



**Joint Federal Review of  
Ontario Power Generation's Proposed Deep  
Geologic Repository for Low and Intermediate  
Level Radioactive Wastes**

**Resumed Hearing – September 2014**

**DGR Joint Review Panel Hearing Written Submission  
in Support of an Oral Intervention**

**WASTE ISOLATION PILOT PLANT (WIPP)  
and  
INITIAL QUESTIONS AND LESSONS FOR THE  
ONTARIO POWER GENERATION PROPOSED  
DEEP GEOLOGIC REPOSITORY**

**Don Hancock**



**July 2014**

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**RECENT EVENTS AT THE  
WASTE ISOLATION PILOT PLANT (WIPP)  
and  
INITIAL QUESTIONS AND LESSONS FOR THE  
ONTARIO POWER GENERATION PROPOSED  
DEEP GEOLOGIC REPOSITORY**

July 21, 2014

Don Hancock

Prepared for Northwatch

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## Introduction

The Joint Review Panel issued a Public Notice and Amended Public Hearing Procedures on June 3, 2014.<sup>1</sup> The sixth subject for the additional public hearing is:

Applicability of recent incidents at the Waste Isolation Pilot Plant (WIPP) to the safety case for the DGR project:

- Relevance of the incidents, as they are currently understood, to worker and public health and safety at the proposed DGR; and
- Whether incidents such as those that occurred at WIPP are encompassed by the accidents, malfunctions and malevolent acts assessed for the proposed DGR.

On May 9, 2014, Ontario Power Generation (OPG) submitted its responses to Information Request Package #13, including IR# EIS 13-515 related to the recent incidents at WIPP.<sup>2</sup> On that same day, the Canadian Nuclear Safety Commission (CNSC) staff submitted its response to IR# EIS 13-515.<sup>3</sup> On July 7, 2014, OPG submitted a summary of its Information Responses for the additional public hearing, including additional information about the WIPP incidents.<sup>4</sup> On that same day, the CNSC staff submitted its Panel Member Document PMD:14-P1.2, as supplemental Technical Information, including a review of OPG responses and providing additional information about the WIPP incidents.<sup>5</sup>

This report briefly reviews those four submittals from OPG and CNSC, provides additional information about the WIPP incidents, raises questions, and discusses initial lessons learned that could be relevant to the proposed Deep Geologic Repository (DGR) for radioactive wastes. This report is in addition to previous activities during this proceeding on behalf of Northwatch, which are a report regarding WIPP and International Experience<sup>6</sup> submitted on August 20, 2013, supplementary information provided on August 27,<sup>7</sup> and oral testimony that was given at the public hearing on September 23, 2013.<sup>8</sup>

<sup>1</sup> Document #1865, <http://www.ceaa.gc.ca/050/document-eng.cfm?document=99326>

<sup>2</sup> CEAA Registry Item #327, <http://www.ceaa.gc.ca/050/documents/p17520/99176E.pdf>

<sup>3</sup> Document #1847, <http://www.ceaa.gc.ca/050/documents/p17520/99178E.pdf>

<sup>4</sup> Document #1911, <http://www.ceaa.gc.ca/050/documents/p17520/99541E.pdf>

<sup>5</sup> Document #1915, <http://www.ceaa.gc.ca/050/documents/p17520/99546E.pdf>

<sup>6</sup> Document #1437, <http://www.ceaa.gc.ca/050/documents/p17520/93467E.PDF>

<sup>7</sup> Document #1526, <http://www.ceaa.gc.ca/050/documents/p17520/94179E.pdf>

<sup>8</sup> Document #1599, pp. 282-331, <http://www.ceaa.gc.ca/050/documents/p17520/94553E.pdf>

The February 2014 incidents at WIPP and subsequent information confirm the basic facts presented in the 2013 submissions:

“The basic fact is that there is not yet one example of a DGR that successfully operated to fulfill its mission of safely isolating the wastes from people and the environment for the thousands of years that they are hazardous. Nor is there an example of a DGR that has been closed and decommissioned. Thus, there is no example of a DGR that has safely contained radioactive wastes throughout even its operational phase, let alone for the thousands of years that those wastes pose significant risks to human health and the environment. International experience, including ‘best practices,’ demonstrate that there are many uncertainties; it does not establish that a DGR can be successfully operated and decommissioned.”<sup>9</sup>

1. OPG’s May 9 and July 7 submissions are incomplete.

OPG cites as its source the WIPP recovery website

(<http://www.wipp.energy.gov/wipprecovery/recovery.html>), including the fire and radiological release Accident Investigation Reports (AIR).<sup>10</sup> Unfortunately, the Department of Energy (DOE) has not made all relevant documents available on that website. As a result, the New Mexico Environment Department has established a special website, consisting of many DOE documents not available on the WIPP website:

<http://www.nmenv.state.nm.us/NMED/Issues/WIPP2014Docs.html>. Other organizations also provide relevant information, and OPG should have used additional sources, not just the DOE website.

Regarding the underground fire, in both of its submissions OPG states: “The potential impacts to worker and public safety were assessed to be below criteria.” Neither OPG submission includes the facts that all 86 workers underground at the time of the fire had to be evacuated, that 13 workers were treated for smoke inhalation (seven at the WIPP site and six at the Carlsbad Medical Center), and that one of the workers is still being treated, more than five months after the event occurred.<sup>11</sup> OPG does not discuss why it considers such effects, including health impacts and ongoing treatment for smoke inhalation, to be “below criteria.”

<sup>9</sup> Document #1437, p.2.

<sup>10</sup> February 5, 2014 Fire - <http://www.wipp.energy.gov/Special/AIB%20Report.pdf>; February 14, 2014 Radiological Release (Phase 1) - [http://www.wipp.energy.gov/Special/AIB\\_Final\\_WIPP\\_Rad\\_Release\\_Phase1\\_04\\_22\\_2014.pdf](http://www.wipp.energy.gov/Special/AIB_Final_WIPP_Rad_Release_Phase1_04_22_2014.pdf)

Regarding the radiological release, neither OPG submission discusses that 22 workers, including nine that were not on site until hours after the underground radiation release was detected, tested positively for internal radiation contamination from bioassay examination.<sup>12</sup> At least four of those workers were originally told that they had tested negative, then almost six weeks after the event were told that they had positive results.<sup>13</sup> OPG does not discuss what actions it would take to inform workers of radiation exposure and to assess possible health effects in the event of a radiological release being detected at the proposed OPG DGR.

## 2. CNSC Staff submissions have some inaccuracies and are incomplete.

The two CNSC staff submissions generally include more details than the OPG submissions, but also use only the same DOE WIPP website and the two AIRs as sources. Thus, the submissions exhibit the same insufficient use of other sources as the OPG submissions.

Regarding the underground fire, both submissions state that six workers “were treated for smoke inhalation during the event, but no injuries occurred.”<sup>14</sup> As described above, 13 workers were treated, and one is still being treated. CNSC Staff should clarify why it believes that situation indicated “no injuries.” CNSC Staff also stated that there “were no significant injuries to underground workers from smoke inhalation as a result of the fire event.”<sup>15</sup> CNSC Staff should clarify what criteria that it used to determine that the situation resulted in “no significant injuries,” as well as describing what constitutes “significant injury.”

Regarding the radiation release, both submissions correctly state that the event “resulted in the exposure of workers, the public and the environment to radiological contaminants released from packaged wastes located underground.” Both submissions state that a total of 21 workers were determined to have contamination at “very low levels.”<sup>16</sup> As noted above, the correct count is 22 workers with internal contamination.

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<sup>11</sup> Fire AIR, p. ES-1. That one worker is still being treated was reported by José Franco, WIPP Manager, on July 9, 2014 (personal communication).

<sup>12</sup> [http://www.wipp.energy.gov/Special/WIPP%20Update%205\\_15\\_14.pdf](http://www.wipp.energy.gov/Special/WIPP%20Update%205_15_14.pdf)

<sup>13</sup> [http://www.wipp.energy.gov/Special/WIPP%20Update%203\\_27\\_14.pdf](http://www.wipp.energy.gov/Special/WIPP%20Update%203_27_14.pdf)

<sup>14</sup> Document #1847, p. 5; Document #1915, p. 56.

<sup>15</sup> Document # 1915, p. 58.

### 3. Additional information about the fire incident.

During the fire, smoke and soot went through the underground and came to the surface through three shafts – the salt shaft, the waste shaft, and the exhaust shaft. As a result of the smoke and soot, the waste hoist has been inoperable since February 5 and has been undergoing extensive cleaning.<sup>17</sup> The WIPP environmental analysis never analyzed the impacts of such a fire for those out-of-service and cleaning activities. In response to the Fire AIR, there are many procedures that must be changed, which will take an undetermined number of months to complete.

For six days after the fire, underground air monitors were inoperable.<sup>18</sup> Thus, any release of radioactivity would not have been detected in the underground, the filtration system would not have been engaged, and the radioactivity would have been released directly into the environment.

### 4. Additional information about the radiological release.

#### A. The release was never supposed to happen.

An essential part of WIPP’s mission is to “start clean, stay clean,” including never having a radiation release. WIPP environmental impact statements and other documents did not include such a radiological release, nor what would be done to assess the causes of the incident, nor how recovery would be done, nor what criteria would be used to clean up the site, nor special protocols to treat workers, among other issues.

#### B. What caused the release is unknown.

Five months after the event occurred, the cause of the release is unknown. Pictures have shown one breached container – LA00000068660 – in Room 7 of Panel 7, where radioactivity is detected as high as 40,000 disintegrations per minute per 100 square centimeters.<sup>19</sup> Whether that container initiated the release, whether other containers have been breached, and what

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<sup>16</sup> Document #1847, p. 12; Document #1915, p. 57.

<sup>17</sup> [http://www.wipp.energy.gov/Special/WIPP%20Update%207\\_1\\_14.pdf](http://www.wipp.energy.gov/Special/WIPP%20Update%207_1_14.pdf)

<sup>18</sup> <http://www.dnfsb.gov/board-activities/letters/boards-initial-assessment-two-recent-events-does-waste-isolation-pilot-plan>

<sup>19</sup> [http://www.nmenv.state.nm.us/NMED/Issues/WIPP\\_docs/2014%20Admin%20Orders%20Bi-Weekly%20Report%20+%20letter\\_06\\_13\\_14\\_All%20Attachments%20Final.pdf](http://www.nmenv.state.nm.us/NMED/Issues/WIPP_docs/2014%20Admin%20Orders%20Bi-Weekly%20Report%20+%20letter_06_13_14_All%20Attachments%20Final.pdf), pp. 192-195.

precipitated the release are unknown. DOE, OPG, and CNSC acknowledge that the cause(s) of the radiation release are unknown. There is no public technical document describing the activities necessary to find the cause. No one has physically examined the breached drum, nor have any scientific analyses of the container been conducted. Whether the cause of the release will ever be known with certainty has not been determined.

#### C. Some WIPP control systems failed.

It is known that some radioactivity was released into the environment through the exhaust system without going through filtration, because two bypass dampers were not designed to fully close and did not fully close.<sup>20</sup> Three weeks after the release was detected, workers applied foam materials on the two dampers to fully seal them. Whether other control systems failed is yet to be determined.

#### D. Radiation protection and notification for workers failed.

Eleven WIPP workers were on the surface when the underground continuous air monitor detected radiation at 11:14 pm on Friday, February 14, 2014. Two additional workers came onsite soon thereafter. All of the workers were frisked with radiation detection equipment that indicated no contamination.<sup>21</sup> On the contrary, each one of the 13 workers received internal radiation contamination, but no one was apprised of those results until February 26.<sup>22</sup> Another 135 workers came to the site on the morning of Saturday, February 15. No personnel contamination was detected. However, by March 27, eight of those workers were reported to have internal radiation contamination. In May, an additional worker was notified of internal contamination.<sup>23</sup> Thus, the radiation detection equipment and radiation control personnel did not detect radiological contamination, even though it was present. Workers were told that they had no radiation exposure, and days or weeks later were told that they did have internal contamination. Adequate radiation protection and notification for workers was supposed to be in

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<sup>20</sup> [http://www.wipp.energy.gov/wipprecovery/accident\\_desc.html](http://www.wipp.energy.gov/wipprecovery/accident_desc.html)

<sup>21</sup> [http://www.nmenv.state.nm.us/NMED/Issues/WIPP\\_docs/NGO%20QUESTIONS%20FOR%20DOE%20%204-9-14.pdf](http://www.nmenv.state.nm.us/NMED/Issues/WIPP_docs/NGO%20QUESTIONS%20FOR%20DOE%20%204-9-14.pdf)

<sup>22</sup> [http://www.wipp.energy.gov/Special/CBFO\\_Mgr\\_Letter.pdf](http://www.wipp.energy.gov/Special/CBFO_Mgr_Letter.pdf)

<sup>23</sup> [http://www.wipp.energy.gov/Special/WIPP%20Update%205\\_15\\_14.pdf](http://www.wipp.energy.gov/Special/WIPP%20Update%205_15_14.pdf)

place before the radiation release, but those systems were demonstrated to be inadequate as a result of the incident.

E. Radiation protection and notification for the public failed.

The first public information advisory about the radiation release was at 2:49 pm on Saturday, February 15. The notice was of a “possible radiological event” and stated that “No personnel contamination has been identified.”<sup>24</sup>

The second public information advisory about the radiation release was at 9:17 pm on Saturday, February 15. The notice stated that there was a “radiological event,” but that “multiple perimeter monitors at the WIPP boundary have confirmed there is no danger to human health or the environment. No contamination has been found on any equipment, personnel, or facilities.”<sup>25</sup>

The third public information advisory about the radiation release was on Sunday, February 16 at 6:32 pm. The notice stated that “No surface contamination has been found on any equipment, personnel or facilities,” and that “DOE emphasizes there is no danger to human health or the environment.”<sup>26</sup>

Each of those public notices had significantly incorrect statements, advising the public that there was no personnel or other contamination and no danger to the public. In fact, there was worker contamination, on-site contamination, and contamination at the WIPP perimeter and beyond. Thus, the radiation protection and public notification systems failed to fully protect the public and provide accurate notification in a timely manner. The supposedly adequate radiation protection and public notification systems proved to be inadequate.

F. Most sensitive radiation detection equipment and most prompt public notification was not from DOE and the operating contractor.

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<sup>24</sup> [http://www.wipp.energy.gov/pr/2014/2-15-14\\_Event%20Release-1.pdf](http://www.wipp.energy.gov/pr/2014/2-15-14_Event%20Release-1.pdf)

<sup>25</sup> [http://www.wipp.energy.gov/pr/2014/2-15-14\\_Event%20Release-2.pdf](http://www.wipp.energy.gov/pr/2014/2-15-14_Event%20Release-2.pdf)

<sup>26</sup> [http://www.wipp.energy.gov/pr/2014/2-16-14\\_Event%20Release-3.pdf](http://www.wipp.energy.gov/pr/2014/2-16-14_Event%20Release-3.pdf)



The first public notice that contamination had been released was on Wednesday, February 19, when the Carlsbad Environmental Monitoring and Research Center (CEMRC) issued a statement that laboratory analysis of a filter at its air monitoring station #107, 0.6 miles from the WIPP exhaust shaft, found 0.64 becquerels (Bq) per cubic meter of air of Americium-241 and 0.046 Bq per cubic meter of air of Plutonium-239+240.<sup>27</sup>

Repeatedly since that time, CEMRC's air monitoring and its laboratory analysis of the station A and station B filters in the exhaust building have detected radiation when DOE's monitoring and laboratory has not detected any radioactivity. CEMRC has consistently provided its data to the public on its website – [www.cemrc.org](http://www.cemrc.org) – and in public forums.

Thus, DOE and contractor radiation detection equipment and personnel were found to be not as sensitive and proficient as those of a non-governmental organization. CEMRC also provided more timely and accurate information to the public than did DOE and its contractor.

#### G. No effective WIPP decontamination procedures exist.

Because a radiation release was not supposed to occur, a decontamination plan and procedures did not exist for WIPP. Since there is no international experience in decontaminating a radiologically contaminated salt mine, there are not proven techniques to carry out such a large-scale decontamination effort.

If decontamination cannot be accomplished, there are limited options: (1) decommission the site; (2) re-open with workers having to function in a contaminated environment, or (3) re-open with part of the site being contaminated and part of the site being “clean.”

#### H. WIPP will need a new exhaust shaft, if it is to re-open for waste disposal.

While DOE has not released the “recovery plan” that is to detail the many changes that will be made in order for the site to re-open, it has determined that the existing exhaust shaft is too contaminated for “clean” operations and that a new exhaust shaft will be needed. The amount of

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<sup>27</sup> <http://www.cemrc.org/2014/02/19/cemrc-detects-trace-amounts-radioactive-particles-air-sampling-station-near-wipp-facility/>

funding and time for the construction are unknown. Other construction required and operational changes have not been detailed.

I. A new underground ventilation system will be required, if WIPP is to re-open for waste disposal.

While DOE has not released the “recovery plan,” it has determined that the existing ventilation system is too contaminated and insufficient for future waste management operations. The amount of funding and time for the construction are unknown. Other construction required and operational changes have not been detailed.

J. How long WIPP will be out of operation is unknown.

While DOE has not released the “recovery plan,” it has told the New Mexico Environment Department that waste operations would not resume until at least January 2016.<sup>28</sup> Whether that date is achievable is unknown. Since the cause of the release is unknown, whether any future release can be avoided, what decontamination will be required, what changes in facilities and procedures will be required by regulators, among other issues, are unknown. Indeed, whether the site will re-open for waste operations is unknown.

## 5. Initial Questions

- A. What would be the effects from an underground fire at the DGR if one or both shafts were taken out of service for an extended timeframe, as has occurred at WIPP?
- B. Will underground radiation control equipment and systems properly operate if there is an underground fire?
- C. If underground radiation detection equipment is inoperable, how will workers on the surface and underground be made aware of that fact? How would regulators and the public be made aware of that fact?
- D. Why does OPG consider that having 13 workers treated for smoke inhalation, including one being treated for more than five months, to be “below criteria”? What additional effects are required to not be “below criteria”?

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<sup>28</sup> [http://www.wipp.energy.gov/library/Information\\_Repository\\_A/Extensions\\_of\\_Time/14-1545\\_Redacted.pdf](http://www.wipp.energy.gov/library/Information_Repository_A/Extensions_of_Time/14-1545_Redacted.pdf)

- E. Since a diesel-fueled underground vehicle was involved in the WIPP fire, consideration is being given to eliminating all such vehicles in the future. What would the impacts be on OPG if such vehicles were eliminated?
- F. Does OPG expect that the DGR would “start clean, stay clean?”
- G. What are the expected levels of radiation releases during the operation of the DGR?
- H. What levels of radiological contamination would stop operations at the DGR?
- I. What specific, tested radiological decontamination procedures exist should cleanup be required in the DGR?
- J. What standards would be used for radiological decontamination?
- K. How does the OPG protocol for testing and informing workers with potential radiation contamination compare with the WIPP procedures?
- L. How would a new ventilation system be installed in the DGR, if it were necessary?
- M. How would a new shaft be installed at the DGR, if it were necessary?
- N. By what criteria did the CNSC Staff conclude that the February 5 fire resulted in “no injuries” or “no significant injuries”?
- O. Why does CNSC Staff conclude: “it was not the control measures that failed at WIPP”?<sup>29</sup>
- P. What Ontario / Canadian corollary to the CEMRC would have the capacity to conduct independent monitoring and provide the results to the public?
- Q. What procedures and requirements are there to ensure that the DGR would not, over time, have the declining safety culture that was evidenced by DOE, its contractor, and the regulators at WIPP?
- R. How would adequate maintenance of equipment, timely replacement of equipment, ongoing testing of communications equipment, and ongoing training of personnel be done throughout the lifetime of the DGR? What regulatory procedures would ensure those requirements are met so that the WIPP failures would not occur at the DGR?

## 6. Initial Lessons Learned

- A. “Below criteria” events can have major consequences for a repository. OPG and CNSC – and DOE – consider the WIPP fire and radiological events to be “below criteria” related to injuries, worker exposure levels, and public exposure amounts. Such events

are not expected to occur, and if they do, are not expected to significantly impact the repository operations.

The WIPP incidents show such analysis and expectations to be incorrect. The fire directly affected 86 workers, with one still being treated more than five months after the event. The waste hoist, which is required for waste operations, was put out of service for more than five months because of the fire. The operational and safety procedure changes that are being required by the Fire AIR will take months to accomplish, and there is not yet a schedule for their completion.

The radiation release was never supposed to occur, but it has resulted in the facility being unable to accept additional waste for at least two years. The “below criteria” event will require, if the site is to re-open, major new facilities, including a new exhaust shaft and a new ventilation system. That new construction will likely lead to other physical changes, including new underground panels and drifts. Operational and safety procedures that are being required by the Radiological Event AIR will take months or years to accomplish, and there is not yet a schedule for their completion.

B. In significant ways, repository operations are more complex than storing wastes on the surface.

The reason that the United States and other nations are proposing deep geologic repositories is because of the long-term dangers posed by the wastes and the assumption that a well-understood geologic site can contain the radioactive wastes for the thousands of generations that they remain dangerous. Thus, the assumption is that repositories are more safe than leaving the wastes on or near the surface. (And that geologic disposal is preferable to seabed disposal or putting waste into outer space.)

However, actual experience at the three deep geologic repositories that have operated for more than ten years – Asse and Morsleben in Germany and WIPP – have established that safe operations of any DGR are difficult, and apparently more difficult than surface storage. For

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<sup>29</sup> Document #1915, p. 60.

example, while some transuranic waste containers have exploded or breached during surface storage,<sup>30</sup> no such events have been documented during the past 15 years that WIPP has operated. Thus, during that timeframe, transuranic waste has apparently been more safely stored on the surface than at WIPP.

When transuranic waste containers were breached in the more distant past, remedial actions and decontamination has been accomplished much more easily than is the case in the WIPP underground environment. Given the WIPP design, which is being generally followed by the DGR, an underground radiation release can contaminate a much larger area than what has occurred with surface releases.

The fact that five months after the radiation release was detected, the Room 7, Panel 7 location is largely inaccessible and the cause of the release remains unknown show the additional complexity of DGR operations. In previous breaches at surface facilities, accessibility and determining the causes was much more easily accomplished.

At WIPP, the promise to “start clean, stay clean” has failed. Significant other aspects of the repository system also have failed. Determining the causes, demonstrating that future releases will not occur, completely decontaminating the facility, and providing adequate assessment and treatment for workers are so far proving to be very difficult. The lessons from the incidents will take years to address. But the WIPP incidents demonstrate that there are additional uncertainties regarding repositories than have not been adequately understood and analyzed in environmental analyses and nuclear safety requirements.

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<sup>30</sup> Silva, Matthew. *An Assessment of the Flammability and Explosion Potential of Transuranic Waste*, EEG-48, June 1991.