M.E.T.T.S.Pty. Ltd.

ABN 66 050 710 015

Consulting Engineers, Resource & Infrastructure Development

Dr. Michael C. Clarke, CPEng., F.I.E.Aust., F.Aus.I.M.M., RPEQ. Managing Director

PO Box 843
Helensvale, Qld. 4212
Telephone: (+617) 5502 8093
http://www.metts.com.au

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Dr Allan Hawke AC
Commissioner
Northern Territory Hydraulic Fracturing Inquiry

Dear Allan,

I would like to thank you and Robyn for your time on Friday July 11; I very much appreciated the opportunity to put my views on fraccing and associated issues to you directly. Also thank you for the opportunity to submit some comments, additions and clarifications to the M.E.T.T.S.'s submission in this addendum.

Firstly, the last question that you raised was how does fraccing relate to the carbon question, my reply was thus:

- Natural gas generally has the lowest carbon footprint of all fossil fuels. Its hydrogen to carbon ratio is much higher than coal or oil and therefore its combustion produces a significantly lower carbon intensity (as kg CO_2/kWh),

- It is a low carbon and economically viable replacement to coal fired power generation,

- Raw natural gas can however have significant concentrations of carbon dioxide with the Cooper Basin, South Australia being one such resource,

- Pipeline grade natural must contain less than 2% CO_2 and LNG must contain less than 50 ppm CO_2 so gas from high CO_2 fields must be purged of CO_2 before dispatched by pipeline and/or converted to LNG,

- The North American shale-gas has generally very low CO_2 and is often sent directly into the gas transmission pipeline grid, and

- Many of the shale-gas exploration wells sunk in Australia have likewise indicated very low CO_2 and thus the propensity for those gas fields to have high CO_2 fugitive emissions is low.

The above question is also answered in the positive, in the Weekend Australian of July 11/12 where there is an article by Dr Borjn Lomborg entitled, 'Gas is greenest in the short term' with a quote, 'Fraccing is by far the cheapest way to tackle climate change at the moment '. Dr Lomborg very eloquently describes the role of fraccing in the article in that it is the way for producing gas in quantities that will provide an alternative to coal, and also states the improbability of renewables ever being able to replace fossil fuel in power generation. For China Dr Lomborg also mentions the use of gas as a clean domestic fuel (replacing coal), and for India gas as a replacement for the dung and wood that cause many deaths through respiratory disease each year.

See: http://www.theaustralian.com.au/opinion/columnists/gas-is-greenest-in-the-short-term/story-fni1hfs5-1226986166242

There are contiguous gas/oil bearing geological structures that cross the Territory/state boundaries, examples being the Amadeus basin in South Australia and Western Australia, the McArthur Basin in Queensland and the offshore basins in the north west. Having one jurisdiction allowing fraccing in their portion of the structure but another jurisdiction banning fraccing makes little sense.

The possibility of having multiple and conflicting environmental legislation governing fraccing must be avoided. Environmental legislation already needs simplification especially where it relates to petroleum and minerals. The existing legislation that pertains to environmental management of petroleum should be sufficient to cover fraccing; what can be done is to produce some specific regulations where there are gaps, and look to the concept of 'managers rules' (as approved by Petroleum Inspectors) for defining specific site activities including fraccing water control, wastes management and emergency pollution control measures. The Managers Rules could be published by the relevant department and the field exploration operators, as suggested by Halliburton.

Manager's Rules should take into account the climatic variation of the field's location. The NT is subject to the Monsoon and as such has distinct wet and dry seasons and thus the management of dams and ponds associated with fraccing should take into account the local monsoonalclimate.

In the past the conversion of natural gas to liquid (GTL) transport fuels has been seriously considered by NT and Commonwealth governments; in 2000 Methanex proposed a methanol – GTL project for Darwin. Given that there could be an oversupply of LNG in the medium to long-term as Russian and US suppliers compete for the Asian-Pacific markets, having a gas-to-liquids operation in the Territory could increase the Energy Security of the region and for Australia, and provide gasfield operators with a second monetisation option for their raw gas.

The M.E.T.T.S.'s submission distinguishes between brownfield and greenfield projects. Where the site rehabilitation has been undertaken under old regulations (that are now considered inadequate) the introduction of fraccing and associated technologies will see new rehabilitation regulations and standards applied and thus a more thorough rehabilitation achieved.

Note: Brownfields gas and oil reserve redevelopment and fraccing fluid management go hand-in-glove as petroleum activities.

Helium and the Northern Territory

Helium as a by-product of LNG production and as a primary target of exploration.

The world has seen the passing of the US monopoly of helium over the last twenty years; although the US is still a major producer, has considerable explored reserves (and potential reserves) and a large national stockpile, helium as a by-product of LNG production has come to the fore, with Qatar and Algeria becoming major producers. Australia has also an established helium production plant in Darwin since the mid 2000s which produces around 3% of the world's helium, a similar quantity to what is used in Australia. Russia, Poland and potentially Indonesia also have helium resources.

The LNG related helium production is basically the production of a relatively concentrated helium containing tails-gas from a raw natural gas flow that contains only a small percentage of helium (Note: Qatar has around 0·04% He in its raw natural gas but can still economically produce liquefied helium). Figures 1 & 2 demonstrate to connection between He and LNG production.

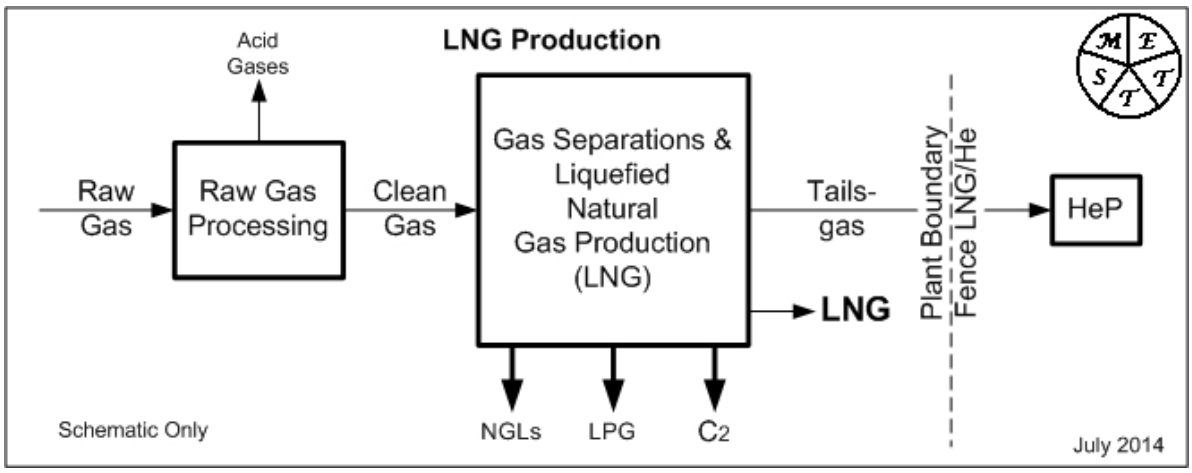

Figure 1. The production of a tails-gas stream post LNG production

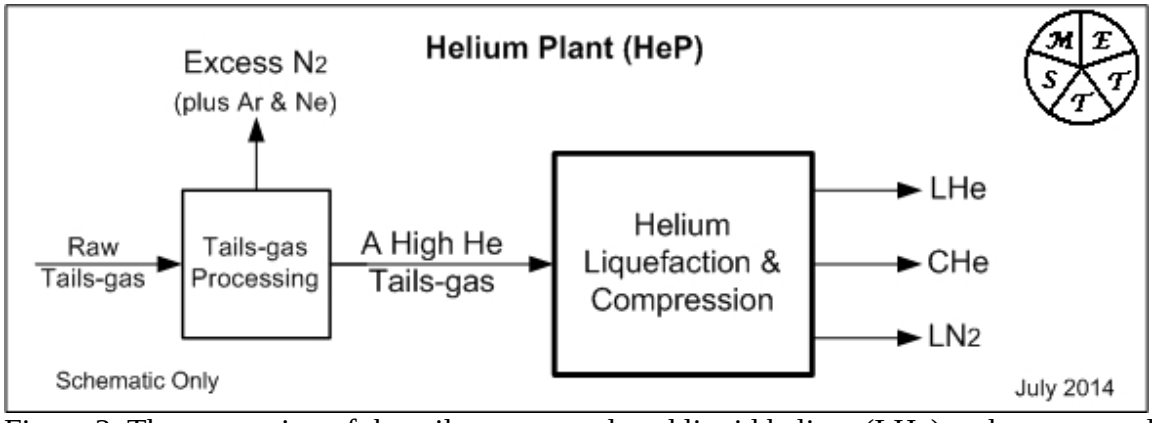

Figure 2. The processing of the tails gas to produced liquid helium (LHe) and compressed helium (CHe) products and a liquid nitrogen by-product (LN_2)

The split of returns from the LNG (plus C_2 being ethane and ethylene, LPG and natural gas liquids (NGLs)) will depend on the raw feed gas composition and the markets for each product, whilst the split on helium versus hydrocarbons will be dependant of the relative compositions and the specific markets for products, especially the He. The traditional split between a primarily hydrocarbon versus a primarily helium project has been put at 3% helium in the raw feed gas (for US operations). As stated, in Qatar the raw natural feed has 0·04% He, the feed-gas coming into the Darwin LNG plant reportedly contains around 0·3% He, the raw gas in the northern Amadeus historically ranges from 0·15 – 0·2% He and in the southern Amadeus up to an exceedingly high 9% He; so a process to handle high raw He gas feeds is also required – see Figure 3.

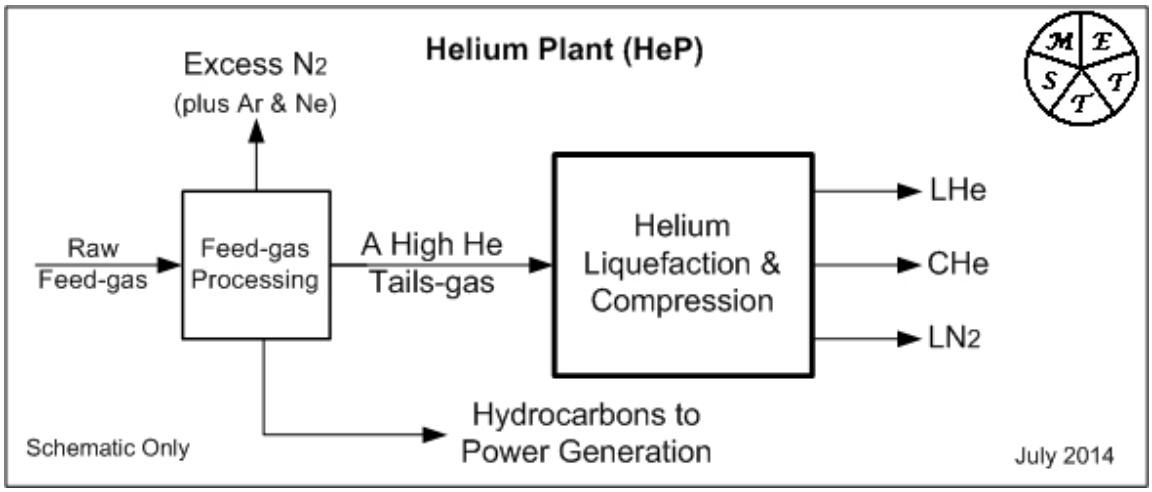

Figure 3. A process train for a raw feed-gas with He say >3% and hydrocarbons <20%

In the McArthur basin (Gulf of Carpentaria) there has been a significant helium find (raw natural gas with >1% He) just over the Queensland /NT border. There is the prospect of similar finds in the contiguous geological structure on the NT side of the border; a prospect that could also greatly expand the Territory's potential to be a major international helium producer.

To be able to fully develop the Territory's helium potential fraccing will be required in most of the potential resources to create the reserves and establish the required gas flows.

BETX

BETX (Benzene, Ethyl-benzene, Toluene and Xylene – all aromatic compounds) is used as a fraccing additive in very low concentrations, concentrations that are being continually reduced in fraccing practice. Some points to be noted:

- Natural petroleum contains BETX (in fact those components are part of the higher energy fraction of petroleum) and that strata (reservoirs) targeted for fraccing can contain natural BETX,

- The depth of the target petroleum reservoirs is considerably greater than aquifers that are part of the water supply, and as such contamination of potable aquifers is very unlikely,

- The use of existing petroleum/environmental legislation to regulate the use, storage and processing of spent fraccing fluids with BETX is recommended, and

- The technologies that are suitable for processing BETX containing fluids include the enhanced biodegradation where microbes are used to destroy the aromatic hydrocarbons.

Low concentrations of BETX in spent fraccing fluids are not an environmental challenge.

I was assisted in preparing the original submission and this addendum by my friend and colleague, Dr Duncan Seddon. Dr Seddon is one of Australia's leading petrochemical industrial chemists with a particular interest in the production of chemicals and fuels from gas and coal. Duncan has written over 120 articles and papers plus two books on petrochemicals. His recent publications on fraccing are attached.

Again I thank you for the opportunity to comment on M.E.T.T.S.'s original submission and on our telephone conversation.

Best regards,

Mike

Dr. Mike Clarke
M.E.T.T.S. Pty Ltd
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CC Ms Victoria Jackson, Director, Energy Directorate, NT Government, Darwin