Re: OPG application for 13 year license renewal for Darlington NGS

By Louisette Lanteigne

Issue #1: Zebra Mussels

Zebra Mussel & Associated Costs

- **Ontario Power Generation estimates that as a direct consequence of zebra mussels, its operating costs increased by between $500,000 and $1 million per year at its Darlington and Pickering nuclear stations,** and for fossil fuel stations, about $150,000 per year at Nanticoke, $75,000 per year at Lambton, and $50,000 per year at Lakeview. **It has spent over $20 million installing and maintaining chlorine applicators at its Great Lakes facilities** and a few inland facilities to deter zebra mussels, and **it has spent $13 million on research to reduce or eliminate chlorine.** Ongoing operating costs attributable to zebra mussels are not available for the hydraulic stations on the Great Lakes.

Source: Office of the Auditor General of Canada's

2002 October Report of the Commissioner of the Environment and Sustainable Development

http://www.oag-bvg.gc.ca/internet/English/att_c20021004se01_e_12345.html

De-fouling of water intakes and other equipment infested with zebra mussels, such as these debris racks, cost millions of dollars each year.

Photo: Paul M. Wiancko, Ontario Power Generation

Methods being used to curb Zebra Mussels

The CNSC asked the OPG how they are addressing issues of Zebra Mussels. An OPG representative responded that OPG was using chlorination (sodium hypochlorite) in order to manage the zebra mussel issue and maintain/ the flow of water in its cooling system.

Source: **CNSC Record of Proceedings, Including Reasons for Decision December 3-6, 2012**

Re: Environmental Assessment Screening Regarding the Proposal to Refurbish and Continue to Operate the Darlington Nuclear Generating Station in the Municipality of Clarington, Ontario

http://nuclearsafety.gc.ca/eng/the-commission/pdf/2012-12-03-Decision-DarlingtonEA-e-Edocs4105509-final.pdf

Problems with using sodium hypochlorite

- In Ontario, Zebra Mussels spread into the Great Lakes about 1988.
- At that time, systems had to be designed quickly to deal with the risk, so there was little time to fine tune the systems to operate well with our four different generating stations that had different physical characteristics.
- It did not take long before **PVC piping became brittle, pumps broke down and the automatic system became dysfunctional**
- Many other technologies have been evaluated by OPG over the years, but sodium hypochlorite is still the favoured and most effective approach in our operating environment
- Over time, because **the systems broke down a lot**, there was not much "continuous" treatment taking place. The system often ran for a few days, then broke down, requiring repairs. The "temporary" system was becoming **a very labour intensive system to operate, and ultimately a system that resulted in ineffective treatment.**

Source: Re-design of the Sodium Hypochlorite Treatment Approach for Zebra Mussels at Niagara Plant Group Generating Stations Tony Van Oostrom, BES, Ontario Power Generation Kelly Peterson ASI Group Ltd., St. Catharines, Ontario

Questions regarding Zebra Mussels

- How effective is the current zebra mussel management program at Darlington?
- Has any progress been made to achieve a chloride free alternative to zebra mussel management? If so, how much do the alternatives cost to use per year?
- Are the costs of zebra mussel management included with the permit application?
- Do the costs of zebra mussel management for this application include the cost of chemicals, replacement of infrastructure and projected lost revenues for down time needed to address issues at the plant?

Issue #2: Cladophora In Ajax And Surrounding Areas

Cladophora's Dramatic increase: from 1981 to 2013

This substrate is also representative of the substrate conditions that existed between the Pickering NGS and the Darlington NGS during the 1980's (pers. comm. Dr Schiefer) and as described from studies summarized by Golder (2007) and Golder and SENES (2009**) including Beak (1990)** and Lush (1981). **The habitat is not impaired** as the substrate is clearly discernible and the spaces between the rocks, where Round Whitefish eggs overwinter, are evident (i.e., they have not been covered or filled in).

In comparison, the substrate observed in the vicinity of the Ajax waterfront and the existing Duffin Creek WPCP Outfall in **the summer of 2013** (Figure 3.4, Figure 3.5, and Figure 3.6) **is almost entirely obscured by excessive Cladophora growth**. Little to no visible sand, gravel, rubble, cobble, boulder or bedrock in the vicinity of the existing outfall pipe and beyond (including the nearshore off the Pickering NGS and to the east of the Darlington NGS) was observed. Instead, Cladophora algal mats covered essentially all hard substrates west and east of the existing outfall (Figure 3.4, Figure 3.5, Figure 3.6 and Figure 3.7). Ponar grabs confirmed the substrate in this area to be sand with hard rocky material (gravel and cobble) covered with mussels and Cladophora mats (Figure 3.8).

Source: EcoMetrix: Literature Review and Field Investigations of Round Whitefish Habitat Along the North Shore of Lake Ontario

http://www.ajax.ca/en/doingbusinessinajax/resources/LiteratureReview.pdf

Cladophora & Darlington Nuclear Power

In 2003, algae accumulated at the intakes of the Pickering Nuclear Generating Station in Ontario, Canada, causing operators to preventively shut down its Unit 7 for two days. A more problematic event occurred in 2005, when three of the four operating units at Pickering shut down because of a large algae incursion. That same year, Ontario's Darlington generating station reduced its electrical output as a result of algae and silt blockage in its water intake system; to protect equipment, personnel shut down Unit 1.

Ontario Power tried to correct the problem by installing a diversion net by the water intake and improving its operating procedures, but with mixed success**.** **Ontario Power estimated that *Cladophora* fouling of cooling water intakes at its Pickering and Darlington nuclear power plants on Lake Ontario cost the company more than $30 million in lost power generation over a 10-year period.**

Source: Bulletin of the Atomic Scientist

http://thebulletin.org/spineless-attacks-nuclear-power-plants-could-increase8001

Figure 3.4, Figure 3.5, Figure 3.6 and Figure 3.7 including the nearshore off the Pickering NGS and to the east of the Darlington NGS as noted in the EcoMetrix report.

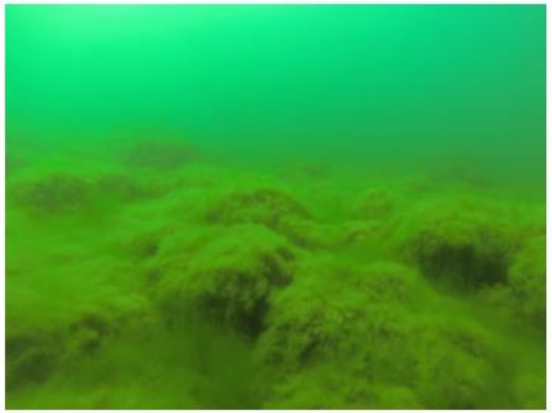


Figure 3.4: Substrate along the Ajax Waterfront at 5 m Depth, August, 2013

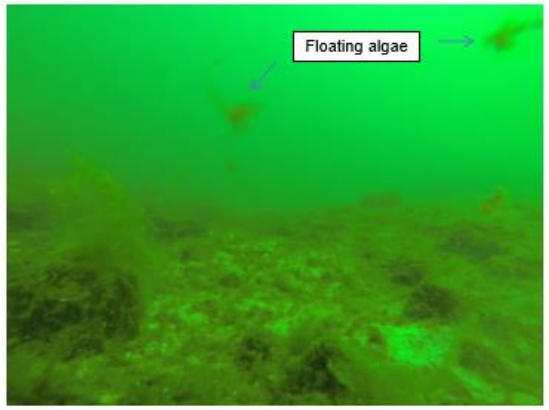


Figure 3.5: Substrate near the Duffin Creek WPCP Outfall at 10 m Depth, August, 2013

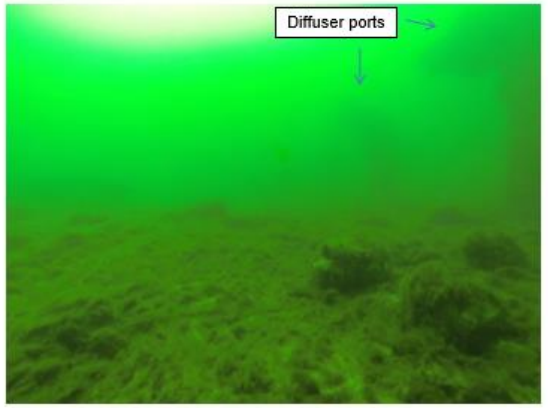


Figure 3.6: Substrate near the Duffin Creek WPCP Outfall at 10 m Depth, August, 2013

Figure 3.7: Diffuser Ports of the Duffin Creek WPCP Outfall at 10 m Depth, August, 2013

Questions regarding Cladophora Issues

- Is it possible that the use of sodium hypochlorite to control zebra mussels resulted in the increased growth of Cladophora?
- Is OPG still at risk of loosing more than $30 million in lost power generation at Pickering and Darlington over a 10-year period as a result of Cladophora?
- How are issues of Cladophora being addressed currently?
- What measures are there in place to avoid the costs re: Cladophora?
- Are these risks along with projected downtime for repairs/maintenance included in the cost analysis associated with the current permit application?

Issue #3: Concerns for oil spills

Case Scenerio: The Athos 1

Forty miles north of the Salem Nuclear Generating Station in New Jersey, an oil tanker called the Athos 1 struck an object beneath the Delaware River. As it was preparing to dock at the CITGO refinery near Philadelphia on November 26, the ship began tilting to one side, the engine shut down, and oil started gushing out.

Instead of rising to the river surface, it sank to the bottom or drifted in the water column. Even some of the oil that floated became mixed with sediment along the shoreline, later sinking below the surface. For the oil suspended in the water, the turbulence of the Delaware River kept it moving with the currents increasingly toward the Salem nuclear plant, perched on the river's edge.

The trouble with oil that does not float is that it is harder to see, especially in the murky waters of the Delaware River.

A thin layer of floating oil was nearing the plant by December 1, 2004, with predictions that the heavier, submerged oil would not be far behind.

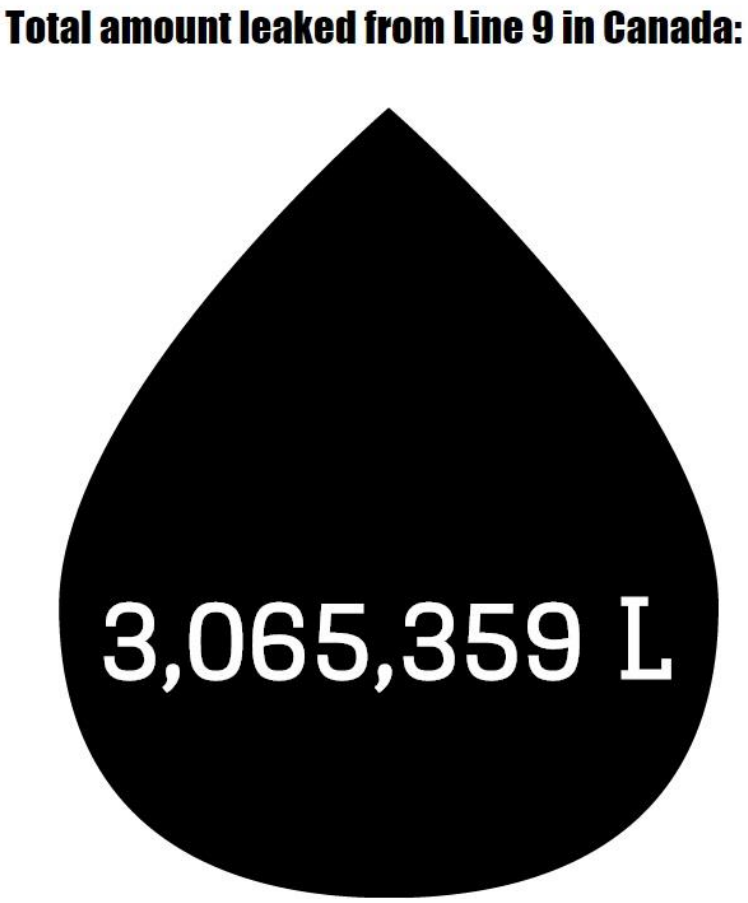
By December 3, **small sticky bits of oil began showing up in the screens on the plant's cooling water intakes**. To keep them from becoming clogged, the plant decided to shut down its two nuclear reactors the next day.

The Salem Nuclear Generating Station in New Jersey was shut down for 11 days to prevent the heavy, submerged oil from the Athos spill from clogging the water intakes. Closing this major electric generating facility cost $33.1 million.

Source: NOAA: When the Dynamics of an Oil Spill Shut Down a Nuclear Power Plant
http://response.restoration.noaa.gov/about/media/when-dynamics-oil-spill-shut-down-nuclear-power-plant.html

Line 9 has been approved by the NEB

- CTV W5 has uncovered that Enbridge's Line 9 pipeline has almost had a spill a year over the course of its history, some small but some as large as thousands of litres. There are a number of incidents that were not reported to municipalities or the NEB.
- Total spilled is equal to 19,280.53 US Barrels of Oil



Tar Sands Diluted Bitumen Sinks

The NEB Line 9 decision includes approval for the transport of heavy crude oil. Enbridge will be permitted to operate all of Line 9 in an eastward direction in order to transport crude oil from western Canada and the U.S. Bakken region to refineries.

Source: NEB https://www.neb-one.gc.ca/pplctnflng/mjrpp/ln9brvrsl/ln9brvrslrfdfq-eng.pdf

TransCanada acknowledged that heavy oil sands crude could sink in water, in comments released to the U.S. State Department on its controversial Keystone XL pipeline.

Source: Vancouver Observer http://www.vancouverobserver.com/environment/transcanada-admits-bitumen-sinks-contradicting-enbridges-claims

Expert Affidavit Evidence re: Line 9 Risks

The international pipeline safety expert Richard Kuprewicz , a pipeline safety expert with over forty years of experience in the energy sector, described Enbridge's Line 9 pipeline as "high risk of rupture" now says **the probability of Line 9 rupturing is "over 90%."**

"I do not make the statement 'high risk for a rupture' lightly or often. There are serious problems with Line 9 that need to be addressed."

Source: Richard Kuprewicz video interview with Desmog Canada

http://desmog.ca/2013/10/21/pipeline-expert-90-percent-probability-line-9-rupture-dilbit

Questions regarding Line 9 Risks to Darlington

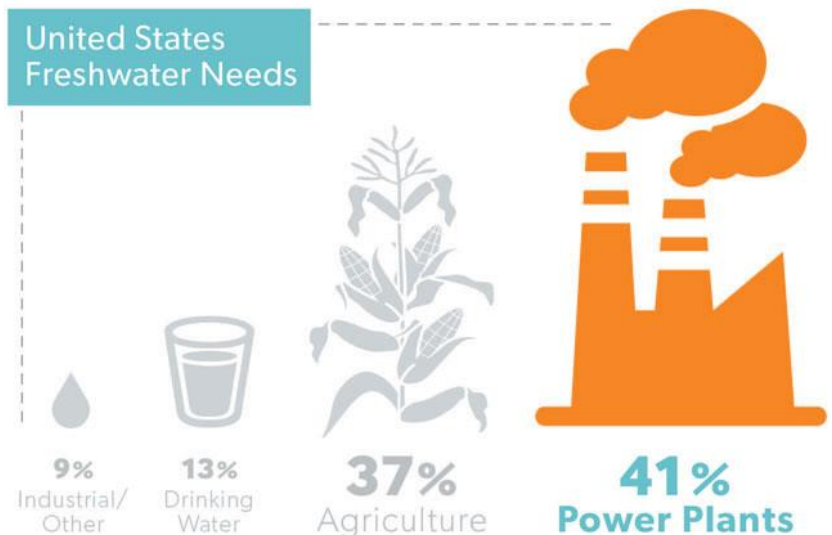
- If a major pipeline spill from Line 9 occurs and discharges in a sewer or tributary, what is the projected time it would take for the spill to reach the intake zone at Darlington?
- What is the projected response time for Enbridge staff to arrive?
- Has there been any dialogue between Enbridge and OPG regarding emergency measures needed to address a spill from Line 9 in proximity to Darlington?
- Are the booms big enough and would they be effective should the heavier crude/diluted bitumen sinks below the surface?
- What if a pipeline rupture takes place in the winter with ice obstructing clean up?
- Who pays for the lost revenues and associated clean up costs if a spill happens?

Here is one way to avoid all these problems

THE ENERGY WATER COLLISION

PROBLEM

Today's power plants depend on **massive** amounts of water for cooling.



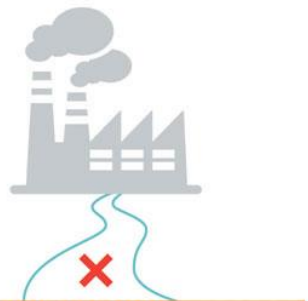
More water is withdrawn for cooling power plants than for any other use.

Source: UCS Report, *Power and Water at Risk*
For more information, visit www.ucsusa.org/power-water-risk.

THE ENERGY WATER COLLISION

COLLISION

Hot, dry summers put electricity and water supplies at risk, with serious consequences for people and wildlife.



NOT ENOUGH WATER

Without enough water for cooling, power plants must cut back production or even shut down.

INCOMING WATER TOO WARM

Hot weather can make water supplies too warm for cooling, forcing power plants to reduce their electricity production when it's needed most.

OUTGOING WATER TOO WARM

Wildlife can be harmed or killed when power plants discharge hot water back into rivers and other water bodies.

Source: UCS Report, *Power and Water at Risk*
For more information, visit www.ucsusa.org/power-water-risk.

THE ENERGY WATER COLLISION

CASES

Energy-water collisions are happening **now,** and will get worse as temperatures increase and droughts become more frequent.

INCOMING WATER TOO WARM

- → Prairie Island nuclear plant, MN
- → LaSalle County nuclear plant, IL
- → Hope Creek nuclear plant, NJ
- → Limerick nuclear plant, PA
- → Dresden nuclear plant, IL
- → Hatch nuclear plant, GA
- → Millstone nuclear plant, CT
- → Powerton coal plant, IL

OUTGOING WATER TOO WARM

- → Quad Cities nuclear plant, IL
- → Monticello nuclear plant, MN
- → Harllee Branch coal plant, GA
- → GG Allen coal plant, NC
- → Riverbend coal plant, NC
- → Browns Ferry nuclear plant, AL
- → LaSalle County nuclear plant, IL
- → Braidwood nuclear plant, IL
- → ED Edwards coal plant, IL
- → Joliet coal plant, IL
- → Will County coal plant, IL
- → Dresden nuclear plant, IL

NOT ENOUGH WATER

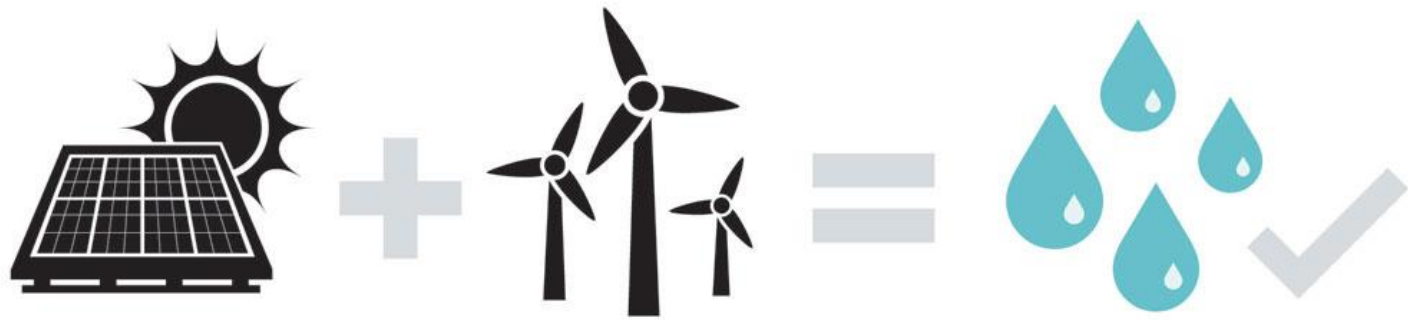
- → Hammond coal plant, GA
- → Laramie River coal plant, WY
- → Yates coal plant, GA
- → Hoover Dam hydroelectric, NV
- → Martin Lake coal plant, TX
- → Vermont Yankee nuclear plant, VT
- → Duane Arnold nuclear plant, IA

Source: UCS Report, *Power and Water at Risk*
For more information, visit www.ucsusa.org/power-water-risk.

THE ENERGY WATER COLLISION

SOLUTION

Smart energy decisions can reduce the risk of energy-water collisions.



No-Water Energy Sources **Big Water Savings**

We can minimize the risk of water-related power disruptions by embracing **no-water** options like wind farms, solar photovoltaics, and energy efficiency, or **lower-water** technologies like air cooling for power plants.

Source: UCS Report, *Power and Water at Risk*
For more information, visit www.ucsusa.org/power-water-risk.