 2014 tour outcomes include: new stand-over rig services, proppant testing facilities, guar growing trials and the establishment of valuable engineering network ties into the US market. The 1Q 2015 tour will further foster local content in supply chains for the upstream petroleum industry in the State, nationally, and prospectively, world-wide. Details of the 2015 supplier study tour will be published in the next MESA Journal in 2015.
#3, #23, #53, #58 and #82	Protect water resources	A fully independent report on water use for the upstream petroleum operations has been commissioned by DSD. The research agency for this review of existing information is the National Centre for Groundwater Research and Training. The CSIRO and the Office of Water Science have agreed to peer review this study ahead of its publication. Insights into this research will be provided at the Roundtable meeting on 25 September 2015 DSD has commissioned an independent study entitled <i>Hydrogeological Risk Assessment - Oil and Gas Development - South East</i> . The draft is undergoing peer review by the National Centre for Groundwater Research and Training (NCGR&T) and is expected to be released in 2015/16. Roundtable Working Group #8 will form and focus on sharing information An independent University of Adelaide review has been commissioned to confirm leading (effective) practice risk management for well integrity, including cementing practices – and will identify gaps in peer reviewed studies, if any. Researchers are: Terry Bennet, Philip Visintin, Mohamed Ali Sadakkathul and Dusan Losic DSD has Sponsored ASTE conference in September 2015 A NICNAS report on the chemicals used during fracture stimulation is underway – and South Australian co-regulators will offer peer review, along with review by other Federal, State and Territory government agencies (through CoAG). Updates will follow.
#4	Make fracture stimulation data transparently available	Update since last report To end August 2015 - 798 wells have been fractured stimulated with 1977 stages (zones) in South Australia - all safely without deleterious impacts. This includes fracture stimulation in 795 wells in the Cooper Basin, one well in the Arrowie Basin and 2 wells in the Officer Basin. The extents of perforated intervals have been compiled from existing databases. An updated display of fracture stimulated zones position relative to aquifers will be developed (soonest)
#6, #49, #74 and #114	Bolster understanding (with reliable information) re: hazards and risk management	Continue to update answers to Frequently Asked Questions (FAQs) for historical and potential upstream petroleum operations the South East (Otway Basin) since March 2014. This is done to inform the public, overall. See: DSD's Key Points and FAQ - Petroleum in Unconventional Reservoirs in the South East of South Australia: http://www.petroleum.statedevelopment.sa.gov.au/data/assets/pdf_file/0003/218109/FAQ_-_South_East_Gas_and_Oil_in_Unconventional_Reservoirs_25_May_2015.pdf A whole-of-State Government submission to the Parliamentary Natural Resource Committee inquiry into fracture stimulation in the SE of South Australia . Continue to participate in regional fora that enable information sharing. Key focus on the SE of the State Instigate 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 for ATSE's 2015 International Unconventional Gas Workshop, 22-23 September 2015, and for academic experts to participate in the 25 th Sept 15 Roundtable discussions Research by the National Centre for Groundwater Research and Training to separate fact from myth in regard to protecting water resources under Working Group #3 An independent University of Adelaide review has been commissioned to confirm leading (effective) practice risk management for well integrity, including cementing practices – and will identify gaps in peer reviewed studies, if any. Researchers are: Terry Bennet, Philip Visintin, Mohamed Ali Sadakkathul and Dusan Losic Support organisations such as The Norwood Resources (through DSD) and the Conservation Council (through DEWNR) to balance public discourse Water balancing modelling in the Cooper under Working Group #3 DSD has commissioned an independent study entitled <i>Hydrogeological Risk Assessment - Oil and Gas Development - South East</i> . The draft is undergoing peer review by the National Centre for Groundwater Research and Training ARC grant supported research to develop accurate but more cost effective means to measure and monitor fugitive greenhouse gas emissions under Working Group #5 Research to clarify the materiality of emissions from alternative sources of greenhouse gas under Working Group #5 Watching brief for relevant research such as the CSIRO's evaluation of the average fugitive emissions from CSG wells in Qld and NSW being the equivalent to 4 cows. See: https://www.environment.gov.au/climate-change/greenhouse-gas-measurement/publications/csg-fugitive-emissions
#7, #8, #9, #13 and #84	Improve roads to and within the Cooper-Eromanga basins	A project plan to seal the Strzelecki Track has been submitted to Infrastructure Australia. An update will be provided at the 25 Sept 2015 meeting of the Roundtable. For some details – see: http://www.dpti.sa.gov.au/infrastructure/content/strzelecki_track_upgrade_and_sealing_project
#15, #31 and #52	Clarify oil and gas plays, resource and reserve estimates	Cooperate with the USGS and Geoscience Australia (GA) to gather conventional and unconventional reserve and resource estimates, and also independently assess potential of certain Cooper Basin plays. Early joint SA-GA outputs published at the AAPG International Conference, September 2015. Outputs from the USGS expected in 2015/16 An update to be provided by GA at the Roundtable meeting on 15 September 15
#17, #29, #109 and #112	Petroleum pipelines fit for demand	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 (see Attachment 1)
#18 and #96	Fit-for-purpose air strips and services in proximity to operations	Special Facilities Licence granted to KJM – Cooper Parks constructed / opened. See: http://www.kjmcontractors.com.au/kjm-cooper-parks Special Facilities Licence granted to Rossair – preliminary site survey completed. For 23 June 2015 Rossair presentation – see: http://www.petroleum.statedevelopment.sa.gov.au/data/assets/pdf_file/0009/256068/20150623_3B_-_Mark_Lindh_-_Rossair_and_Innamincka_airport.pdf
#32, #47 and #60	Applied R&D	Funds provided for a research chair in unconventional reservoirs at the University of Adelaide – Australian School of Petroleum - to focus on the characterization and the prediction of deliverability 'sweet spots'. Recruitment expected in 2015. Funds also provided for guar crop trials, cement integrity, impacts of operations on water, the use of magnetics to detect fracture propagation, efficient means to measure fugitive greenhouse gas emissions, greenhouse gas capture and storage Backed a bid by the Australian School of Petroleum to host the headquarters for the Commonwealth's Oil, Gas and Energy Resource Industry Growth Centre
#41, #64, #79, #89 and #111	Greater transparency and competition in the price / terms for wholesale gas and for processing and transport tolls.	Cooperating through CoAG and other bodies – including but not limited to <ul style="list-style-type: none">• ACCC investigation – See: https://www.accc.gov.au/regulation/infrastructure/energy/east-coast-gas-inquiry-2015• Gas trading hubs. See: http://www.scer.gov.au/workstreams/energy-market-reform/gas-market-development/gas-supply-hub-trading-market/• Commissioned Core Energy to provide a review of South Australia's position in gas supply: demand for eastern Australia (Preliminary findings will be revealed at the Roundtable's meeting on 25th September 2015)
#43	Drilling subsidies	The West Australia State Government offered up to \$20 million to underpin multi-well schedule to stimulate the mobilization of drilling rigs and fracture stimulation spreads without industry taking up offers. Rig count has fallen significantly in alignment with the fall in the price for oil, and hence a fall in the price for gas that is benchmarked with the price paid for Brent crude oil
#51	Accreditation for one-stop-shops in relation to the EPBC and petroleum resource legislation	MoU signed with Commonwealth to allow assessment and approval once-for-all under relevant resource and environmental protection legislation NOPSEMA now manages both safety and environment matters for Commonwealth waters and South Australia is progressing an MoU to enable conferral to NOPSEMA in State marine waters MoU efforts are being implemented in alignment with the concerns of co-regulators in the State
#61, #98, #110 and #120	Gas (CNG and LNG) for transport and equipment	Book published in Dec 2014 on using natural gas for transport in Australia Working Group 7 (using gas for transport) established and held its inaugural meeting in 2015. See: http://www.petroleum.statedevelopment.sa.gov.au/prospectivity/basin_and_province_information/unconventional_gas/unconventional_gas_interest_group/roadmap_for_unconventional_gas_projects_in_sa/working_group_seven See BOC action: http://www.boc-gas.com.au/en/industries/power_and_energy/lng/plans-in-australia.html See AGL action: http://aglblog.com.au/2015/05/lng-semitrailers-commissioned/ Analysis of CNG for shipping instigated WG#7 will be asked to review opportunities for Hybrid Air Vehicles. As presented to the Roundtable in Oct 2014, Variable tonnage capacity air ships with up to 4000 km range are available. 2 people to fly, load & unload. First 50t model doesn't need air strips. Passenger versions could be developed. No issue with flooding.

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#67 and #102	Operators reveal forecast supply-chain requirements to entice competitive local suppliers	DSD's MIPO and the Commonwealth Government's ICN agencies have worked with BP to create a portal to tenders for services required for its offshore Bight Basin exploration program. Similar will follow for Chevron and Santos/Murphy Bight Basin programs See: http://gateway.icn.org.au/project/3552/bp-great-australian-bight-exploration?pl=1
#73 and #97	Conjunctive ILUAs for operations and facilities	A Cooper – Eromanga Basins Aboriginal Conference (CEBAC) focused on indigenous enterprise participation in oil and gas supply chains will be convened in Adelaide on 26 October 2015. This will be the first time leaders from across industry and the Dieri People, the Wangkanguru / Yarluyandi People and the Yandruwandha / Yawarrarrka Peoples will meet to discuss these issues. A single whole-of-basin ILUA for the whole of the Cooper-Eromanga in SA was discussed in principle with representatives of the same three key Aboriginal people in August 2015.
#78, #80 and #82	Take account of lessons learnt nationally and internationally (USA, Canada, NZ, IEA Golden Rules, etc.)	Roundtable Working Group #8 (sharing information) will be launched in September 2015 FAQ sheets reference ever-increasing number of relevant assessments A fully independent report on water use for the upstream petroleum operations has been commissioned by DSD. The research agency for this review of existing information is the National Centre for Groundwater Research and Training. The CSIRO and the Office of Water Science have agreed to peer review this study ahead of its publication. Insights into this research will be provided at the Roundtable meeting on 25 September 2015 DSD has commissioned an independent study entitled <i>Hydrogeological Risk Assessment - Oil and Gas Development - South East</i> . The draft is undergoing peer review by the National Centre for Groundwater Research and Training (NCGR&T) and is expected to be released in 2015/16. Roundtable Working Group #8 will form and focus on sharing information An independent University of Adelaide review has been commissioned to confirm leading (effective) practice risk management for well integrity, including cementing practices – and will identify gaps in peer reviewed studies, if any. Researchers are: Terry Bennet, Philip Visintin, Mohamed Ali Sadakkathul and Dusan Losic DSD has Sponsored ASTE conference in September 2015
#87	Telecommunications improved. Industry – Government forum to elaborate cost: benefit for such improvements	The 3rd ICT Roadmap for Minerals and Energy Industry Roundtable was held on 28 October 2014. For details of the ICT Roadmap– see: http://www.statedevelopment.sa.gov.au/resources/ict-roadmap-for-minerals-and-energy-resources-project Collaborative Remote Operations Centre Report published in October 2014. See: http://www.statedevelopment.sa.gov.au/upload/manufacturing/1446_collaborative_remote_centre_operations_report.pdf?t=1442823873288 . DSD \$383,000 grant for this project
#89 and #107	Sustain supply-side competition between multiple Joint Ventures	Basin-on-basin competition to supply gas to markets has been the tradition for eastern Australia. Most recently: <ul style="list-style-type: none"> the development of LNG export terminals at Gladstone have brought price parity the prospects for long term contracts at stable prices into flux; and the fall in international benchmark product prices has increased commercial risks gas exploration and appraisal necessary to book reserves The ACCC has instigated an inquiry into East Coast natural gas markets. Matters being considered include: <ul style="list-style-type: none"> the availability and competitiveness of offers to supply gas and the competitiveness and transparency of gas prices the competitiveness of, access to, and any restrictions on market structures for gas production, gas processing and gas transportation the significance of barriers to entry into the upstream production sector the existence of, or potential for, anti-competitive behavior and the impact of such behavior on purchasers of gas; and transaction costs, information transparency including gas supply contractual terms and conditions, and other factors influencing the competitiveness of the markets In South Australia, <i>PGE Act 2000</i> petroleum licences in the proven-to-be-productive Cooper and Otway basins with appropriate areas and tenure have been granted to multiple JVs competing to explore-for and sell gas to markets Now have 18 companies under 6 operators exploring for gas resources in the South Australian Cooper Basin and 4 companies under 3 operators in the South Australian Otway Basin. Supply-side competition is the objective of the proposed opportunity for JVs to defer royalties on gas and gas liquids produced from (to be defined) unconventional reservoirs. This is an evergreen action All gas supplies in the Cooper-Eromanga basins are currently processed at the Santos operated facilities at Moomba in South Australia. PGE Act licences enable the construction of additional gas processing plants, but any such development will be commercially driven by at least one other JV finding and developing sufficient gas reserves to justify such infrastructure investment. Have assessed the NT governments prospects for connecting NT fields with eastern Australian markets (including LNG export) – and will report preliminary findings on 25 Sept 15
#121	Entice large customers for gas into upstream investment	Industry has implemented in places (government has a watching brief) \$17mln prepayments made for gas offtake contracts for Strike Energy's Southern Cooper Basin Project with Orica, Orora, and Brickworks <ul style="list-style-type: none"> For Orica's participation - see: http://www.smh.com.au/business/orica-makes-75m-prepayment-for-strike-energy-gas-20150527-ghaivf.html For Orora's gas sales agreement– see: http://www.ororagroup.com/about_us/media_centre/news/Media-Release_Gas-Supply-Option-Agreement_150113.html For Brickwork's (Austral Brick's) gas supply option agreement for 12.5 PJ of gas , see: http://www.rigzone.com/news/oil_gas/a/131840/Strike_Energy_to_Supply_Gas_to_Austral_Bricks_from_SCB_Gas_Project For all the above plus Incitec Pivot and miner MMG, see: http://www.afr.com/business/gas-buyers-back-junior-explorers-to-target-east-coast-market-20150722-qihy0u DSD to undertake outreach as appropriate
#124 and #125	Syngas to Power and/or Synfuel	PELs have been offered for synthetic gas projects with prospects for power generation SFLs can be applied for to enable gasification of coal plants Working Group #7 formed to address prospects for using gas for transport. See http://www.petroleum.statedevelopment.sa.gov.au/prospectivity/basin_and_province_information/unconventional_gas/unconventional_gas_interest_group/roadmap_for_unconventional_gas_projects_in_sa/working_group_seven The <i>Gas Commercialisation Options - Model User Guide</i> can be downloaded from DSD's web pages and provides access to assumptions and commercialisation plans, with guidance on using the worksheets for LNG, GTL, power generation and domestic gas. Click on the link to download the <i>Gas Commercialisation Options - Model User Guide (.pdf 218.1kb)</i>
From Oct 2014 discussions #126	Rig count as an indication of activity isn't easily understood.	The direct correlation between the price for oil and rig counts is well established. Rig count data by Australian jurisdiction are accessible. Correlations between rig counts and the price of Brent crude with ABS-derived oil and gas industry FTE data have been reviewed. Based on this analysis – there is a change of roughly 20 FTEs per US\$1 change in the price of Brent crude
#127	Assess cost/benefit of unlinking oil and gas price in Australia.	Basis to understand price parity benchmarks between gas exported as LNG and domestic gas is documented as follows Gas price parity (per FERC Sept 2015 LNG & 0.71 US\$/A\$ on 16/9/15) US7.45 to US\$7.85 = A\$10.49 to A\$11.06 per gigajoule (GJ) for LNG in Asia <ul style="list-style-type: none"> 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 <u>ex-Gladstone</u> A\$9.45/GJ for LNG ex Gladstone <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> 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
127	Rig count as an indication of activity isn't easily understood.	The direct correlation between the price for oil and rig counts is well established. Rig count data by Australian jurisdiction are accessible. Correlations between rig counts and the price of Brent crude with ABS-derived oil and gas industry FTE data have been reviewed. Based on this analysis – there is a change of roughly 20 FTEs per US\$1 change in the price of Brent crude
128	Cost curves of developing gas in unconventional reservoirs for SA.	Price parity analysis pose targets for cost per GJ at Moomba gate Core Energy spreadsheets remain valid – pending new data Key break-through factors will be: <ul style="list-style-type: none"> The identification of reservoir sweet spots. The funding for a research chair in unconventional reservoir will address this uncertainty. Completion efficiency. Baker Hughes say 80% of stages do not flow much.