DMITRE

Roundtable for Unconventional Gas Projects, South Australia

Leading practice for the monitoring of greenhouse gas emissions in petroleum operations.

Minutes of meeting 22 November 2013

Facilitator: Barry Goldstein (DMITRE)

Guest Speakers: Matt Harrison (URS); Stuart Day (CSIRO); Mike Hatch (The University of Adelaide)

Meeting commenced: 9.40am

BG: Opened and welcomed attendees

- We are here today to address an issue of public concern, that is, environmental protection. If we are going to minimize GHG emissions we must do this at 'lowest price'.
- We must be able to see with clarity where we sit with all different CO2 issues. The cost of monitoring at the well head is far too expensive. We must focus on, not our own patch, but more widely and look at technologies across all sectors.

Welcome Matt – lead GHG scientist with URS – leading studies in the US for government and industry.

Presenter: Matt Harrison

Thanked DMITRE for the invitation to speak today. Interesting reading Roadmap – looking at measure and discuss dissemination.

In the US unconventional took 18 years. URS did a study in the mid 90s for the GAS research institute – how much gas was lost from the well head to the user. Included a 14 volume set in the 90s but with changes in unconventional gas, questions arose – things have changed since this time. There has been a shift from conventional to unconventional.

Context: why care about the emissions? The effects on water etc are the public's main concern.

Issues today mainly revolve around carbon tax but what is going on in industry?

In the US coal has been the back bone of the US electrical generation – this has now been stopped – there won't be any new plants of this type.

When comparing natural gas to diesel there are different percentages of well head leakage.

GHG and reporting: there are approximately 15 studies currently taking place in the US and Canada and we shall see results in the near future.

Need for study: US federal EPA produced an inventory for all different sectors. When looking at oil and gas, the inventory units went up significantly across 1 year (2008 – 2009).

When MH's study first began it consisted of multiple different companies including the Environmental Defense Fund (EDF). They needed to know the true data and decided to measure the upstream issues.

This study included mid-sized companies, international companies but not smaller. The study team was led by Dr. David Allen (University of Texas).

As for the supply chain, we are only talking about the upstream portion. EDF are initiating and gathering info.

See slide of different regions – shale gas plays: Appalachian, Rocky Mountain, Midcontinent and Gulf Coast.

Measurements focused on methane and the majority, but not all, were sources of upstream due to resources / funds. Didn't measure tank emissions as it wasn't deemed necessary.

See pie chart for those areas that were measured.

Study measured 27 new well completion flowbacks. There was speculation amongst the press that it would be different to unconventional.

The time taken to gather one value could last from 2 days to 2 weeks; there was a great amount of time invested.

Techniques used:

- Forward looking Infrared Camera (FLIR)
- HiFlow Sampler (Cataltic FID)
- Downwind
- Flow Tubes
- Part 1: Pitot tube, sampling lines
- Part 2: thermal mass flow meters

Flowback: open flow tank then through a diffuser (3 phase or 2 phase separation). First step was to open the top tank. At this stage we weren't sure what the flow to that would be.

Downstream analysis: between 10 – 20% used two tracer releases, we know how much release by ratio.

Findings: completion flow back – much lower emissions than previously estimated – from 26% to 1%.

Wells in routine operation: these were higher than expected. Higher emissions from neumatics, leaks and production. Some people involved in the study went back and checked but this data was confirmed.

Liquids unloading – still working in part 2 project

Neumatic controllers – using well head methane

Backarak flow device (Hi Flow) – flow high enough

Findings: completion flowbacks – 67% already controlled, 33% without controls or capture were less than 1%.

Sites in routine production: emissions from controllers ranged from 30 – 300% or higher.

Assumptions: sampled only a small proportion of what was available.

Natural gas production: *compare pie charts*

Summary: (*refer to pie chart slide*) in blue the complete findings are summarised.

Take away for SA: methane losses from natural gas production will continue to be at the forefront of press and media.

Differences between the US and Australia: US battle with the rights from the landholder whereas in Australia it's Government.

Can control the data (LDRA)

More studies coming 2014 as the EDF have initiated a study also.

Q & A

What concentration can the flare camera capture?

It's low, minimum leak rate is low (not sure off top of head) – it can detect leaks that the TBA can't see in the level where you add something.

Was the different equipment used the reason for the EPA's different study

The EPA is a measurement study (on paper only emissions estimate). The big change in 2008-2009 – EPA looked at liquids unloadings, change was based on company info. URS provided measurements across the board.

Life cycle: is there a place to have a representative equation from source to use? Include gas compression, liquification where applicable in a chain and ensure transparency.

We would want continuous emissions monitoring but it is very expensive. Well completion issues are the start of the cycle. Some changes in the cycle are always different.

Look at the Mezza scale approach – the background, baseline

The US doesn't have the same issues. Our study wasn't looking at seeps. Shale gas is identical to Australia.

What is the value for sponsors?

URS didn't have difficulties getting people together; the EDF sold the value to the companies.

Will these results be used by the EPA?

This project had much press exposure, URS briefed the Whitehouse, the Senate etc. The EPA didn't make a commitment to use it even though there is a great amount of pressure to use it.

What about factors of methodologies? Total emissions from the US is approximately 2000 tonnes, are there similar studies for coal mining?

It's only the macro level that is being looked at. In the US they have already decided to eliminate the coal production facilities.

Where there differences between the companies?

There were some regional differences in pneumatics, some company differences we didn't have an explanation for and some were state differences.

BG thanked MH and URS – break for 10 minutes.

BG welcomed Stuart Day from the CSIRO

CSIRO have conducted a project on fugitive emissions similar to MH's but on a smaller scale.

CSG is rapidly expanding in Australia. Gas is a better option over coal for example, but must consider the emissions.

Large portion of gas is lost through emissions. One study that was done showed about 8% lost – another study goes as low as 0.4%.

CSIRO began a study to measure and take recordings on site The Department of Environment became involved, looking at emissions from wells specifically.

Objectives:

1. Develop top down

2. Measurements

1. Uses inverse modeling – the process for calculating the emissions (*see slide*). You need to know where the emissions are to get the model to run well.

Atmospheric monitoring station: note that CSIRO are not using this for the CSG project. If we can get funding later then we will deploy this into the field.

2. Field measurements: make measurements at producing wells across a small number in Queensland and New South Wales. We have now done 5 companies – 45 wells in all – different wells including plug and abandoned wells.

Interested in looking at emissions from compression plants for example.

Methodology: mobile surveys to detect sources as well as downwind plume traverses. Estimate height of plume by using dispersion modeling.

Methodology: bagging, suck the gas through a tube, measure the flow. Also used surface flux chambers – can measure the emission rate.

Results: plume traverses can measure low emissions, detect a plume. Enter the well pad – 50m from the pad, do 10 circuits and take the average.

Results: measurements on the well pad typically found the leaks were quite low when you compare to the volume of gas being produced. Some equipment was more prone to leak than others, pump seals, full systems that went into wells that had an engine on site.

Biggest sources were Pneumatics and vents, would sometimes measure a few litres per minute. Some wells have electrically operated actuators therefore no emissions.

Results: the seal around certain pumps were found to be quite high as the pressure on the pumps was great. Where we found the leaks, the operators could come in straight away and fix it. Another leak was on a gathering line – in the traverses, it came from underground. Power packs on the engine exhausts?

MH: How did you pin point on the traverses?

SD: There was common equipment that would leak.

Results: casing leaks – gas can leak from the seam to the surface. CSIRO put flux chambers around it but didn't find anything.

Results: traverses confirmed most leaks were picked up; the wind would determine how hard it was to collect the data but still was able to detect gas. Also picked up engine exhausts on the pad.

Mobile surveys: drove on public roads and tried to identify sources, must be clear about where concentrated readings come from, CSIRO did pick up large amounts were cattle were for example.

Gas compression plant: *see slide for graphic and data* – approximately 60 tonnes of methane per year, after finding this data on a more natural weather up to 300 tonnes per year.

Keep in mind the engines on site contribute largely to the methane count.

Cattle that is close may amount to approximately 800 tonnes per year.

Geological sources: seeps, there is methane in the soil and also abandoned coal mines that weren't capped off properly. The study showed peaks along the side of the road where no obvious source could be seen. We did surface flux measurements, these showed that the methane was in one small area however we couldn't see any changes in vegetation.

The State Government has records of previous core holes made but the records are not accurate.

There are obviously holes out there venting freely that haven't been closed off properly.

Conclusion:

- Emissions have generally been low
- Gas plant emissions have been significant
- Significant other methane sources in Queensland (CSG region)
- More work needed

Does Queensland have same standards for abandoning wells as in South Australia?

Action: BG to check the Acts.

There is the Government Department that is trying to go around and plug these holes. Essentially if the company who made the hole is still around they are liable to plug the holes.

Q & A

Flux calculations: litres per minute – is this based on wind speed?

This is estimated from the downwind distance.

Need to be clear that some seeps are naturally occurring .

BG. Leading practice is evolutionary – is this our legacy or is it still going on?

MH: Would clear camera help in future studies?

Many leaks were small so need to be very close.

How has the Department seen this data?

CSIRO will provide a report, feeling that they will take the data from the leaks and come up with an emission factor. This is validating what we have already.

SD acknowledged contributing companies.

CSIRO presentation concluded at 11.35am

BG mentioned the December Roundtable meetings, explained who would be presenting and the panelists. Welcomed Mike Hatch from The University of Adelaide.

11.37am M. Hatch introduced team from The University of Adelaide and what their different roles are.

Southern Cross University slide: comparison with data collected near Tara, Queensland.

Tara / Chinchilla nigh data is small amounts PPM (ranges from 2 – 16ppm).

Data was collected from main roads and within the Colamine River. Can't determine what is causing the high 16ppm readings. Local water boars also show decent size readings.

During the day the readings are much less compared with at night time. The University is using the same technology as the CSIRO etc. There are, however, similarities during the day and night in certain areas.

A lot of the higher numbers relate to the geography of the river.

What would be the difference in temperature during the day and night?

From 5 degrees at night to 15 – 18 degrees during the day.

Found a spot from feed lots that peaked at 22ppm.

Recently did a test through coal mine areas. The outcome was that there are definitely old mines still producing emissions.

In near future will utilise mobile units to locate methane sources and continuously measure methane concentrations, as well as wind velocity. Go to a site that is reasonably newly developed and work through the life span of the area. Try and separate the natural and unnatural sources.

Will the seasons, drought years etc effect the emission data collection?

We need to continually collect data and identify abnormalities.

Another approach: tracer dilution method is useful for calibration of network and when looking at ratios between two samples.

Conclusions: energy will be looked at and scrutinised continuously until we have a better understanding of unconventional.

Will there be the opportunity for companies to have this equipment (kit) to do this themselves?

We need to make the equipment cheaper and to simplify the equipment. We need to try and see about monitoring and measuring techniques and come down the cost curve – this is what this group needs to focus on.

Some companies will want to monitor this on site rather than from the vehicle.

BG: we need to develop technologies that are most cost effective which would include monitoring OH&S issues also.

How do we improve the knowledge to address the bias data that is made public?

Action: this group should meet early 2014 and discuss time writing inputs. What can we do to reduce bias in the public discussion? Members of the Roundtable include all sides of the story. We can use the Roundtable as a way of opening discussion.

The capacity when trying to make these measurements are only a few years old. These are initial studies that will get data to the public, this can't be delayed, the data needs to go out now.

BG provided an update on the Roundtable for Unconventional Gas Projects in SA:

WG 1 – has gotten support from Beach, Senex and Santos to move a kit from the Cooper Basin into the new Tonsley training facility. Here, they can take on practical skills.

WG 1 – trying to devise a way whereby workers can punch the same OH&S safety ticket and be able to afford better training.

WG 2 – depots, roads, rail - there is more happening in context of legislation. We have had people apply for new air strips etc. G&W will be updating in December.

WG 3 – Beach and Santos got together to approach others to put together all their data from water issues. Decided on a need for a third party, someone who knows how to manage water that results from the Cooper Basins.

WG 4 – hasn't gotten off the ground yet. Focus is to minimise red tape between Queensland and South Australia. Haven't had the resources to follow up as yet but it is still a high priority.

WG 5 – is today, getting views of where to go and are sharing data.

BG asked for other questions and comments. None were raised.

Thanked everyone for coming and offered lunch.