Unconventional Gas

The environmental challenges of coalbed methane development in Alberta

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Executive Summary

The term "unconventional gas" applies to natural gas from coal seams, tight gas sands, gas shales and gas hydrates. The most significant source of unconventional gas in Alberta is natural gas from coal seams and is most commonly referred to as coalbed methane (CBM). As demand for natural gas continues to grow and the supply of conventional natural gas declines, attention has turned to CBM. By 2002, the US obtained 9% of its gas supply from CBM, and development has recently begun in Alberta and BC. It has been estimated that over 60% of Canada's CBM resource is in Alberta. The coal seams that lie under most of central and southern Alberta contain very large amounts of CBM. It is not known how much of this resource can be extracted, but Canada's CBM reserves are estimated to be about 60 trillion cubic feet (Tcf), with over 20 Tcf in Alberta, excluding the Foothills region. For comparison, the total production of conventional natural gas in Alberta to date is over 100 Tcf and the remaining conventional natural gas reserves are slightly over 40 Tcf.

Coal beds between 150 and 1600 metres deep are currently being explored in Alberta. In addition to exploratory wells there are extensive pilot projects underway and two companies started commercial production in 2002. In some formations, the coal is dry and CBM can be extracted in the same way as conventional natural gas from shallow formations. More commonly, it will be necessary to dewater the coal to reduce the pressure and allow the gas to be extracted.

The extraction of CBM differs from conventional natural gas production in several respects, especially where the coals need to be dewatered. Key environmental issues can include land disturbance from the high density of wells; surface water and groundwater impacts associated with the dewatering of coal seams; venting and prolonged flaring of non-economic gas; and noise pollution from compressors and pumps required to produce CBM (see the table below). Experience with CBM development in the US has demonstrated that these issues can have significant impacts. While the geological conditions in Alberta differ somewhat from those in the US, it is important to learn from the US experience and avoid or reduce potential impacts in Canada with pro-active, effective regulation and the adoption of best practices by industry.

The Alberta Energy and Utilities Board currently regulates CBM in the same way as conventional natural gas. However, if the coal seams contain non-saline water, a company must also apply to Alberta Environment to dewater the coals. Alberta Energy has initiated a review and cross-government consultation process to determine how existing rules should be modified for CBM development. They plan an external consultation phase, to involve industry, landowners, environmental organizations and other stakeholders. This report by the Pembina Institute provides ideas for public input on decisions relating to CBM, both with respect to the regulatory process and for individual projects.

The report makes a number of recommendations on ways in which regulations should be improved to reduce the risk of harmful impacts. One recommendation is that for large-scale CDM projects (that is, extensive pilot projects and commercial projects) environmental impact assessments (EIAs) should be conducted. This would enable the examination of the cumulative environmental and social impacts of CBM development and the establishment of plans to minimize these impacts if development proceeds. Currently, even though the surface area affected may be as great as for heavy oilsands projects (for example, the steam-assisted gravity drainage process) for which an EIA is required, conventional oil and gas projects are exempt from the EIA process. Setback distances, as well as the regulatory process for the protection of groundwater, also need to be reviewed.

Some potential impacts of CBM well development

Issue	Description	Potential impact
High density of wells	An average of two to eight wells per section to access the gas compared to the basic standard of one well per section for conventional natural gas.	Disturbance of land surface by well pads, pipelines and roads. Land disturbance and fragmentation results in loss of wildlife habitat and affects animal behavioural patterns; it also has an impact on native vegetation and farming operations.
Dewatering of coal	While some coal seams are dry, many will require significant amounts of dewatering to relieve pressure before gas can be extracted. Conventional gas wells generally produce no water at the start of development, although water may be pumped from a well as it ages.	Dewatering of non-saline aquifers where coal seams are shallow, which could impact fresh groundwater supplies needed for human use and to recharge surface water bodies.
Venting and flaring of CBM gas	During dewatering, CBM may be vented or flared until gas volumes are sufficiently economic to pipeline. The duration will likely be for much longer periods than that experienced with conventional gas wells.	Local air pollution and an increase in greenhouse gas emissions are key human health and environmental issues of concern.
Noise	Where coal seams need dewatering, the lower gas pressure and higher density of CBM wells compared to conventional gas wells will result in increased intensity of pumps and compressors used to dewater the coal seams and pressurize the gas.	Elevated noise levels created by this equipment can contribute to degradation of rural lifestyle aesthetics and disturb wildlife patterns.

Recommendations for industry best practices that can reduce impacts include a proposal for multiple wells to be drilled directionally from a central pad wherever technically feasible. This would allow wells to be concentrated along road and pipeline corridors, limiting land fragmentation and impacts on both agricultural land and natural habitat.

The report concludes with a list of questions that landowners or others potentially impacted by CBM development can ask a company or regulators before the start of operations, so they can better understand the potential impacts of developments in their area.