Hydro-fracturing has a lucrative dirty secret

The B.C. government isn't asking many questions about a natural-gas-drilling technique involving toxic compounds.

By Chris Wood

Biologist Jessica Ernst says that after gas wells were "fracked" near her Alberta home, gas came out of her tap water—so much so that she could light it on fire. (📷 Colin Smith)

January 28, 2010

Gwen Johansson lives in what used to be idyllic surroundings a few kilometres west of Fort St. John in B.C.'s northeast. Lately, though, the tranquillity of her home overlooking the placid Peace River has been shattered by an intrusive flow of traffic. Often operating around the clock, heavy-bodied tanker trucks pull off Highway 29 and line up at the riverbank to drop in thick hoses and gun high-volume pumps that suck up thousands of litres of water in just a few minutes. "They're hauling out of there day and night," Johansson told the Georgia Straight by phone, "one loading, two more waiting. You can see the amount of water that's going out."

You may be able to see it, but you can't measure it. No public agency requires the truckers or their employers to keep a tally of the water they extract from the Peace and other streams for delivery to the scores of gas wells being drilled at any one time in the area. Estimates based on Peace drilling activity, however, suggest that the giant sucking sound could reach as high as 135 billion litres a year. That's enough water to fill a line of tanker trucks parked bumper to bumper around the equator—five abreast.

You're also not allowed to know what gets mixed in with the river water before it's injected into the ground under staggering pressure in order to fracture solid rock and release the hydrocarbons trapped there. Drilling contractors insist the mixes they use are trade secrets. The Oil and Gas Commission, British Columbia's decade-old one-stop shop for gas and oil oversight, isn't curious. "The question I ask in reverse," said the OGC's leader for corporate affairs, Steve Simons, in his Victoria digs—the temple to sustainable building, Dockside Green—"is why? Why is it important to know?"

Well, perhaps because the chemicals the same international gas-field contractors have injected in the United States and elsewhere in Canada using the same fracturing technique have been linked to a string of contaminations—culminating in events as bizarre as a house explosion in Ohio and the flammable water that flows from faucets in the high-prairie hamlet of Rosebud, Alberta.

Or perhaps because boosters claim that companies pursuing the high-pressure penetration of holes in the earth known as "hydro-fracturing"—or more often simply as "fracking"—will pour close to a billion dollars a year into provincial coffers over the next quarter-century and boost our gross provincial product over the same period by $121 billion. Although all that coin certainly makes a nice sound, when someone is spending that much money on you, it's also wise to know what they expect once the lights are turned low.

But this is not a love story. It's a story about power, both the raw and naked kind, and the subtler sort of influence that plays the instruments of public policy. It's the story of how British Columbia's water is being well and truly fracked over on the way to igniting the continent's hottest gas play—and helping businesses like Exxon and Calgary-based EnCana Corporation reposition themselves for the inevitable economic rebound as vendors of a new kind of "green" hydrocarbon.

"Clean", "clean burning", "clean energy", "the cleanest-burning fossil fuel"… Such boasts leap routinely from Web sites and promotional material produced by major gas companies. The claims are based on the fact that burning natural gas, typically a mixture of methane, ethane, propane, and other volatile molecules, produces fewer greenhouse gases than burning coal or oil. And recently, with an incipient economic recovery poised to send subdued gas prices soaring, the industry has been steadily revising its reserve estimates upward based on what it maintains are new and innovative techniques to unlock previously inaccessible deposits. Horizontal drilling and hydro-fracturing, drillers say, have pushed estimates of recoverable gas reserves in North America to record highs (in part explaining the current dip in gas prices). Global adoption of the same techniques, said Houston industry watcher Amy Myers Jaffe of Rice University in an October 2009 article in the New York Times, "will change the geopolitics of natural gas".

Sideways holes and fast fracking have certainly buffed the geoeconomics of British Columbia. Hydrocarbon-bearing shale deposits in the Horn River and Montney areas of the province's northeast are widely touted as North America's most promising gas plays, bigger even than the Barnett Shale, a heavily developed zone underlying east Texas. A July 2009 analysis by the Calgary-based and industry-funded Canadian Energy Research Institute produced the eye-popping forecast that gas development in the Peace country would generate 847,000 person-years of employment over the next 25 years—the equivalent of about 34,000 permanent jobs.

That the practices behind this bonanza are either new or clean, however, is a stretch. Hydro-fracturing dates back to the years immediately after the Second World War, when a then-modest oil-field-service company named Halliburton (yup, that Halliburton) acquired a proprietary technique for pumping water mixed with jellied gasoline—aka napalm—at horrendous pressure into oil wells. The injections loosened sticky crude from surrounding rock and increased the amount that could be recovered. Soon, hydro-fracturing became one of the company's biggest revenue earners.

Modern hydro-fracturing has evolved, but continues to rely on a combination of brute force and chemistry. Multiple high-pressure pumps force vast quantities (as much as 10 million to 15 million litres at a time) of water-based fracking liquid into gas-bearing rock with the intent of shattering it like a piece of plate glass dropped on cement. Additives in the fracking liquid may include solvents, acids, detergents, and even diesel and kerosene. This then serves to dislodge gas molecules from the broken rock, while sand or glass pellets ("proppants", in the jargon) keep the newly created fissures open, allowing the freed gas to migrate to a recovery well.

The more recent development of horizontal drilling—boreholes that start out going straight down but are made to turn and extend out horizontally for thousands of metres—has simply allowed rigs located on a single pad at the surface to reach much farther and wider underground than ever before. In the Peace, a single pad may be the starting point for a dozen holes that radiate out below ground to tap into several square kilometres of buried shale. Each hole will typically be "fracked" a dozen times, some more than twice as often. Field operators in the Peace have told area citizens that a typical frack there takes 2,000 cubic metres of water to complete. That's roughly 110 tanker hauls.

Gas companies like EnCana point out that additives make up only about one percent of the volume injected. But if you do the math, that's still 20,000 litres of concentrated chemicals per frack. What's in the cocktail is a secret, kept closely guarded by Halliburton, Schlumberger, and other well-service companies. A B.C. Energy, Mines, and Petroleum Resources Web site offers this comforting but naive description of what's being pumped down: "The fluids used are generally biodegradable organic materials, a mixture of nitrogen and water to create thick foam—simply water with a small amount of biodegradable gel."

But frack fluids used here are the same ones used everywhere else in North America. Chemical detective work by several U.S. environmental groups has identified at least some common ingredients. One analysis circulated by the U.S. Environmental Protection Agency found that among the many toxic compounds blended into fracking foams and gels were benzene, toluene, ethylbenzene, naphthalene, xylene, and 2-butoxyethanol; several were found to exceed U.S. safe drinking water standards even in diluted use. Another group, the Endocrine Disruption Exchange, analyzed the "material safety data sheets" about the compounds that are posted at most job sites and found that "ninety-six percent provide a warning about eye and/or skin harm, 94 percent warn about respiratory harm, and 49 percent warn about brain or neurological harm."

Most big fracking outfits in the States agreed voluntarily in 2003 to drop one prominent source of benzene and naphthalene from their mixes—common diesel oil—while making no concession that its use was unsafe. When asked if diesel could be in the B.C. mix, the OGC's Simons replied, "It could be. We don't require them to give us a stock list, x percent of this and x percent of that and y of the third ingredient. The protection is in not allowing that water to reach the environment. We closely monitor the [aboveground] handling at all stages." Aboveground, frack fluids get the full hazmat treatment. As for what's pumped down the hole, the OGC's position is that what's deep out of sight is safely out of mind.

In that, the British Columbia regulator is in step with most of its North American counterparts. Only a handful of U.S. states require drillers to disclose their fracking formulas. Things got even better for the industry in 2001. Halliburton's former CEO, Dick Cheney, was vice president of the United States and tasked with writing a new energy policy. In the interest of boosting domestic gas production, it granted the fracking business an unprecedented blanket immunity from provisions of the U.S. Clean Water Act. Again, the rationale was that what happens to nasty gunk thousands of feet underground shouldn't worry us none up here in the daylight.

Flaws in that complacent argument surfaced almost immediately, often literally bubbling up from the ground. Another EPA study, released only after the Cheney-Bush administration left office, linked fracking to the contamination of scores of water wells in rural Wyoming. Of particular concern was the detected presence in several of 2-butoxyethanol, a fracking compound associated with kidney damage and reproductive problems. In Ohio, fire investigators blamed a 2007 explosion that levelled a family home (happily, without fatalities) on gases released from shale seams fracked

too close to the surface. In September 2009, wildlife officials identified waste fracking fluid as the likely cause of a fish kill that sterilized 30 miles of a Pennsylvania creek, exterminating 160 species of fish, salamanders, crawfish, and freshwater mussels.

Jessica Ernst, a biologist and environmental consultant to the oil and gas industry in Alberta, has firsthand experience of what happens when fracking products don't stay safely underground. After EnCana drilled and fracked several experimental gas wells in the coulees above her home east of Calgary, Ernst said in a phone interview, "I began to notice that my skin was burning in the shower. I thought it was some weird early menopause thing. Then my dogs suddenly refused to drink the water. They backed up away from it."

Tests discovered sky-high levels of methane and ethane in Ernst's tap water and kerosene in the municipal well serving her hamlet of Rosebud. On some days, so much gas bubbled out of Ernst's tap water that she could (and for demonstration purposes often did, until the risks began to alarm her) set the flaring gas alight.

It should come as no surprise that a hard fracking could open up unforeseen conduits for hydrocarbons and fracking fluid itself to migrate to the surface. Opening channels for the movement of gas and liquids is, after all, the point of the exercise. "The idea is that it expands existing fractures and opens up new ones," Diana Allen, a ground-water scientist at Simon Fraser University, told the Straight. "If you enhance the permeability of the rock mass—which is the purpose of hydro-fracking—you create pathways, so that if you put something into the ground, it's going to go somewhere else."

Still, the OGC's Simons said British Columbians need not fear a repeat of the unpleasantness associated with fracking in other places: "We've had the benefit of learning from other jurisdictions. We're light-years ahead of other regulators, in the North American context."

That leading position may depend on your perspective. Certainly, the provincial commission created in 1998 to take over oil- and gas-patch oversight previously conducted by a half-dozen provincial ministries, ranging from Environment to Multiculturalism (functions still divided among numerous agencies in most U.S. states), offers convenience to the industry. Rules require drill holes be lined with steel and cement at least 25 metres into impermeable rock below any known aquifers, Simons noted, a measure he insisted adequately prevents the inadvertent release of fracking fluid. The OGC, he added, can deny or revoke permits allowing contractors to pump water from lakes and streams if the withdrawal would harm the environment.

But universal experience suggests that Murphy's Law sooner or later trumps those that legislators enact. And B.C.'s "light-years ahead" regulator has some catching up to do with the state of the art in responsive measures to protect the public interest:

> • Ten U.S. states now require frackers to disclose, at least to officials, exactly what it is they're injecting into the ground. The idea is to make it easier to prove—or disprove—any alleged link between a specific frack and subsequent water contamination.
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> • After the events in Rosebud, Alberta prohibited fracking at depths shallower than 200 metres. B.C. is inching toward a similar prohibition, although SFU's Allen objected that no single measure can adequately protect B.C.'s poorly understood aquifers or the significant number of water wells deeper than the proposed safety zone. By contrast, the state of

Virginia banned fracks at depths of less than 152 metres below the lowest point of elevation or the deepest water well located within 457 metres of a gas well.

• Alberta also gives the owner of any water well exposed to proposed fracking the right to have water from the well tested at the expense of the gas company before development occurs. Without such a baseline test, any later allegation blaming loss of a well's flow or its contamination on overly energetic fracking will come down to a "he said, she said" standoff, Simons said. Yet British Columbians are entitled to no such predevelopment test and may even find tests they pay for themselves disqualified on technical grounds.

The Oil and Gas Commission's makeup and funding offer little reassurance on its loyalties. Fees levied on the industry it polices, $27 million in the past fiscal year, fund its 185 staff salaries and pay the rent on its ergonomic office space in Victoria. Membership on its board of directors is limited to three people: the deputy minister of Energy, Mines, and Petroleum Resources; the commission's CEO, Alex Ferguson; and a retired oil-and-gas driller named John Jacobsen.

Asked if this was like letting the fox into the hen house, Simons said: "That's an image we've worked hard at overcoming."

Maybe not hard enough. "The OGC has a very real interest in getting the oil and gas out of the ground," observed the Peace District's Gwen Johansson. "Oil and gas are nice, but water is essential, and they're not keeping track of it."

That's Rick Koechl's concern too. The Fort St. John teacher has taken on the task of educating himself and his neighbours about what the gas boom in the northeast may mean for its water. Koechl says his "awareness moment" came in the spring of 2009. Through membership in a local volunteer group, he was present when a fellow from Schlumberger, one of the big field-service outfits, explained fracking. As Koechl contemplated the volumes of water being described, "my jaw started to drop. It would have to be a four-lane highway to the Horn River and it would be wall-to-wall water trucks, 24-7. Clearly, there is not enough water in the river."

But then, who's counting?