Submission to the Victorian Government's Inquiry into Unconventional Gas

To the Parliamentary Committee to the Inquiry,

Otway Conservation Association Inc. (OCA) is a small organisation operating within Colac-Otway Shire, which seeks to promote long term environmental sustainability and social justice through education and action. OCA makes the following submission to the Victorian Government Parliamentary Inquiry into Unconventional Gas.

The members of OCA unreservedly oppose the exploration for, extraction and processing of all forms of unconventional gas; and we oppose the use of all associated technologies including but not limited to hydraulic fracturing.

We request the State Government of Victoria permanently bans all forms of unconventional gas exploration, extraction and fracking.

We address the terms of reference to the inquiry as follows:

(1) The prospectivity of Victoria's geology for commercial sources of onshore unconventional gas;

Although there are reserves of natural gas trapped within the geology of various regions of Victoria, the energy return on investment (EROI) of unconventional gas (UCG) deposits has been reported at ratios as low as 2:1 and 3:1 energy invested to energy returned.[i] Downward EROI trends on all fossil fuel sources are noted in global studies.[ii] Sources of energy with an EROI of less than 3:1 are not considered minimally viable[iii] as the cost of energy extraction outweighs the benefit of energy return.

Furthermore, to quote from the Victorian Government's climate change website:

> Increases of the main greenhouse gas - **carbon dioxide (CO_2)** - stem from burning petrol, coal, oil and natural gas, and from some activities, such as clearing trees and other vegetation and ploughing the soil.
>
> CO_2 is the main contributor to climate change, and accounts for about two thirds of greenhouse gases produced by human activities.[iv]

Extraction of yet another fossil fuel will only add to the climate crisis we are now entering, as noted by global financial institutions in consideration of "systemic [financial] risk associated with carbon-intensive activities".[v]

> The new warning from one of the world's key central banks follows a caution from its head Mark Carney that the "vast majority of [fossil fuel] reserves are unburnable" if climate change is to be limited to 2C, as pledged by the world's governments. The bank will deliver a report to government on the financial risk posed by a "carbon bubble" later in 2015.[vi]

Additional costs not factored into the extraction and use of fossil fuels, inluding UCG, are social, health[vii] and environmental costs,[viii] and the cost of climate change.[ix]

Given the evidence of low energy return from established UCG projects overseas and the known link between combustion of fossil fuels and climate change; exploration and extraction of UCG in

any form does not make good long-term economic or environmental sense as a domestic or exportable energy prospect.

(2) The environmental, land productivity and public health risks, risk mitigations and residual risks of onshore unconventional gas activities.

Health damage due to exposure to pollutants associated with coal mining and coal-fired power generation[x] is an established area of concern to the public health sector.[xi] Although a review into health effects of UCG on Tara residents found no clear link between reported illnesses and UCG operations and little evidence of reported syptoms,[xii] it must be noted, this study was conducted on a small group of subjects. Furthermore, findings run contrary to documented medical observations conducted on a broader population from the same region[xiii] and additional research now becoming available in the United States.[xiv]

Current research demonstrates concerning associations between UCG and population health,[xv] particularly in the area of child and maternal health. Low birth weight and APGAR readings[xvi] and an increase in congenital heart defects[xvii] have been recorded in populations living within close proximity to gas wells in Pennsylvania and Clorado respectively.

(3) The coexistence of onshore unconventional gas activities with existing land and water uses, including —

(a) agricultural production and domestic and export market requirements;

(b) the legal rights of property owners and the impact on property values; and

(c) any implications for local and regional development, investment and jobs.

OCA does not credit the viability of onshore UCG activites co-existing with current land and water use for the following reasons:

- UCG activities consume an unacceptable volume of water per gas well, and produce unacceptable levels of waste water which create disposal issues and risks.[xviii]
- There is an identified and well documented risk of shallow aquifer contamination within the active zones of UCG wells by chemicals utilised in the extraction process.[xix]
- Many environmental contamination and chemical spillage incidents associated with multiple stages within the UCG production chain have been reported internationally and domestically.[xx]
- Studies indicate “animals exposed to [UCG] drilling chemicals were far more likely to experience reproductive failure, stillbirths, and sudden deaths”[xxi] and there was an increased incidence of respiratory lesions and immune effects in calves exposed to increased levels of volatile organic compounds present at UCG sites.[xxii]
- Social justice issues and social impacts of UCG development place communities under increased stress which further exacerbate health concerns within gasfield communities.[xxiii]
- The inability of landholders to prevent trespass on their land and the forced entry for exploration and drilling by UCG companies has increased stress for landholders and

communities affected by UCG and opened a new range of human rights issues for consideration.[xxiv]

- Property values plummeted in gasfield regions of New South Wales following the introduction of UCG activities, and landholders who are relocated due to UCG activities have commonly been silenced through non-disclosure clauses[xxv] in compensation arangements with companies.

A further issue arising from UCG development may include the vacuum effect of a short-term gas industry withdrawing, causing regional socio-economic contraction and loss of services. This issue would be further exacerbated by the altered social demographic of gasfield communities, from long-term to short term (fly-in, fly-out) populations, the loss of pre-gasfield land uses and the liklihood of UCG associated long term environmental damage.

(4) The ability of potential onshore unconventional gas resources contributing to the State's overall energy sources including —

(a) an ability to provide a competitive source of energy and non energy inputs for Victorian industries;

(b) an affordable energy source for domestic consumers; and

(c) carbon dioxide emissions from these sources.

OCA does not hold the view UCG resources can contribute meaningfully to the State's overall energy resources. As detailed previously in this submission, many forms of UCG do not demonstrate sufficient energy return on energy invested[xxvi] to be regarded as a viable energy source. As the integrity of UCG as an energy source is questionable,[xxvii] the long term negative social health and justice issue, potentially damaging environmental effects and increased greenhouse gas emissions and subsequent exacerbation of climate change greatly outway the value of UCG as a source of domestic or exportable energy.

Given the increasing efficiency and declining costs of renewable power sources[xxviii] and research indicating wind power may have better energy return on investment than fossil fuel based technologies,[xxix] OCA supports a rapid transition to solar, wind, tidal and wave powered renewable energy sources as principal power generators for this state. OCA strongly advocates investment in renewable base-load technologies as an alternative to UCG development. This will improve regional employment opportunities and diminish the health issues associated with gas extraction and other fossil fuel technologies[xxx] in Victoria.

(5) The resource knowledge requirements and policy and regulatory safeguards that would be necessary to enable exploration and development of onshore unconventional gas resources, including —

(a) further scientific work to inform the effective regulation of an onshore unconventional gas industry, including the role of industry and government, particularly in relation to rigorous monitoring and enforcement, and the effectiveness of impact mitigation responses; and

(b) performance standards for managing environmental and health risks, including water

quality, air quality, chemical use, waste disposal, land contamination and geotechnical stability.

Resource knowledge requirements, industry regulation, technicological and performance standards have been repeatedly demonstrated to be insufficient to prevent, mitigate or remedy environmental damage caused by this industry.[xxxi]

The Santos aquifer contamination incident,[xxxii] broadly covered in the media during 2014, demonstrates environmental damage is a real risk despite "safe" industry practices and reassurances the technology will not endanger water supplies. Ananlysis of shallow aquifers and water supplies located within American gasfields have indicated multiple pathways for water contamination by stray gas and other contaminents *throughout all stages of UCG development*.[xxxiii]

In addition to accidental release of contaminants and environmental pollutants stemming from UCG development, increased levels of pollutants[xxxiv] and endocrine disruptors[xxxv] are a feature of gasfields. The long term implications of elevated levels of pollutants in the environment, potential pathways into the food chain and risks to human and animal health in rural residential, agricultural and natural environments is poorly understood due to a lack of research.

(6) Relevant domestic and international reviews and inquiries covering the management of risks for similar industries including, but not limited to, the Victorian Auditor-General Office's report Unconventional Gas: Managing Risks and Impacts (contingent upon this report being presented to Parliament) and other reports generated by the Victorian community and stakeholder engagement programs.

OCA directs the attention of the Committee to the following independent reviews of UCG activities and their effects upon human health, the environment. Further more, our organisation directs the Committee's attention to the role of UCG and fossil fuel based energy sources in undermining population health and increasing the risk of climate change.

The Lancet, Commission on Health and Climate Change, June 2015. www.thelancet.com

Fracking by the numbers, Report of Environment America, Research & Policy Center, 2013. www.environmentamerica.org/sites/environment/files/reports/EA_FrackingNumbers_scrn.pdf

Symptomology of a gas field – an independent health survey in the Tara rural residential estates and environs. Published by Gerralyn McCarron, 2013.

Recommended viewing: "The Human Cost of Power", a short documentary outlining the risks to human health associated with fossil fuel technologies. Available at www.caha.org.au

Concluding statements:

OCA supports a permanent ban on all UCG activities includingbut not limited to exploration, drilling, fracking.

Over sixty communities in Victoria have declared themselves "Frack Free" and have voted to stop UCG in their regions, and around 74% of the Municipal Association of Victoria voted to oppose UCG in this state.

There is no social license for unconventional gas developments in this state.

Otway Conservation Association Inc.

[redacted]

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Prepared by K. Holmes on behalf of OCA Inc.

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i Meurns, E. (2012) Unconventional Gas and Oil, a Game Changer? In *Association for Peak Oil Conference*, Austria, May 30 – June 1 2012. Available: http://www.aspo2012.at/wpcontent/uploads/2012/06/Mearns_aspo2012.pdf [accessed 9 July 2015]. See also "Planet Re:Think", a documentary by Eskil Hardt, (c) Ace & Ace 2013. Available: http://planetrethink.com/.

ii Freise, J (2011) The EROI of Conventional Canadian Natural Gas Production. *Sustainability* **2011(**3) 2080-2104; doi:10.3390/su3112080; and see Hall, C. *et. al.* (2014) "EROI of different fuels and the implications for society." In *Energy Policy* 64 (2014) 141–152.

iii See above, Hall, C. *et al.* (2014), p144.

iv http://www.climatechange.vic..gov.au/climate-science-and-data/video-transcript

v Carrington, D. Bank of England warns of huge Financial Risk from Fossil Fuel Investments. The Guardian [online] Available: http://www.theguardian.com/environment/2015/mar/03/bank-of-england-warns-of-financial-risk-from-fossil-fuel-investments [accessed 9 July 2015].

vi *Ibid.*

vii Armstrong, F. Inquiry into the impacts on health of air quality in Australia, Climate and Health Alliance (CAHA) Submission to the Senate Standing Committees Community Affairs, March 2013. **See also**, Biegler, T. The Hidden Costs of Electricity: Externalities of Power Generation in Australia, Report for the Australian Academy of Technicological Sciences and Engineering (ATSE), 2009. Available: http://www.atse.org.au/Documents/reports/the-hidden-costs-of-electricity.pdf

viii See Hall, C. *et. al.* (2014) *above*.

ix See article by Director-General of WHO: Chan, M. Achieving a cleaner, more sustainable, and healthier future. Health and climate change, A Commission by The Lancet, June 2015. pp 2-3.

x Ahern M, Mullett M, MacKay K, Hamilton C. Residence in coal-mining areas and low-birth weight outcomes. Matern Child Health J 2011;15:974–9; Physicians for Social Responsibility, Coal's Assault Human Health, 2009. Available: http://www.psr.org/assets/pdfs/psr-coal-fullreport.pdf.

xi Health and climate change, a Commission by The Lancet, June 2015. Available: www.thelancet.com

xii Adam, K. Health Effects of Coal Seam Gas – Tara, Report by Medibank Health Solutions, Feb 2013.

xiii McCarron, G. Symptomology of a gas field – an independent health survey in the Tara rural residential estates and environs, April 2013.

xiv Kassotis CD, Tillitt DE, Davis JW, Hormann AM, Nagel SC. Estrogen and androgen receptor activities of hydraulic fracturing chemicals and surface and ground water in a drilling-dense region. Endocrinology 2014, 155. pp 897–907.

xv Werner, A. *et al*. Environmental health impacts of unconventional natural gas development: A review of the current strength of evidence. Science of the Total Environment 505 (2015) 1127–1141.

xvi Hill, E. Shale Gas Development and Infant Health: Evidence from Pennsylvania. Working Paper, The Charles H. Dyson School of Apllied Economics and Management, Cornell University, New York, December 2013. Available: http://dyson.cornell.edu/research/researchpdf/wp/2012/Cornell-Dyson-wp1212.pdf

xvii McKenzie LM, Guo R, Witter RZ, Savitz DA, Newman LS, Adgate JL. 2014. Birth outcomes and maternal residential proximity to natural gas development in rural Colorado. Environ Health Perspect 122:412–417. Available: http://dx.doi.org/10.1289/ehp.1306722

xviii Ridlington, E. & Rumpler, J. Fracking by the numbers, Report of Environment America, Reserach & Policy Center, 2013. Available: www.environmentamerica.org/sites/environment/files/reports/EA_FrackingNumbers_scrn.pdf

xix Vengosh, A. *et. al.* The Effects of Shale Gas Exploration and Hydraulis Fracturing on the Quality of Water Resources. In Proceedings of the Fourteenth International Symposium on Water-Rock Interaction, WRI 14. Vol. 7 (2013) pp. 863–866. Available: http://www.sciencedirect.com/science/article/pii/S1878522013002944 [accessed 9

July 2015].

xx Consider Environmental Impacts of CSG as summarised at: http://quitcoal.org.au/learn/unconventional-gas-environmental-impacts/ and EPA Investigation Report: Santos Limited and Eastern Star Gas Pty Limited. ***Consider also*** documented environmental breaches of AGL UCG projects in Gloucester, New South Wales (https://www.getup.org.au/campaigns)

xxi Bamberger, A. & Oswald, D. Unconventional oil and gas extraction and animal health. Environ. Sci.: Processes Impacts, 2014, **16**, 1860-5.

xxii Ibid.

xxiii Coram, A., *et* al. (2014) Harms unknown: health uncertainties cast doubt on the role of unconventional gas in Australia'senergy future. MJA 200 (4) , 210-3. doi: 10.5694/mja13.1102 3

xxiv Damien Short, Jessica Elliot, Kadin Norder, Edward Lloyd-Davies & Joanna Morley (2015): Extreme energy, 'fracking' and human rights: a new field for human rights impact assessments?, The International Journal of Human Rights, DOI:10.1080/13642987.2015.1019219 Available: http://dx.doi.org/10.1080/13642987.2015.1019219

xxv Jackson, R., e*t al.* The Environmental Costs and Benefits of Fracking, ARER Final Report, 2014. See also the closing credits in the "Frackman" movie. Available: www.frackmanthemovie.com

xxvi See above: Meurns, E. (2012); Freise, J (2011).

xxvii Consider the value of energy resources with EROI below 3:1 as noted in Hall, C. *et al.* (2014).

xxviii IRENA, Renewable Power Generation Costs 2014. Available: http://www.irena.org/DocumentDownloads/Publications/IRENA_RE_Power_Costs_2014_report.pdf

See also, Elliston, B., *et al* (2013) Comparing least cost scenarios for 100% renewable electricity with low emission fossil fuel scenarios in the Australian National Electricity Market. Available: www.ies.unsw.edu.au/sites/all/files/LowEmissionFossilScenariosSubmitted.pdf

xxix Ida Kubiszewski, I. *et. al.* "Meta-analysis of net energy return for wind power systems" in *Renewable Energy* **35(1)** (2010). pp. 218–225.

xxx See above, Armstrong, F. (2012).

xxxi See above, Ridlington, E. & Rumpler, J. 2013.

xxxii See above, xviii.

xxxiii See above, Vengosh, A. *et. al.* (2013).

xxxiv See Hill, E., (2013).

xxxv See above, Bamberger, A. & Oswald, D. (2014).