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## **NUCLEAR TRANSPORTATION ACCIDENTS IN CANADA:**

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### **NUCLEAR TRANSPORT ACCIDENTS AND INCIDENTS**

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#### **BURNING TRUCK, BURNING SHIP CARRYING URANIUM HEXAFLUORIDE**

Recent reports have detailed an August 22 event in Ohio, USA, involving a burning truck carrying uranium hexafluoride. Nuclear regulators in Canada – where the cargo originated – and in the US were not informed of the incident. Indeed there was no requirement for them to be notified.[1]

The fire was caused by brake overheating. Driver Brian Hanson doused the fire with water and thought he had extinguished it, and climbed back into the cab to call for a service truck. Then he realized the fire wasn't out and disconnected the trailer.

Hanson said: "I wound the legs down and disconnected it from the truck, losing the hair on my arms because it was really burning at that time – which I figure was kind of crazy in hindsight. But we're so programmed and told about the danger of a load, and the media danger. We're basically taught that the media's like terrorism. We're supposed to do everything we can to avoid media. I wanted to get the fire away from the uranium hexafluoride because it's heat activated ... It's really nasty stuff, and they would have had to evacuate a huge neighbourhood we were beside."

Hanson added: "So I got the truck disconnected, it was burning like crazy, fire blazing out the back, trying to get to a safe place to get off the highway and away from the load. I made it two miles before the truck was disabled, but I got off on the exit ramp and by that time the police were just seconds behind me, and the fire trucks were on the way."

#### **A NEW RIG WAS DISPATCHED TO PICK UP THE URANIUM LOAD.**

The shipment came from a Cameco refinery in Port Hope, Ontario, Canada. Cameco said: "Uranium hexafluoride is transported in special containers that are designed and tested to withstand a significant impact and at least 30 minutes engulfed in flames at a temperature of 800 degrees Celsius." The material is transported in a cylinder about 1.2 metres in diameter and 6 metres long, containing 12,000 kilograms.

According to Argonne National Laboratory (ANL) – a U.S. Department of Energy research lab – if uranium hexafluoride interacts with water or water vapour, it is "chemically toxic," forming dangerous hydrogen fluoride gas. "Uranium is a heavy metal that, in addition to being radioactive, can have toxic chemical effects (primarily on the kidneys) if it enters the bloodstream by means of ingestion or inhalation," ANL says, and hydrogen fluoride "is an extremely corrosive gas that can damage the lungs and cause death if inhaled at high enough concentrations."

#### **ATLANTIC CARTIER SHIP FIRE**

In May, fire damaged the Atlantic Cartier ship carrying nine tons of uranium hexafluoride while it was in the Port of Hamburg. The uranium was destined for the Areva-owned

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uranium enrichment plant at Lingen, Lower Saxony.[2] Authorities said containers with dangerous substances were promptly removed from the ship.[3]

From 2008–2013, inspections recorded 20 deficiencies involving the Atlantic Cartier relating to: international safety management; documentation of compliance with dangerous goods legislation; safety of access to working areas; Marpol (UN marine pollution convention) Annex 1 fire prevention issues; speed and distance indicators; safety of navigation (voyage plan); loadlines; propulsion auxiliary engine concerns; accident prevention (on-board personnel); ships certification and documentation; operational procedures (engines and equipment); and distress signalling.[4]

### **CANADA – TRUCKS WITH RADIOACTIVE CARGO FAIL INSPECTIONS**

Since 2010, more than one truck in seven carrying radioactive material has been pulled off the road by Ontario ministry of transportation inspectors for failing safety or other requirements.[5] The information is contained in a notice [6] filed with a panel studying a proposal to establish a radioactive waste repository near Kincardine.

The notice states that since 2010, inspectors examined 102 trucks carrying "Class 7 Dangerous Goods (Radioactive material.)" Of those, 16 were placed "out-of-service," which means the vehicle "must be repaired or the violation corrected before it is allowed to proceed." Violations included faulty brake lights; "load security" problems; flat tires; false log; damaged air lines; and a driver with no dangerous goods training.

In other cases, trucks were allowed to proceed but were slapped with enforcement actions for problems with hours of service; annual inspection requirement; missing placards; exceed gross weight limit; speed limiter; overlength combination; overheight vehicle; and vehicle registration / insurance.

In total, 25 of the 102 inspections – nearly one in four – resulted in the vehicle being placed out-of-service and / or enforcement action taken against the operator of the vehicle.

### **REFERENCES:**

[1] John Spears, 31 Oct 2013, 'Burning truck hauling nuclear load flies under radar', [www.thestar.com/business/2013/10/31/burning\\_truck\\_hauling\\_nuclear\\_load\\_f...](http://www.thestar.com/business/2013/10/31/burning_truck_hauling_nuclear_load_f...)

[2] Martyn Lowe, 25 Aug 2013, 'Next Destination – Antwerp', [www.theproject.me.uk/?p=492](http://www.theproject.me.uk/?p=492)

[3] May 2013, <http://rt.com/news/hamburg-radioactive-ship-fire-464/>

[4] UK Nuclear Free Local Authorities, 28 Aug 2013, 'NFLA alarmed about docking of Atlantic Cartier in Liverpool', [www.nuclearpolicy.info/docs/news/NFLA\\_Atlantic\\_Cartier\\_concerns.pdf](http://www.nuclearpolicy.info/docs/news/NFLA_Atlantic_Cartier_concerns.pdf)

[5] John Spears, 15 Nov 2013, 'Trucks with radioactive cargo fail inspections', [www.thestar.com/business/2013/11/15/trucks\\_with\\_radioactive\\_cargo\\_fail\\_i...](http://www.thestar.com/business/2013/11/15/trucks_with_radioactive_cargo_fail_i...)

[6] Ministry of Transportation – Undertaking #61:

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The nuclear power industry has improved the safety and performance of reactors, and has proposed new safer (but generally untested) reactor designs but there is no guarantee that the reactors will be designed, built and operated correctly. Mistakes do occur and the designers of reactors at [Fukushima](#) in Japan did not anticipate that a tsunami generated by a such unexpected large earthquake would disable the backup systems that were supposed to stabilize the reactor after the earthquake. According to [UBS AG](#), the [Fukushima I nuclear accidents](#) have cast doubt on whether even an advanced economy like Japan can master nuclear safety. Catastrophic scenarios involving terrorist attacks are also conceivable. An interdisciplinary team from [MIT](#) has estimated that given the expected growth of nuclear power from 2005–2055, at least four serious nuclear accidents would be expected in that period.

### **OVERVIEW:**

Globally, there have been at least 99 (civilian and military) recorded nuclear power plant accidents from 1952 to 2009 (defined as incidents that either resulted in the loss of human life or more than US\$50,000 of property damage, the amount the US federal government uses to define nuclear energy accidents that must be reported), totaling US\$20.5 billion in property damages. Property damage costs include destruction of property, emergency response, [environmental remediation](#), evacuation, lost product, fines, and court claims. Because nuclear power plants are large and complex, accidents on site tend to be relatively expensive.

The 1979 [Three Mile Island accident](#) in [Pennsylvania](#) was caused by a series of failures in secondary systems at the reactor, which allowed radioactive steam to escape and resulted in the partial core meltdown of one of two reactors at the site, making it the most significant accident in U.S. history.

The world's worst nuclear accident has been the 1986 [Chernobyl disaster](#) in the [Soviet Union](#), one of two accidents that has been rated as a level 7 (the highest) event on the [International Nuclear Event Scale](#). Note that the [Chernobyl disaster](#) may have scored an 8 or 9, if the scale continued. The accident occurred at the [Chernobyl Nuclear Power Plant](#) after an unsafe systems test led to a series of steam explosions that destroyed reactor number four. The plume spread in the near distance primarily over [Belarus](#) and after that covered extensive portions of Europe with traces of radioactivity, leaving reindeer in [Northern Europe](#) and sheep in portions of [England](#) unfit for human consumption. A 30 kilometres (19 mi) "[Zone of alienation](#)" has been formed around the reactor.

At least 57 accidents and severe incidents have occurred since the Chernobyl disaster, and over 56 severe incidents have occurred in the USA. Relatively few accidents have involved fatalities.

Note that not all ratings are final as Cancer and Uncounted/Hidden results may have/will occur.

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Nuclear power accidents in Canada					
Date	Location	Description	Fatalities	Cost (in millions 2006 US\$)	<u>INES</u> rating
August 1, 1983	<a href="#">Pickering nuclear Reactor 2</a> , <a href="#">Pickering, Ontario, Canada</a>	LOCA loss of coolant accident. Pressure tube, that holds the fuel bundles, ruptured due to hydriding. All four reactors re-tubed with new materials (Zr-2.5%Nb) over ten years.	0	1 billion Canadian dollars (1983-1993). [ <a href="#">25</a> ]	
August 2, 1992	<a href="#">Pickering nuclear Reactor 1</a> , <a href="#">Pickering, Ontario, Canada</a>	A Heavy water leak of 2300 trillion becquerels of radioactive tritium into Lake Ontario, resulting in increased levels of <b>tritium</b> in Toronto drinking water .	0	Unknown.	
December 10, 1994	<a href="#">Pickering nuclear Reactor 2</a> , <a href="#">Pickering, Ontario, Canada</a>	LOCA loss of coolant accident. A spill of 185 tonnes of heavy water. The Emergency Core Cooling System was used to prevent a meltdown.	0	Unknown.	2
December 12, 1952	<a href="#">CRL</a> , Ontario, Canada	The <a href="#">NRX</a> accident. A hydrogen explosion occurred in the reactor core due to a cascade of malfunctions and operator errors. The world's first major nuclear reactor accident.	0	See <a href="#">NRX</a> accident	5
December 21, 2009	<a href="#">Darlington nuclear station</a> . <a href="#">Clarington, Ontario, Canada</a>	Around 200,000 litres of water with trace amounts of radioactive isotope tritium coming from a storage tank mistakenly were released by workers into Lake Ontario, representing 0.1% of the monthly allowed amounts of tritium for this power plant.	0	Unknown.	
June 11, 2002	<a href="#">Bruce nuclear Reactor 6</a> ,	Pressure tube and calandria tube damage	0	Unknown	0

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	Bruce station. <a href="#">Bruce County, Ontario, Canada</a>	during a channel maintenance procedure, required replacement of the two tubes.			
March 14, 2011	<a href="#">Pickering nuclear Plant A Pickering, Ontario, Canada</a>	A leak of 73 cubic metres (73,000 litres) of <a href="#">demineralized water</a> into Lake Ontario from a failed pump seal. There was negligible risk to the public according to the <a href="#">Canadian Nuclear Safety Commission</a> .	0	Unknown.	
March 1986	<a href="#">Bruce nuclear Reactor 2, Bruce County, Ontario, Canada</a>	LOCA Loss of coolant accident. Pressure tube rupture during pressurizing test (reactor shut down). Pressure tube holds the fuel bundles.	0	Unknown	
May 24, 1958	<a href="#">CRL, Ontario, Canada</a>	The <a href="#">NRU</a> accident. A fuel rod caught fire and broke when removed, then dispersed fission products and alpha-emitting particles in the reactor building.	0	See <a href="#">NRU</a> accident.	
November 1978	<a href="#">WR-1 Reactor at Pinawa, Manitoba, Canada</a>	LOCA loss of coolant accident. 2,739 litres of coolant oil leaked, most of it into the Winnipeg River. The repair took several weeks for workers to complete.	0	Unknown	

### TRUCKS WITH RADIOACTIVE CARGO FAIL INSPECTIONS



By John Spears Business reporter

Since 2010, more than one truck in seven carrying radioactive material has been pulled off the road by Ontario ministry of transportation inspectors for failing safety or other requirements.

The information is contained in a notice quietly filed with a panel studying a proposal to store low- and intermediate-level nuclear waste in deep underground near Kincardine.

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The information filed doesn't specify what sort of radioactive cargos the trucks were carrying. In theory, it could have been anything from uranium fuel for nuclear reactors, to radioactive isotopes for medical use.

A spokesman for Ontario Power Generation said that none of its nuclear shipments has failed a vehicle inspection.

"We have zero tolerance" for failed inspections, Neal Kelly said. "We've got no infractions. Period."

What the information does show is that since 2010, inspectors have examined 102 trucks carrying "Class 7 Dangerous Goods (Radioactive material.)"

Of those, 16 were placed "out-of-service," which means the vehicle "must be repaired or the violation corrected before it is allowed to proceed."

### **AMONG THE VIOLATIONS:**

Faulty brake lights; unspecified "load security" problems; flat tires; false log; damaged air lines; and driver with no dangerous goods training.

Critics of the Kincardine waste project have said not enough attention has been paid to the transportation of radioactive material.

A federal panel is considering a proposal by Ontario Power Generation to bury 200,000 cubic metres of low- and intermediate-level radioactive waste in chambers carved out of limestone 680 metres deep.

The billion-dollar depository would be constructed at the site of the Bruce nuclear plant on the shore of Lake Huron, north of Kincardine.

The site would not contain used fuel (although a separate process is considering sites for a used fuel disposal site in the area, as well as in other regions of Canada.)

The material destined for the site would range from mops and protective clothing – much of it incinerated – to components from reactor cores, which will remain dangerously radioactive for many thousands of years.

Some opponents of the site have closely questioned planners about transporting material to the site, which will contain waste from the Pickering and Darlington nuclear stations as well as the Bruce plant.

That material is already being trucked to the Bruce site, and stored in warehouses or shallow underground vaults.

Brennain Lloyd of Northwatch said in an interview that the number of trucks pulled over until defects are remedied is "shocking."

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“It only heightens the need for a real substantive discussion on transportation and what are the transportation safeguards,” she said.

The lack of detail in the statistics adds to the need for further information, she said.

“I think it raises more questions than it retires, for sure,” she said.

Toronto city council joined the ranks of municipalities calling for the project to be halted this week.

**In a motion adopted unanimously, councillors urged that “neither this proposed nuclear waste repository near Kincardine, Ontario, nor any other underground nuclear waste repository, be constructed in the Great Lakes Basin, in Canada, or in the United States.”**

Councillor Mike Layton, who made the motion, said it’s impossible to guarantee the depository won’t leak over the millennia.

“We have a massive endowment of fresh water,” he said in an interview. “We shouldn’t be putting it at risk.”