

QUESTIONS & ANSWERS

PETRAGAS - EXPLORATION OF SHALE OIL AND SHALE GAS

Below is a list of questions and answers that provide the relevant facts in relation to PetraGas and the Company's recent application for an oil and gas exploration licence in Tasmania

Who is PetraGas?

PetraGas Limited is a wholly owned subsidiary of Petratherm Limited. Petratherm Limited is an ASX listed geothermal exploration and development company, which has been operational since July 2004. The move by Petratherm to investigate oil and gas opportunities leverages off its core strengths of geological expertise, deep drilling technology and our knowledge of the Australian electricity and gas markets.

What does PetraGas plan to do in Tasmania? Exactly where is the project site?

PetraGas plans to undertake works to identify whether there is potential for conventional and/or unconventional oil and gas in Central Tasmania. PetraGas has an application for one Petroleum Exploration Licence covering a portion of the Central Highlands and Southern Midlands region. Low impact activities such as a review of existing data and surface geophysical surveys (i.e. gravity and magneto-telluric surveys) are planned for in the first stages of exploration before the company might consider applying to drill a well during the fourth year of operations.

How much shale oil or gas do you estimate is available at the proposed project site?

This is speculative and it is not known if any potential oil or gas reserves occur. Previous limited exploration by others indicates the basin may be prospective, however the reality remains the chances of finding economic accumulations of oil or gas are very low. Initial planned assessment works during the first 2 years will be largely a desktop review of existing data or very low impact surface surveys (i.e. ground gravity measurements). If this initial work is positive, the company may consider undertaking further ground surveys (a 2D or 3D seismic survey) prior to drilling a well in the fourth year of the operations.

How much will the project cost and how will it be funded?

The cost of initial low impact exploration work is estimated at \$300,000 over a two year period. Early findings will help define the potential for oil and gas in the licence area, and if the results are promising, we will continue with the full five-year program.

Why have you chosen Tasmania and this particular region to explore for shale oil and gas?

Historical works have determined potential hydrocarbon source rocks exist in the region and the exploration licence is traversed by the Tasmanian Gas Pipeline, which may provide a low cost connection point to market.

What are the potential benefits of this project for Tasmania, and in particular the local region?

Benefits include job opportunities, upgraded infrastructure, improved energy security and significant investment in the local and state economies. Gas in particular is an important part of the current and future energy mix supplementing other renewable technologies such as wind and solar by providing 24 hour backup, and is a cleaner alternative than coal, in the transition to a renewable energy future.

The planned exploratory work will also provide a range of new geological data for Tasmania, in an area of limited current knowledge.

How close is the project site to homes and businesses? Will any nearby properties be affected in any way by the project?

No prospective sites have been defined yet and it will be at least two to three years before prospective sites can be identified. Site selection will take into account proximity to sensitive areas, and we will seek to avoid such areas. Regulations prohibit exploration/development in close proximity to homes or buildings. No project development would occur anywhere without extensive consultation.

Some people may fear that such a project will spoil the natural environment and be a visual blight. Can you allay those people's concerns?

The nature of the project is such that we expect minimal visual and environmental impact. Before any ground disturbing activities, a full environmental, safety and risk assessment would be undertaken, including baseline studies prior to commencement of well development. Detailed stakeholder consultation and review process would also occur. A permit to undertake ground work could only be issued by the government after all of these issues had been satisfied to a very high level of satisfaction. Refer to the *Schedule for Onshore Exploration - November 2012* for more information which can be found on the publication portal of the Mineral Resources Tasmania web site (www.mrt.tas.gov.au).

How environmentally friendly is the extraction of shale oil and shale gas?

Shale oil and shale gas extraction has low surface impact. Like most oil and gas projects, drilling and fracking carry a certain degree of risk, however this is greatly reduced through detailed engineering and environmental and safety risk assessment prior to any activity.

Modern drilling and fracture stimulation programs must meet rigorous industry and government standards and guidelines before any work approval is obtained.

What are the key differences between shale gas and coal seam gas?

Coal seam gas and shale gas, while they employ the use of drilling and fracing technologies, are very different and as a result have very different levels of environmental risk.

Target coal seams for coal seam gas (CSG) production are generally relatively shallow and are typically 300-1000m depth below the surface. CSG is adsorbed into the coal matrix and is held in place by the pressure of formation water. To extract the gas, a well is drilled into the coal seam and the formation water is pumped out reducing the pressure and enabling the CSG to be released from the coal. In some instances fracing is employed to create fracture pathways that may allow a greater production of gas from the well. Large amounts of brackish water are produced that require safe disposal. Careful management of local fresh aquifers needs to be in place to ensure they are not affected in any way by these processes.

Shale gas is very different. Shale gas is generally found at much greater depths, typically 1 km to 3 km depth, well below any aquifer that may be utilised for groundwater. The gas is contained in clay rich sedimentary rock as free gas in the pores of the rock or adsorbed by organic matter contained in the rock. The gas is trapped in the rock as there is no open space around the pores and organic matter to allow a flow of gas out (it is held in place by the fine clays and sand effectively “clogging” the pathways). For this reason, unlike coal seam gas, shale gas rocks do not contain aquifers. The fracing process creates fracture networks near the well bore which releases the trapped gas back into the well. The fractures themselves do not extend more than 100 to 200 metres from the well bore and remain contained in the “tight” rocks. The shale and surrounding rock strata act as a natural seal or barrier, so there is no risk of contamination with aquifers near the surface.

I understand “fracing” will be a future part of the project process? How can you be sure that fracing fluid won’t contaminate underground aquifers and the local water supply?

If initial studies show promising results and suggest that some reservoir stimulation (fracing) are suitable for the geological context, some such activities may be required.

Aquifers may be intersected when a well is drilled; however any aquifers will be isolated from the well by layers of cemented steel casing which line the well. The casing and cement provide a mechanical barrier between the inside of the well and geological formations, ensuring the fracture stimulation fluid, or gas from deeper formations, cannot enter the aquifers.

In Tasmania, gas prone rock formations will be targeted where they occur well below the deepest utilised aquifers. Monitoring of the height growth of typical shale gas fracture stimulation treatments in the US indicates that fractures do not grow more than 100-200 metres from the treatment zone. The propagation and extent of the fractures in the reservoir can be monitored and controlled in real time using microseismic arrays. This ensures that the fractures remain in the target reservoir.

Why are chemicals used in hydraulic fracturing?

Chemicals may be added to the hydraulic fracturing water for the variety of purposes, such as;

- to carry the proppant (sand or garnet grains),
- to reduce the friction between the water and the pipe or casing in the well,
- to stop the growth of bacteria in the well and underground intervals,
- to remove oxygen and prevent corrosion of the casing.

Chemical additives in the fracture stimulation fluid are highly diluted so they only represent less than 1% of the volume of the fluid and include sodium hypochlorite and hydrochloric acid (both used in swimming pools), cellulose (used to make paper), acetic acid (the active part of vinegar) and small amounts of disinfectants. The additives can have ingredients that are also found in commonly used household products. In all cases with good well design, construction and maintenance, the risk of cross flow between the stimulated reservoir and aquifers can be reduced to as low as reasonably practicable, avoiding the introduction of any of these chemicals into aquifers. In addition, with good work practices, all chemicals will also be contained at the surface and disposed of appropriately using evaporation, filtering or chemical precipitation of substances.

Is there a chance that fracking could cause a felt earthquake in the region?

The relatively small volumes of fluid injected in fracking do not cause felt seismicity as demonstrated by the hundreds of thousands of fracking procedures that have been undertaken by the oil and gas industry without felt seismicity. Seismic events related to hydraulic fracturing in the oil and gas industry are miniscule and cannot be felt. Even sensitive geophones are unable to detect the vast majority of seismic events because they are so small. PetraGas's parent company Petratherm Limited, has substantial fracture stimulation experience developed from its work on engineered geothermal systems. It has a great track record of carrying out these operations well and safely. Extensive stakeholder consultation is a key part of the process before any works occur.

What do you say to local landowners and farmers nervous about a shale gas project on their doorstep which could compromise the region's "clean and green" image?

The surface impact of shale oil and shale gas exploration is minimal and will not impact on the landscape. On completion of ground works, the site will be rehabilitated to its former state prior to ground activities. It should be noted that gas is the cleanest of all fossil fuel alternatives generating relatively little carbon dioxide when burnt, and is a good back-up for intermittent wind and solar power generation.

Will you be undertaking community consultation, and if so, when, where and how?

A process for consultation will be established from the outset of receiving an exploration licence. We expect to undertake extensive local stakeholder consultation which will provide information and ensure an agreed work program occurs. Public meetings will be held in council areas where activities will be performed and key associations and groups will also be consulted.

What are the next steps from here in terms of key timeframes including approvals and project commencement?

Once the licence has been granted we will commence our consultation; then a process to gain a work program approval can commence leading to the exploration program starting, with all works to be regulated by Mineral Resources Tasmania (MRT).

The first stages of exploration will focus on desktop analysis of historical work and minor non intrusive field surveys and analysis. If this work was positive it would be followed by further ground surveys in year 3, with baseline studies to be carried out (e.g. groundwater). Drilling and well testing would occur in years 4 and 5 of the licence. A detailed operation program must be presented to MRT for approval prior to any ground activity. The program must include detail of the stake holder consultation process, environmental impacts and safety risk assessment to perform the works.

If the project is given the green light, what would its lifespan be and how many jobs would be created?

At this stage, this is a 3 to 5 year exploration project. It must be emphasised that this is an early stage speculative exploration project that may not lead to any future drilling or test works for oil and/or gas production. It is too early to discuss lifespan and potential job numbers that such a project would generate for the local community.

If exploration proceeds, are there any plans to rehabilitate the site upon completion?

On completion of ground works, the site will be rehabilitated to its former state, and to the satisfaction of the landowner, as agreed, prior to ground activities and in compliance with State regulations.