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Big dams and a big fracking problem in BC's energy-rich Peace River Region

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Senior BC Hydro officials have quietly feared for years that earthquakes triggered by natural gas industry fracking operations could damage its Peace River dams, putting hundreds if not thousands of people at risk should the dams fail.

Yet the Crown corporation has said nothing publicly about its concerns, opting instead to negotiate behind the scenes with the provincial energy industry regulator, the BC Oil and Gas Commission (OGC).

To date, those discussions have resulted in only modest "understandings" between the hydro provider and the OGC that would see a halt in the issuance of any new "subsurface rights" allowing companies to drill and frack for natural gas within five kilometres of the Peace River's two existing dams or an approved third dam on the river, the controversial $9-billion Site C project. Companies already holding such rights, however, would not be subject to the ban.

But once again, none of this is public knowledge. Only after the Canadian Centre for Policy Alternatives filed a Freedom of Information request with BC Hydro did the Crown corporation disclose its concerns, which focus on the possibility that fracking could trigger earthquakes more powerful than some of its dams are designed to withstand.

Documents released by the Crown corporation under the FOI show that in December 2009 senior officials at BC Hydro became alarmed at oil and gas industry operations on lands near its Peace Canyon Dam. The dam is 23 kilometres downstream from the W.A.C. Bennett Dam, a 49-year-old structure that impounds the world's seventh-largest hydro reservoir by water volume.

Of concern was an experiment underway to extract methane gas from coal seams in proximity to the Peace River. Coal bed methane extraction had never before been tried in B.C., although it had been done extensively in several U.S. states and in Alberta with sometimes disastrous results, including instances of water so badly contaminated with gas that people could set their household tap water on fire.

To extract such gas, companies drill into relatively shallow coal seams and then pressure-pump immense amounts of water into wellbores in fracking operations. Fracking creates cracks or fractures in the coal seams that allow trapped gas to be released. Typically, companies then "de-saturate" or de-water the sites by pumping water out so the gas can flow.

At the time, Hudson's Hope Gas, a subsidiary of Canada Energy Partners and GeoMet Inc., had drilled at least eight coal bed methane wells near the community of Hudson's Hope, which lies about nine kilometres downstream of the Peace Canyon Dam and is home to more than 1,000 people.

The company had plans to drill and frack up to 300 more wells, with at least three of those wells situated close to the Peace Canyon Dam. The plans clearly alarmed BC Hydro's then chief safety, health and environment officer, Ray Stewart, who called them an "immediate" threat to the region's hydro facilities.

"The production of coal bed methane from these wells involves hydro-fracturing [fracking] to increase permeability of the coal seams, followed by extraction of groundwater to de-saturate coal seams and allow methane gas to be released," Stewart noted in a letter to the provincial Ministry of Environment's Glen Davidson, then British Columbia's comptroller of water rights.

"BC Hydro believes that there are immediate and future potential risks to BC Hydro's reservoir, dam and power generation infrastructure as a result of this."

Stewart went on to warn that the "potential effects" of such actions could be natural gas industry-induced earthquakes that were greater in magnitude "than the original design criteria for the dam." What risks this posed to people and communities immediately downstream of the dam, he did not say.

Stewart also warned that fracking could "reactivate" ancient faults in the region, which could potentially set the stage for earthquakes. He also warned of unspecified "hydrogeologic impacts" on hydro reservoirs from fracking and the potential for site-specific areas of land to subside or sink as a result of immense amounts of water being pumped out of the earth or in the event that de-watered coal seams somehow ignited.

There are no further such letters from Stewart in the documents supplied by BC Hydro. Part of the reason for that may be that coal bed methane extraction was a short-lived phenomenon in B.C. No company in the Peace region or anywhere else in the province for that matter is currently drilling or fracking for such gas.

However, no sooner had natural gas companies dropped their pursuit of coal bed methane than they turned to another so-called "unconventional" fossil fuel – shale gas. The Montney Basin, which underlies much of the Peace River region, is rich in shale gas. But extracting shale gas, which is tightly bound up in rock formations, requires the use of even greater brute force fracking technology. More water must be pumped at even higher pressure to fracture the rock and extract the trapped gas than is the case with coal bed methane, which is typically found closer to the earth's surface.

As fracking for shale gas became more common, senior officials at BC Hydro began to see a pattern. Earthquakes started occurring in lockstep with fracking operations. One of the most

pronounced examples occurred in the Farrell Creek fracking zone, near BC Hydro's Peace River dams. Between July 2010 and March 2013, a dozen earthquakes were recorded in the region, ranging from a low of 1.6 magnitude on the Richter scale to a high of 3.4.

The cluster of earthquakes, all in roughly the same confined region where one company, Talisman Energy, was involved in extensive fracking operations, caught the attention of Scott Gilliss, BC Hydro's dam safety engineer in the Peace River region.

Gilliss made his concerns known to senior officials at head office. Shortly after that, he received an email from Des Hartford, Hydro's principal engineering scientist, who reported directly to Stephen Rigbey, the corporation's director of dam safety.

"Scott," Hartford's email began: "As was discussed at the Department Meeting yesterday, this is to confirm that having brought forward your concerns about hydraulic fracturing ('fracking') activities in proximity of dams and reservoirs, you have discharged your responsibilities with respect to reporting and management of this matter. It is now up to Stephen as advised by me to determine what if any action should be taken by Dam Safety with respect to this matter."

"Fundamentally," Hartford's email continued, "hydraulic fracturing ('fracking') is one of these 'new and emergent' threats that require examination in the context of scientific and policy considerations in order that any meaningful management actions can be initiated if required."

Hartford instructed Gilliss to document his concerns so that others at BC Hydro could "take them forward."

Gilliss did so, pointing out in a subsequent email released by BC Hydro that "oil and gas production may have contributed to a dam breach" at the Baldwin Hill Dam in Los Angeles in 1963.

The Baldwin Hill breach, as described by award-winning investigative reporter and writer Andrew Nikiforuk in his most recent book Slick Water: Fracking and One Insider's Stand Against the World's Most Powerful Industry, occurred at a then new dam, and resulted in a "colossal rupture that sent 292 million gallons of water spilling into a residential community, destroying hundreds of homes and killing five people."

A subsequent review of the catastrophe by Richard Meehan, a leading expert on fluid migration at Stanford University, and Douglas Hamilton, a prominent civil engineer, concluded that "fluid injection" by the oil and gas industry, combined with sinking ground around the dam had led to the structure's sudden and ultimately deadly failure.

"This is the case study that triggered my concern over hydraulic fracturing in the Peace," Gilliss wrote in an email to Hartford on March 17, 2013. "The Baldwin hills case appeared to have occurred following very intense [oil and gas industry] exploration and development, the likes of which we don't have here yet. The geology of their site was also quite complex and riddled with faults. A similarity does exist in that there are two small thrust faults downstream of PCN [the Peace Canyon Dam] which dip beneath the dam. Reactivation of these small faults could be problematic for PCN. There are other north south trending fault[s] in the area."

Gilliss ended his letter on a note of exasperation.

"In my view, which I have already shared, the province should simply add buffer zones around any very Extreme and Very High Consequence Dams, where hydraulic fracturing cannot be undertaken without a prior full investigation into the risks, and an implemented risk management plan. Why is this so difficult?"

Gilliss's buffer zone idea was by no means new. Two years earlier, after conducting research for the Canadian Centre for Policy Alternatives, I had authored a report calling for "no-go zones" where fracking was prohibited to protect other important resources such as water. By then, there were also de facto bans on fracking in Quebec and New York State.

After writing his email, Gilliss and other top BC Hydro officials had even more reason to think that no-go zones made sense. More and more earthquakes in northeast B.C. were being triggered by fracking, including a magnitude 4.6 tremor that occurred to the north of Fort St. John last year. It was in an area then being actively fracked by Progress Energy, a subsidiary of Malaysian state-owned Petronas. The strength of that induced earthquake was the largest to date anywhere in the world associated with fracking operations.

Petronas is behind a controversial proposal to build a massive Liquefied Natural Gas or LNG terminal at Lelu Island near Prince Rupert. The raw gas for the plant would come almost entirely from northeast B.C., including the Peace River area, and would have to be fracked to be produced. This fact has led some people who oppose the project to refer to it not as an LNG project but an LFG or Liquefied Fracked Gas project.

At least some of that gas would come from lands adjacent to what could one day be a new 83-kilometre-long reservoir impounded by the Site C Dam. Like the upstream Bennett Dam, Site C would be an earth-filled dam.

The Bennett dam, completed in 1967, is now almost exactly halfway through its projected 100-year operating life. At nearly two kilometres across and the height of a 60-storey building, it is one of the largest earth-filled dams in North America. In 1996, it became the subject of intense engineering and safety scrutiny when two sinkholes suddenly opened at the crest of the dam.

In an investigative magazine article written a few years after that discovery, writer Anne Mullens noted that were the dam to fail, it would unleash a torrent of water so powerful that it would wipe out the Peace Canyon dam downstream, sending an "unstoppable burst of water 135 metres high," down on the residents of Hudson's Hope and communities much farther downstream.

"Unlike a tsunami, the destruction wouldn't simply peak and stop," Mullens wrote in *BC Business Magazine*. "The pent-up waters of Williston Lake would just keep coming, seeking to return to its natural elevation. The waters would flow for weeks, scouring away communities like Old Fort, Taylor, Peace River, Fort Smith and beyond. The onslaught would back up tributaries and inundate the entire Peace River Basin, flooding Lake Athabasca and Great Slave Lake. The floods could devastate northern Alberta, portions of Saskatchewan and the Northwest Territories all the way to the Arctic Ocean. The death toll could be high; the environmental and structural damage astronomical. Combined with the loss of generating power of the dam, the unprecedented disaster would cost billions of dollars and throw B.C.'s economy into turmoil."

Stephen Rigbey, BC Hydro's director of dam safety, says that in the aftermath of the discovery and repair of those sinkholes the Bennett dam has become "one of the world's most studied and instrumented dams." There are a number of upgrades underway at the dam, including the replacement of "large rocks on the upstream face of the dam that protect the dam from wind and wave action."

In an interview following the release of the FOI materials, Rigbey said that Gilliss and other dam safety officials operating in the field are paid to worry, but that he himself has no concerns that fracking operations would trigger any catastrophic failure at BC Hydro's Peace River dams.

Rigbey did say, however, that ground motions from fracking operations could cause slight alterations to "weak bedrock" near the dams and that in turn could change the way that water naturally seeps through earth-filled dams. Ground motions could also potentially knock some electrical control equipment off-line, Rigbey added. In the event that one or both happened, BC Hydro would be faced with high repair and maintenance costs.

"Would it [fracking] bring the dam down? Not a hope. Would it do damage and cost me a lot of money? Absolutely. It would cost me a lot of time and a lot of money and that's what I don't want to occur," Rigbey said.

Rigbey said that for these reasons BC Hydro has sought to exclude fracking from zones nearby the Bennett and Peace Canyon dams and around the construction zone of the Site C dam.

At this point in time, the unwritten "understanding" between the OGC and Hydro is that no new tenures will be awarded to companies allowing them access to natural gas deposits in a zone within five kilometres of the three dam sites. Companies already holding such rights will, however, be allowed to drill and frack for gas. In the event that happens, BC Hydro says it will work with the OGC "to effectively manage any risk."

"This is a work in progress," Rigbey said. "We are working toward strengthening the current understanding."

Graham Currie, the OGC's executive director of corporate affairs, confirmed in an email response to questions that five-kilometre buffers are in place around the two existing dams and the proposed Site C dam. He said that the buffer zone around Site C will "prevent the sale of oil and gas rights within the buffer area."

Currie added that the proposed Site C dam falls within the Montney shale gas zone, one of the most actively drilled and fracked zones in the province.

"Site C falls within the Montney play and will be built to a high seismic safety standard," Currie said in an email response to questions filed with the OGC. "During construction, permit conditions on a [natural gas] well in the Montney may be used to control the timing of hydraulic fracturing operations. All wells in the Montney are double-lined with cement and steel to a depth of 600 meters for further protection."

The email fails to mention that such protective measures do not prevent fracking-induced earthquakes. Cement casings, which are often imperfectly poured and prone to fail, are intended to prevent groundwater from being contaminated – an entirely different issue.

The "understanding" between Hydro and the OGC does not extend to the lands around the reservoirs themselves, Currie said. That includes lands around what could one day be the Site C reservoir; lands that according to a document prepared for BC Hydro could experience as many as 4,000 landslides during and after the reservoir fills. Whether or not fracking could further destabilize those lands damaging the reservoir and dam itself remains unknown.

What is known, however, is that earthquakes induced by fracking behave entirely differently than do naturally-occurring earthquakes.

Gail Atkinson is a professor in Earth Sciences, a leading expert on the effects of induced earthquakes, and holds the Industrial Chair in Hazards from Induced Seismicity at the University of Western Ontario. The chair is funded, in part, by TransAlta, a privately owned hydro provider in Alberta.

In response to written questions, Atkinson said most people would agree with the proposition that "precluding oil and gas activity such as fracking . . . within some radius of dams and reservoirs would prevent the possibility of induced seismicity that could damage such facilities."

Atkinson said the big concern with earthquakes triggered by events such as fracking is that they occur much closer to the earth's surface than do natural earthquakes. A fracking-induced tremor might be as close to the surface as two kilometres, while a natural earthquake might occur 10 kilometres down. The shaking caused by a fracking-induced earthquake may be of only short duration, but it is a stronger and different kind of shaking. The potentially "strong ground motions" generated by such shaking occur "closer to infrastructure on the surface."

"The concern is that the potential for induced earthquakes to generate strong motions makes it difficult to satisfy the high safety requirements for critical infrastructure, if earthquakes can be induced by operations in very close proximity [to dams and reservoirs]," Atkinson said.

While there is presently "no consensus" over what constitutes a reasonable size for no-frack zones, buffer zones do make sense, Atkinson said. "A zone of monitoring beyond the buffer zone is also a good precautionary measure in my view, as it would allow low-level induced seismicity from disposal or fracking beyond the buffer to be detected quickly and any necessary measures to be taken. Enhanced monitoring would also provide valuable research data to improve our understanding of the issue."

In a telephone interview, Rigbey said he agreed with Atkinson's thinking that both firm no-fracking buffer zones and special management zones beyond that made sense.

Atkinson's thinking is in keeping with ongoing efforts by TransAlta to protect some of its hydro facilities in Alberta from natural gas industry fracking operations. Those efforts appear to have effectively shut down fracking in a buffer zone around one of TransAlta's dams and the dam's reservoir as well. Special operating guidelines are also in place beyond the buffer zones that can force companies to cease fracking.

But, as is the case in B.C., negotiations between TransAlta and Alberta's energy industry regulator have happened behind closed doors.

Members of the public who are at direct risk should a catastrophic dam failure occur are kept in the dark when it comes to negotiations that could have a direct impact on their lives.

Fracking, earthquakes and hydro dams? Don't worry. We have an understanding

Efforts by BC Hydro to ban potentially destructive natural gas company fracking operations in the vicinity of its biggest dams fall well short of what an Alberta hydro provider has achieved, raising questions about why British Columbia isn't doing more to protect public safety.

Documents obtained through a Freedom of Information (FOI) request by the Canadian Centre for Policy Alternatives show that BC Hydro officials have feared for years that fracking-induced earthquakes could damage its dams and reservoirs.

Senior dam safety officials with the public hydro utility even worried for a time that natural gas companies could drill and frack for gas directly below their Peace River dams, which would kill hundreds if not thousands of people should they fail.

"The Montney gas field has vertical stratification of subsurface [natural gas] rights, so there may actually be a number of different owners laying claim under our damsites," BC Hydro's director of dam safety, Stephen Rigbey said in an April 2012 email released in response to the FOI.

Yet, after years of discussions with B.C.'s Oil and Gas Commission (OGC), which regulates oil and gas industry activities in the province, BC Hydro has obtained only modest commitments to prevent fracking near its two Peace River dams – the massive WAC Bennett dam, which impounds the world's seventh-largest reservoir, and the smaller Peace Canyon dam downstream.

The restrictions, which BC Hydro's director of dam safety Stephen Rigbey describes as "an understanding", also apply to a third dam on the river, the controversial $9-billion Site C project, currently in pre-construction.

Both BC Hydro and the OGC say that the understanding is that "there will be no new tenures" issued to companies wishing to drill and frack for natural gas within five kilometres of BC Hydro's dams. However, companies holding existing rights would not be prevented from doing so.

"If future activity related to the existing tenures is planned, we will work closely with the Oil and Gas Commission to put restrictions in place to effectively manage any risk," Rigbey said in an email response to questions.

What those measures would be remains the subject of ongoing discussions. No restrictions are presently in place around any of the massive reservoirs impounded by BC Hydro's Peace River dams or the lands that could one day surround the Site C reservoir.

In an email response to questions, the OGC said that at this point in time, the Ministry of Natural Gas Development "is not accepting any new requests for subsurface [natural gas] rights within 5 kilometres of the Site C construction area."

The Commission went on to say that "there are no active hydraulic fracturing operations" within the five kilometres of BC Hydro's Peace River dams but that there are "a small amount of existing subsurface rights issued within the 5 km buffer zone around Site C."

"These were issued prior to the creation of the buffer. Any applications in that area, or elsewhere, go through a strict review process before permits are issued. The Commission is also talking with BC Hydro about any additional permit conditions that would be required to protect public safety and the environment in the area specifically, before construction occurs on Site C."

The measures to date in B.C., fall well short of what Alberta hydro provider, TransAlta, has achieved. In interviews and correspondence with the company, TransAlta revealed that it has effectively shut down all fracking within five kilometres of one of its dams and also around the entire dam's reservoir as well. And it has succeeded in imposing restrictions on potentially destructive fracking operations in a zone up to ten kilometres away from its damsite.

But, as is the case in B.C., there is nothing in writing to reassure members of the public – no regulation or government statement – banning natural gas companies from fracking near sensitive infrastructure such as hydro dams and reservoirs. Both provinces appear reluctant even to suggest that fracking is inappropriate in certain cases where public safety is concerned, perhaps fearing the precedent such an admission would represent.

"At this time there is no regulated/government mandated exclusion areas near critical infrastructure in Alberta," says TransAlta's chief media spokesperson, Stacey Hatcher. Rather, Hatcher says, an "agreement" has been reached to exclude some hydro dams and reservoirs from fracking zones.

BC Hydro's modest achievements to date come as the Christy Clark government pursues two at times conflicting agendas. On the one hand, the government vows to push its Site C hydro dam, the most expensive infrastructure project in B.C.'s history, "past the point of no return." On the other, it continues to aggressively push for Malaysian state-owned Petronas to invest billions of dollars to build a Liquefied Natural Gas (LNG) processing plant near Prince Rupert and to tarnish all those who oppose the project. Should such a plant be built, natural gas drilling and fracking near the Peace River and its hydro facilities would significantly ramp up.

In an April 2012 email, Rigbey likened potential fracking in the Peace to "carpet bombing", and added that much of the anticipated fracking in future years would occur across the "well-established" regional stress regime.

Even if no such plant materializes in B.C. – an increasing likelihood given the recent announcement that another LNG proponent, Shell, appears ready to scrap its bid to build one – an upswing in natural gas prices would almost certainly result in increased gas drilling and fracking operations, including on lands alongside the reservoir that would be created by the Site C dam, which would flood more than 100 kilometres of the Peace River and its tributaries.

Documents filed by BC Hydro with a panel that reviewed the project for the provincial and federal governments noted that, even in the absence of fracking, nearly 4,000 landslides are expected to dump debris into the reservoir as a result of the Site C dam being built. The 676-page report that discusses those landslide risks makes no mention of additional risks to the reservoir should earthquakes be triggered nearby.

Martyn Brown, a former chief of staff to Premier Clark's predecessor, Gordon Campbell, says the province's conflicting agendas underscore a troubling aspect of the government's regulation of oil and gas industry operations near critical infrastructure. From the outset, Brown says, the OGC has both promoted and regulated oil and gas industry activities. Limiting where companies drill and frack is simply not part of the OGC's mandate or culture.

Brown likens the OGC to the National Energy Board. "It has a dual role as a proponent of oil and gas development, but also its regulator. And I think there is a fundamental conflict with that," Brown says. He adds that "political oversight" of the OGC is also problematic because two Cabinet ministers – Energy and Mines Minister, Bill Bennett, and Minister of Natural Gas Development, Rich Coleman – are effectively there to "promote oil and gas activity".

Concerns for public health and safety should mean that when tensions between the province's publicly owned hydro utility and the natural gas industry arise it falls to a neutral ministry to determine what activities will be allowed or disallowed near critically important public infrastructure like dams and reservoirs, Brown said.

"Clearly what you need now is an independent voice in cabinet, the Environment Minister, to make broad determinations in an independent way," Brown said. "The promoter should not be the regulator of oil and gas activities."

Documents released in response to the FOI request show that in both Alberta and British Columbia hydro providers have become increasingly alarmed at natural gas company incursions onto lands near their dams. The concerns have escalated as distinct clusters of earthquakes in confined areas over short periods of time have occurred in lockstep with fracking operations.

In one email, Rigbey notes that there are "no regulations to stop" oil and gas companies "from injecting into a pre-existing fault" in the rock. In other words, there is a risk that induced fractures could be forced into geologically unstable areas triggering or setting the stage for earthquakes. While gas companies might not want to tap into such faults, Rigbey noted, "accidents can happen."

In its public pronouncements, however, BC Hydro has been more muted in its concerns. In a 551-page report filed with the joint federal-provincial panel that reviewed the Site C project for example, BC Hydro devoted less than two pages to discussing "petroleum industry-related" earthquakes and it downplayed their threats.

"The Oil and Gas Commission is now establishing procedures and requirements for monitoring and reporting of induced seismicity," BC Hydro reported to the panel in January 2013. "Each case of induced seismicity will be evaluated on the basis of its unique site-specific characteristics, but it is proposed that hydraulic fracturing would be suspended upon detection of an earthquake of magnitude M4 or larger. It should be noted that

earthquakes less than about magnitude M5 do not release enough energy to cause damage to engineered structures."

In response to written questions, the Oil and Gas Commission said that as a result of discussions with BC Hydro the province "has established a five kilometre buffer area around the WAC Bennett, Peace Canyon and Site C dams."

Graham Currie, the OGC's executive director of corporate affairs, added that the Site C dam location is squarely within the Montney Basin, which contains large quantities of shale gas. Gas from dense shale rock formations can only be coaxed from the earth by extensive use of fracking.

Gail Atkinson, an expert on induced earthquakes and a professor in earth sciences at the University of Western Ontario (UWO), says induced earthquakes can be hazardous because they occur much closer to the earth's surface than do natural earthquakes. If such events happen near dams or other surface structures, the ensuing shaking can be much worse than would be the case with a naturally occurring earthquake of the same magnitude.

The higher the number of fracking-induced earthquakes near dams, the greater the risk that one of them might be sufficiently strong enough to exceed what the dams are engineered to withstand.

"If the frequency of experiencing earthquakes near a dam increases, then the level of expected ground motions at the 1% in 100 year likelihood level will increase," Atkinson said. She warns that the risk will be greatest "in areas where the hazard was initially low because there is little natural seismicity."

Atkinson added that even earthquakes of a "moderate" strength could damage dams or other structures if they are induced "at close distances" to such structures.

Such risks are not something that BC Hydro talks about publicly, however. In an on-line video on dam safety, for example, Rigbey talks about the threats to dams from naturally occurring earthquakes but never once even mentions fracking or the increasing number of tremors associated with it.

Atkinson's work has clearly influenced TransAlta's thinking. The company is one of three organizations that funds Atkinson's fully endowed research chair on hazards associated with induced earthquakes at UWO. The other two are the National Sciences and Engineering Research Council and Nanometrics, a maker of seismic monitoring equipment. TransAlta also pays for some of its engineers and dam safety officials to be part of an ongoing multi-disciplinary research effort known as the Canadian Induced Seismicity Collaboration or CISC.

The CISC's website notes that fracking-induced earthquakes are a "pressing problem" in Western Canada and in British Columbia and Alberta particularly. "There is a significant (though very small) possibility that triggered events could be large enough to cause significant damage," the CISC's scientists say.

According to Hatcher, TransAlta has secured agreement from natural gas companies operating in Alberta that they will adhere to a special "traffic light" system in a zone between five kilometres and 10 kilometres from its Brazeau dam and the shorelines of the

dam's 13-kilometre-long reservoir. "The traffic light system works in a similar manner to other traffic light systems for hydraulic fracturing, with a Green (proceed)/Yellow (pause and monitor) and Red (stop) protocol," Hatcher said in written response to questions.

"TransAlta is concerned about the potential impact of fracking induced earthquakes and continues to work with the Alberta Energy Regulator (AER), Alberta Environment and the oil and gas operators to ensure that hydrocarbon development occurs in a safe manner that doesn't create unnecessary risk to existing infrastructure," Hatcher added.

In the much more sensitive zone immediately beside the dam and reservoir and extending out five kilometres, TransAlta has effectively shut down all fracking operators after filing a number of "statements of concern" with the AER, Alberta's equivalent of the OGC.

Hatcher said that TransAlta could not release the documents and referred questions to the AER. The Canadian Centre for Policy Alternatives has filed a second Freedom of Information request to obtain copies.

Documents released by BC Hydro in response to the first FOI show that BC Hydro was prompted to call for frack-free buffer zones around its dams after learning what TransAlta had achieved in Alberta. BC Hydro's Peace River dams are not only the biggest power sources in the province's hydroelectric network (the Bennett dam furnishes one-quarter of the province's hydroelectric power), but also in the region of the province with the richest natural gas reserves.

Only one other highly sensitive, yet little known, infrastructure project in B.C. is currently the subject of special operating guidelines as far as fracking is concerned.

BC Hydro learned of those guidelines in email correspondence with the OGC.

The infrastructure in question is a massive underground storage reservoir capable of holding 77 billion cubic feet of natural gas. It is near an area called Pink Mountain, where Progress Energy, a subsidiary of Petronas, is actively engaged in building roads, well pads, freshwater and wastewater holdings ponds, compressor stations, pipeline corridors and other infrastructure integral to the gas-drilling and fracking process.

The company also has plans on the books, which the provincial government has exempted from BC Utilities Commission review, to have a privately owned and operated hydro transmission built to the Pink Mountain area from the Peace River's hydroelectric facilities. The new line would allow Progress to burn less natural gas in compressors by switching to hydroelectricity, thus increasing the profitability of its fracked gas.

The underground gas storage facility consists of two underground storage reservoirs and is about 1,400 metres below the ground. Since the late 1980s, natural gas has typically been pumped into the reservoirs in the summer months when gas demand is low and then pumped out as needed in the fall and winter months.

Fortis Inc. announced that it was purchasing the facility from Chevron in 2015 at a cost of approximately US$266 million.

At the time of its purchase, Fortis noted that the facility could become critical in the event LNG went ahead in the province. "The facility – which is the only underground gas storage

facility in BC offering storage to third parties – is also uniquely positioned to benefit from the completion of proposed LNG export projects, where it could provide balancing services to suppliers and LNG exporters."

In an email response to questions, David Bennett, Fortis BC's director of communications and external relations, said that "successful meetings" were held between the company, the OGC and the provincial Ministry of Natural Gas Development. Those talks resulted in new rules that "ensure current and future drillers and well operators are aware of the facility and operate in such a manner to maintain the integrity of the underground storage reservoirs and ensure that new well production is not taken from the ACGS [Aitken Creek Gas Storage] reservoirs."

In a follow-up phone conversation, Bennett said that Fortis had no fears that fracking into the reservoir could result in a cataclysmic event such as an explosion. The main concern, he said, is to avoid someone taking gas out of the reservoirs by fracking into them. "We don't want anyone interfering with the reservoir," he said, adding Fortis wants Progress Energy and any other companies engaged in fracking "to stay away from the reservoir."

Documents released through the FOI show that the OGC has "conditions for permits" in place in proximity to the gas reservoirs. The conditions do not include an outright ban on fracking or gas drilling in a buffer area around the reservoirs. On maps supplied by the OGC, the buffer area is irregularly shaped but in most cases extends less than five kilometres out from the reservoirs.

In email correspondence, the OGC said that any company holding a permit to drill and frack for gas near the reservoirs "must not conduct any drilling completions or well operations" that have "a material adverse impact on the integrity or safe operation" of the facilities.

How this is monitored and enforced is not clear.

Natural gas companies operating in the zone are also required to notify Fortis when a well is about to be drilled and fracked. They must also notify the company when they resume drilling following "a temporary suspension" of such operations.

The special permit conditions, which BC Hydro has a copy of, do not specify what would lead to a "temporary suspension". But earthquakes induced by fracking are among those events that have triggered stoppages in previous fracking operations.

Like the arrangements that have been worked out with BC Hydro, the special operating conditions at Aitken Creek are not common knowledge. Neither the OGC, nor the Ministry of Energy and Mines, nor the Ministry of Natural Gas Development has issued a press release stating that the special permit conditions, such as they are, are in place in the Aitken Creek area.

Much like the silence surrounding buffer zones around B.C.'s biggest hydroelectric dams, the government seems to be of the view that the less said, the better.

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