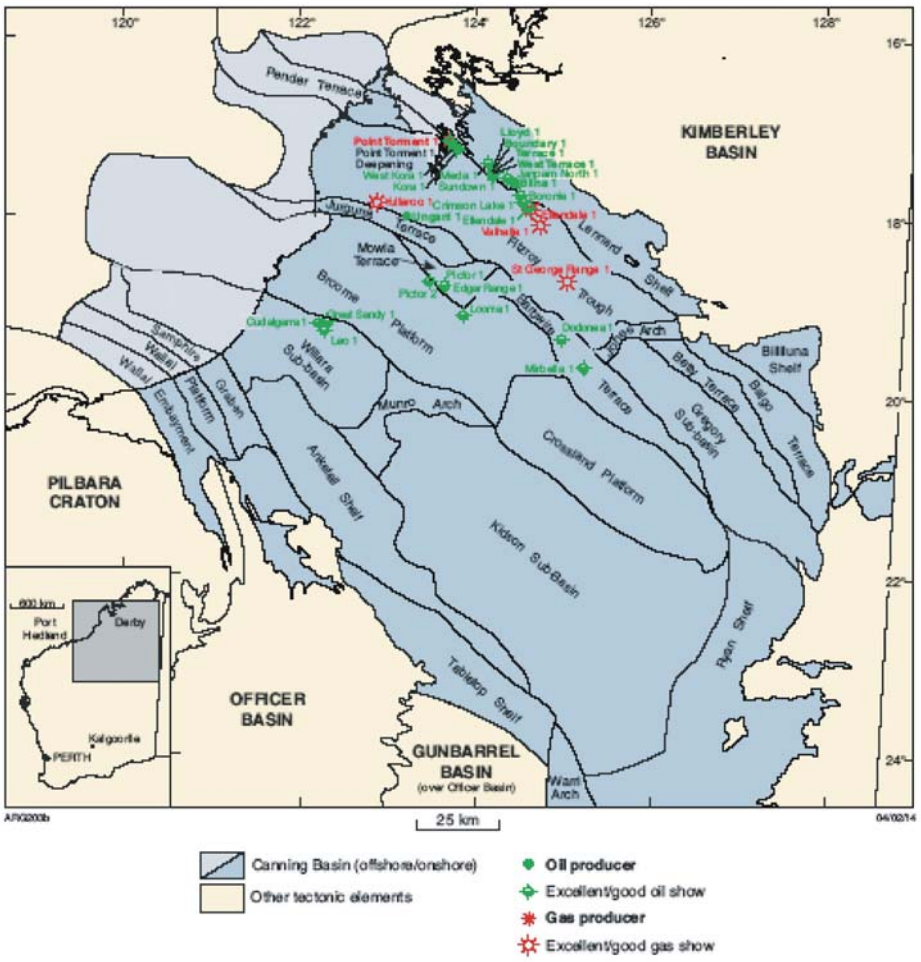
"The Onshore Canning Basin of Western Australia – The Next Big Thing?"

This presentation was given at the monthly meeting of the Denver International Petroleum Society (DIPS) on February 13 at the Wynkoop Brewing Company by Jeff Aldrich, a Vice President at MHA Petroleum Consultants. Mr. Aldrich received a BS degree in geology from Vanderbilt and an MS degree in geology from Texas A&M. He has 30 years of domestic and international geoscience experience that includes work in China, SE Asia, Europe and Africa. Mr. Aldrich worked on the Canning Basin plays as a consultant for Goshawk Energy.

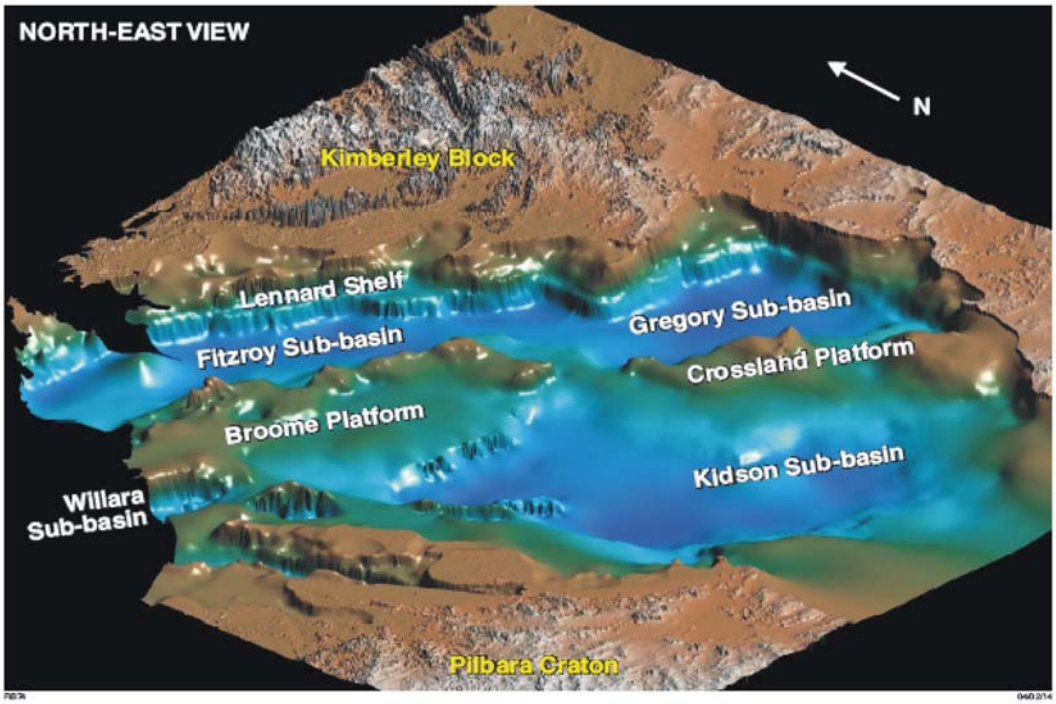


The following abstract was provided as pre-publicity for the talk:

"The onshore Canning Basin is one of the world's largest Paleozoic Basins with a proven petroleum system, measuring over 430,000 km2 of shallow to restricted marine sediments, yet it is one of the most lightly explored basins on the planet. With less than 270 exploration wells (1 well per 1,600 km2), 37 discoveries and a complex structural history, the Canning Basin has been a remote stepchild to Australian exploration efforts.

The recent announcement by Buru Energy of the apparent flow of commercial rates of liquid rich gas from an “unconventional reservoir” has started a new leasing program in the Canning Basin.”

The Canning Basin is the size of Texas and has a potential resource base greater than all the other Australian Basins combined. It has three major world class source rocks, but to date there has only been production from minor oil and gas fields. In mid-Ordovician times (the oldest rocks in the basin), the basin was in the equatorial region; in the Devonian, a time of major reef formation, the basin was located in the sub-tropics; and in the Carboniferous, it was sub-polar and glacial, and not part of a coal forming region. Tectonic movement in Devonian times created the proto-Canning Basin. The basin is subdivided into a series of toughs, sub-basins, platforms shelves and terraces. In the north there is the Fitzroy Trough and the Gregory Sub-basin, which are separated by the Broome and Crossland Platforms from the Kidson and Willara Sub-basins in the south. Most of the initial oil and gas development has been from the Fitzroy Trough and Lennard Shelf in the north, where there are outcrops of Devonian reefs.



The stratigraphic record indicates significant erosion in the Cambrian. Ordovician rocks include marine shales, which are overlain by extensive Silurian salt deposits. The Devonian sequence includes large carbonate reefs. Another period of erosion occurred in the Carboniferous. The Goldwyer, which is a source rock, is an Ordovician play. There are also Devonian to Permian plays and many oil and gas shows.

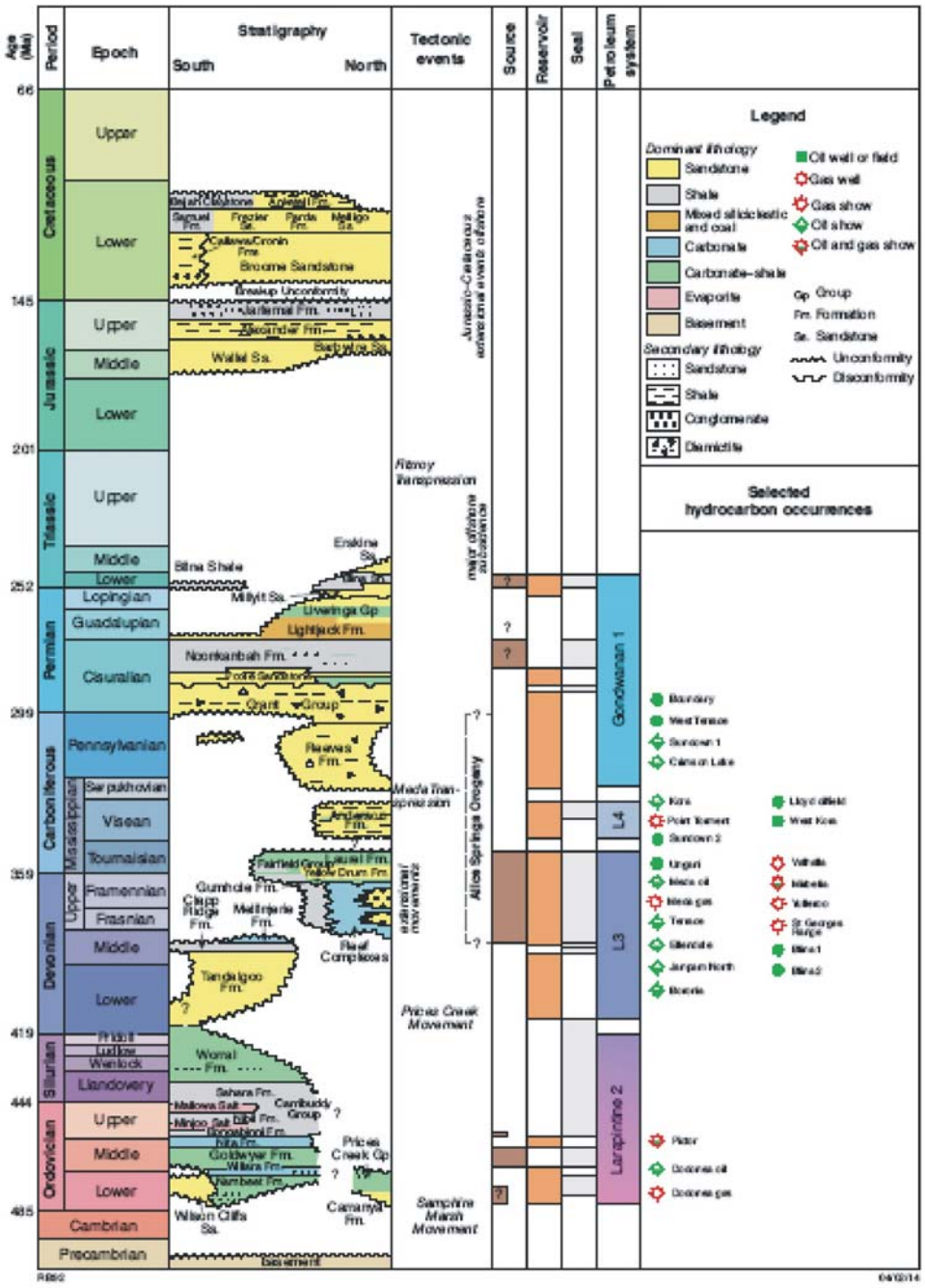


Figure 3. Generalized stratigraphy of the Canning Basin, with major petroleum elements and hydrocarbon occurrences indicated

The three basin source rocks are the Laurel at the base of the Carboniferous, the Gogo in the Devonian and the Goldwyer in the Ordovician. All three units have 2 to 12% TOCs. The largest field to date has produced 15 million barrels. The Goldwyer was the first unconventional resource target for a number of companies. In the Fitzroy Graben, the Goldwyer produces very dry mature gas, as it has been deeply buried, whereas the Laurel produces wet mature gas in the Fitzroy Graben. Only in the Broome Platform is the Goldwyer wet gas mature – it is equivalent to the Marcellus shale gas in the eastern U.S. In the Kidson Sub-basin, very few wells penetrate the Goldwyer or the Laurel. This

Sub-basin has not been well modeled. Mr. Aldrich described six different types of play in the Canning Basin.

The Canning Basin is the size of Texas but contains just one paved road. There are a number of mines in the area that work iron, tin, and gold. There are only four towns, which are located along the coast, and these have a total population less than that of downtown Denver. Energy from the Canning Basin wells could be used by the mine operations or the municipalities. There is little agriculture in the basin, which is too dry for cattle.

All areas of the basin have been leased, but there are fewer than 50 leases in total, so the acreage is enormous. Leases holders include Buru Energy, Mitsubishi, Apache, New Standard Energy, Conoco-Phillips and PetroChina. Hess holds leases in the southern part of the basin but has been quiet. They are planning one well this year. The main player is Buru Energy, which has made discoveries in the Goldwyer and in the Devonian reefs. They drilled one well in the Laurel as an unconventional play, which was drilled in 2010 and fracked in 2011. It produced 1.6 million cu ft per day of very liquid rich gas and was then shut in. Early in 2015, an environmental group called "Lock the Gate" produced a video of the well showing that the well gauge was leaking and dangerous, but it actually appears that "Lock the Gate" damaged the well themselves with a hammer.

Buru Energy has the following three-phase plan for the future:
Phase 1: Export 1- 2 million barrels of liquids per year through Broome.
Phase 2: Build a 200 megawatt power plant to support the mines which currently buy energy from Eastern Australia.
Phase 3: Build a power plant in Perth that would use 1.5 Bcf per day.

A Phase 4 would include the construction of an LNG plant. Buru believes they have energy for each of these phases, but the long term focus will be on gas.

In answer to a question as to who issues leases, Mr. Aldrich replied that it was State of Western Australia. With regard to the depths to targets in the basin, in the Broome Platform the Laurel is found at 2,000 meters and the Goldwyer at 3,000--3,200 meters. In the Fitzroy Trough, targets can be below 5,000 meters and the base of the Kidson Sub-basin is around 4,500 meters. Also, there has been geothermal activity in the Canning Basin; volcanics have caused the mineralization in some of the mines.