

1st DRAFT

SUGGESTED CONTRIBUTION TO RESPONSE FROM KCCG TO REPORT ENTITLED 'ENVIRONMENTAL EVALUATION, COUGAR ENERGY PILOT BURN AT KINGAROY, SUBMITTED TO DERM ON 16TH August 2010

INTRODUCTION

It is hard to cover all the severe deficiencies in this report submitted as a response to the regulatory authority responsible for this project. For example, there is a failure to include necessary supplementary information which would enable DERM, or its consultants, to assess the problem independently. In particular where are:-

*The Logged -record of the flared (or otherwise extracted) syngas, including its flow rate and composition from March 16th onwards? Was the gas scrubbed and, if so, where are the details?

*The Logged-record of injected air pressure and flow rate tabulated against the combustion chamber water pressure from March 16th onwards?

*The logged-record of the estimated audit of coal consumption?

Because the project is an experimental feasibility study, these data would be expected to be of interest to Cougar Energy. In view of the mishap under examination they are also of interest to DERM. and KCCG.

In addition to the above information needed, was a logged time-record made of the gas emanation rate and its composition from well T5037 when water was seen bubbling to the surface? What are the technical details of dewatering the cavity prior to ignition?

How much water was extracted and over what period of time, compared with the estimated initial size of the chamber? This would enable a rough estimate of the the water seepage rate into the new unused cavity to be made. These data would then enable us to have some idea as to how the seepage rate would vary with the air pressure in the chamber. These data would enable us to have some idea of the pressure control characteristics needed for correct combustion. These data could perhaps give an estimate of flow rate of air that was needed to maintain the cavity pressure and enable us to try to find an audit of material transfer? Thereby at least an attempt could be made to estimate the leakage of lost gas from the cavity. All these data would be expected to help us to have an insight into the mass transfer mechanisms within the geological strata.

CRITIQUE OF COUGAR's REPORT

The Report is lengthy and full of speculative explanations which usually have little, if any, scientific basis.

Some specific questions/criticisms are as follows:-

*The report expresses criticism of DERM's Limit of Reporting (LOR) requirements. On page (4) it is stated:-

“The trigger levels for reporting to DERM are exceedences of the Australian Guidelines for Drinking Water (AGDW) being 1ppb for benzene and 800 ppb for toluene which Cougar Energy believes are levels relevant to defining potential contamination”

This is an obfuscation of the purpose of monitoring wells which have their limitations in that they cannot be expected to detect the worst areas of contamination. Do Cougar Energy believe that they

are entitled to get as close as they dare to the LOR of a limited number of test wells? It will be suggested below (Appendix 1) in KCCG's 'chimney effect' explanation of the observations in Cougar's report that there is good reason to suspect much larger contamination closer to P4. Moreover this contamination would have worsened progressively and spread upwards if the burn had continued.. Statistically-speaking a large number of vents would be expected of syngas leaking from the ground. There is no reason to suppose that leaking gas would move preferentially towards any particular monitoring well. If it was possible, (which it is not) to cover the whole site with water it would be expected that gas bubbles would be seen emerging at several places.

With regard to the above suggestion that Cougar feels that they have the right to contaminate within the LOR's prescribed, this seems to be a general and reprehensible attitude within the UCG industry. An examination of past 'in house' UCG conferences (refs) indicates a lack of UCG Industry attention to pollution problems.

* On page (5) DERM requires a hydrogeological investigation. In response Cougar simply quote the original report from Golders which unfortunately is not available to KCCG.

From the part of Golder's report quoted (section 4.6.7) it is apparent that this is a 'water only' study such as one might expect for a relatively straightforward analysis of an above-ground surface polluting industry. In UCG the potentially polluting fluid is generated underground and is also a two-phase fluid namely a mixture of contaminating water together with gases such as CO₂ and nitrogen carrying VOC's (volatile organic chemicals) The CO₂/nitrogen mixture can be considered, nevertheless to behave as an inert 'perfect gas' carrier. Any tradesman-plumber knows that it is relatively easy to seal a water leak because of water's surface tension whereas a potential gas leak requires a much tighter soldered-joint fitting. It follows that with UCG the potential fluid

penetration of the aquitard and other geological strata is a much more complex, likely and worrying issue.

For this reason we have to question the adequacy of Golder's report for the Kingaroy Project. Section 4.6.7 of Golder's report appears to be a 'desk study' and it is conspicuous that it is also couched in such imprecise terms as 'is expected'; 'unlikely'; 'is thought to lie'; 'and possibly'; 'may have'; 'may contribute'; 'might be influenced' etc

Whereas KCCG does not have access to the full Golders Report, it has received a public relations document from Golders dated 1st February 2010. Pages 3-8 of this document are given over to extolling the excellence of the Golders organisation, mentioning 7000 employees in 160 offices and 6000 clients involved with 12000 projects. Yet nowhere in this public relations document is there any mention that Golders have been involved previously with a UCG project.

In view of all this, the question has to be asked- is the Golders Report sufficient?

On page (6) '*the mechanism for potential movement of contaminants*' is a very complex issue.

Cougar attempt to explain the strange observation that T5037 only detected benzene and T5038 only detected toluene. Their explanation based on different volatilities may have some credence. However this also seems to suggest that there may be two different pathways of contaminating fluid moving towards the two wells even if they are so close together. At these temperatures and at atmospheric pressure benzene has a water solubility of 1700mg/l and a vapour pressure of 76mmHg. The corresponding values for toluene are 540 mg/l and 22mmHg. As stated, the

various phenolic compounds (and also PAHs) have lower values. If different venting pathways are involved there is no differentiated and absolute information relating to soil adsorbing effects which would help us to explain these strange observations..

*On page 7 (third paragraph) Cougar entertains the possibility of accidental contamination of the bores. Such a hypothesis disregards the observation of gas emanating from T5037. Cougar support their suggestion with an unscientific test to enhance their argument.

* Also on page 7 it is predicted that ‘groundwater travel time from P4 to T5037 would be likely to exceed 2 years’. The reality is that contamination took less than a month to travel this distance, not 2 years. This is typical of what can happen when reliance is placed on theoretical models (such as carried out by hydrogeology consultants) which presume uniform permeability without consideration of the influence of water transfer through fissures.

* On page 10 ,..... Apart from the chimney effect which suggests that worse contamination is further underground closer to P4, there are likely (in a statistical sense) to be other undetected exit points for the gas and its contaminants.

CONCLUSION

The most surprising feature of Cougar's report is the speed with which contaminants can move through the soil. This emphasises the importance of using the two-phase fluid dynamics mechanisms outlined briefly in this review.

Fortunately the quantity of contaminants dispersed is likely to be small from such a short-duration burn.

APPENDIX 1 THE EXPECTED INFLUENCE OF TWO-PHASE FLOW WITH REGARD TO UCG.

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