Why some players are leaving the Georgina Basin - while others remain

Good Oil 2015
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Acknowledgements

We thank the EP 127 Joint Venture (Baraka Energy, Statoil and PetroFrontier) for making the insights from the OzBeta-1 available for publishing.
Georgina is one of many basins onshore Australia which has potential for petroleum resources
Basins have both conventional and unconventional potential
Generally formed prior to Gondwana break-up in Jurassic and older than US unconventional plays
Local players chasing conventional and unconventional opportunities

International players mainly looking for the materiality of unconventional plays
The Georgina Basin

Remote and harsh environment
- Huge area covering ~325,000 km²
- Mostly in the Northern Territory but also spills into Queensland.
- Sparsely populated with two small commercial centres located in Mount Isa and Alice Springs
- Heavy rainfall from December to March can isolate road network and restrict access

Commercial Options
- Gas
  - New-build pipeline to support a development, either to Darwin or to connect with the eastern gas market - e.g. $1 billion North East Gas Interconnector
  - Development of small scale LNG into a local market such as Moomba
- Liquids
  - The supply chain would be long - e.g. trucking to Geelong

Substantial opportunity worth the challenges
- Prevailing view was that the Georgina Basin had substantial potential as a regional oil shale play
The primary interests of larger players (Statoil, Total and PetroFrontier) in material unconventional play, analogous to the Bakken Shale

APPEA 2014
- Statoil presented at a five-well high-impact shale exploration program that it hoped would lead to a sizeable tight oil development
- One well (Ozbeta-1) to be completed and tested

Smaller players are interested in both unconventional and conventional plays
- Identified significant potential in Georgina Basin - particularly oil
- Carried risked in-place 25 billion barrels of shale oil and condensate and 67 Tcf of shale gas
- Supported ongoing investment activity
Prospective Area of the Georgina Basin

- Huge early palaeozoic, intra-cratic basin
- It was even bigger! Present outline is an erosional remnant of a larger basin
- The northern two-thirds of the basin is shallow, rarely exceeding 400m in thickness and is perceived to have low prospectivity
- The basin deepens in the Dulcie and Toko Synclines in the south, reaching thicknesses of 1500m and 4000m respectively
- The south has seen the majority of the exploration activity and is where the industry players have taken up acreage
- Relatively immature – only ~40 exploration wells have been drilled
- Recent focus has been on unconventional targets
- Ozbeta-1 (2014) ideally located to test the unconventional potential
Concentration of activity over Dulcie and Toko Synclines
Tectonic History

- Basin was initiated during the early Cambrian
- A transgression in middle Cambrian led to the deposition of the Thorntonia Limestone and Arthur Creek Formation
- The Lower Arthur Creek Formation (Hot Shale) is rich in algal/bacterial organic matter
- Recent work suggests significant differences between the two depo-centres
- Followed by a thick interval of mixed carbonate and siliciclastic sediments in the late-Cambrian and Ordovician
- A number of tectonic episodes in the Ordovician and early Devonian caused uplift and erosion
- Followed by deposition of the Cravens Peak Beds in the Devonian
- That's basically it!
Arthur Creek Hot Shale

Excellent target for an unconventional oil play and a source for conventional targets:

- Between 20m and 100m thick
- Total organic carbons commonly making up 3 to 4 per cent and ranging up to 10 per cent
- Hydrogen index from wells indicates predominantly an oil prone source rock
- Geochemical analysis by Dunster et. al (2007), plus others, showed it to be oil mature over much of the basin
Oil Shows

Strong support for oil potential from oil shows

Source: Boreham & Ambrose, 2007
Results from Ozbeta-1

- Ozbeta-1 drilled by Statoil in May 2014
- Objective to de-risk the Arthur Creek Hot Shale and Thorntonia Limestone as unconventional targets by proving moveable hydrocarbons through testing
- Encountered the Arthur Creek Hot Shale at 1330m
- A single stage hydraulic frac was successfully completed but no oil or gas was detected
- Mud log data in the Arthur Creek Hot Shale showed low percentage of C1 and gold florescence which suggests mainly dead oil and no fluorescence was seen in core.
- The Thornton Limestone was more encouraging with vuggy porosity seen in core along with some fluorescence
- Suggested more heterogeneity in the source rock than previously thought
  - Encountered lower TOC and more gas prone source intervals than previously encountered in the basin
  - No surprise to Willink I’m sure!
Conclusions from Ozbeta-1

- Estimated bottom hole temperature is ~ 70-75 deg C and indicates that the Arthur Creek Hot Shale is not currently deep enough to generate hydrocarbons
  - Not surprising given its shallow depth (1330m)
- It was buried deeply in the Ordovician, when it would have generated oil and left maturity markers
- It was uplifted during the Ordovician and Devonian orogenies and has remained at essentially the same depth ever since
- It has been out of the oil generation window for the past 390 million years and has been subject to bio-degradation, leaving residual oil
- Essentially, it has put the dampers on the Arthur Creek Hot shale as a regional oil shale play
The Future

- The disappointing results of Ozbeta-1 have discouraged the industry players such as Statoil and PetroFrontier who were looking for material unconventional opportunities.

- But there is still potential for smaller unconventional targets and conventional plays:
  - The basin architecture is not fully defined and sweet spots may exist.
  - The centre of the Toko Syncline could still be in the oil generation window and remains untested.
  - Oil generation has clearly taken place, and so conventional traps could still work, if the accumulation has been left relatively undisturbed since the time of generation and migration.

- We expect local companies to continue to pursue opportunities:
  - Baraka is pursuing consolidation of ownership to 100% of EP127 and EP128 (approx. 8 million acres) to pursue conventional oil and gas targets.
RISC is writing a series of articles on basins in the region for the *Oil and Gas Investor Australia*

2015

- **March:** Perth Basin
- **May:** Georgina Basin
- **July:** New Zealand
- **September:** Canning Basin
- **November:** Great Australian Bight
Thank you