

AGL CSG OPEN DAY 2012-11-10 Rosalind Park Menangle NSW

SUMMARY: This is a summary of AGL's Camden Gas Project Open Day 2012/11/10. It may interest people who would be affected by AGL's northern expansion and their existing operations. It gives a different perspective to the story AGL tells.

PEOPLE: Some of AGL's people included Mike Roy, Head of Gas Operations; Aron ..., Environment Manager; Kevin Rofe, Land and Compliance Officer; Nicola..., Hydrology Manager; Jenny O'Brien, Community Relations Manager. Fewer than 20 attended. Some were from competitors including Santos, Dart Energy NL and another. Three people asked questions about the environment. Everybody was polite. AGL says it is in their interest to be open about what they do and why they do it. That attitude appears to improve their credibility.

REGULATION: The NSW Government has failed to prohibit (or place any limit at all, or regulate or license) carbon dioxide [CO<sub>2</sub>] and methane [CH<sub>4</sub>] emission. This omission to regulate two of the most important global warming gasses came to light after Mike Roy had spoken for some minutes about how they comply with so many government regulations. AGL's website lists under "Environment" the Acts limiting the Rosalind Park [it is not a park, it is an industrial area] Gas Plant (RPGP) discharges and field emissions, so unless read in detail, it seems impressively onerous. It took a question from the audience to discover they do not continuously monitor environmental emission at each well and that they send their CO<sub>2</sub> downstream to customers.

The technique of talking about how good you are until the audience is bored, is an effective way of shifting the agenda. This is just one example of how AGL avoids covering the issue of global warming. AGL claims that as the only gas and petroleum producer in NSW, they provided most of the advice to the NSW Government on possible, workable, regulations that they could comply with. While ever the NSW government follows the agenda set by AGL, it is not surprising the government is failing to regulate the industry in the interests of the people.

WHY ARE WE HERE? AGL says CSG is a transition fuel after coal, before renewable energy. They expect the population to accept that rather than pay anything extra for renewable energy. The answer to the question from the audience: "Why didn't AGL secure a longer term gas supply contract from Santos?" was "Global economics" and "We can't do anything about it", perhaps because I found out later a Santos person was in the audience. [I have put each aside in square brackets [ ]]: If you were on the Board of AGL and you knew you had not signed contracts for a gas supply after Santos's contract runs out in 2015 or 2016, would you expect shareholders to forgive you for wasting their investment in gas reticulation under Sydney worth \$billions? AGL is responsible for bad planning. AGL should not expect the NSW Government to reduce royalties or make concessions or allow them to bugar our environment just because AGL didn't feel like paying whatever Santos was asking for a long-term supply of natural gas.]

[It would be irritating if AGL eventually succeeds in blaming environmental concerns for gas price increases caused directly by increased overseas demand. The economics and pricing of CSG will continue to fluctuate widely in future, sometimes due to changes in supply and sometimes due to demand. [[ Another aside: As the human population puts more pressure on limited resources, I expect the time between crises to shorten, the magnitude of each crisis to increase and crisis management will become less stable. A reference for this idea is Ockham's Razor 2013 2013 July 7 by Professor Len Fisher, Bristol University, Physics Department.]] Watch how gas prices might be manipulated by presenting the problem differently. AGL could sign a long-term contract with Santos when world prices are low. Because the real problem is an unsustainable demand by consumers

for energy, the sustainable solution is a reduction in demand. Reducing demand for energy is in my opinion inevitable and it will be unpleasant and difficult.]

**GLOBAL WARMING:** It is my opinion that continuing to use fossil fuel because we have in the past and it is convenient, is not sufficient justification to continue. CSG is mined and therefore its use is not sustainable. CSG is a fossil fuel. Methane CH<sub>4</sub> is a cleaner burning fuel and produces less CO<sub>2</sub> than coal because it has more hydrogen and less carbon than coal. To AGL's credit, AGL does not classify CSG as a "green energy source" because it is not renewable.

**MONITORING:** AGL does not monitor its wells for fugitive CO<sub>2</sub> and CH<sub>4</sub> emission. It samples or surveys emissions at each well yearly (according to the Environment Manager) or quarterly (according to the Head of Gas Operations). AGL takes safety, public relations and appearance seriously. They say they want to look like they are good neighbours. At our first well inspection, after AGL's Maintenance person got into his personal safety clothing and monitoring gear, he opened the well compound and explained each component and how it worked. His monitoring alarm sounded. He said it was a warning its battery was low, so it is good that we get warnings about the warning systems, and turned it off. He continued explaining inside the compound relying on his personal gas monitor with its flat battery.

When asked about fugitive emissions from their wells, AGL said they would know of any gas leaks from their continuous pressure and flow measurements. We saw their instrumentation, pressure gauges and orifice plates. It is true such instruments and telemetry would indicate gross blockages and perhaps sudden blowouts, but without atmospheric continuous monitoring at each well, leaks may unfortunately be occurring now. Fugitive emissions may be low and continuous. Such a leak may not show in a discharge pressure measurement. Too much confidence can be a mistake. Continuous field monitoring must be installed before anyone can be optimistic about fugitive emission.

Four days after the AGL Open Day, the ABC 7:30 Report 2012-11-14 showed Dr Isaac Santos from Southern Cross University measuring 8ppm (Dr Damien Maher later reported 6.89ppm) methane in the Tara southern Queensland coal seam gas field operated (coincidentally) by Santos. The researcher showed background (away from the gasfield) methane concentrations were about 1ppm to 2ppm. The Sydney Morning Herald reports 1 850 parts per billion (which is similar) as the background methane concentration of methane in Siberia, and 2 000ppb from defrosting permafrost. The Southern Cross University researchers say the 3 to 3.5 times higher levels in the Queensland gasfield are or may be from methane seeping through the ground, suggesting widespread ground leaks (reference New Scientist 2012 November 24, p 6) occur in the gasfield.

**ECONOMICS.** The first well we inspected was near a religious school. It was designed to blend into a domestic or residential environment. It had an underground (perhaps 5 000 litre) storage pit for its produced water compared to the 20 000 L water storage tank passed on the way into the RPGP (on the left). The typical well we saw supplies enough gas to serve 7 000 houses, cost \$260 000 to complete and they get paid \$1 635/day at wholesale prices by the Moomba Sydney Gas Pipeline to supply it into the pipe. I guess gas consumers might pay about \$21 000 [based on my estimate of \$3?] a day at retail prices for the same gas. Moving the profit to the retail end of the supply chain might offer advantages to the AGL parent company but I do not know what they are.

A horizontal well may cost \$1.2 million to drill 2 km away from a drill pad versus \$150 000 for a vertical well (the last figure quoted by the AGL Maintenance person). [At an earlier 2011 talk to NSW Farmers Association, AGL's Mike Roy quoted figures of \$1.2 to \$1.4

million for a typical horizontal bore compared to \$600 000 to \$800 000 for a vertical well.] AGL's Northern Expansion is now planned for 11 (formerly 12) pads each with one vertical and up to five (or six) horizontal wells. [They didn't say this explicitly but I'd expect they'd want to drain both of the two coal seams, Bulli and Balgownie, so each horizontal well may branch out below the well pad.] They said from 11 pads, they would like to drill 55 to 65 wells.

AGL is willing to pay for more expensive horizontal drilling to minimise community opposition. When I asked in 2011 what their legal costs would be should I lose a hypothetical Land and Environment Court challenge (supposing I had costs awarded against me, which I estimated might be \$100 000), AGL's person [he may have been their Operations Manager] said they would probably not go that far. He said AGL would prefer to drill on a neighbour's property and suck the gas from under my place, to avoid the bad publicity and long term problems of dealing with a person who didn't like them.

**CARBON TAX:** AGL says they pay the Carbon Tax on CO<sub>2</sub> emitted by their gas engines in the Rosalind Park Gas Plant. They use the methane they collect to power the plant. The power of their first (of three) compressors is 2.2 megawatt [MW] or "3 000 horsepower". It is cheaper for AGL to pay the carbon tax than to capture and sequester the CO<sub>2</sub> and CH<sub>4</sub> they free from underground. I suppose gas consumers pay the carbon tax on the gas they use.

Because AGL denies and does not quantify any leakage of fugitive methane either at the well heads or from the field, it pays no carbon tax on those important emissions.

It is possible to sequester carbon already captured. The Gorgon Gas Field in WA received an \$80 million incentive/gift from the Australian Government to separate the CO<sub>2</sub> brought to the surface in their natural gas. The CO<sub>2</sub> is then reinjected underground where it came from. This is not new technology – see the Woodside Goodwin A reference below.

**AQUIFERS.** AGL ignores all aquifer interference below their several wells penetrating 150 m under the surface. They say they have not observed any effects (drop in water table or changes in saltiness) in aquifer monitoring wells down to 250 m (one well) below the surface. They say they only monitor down to 150 m below the surface because that depth contains the aquifers used by people. Other life and bacteria living deeper than 150 m do not survive once they are brought to the surface because our surface environment is not as salty, warm or high pressure. If aquifer interference occurs at levels deeper than used by people, then I suppose the bacteria would have to initiate a court case before AGL would start to worry. AGL has dated water from aquifers at older than 30 000 years. Aquifer interference is an issue AGL likes to discuss because their data from measurements within 150 m from the surface do not appear to show any change due to their activities. This could be another case of agenda shifting. What happens below 250 m? I do not think it is sufficient to consider only the aquifers (within 150 m of the surface) on which humans are currently known to be economically dependent.

AGL shows their well model with a small steel pipe up the centre and an outer steel pipe with cement in the annulus between two pipes and around the outside. They lend it to people wanting to show how the extra heavy, high quality job AGL does stops water and gas leaking from their wells. What I didn't understand until later is that the outside pipe and cement is used only down to 120 m below the surface. With only one pipe below 120 m, there is less protection from aquifer contamination below 120 m. We heard how cement is pumped down the annulus between the two pipes until it reaches the bottom when the pumping continues so the cement slurry then flows up around the outside of the outer pipe (in the annulus between the pipe and the borehole) until it reaches the surface.

**LEAKAGE:** When asked about the life of wells and leakage, Mike Roy gave the example of their experience in the Surat Basin, Qld. AGL bought the petroleum rights of Mozaic Energy who extracted gas in the 1970s. AGL wanted to store gas underground for later export. [The Qld government was also involved.] To find out if the old wells were usable and if any wells had to be blocked off because they could leak, they "logged" each well using several techniques [including "gamma"]. They found most were still good after 40 years.

**HISTORY:** AGL's head office is in North Sydney. [AGL are the people who caused the pollution at Barangaroo and Cabarita.] They acquired the Camden Gas Field from Sydney Gas. AGL also bought CSG prospects at Gloucester and in the Hunter Valley.

**GAS COMPOSITION** The Camden Field gas is about 97% methane, 2% CO<sub>2</sub> and about 1% nitrogen, some ethane with very little liquid petroleum or "hydrocarbons". AGL can supply about 3% CO<sub>2</sub> to the pipeline but they say not more than 5% as that lowers the gas heating index. [People like Woodside on their Goodwin A offshore platform spent \$1 billion sucking up natural gas with some liquid hydrocarbons and separated the valuable oil. Woodside then reinjected the gas and sold the oil, to improve their cash flow.]

**NOISE:** AGL use a petroleum drill rig treated to reduce its average maximum noise to 5 dB(A) above nighttime background (average minimum) noise levels. They still have offensive noise issues with the easily identifiable "clangs" from pipes banging together and reversing alarms from front-end loaders, but they are working on that. When asked about gas emission during drilling, they didn't think that would be a problem (or worth treating) because the seams they drill through are only a small percentage of the overall drill depth, so they don't do anything about gas leakage when drilling.

AGL say their (petroleum industry) drill rig is better specified than drills commonly used in the mining industry. They insist their drillers operate to AGL's standards.

Noise at the first field well (a well enclosed to suit a residential area) visited was about 35 to 45 dB(A) at 2 m distance. It sounded like a "hiss" from the wet coal seam gas flowing up from 500 m below. Some of the noise came from the water separation, some from valves and orifices. Its enclosure could be improved and acoustically treated had they wanted to. The well is near a religious school at Menangle and does not need a pump to get the gas up or pump it to the gas plant some kilometres away. They use a small bore vertical pipe (50? mm diameter) from underground to maintain gas velocities high enough to entrain the produced water. They slow the gas flow with a larger diameter pipe that acts to separate the water from the gas. Water from the separator goes to an underground water tank for daily removal if there is a large volume, weekly if that is not necessary. Some wells produce a lot of water and some don't. If I was a neighbour, I am sure I would object to a water truck coming every day to pump produced water from an underground storage tank. I would prefer less frequent visits (and less noise, less disruption) and a larger holding tank.

**WATER CATCHMENT:** AGL said they wouldn't mine in the water catchment. That means people in the Warragamba catchment are likely to be stuck fighting Apex Energy No Liability, Ormil under their new name Magnum Gas and Power Ltd, who AGL describe as a group as "rough", or miners (perhaps not petroleum people like them). I got the impression AGL feels it is different to Apex, Ormil, Magnum and Dart Energy. I think their reason for saying or implying they wouldn't come to the water catchment is it would antagonise the locals. It may have been unstated that it could be too risky politically and from a public relations point of view. I am left guessing a reason for why AGL wouldn't

want to take gas from the catchment. When pressed, AGL has always avoided answering.

**BLOCKADE TRAINING:** AGL are smooth operators who know the advantages (to them) of getting on well with the community they want to work with. Instead of going in to drill sites with bags of cement like Ormil did, AGL says they talk to neighbours, takes slabs of beer and they repair fences and build roads. AGL runs contractor training to make sure all their people know how to behave if they expect a blockade. AGL tells their contractors what to say, who can say it, when and who to say it to. AGL is going to be much tougher opposition than the underfunded, overconfident Apex and Magnum in catchment areas.

**EXPLOSIVE PERFORATION:** Once they have drilled through the coal seam and forced liquid cement and water down the inside annulus of the pipe and up the outside, they lower a controlled explosive charge down to the depth of the coal seam. Detonating that perforates their steel pipe to allow the water and gas to flow to the surface. They showed a photograph of a perforated steel pipe. It looked like large bullets had been fired from inside, penetrating some 400 mm into surrounding concrete, in a precise pattern.

**FRACKING:** AGL uses pumps of about 4 MW ("5 000 horsepower") to frack their coal seams, over two to three days. Water used to frack a seam is 400 000 to 500 000 litres. A photo showed what looked like six semitrailers of equipment. Water used for fracking is sent to an EPA facility. They said they hadn't fracked a well in this area since 2008. To frack a shale gas well might take 22 MW, 50 to 60 ML [megalitre] of water and 30 days.

They add guar, a food gum to the fracking fluid to increase its viscosity. It was suggested it was innocuous because MacDonaldis used it in their food. [I suggest MacDonaldis could be using fracking additives.] They used to add bacteriacides as well to stop things growing in their fracking water but that had terrible consequences (killed cows) when it reappeared at the surface. They use ultraviolet light to sterilize the water/guar mixture or something else now. Hydrochloric acid is used to free cement from blocked perforations.

**PRODUCTION OVER TIME:** Typically, wells increase their gas output over the first five years, in part due to water extraction and then output decreases. They expect a 10 to 15 year life of each well. Their experience is from 1999 to 2012. AGL observes a 10% to 15% per year decline after five years. One well had an output of 4 terajoule/day [4 TJ/day] in 1999 and was now producing less than 0.1 TJ/day and still economical to continue.

When abandoned, they have to remove the steel from the coal seam, log that there is no steel in the coal seam, then they fill it with cement. They leave the outer steel which is only in place in the top 120 m below the surface. They fill the lot with cement, seal the top 1.5 m, cap it and put an AGL label and GPS coordinates on top. Contrast this with Ormil Energy (now "Magnum") who according to neighbours used 10 to 15 agitator trucks ("concrete mixers") for their well at Oakdale.

**DRILL LOGGING:** Cored, tailings, gamma density, resistivity and neutron logs.

**WELL PRESSURES:** Pipe pressure is 80 kPa when it reaches the Gas Plant. In the Gas Plant, the gas is flash dried using glycol at 800 C. The glycol is reused. The Gas Plant boosts the pressure to 4 400 kPa before injection into the Moomba Gas Pipeline at Rosalyn Park.

**PIPE DIAMETERS:** up to 610 mm, Buried 1 m or 1.2 m below the surface. Smaller diameters 75 mm, 100 mm and so on from individual wells from wells to feeder pipelines.

**SALT:** They send their produced water to Windsor. It is treated (perhaps to remove some

of the salt) and used there to make bricks. Would you want salty bricks?

**PRODUCED WATER:** Is low volume and recycled. From one garbage tin a day to 6 000 L a week. They can use their produced water to drill other wells.

**DAILY COLLECTION OF WATER:** Would you want to have a large water truck visiting every day to suck a tonne (1 000 L) of water out?

**TIME TO DRILL:** Two to three days per well or longer for horizontal wells. For six wells, AGL says about 30 days, so there is no adjustment to the maximum permissible “acceptable” noise level that would classify higher noise levels (compared to the background noise level) as “acoustically acceptable” for a short duration activity. Contrast this estimate with the three and a half weeks Ormil Energy (now “Magnum”) took to drill one 550 m deep exploratory hole at Oakdale. Core sampling does take longer.

**PEOPLE REQUIRED:** Four teams working 12 hour shifts.

**DIRECTIONAL DRILLING:** They use one gyroscope and sensors to monitor where their drill bit is. They send the location information back to the drillers using acoustic information that is audible or at least able to be interpreted at the surface. Using that information, the drillers can change the bit direction and speed.