

# Submission to the SA Joint Select Committee on the Findings of the Nuclear Fuel Cycle Royal Commission

Friends of the Earth, Australia  
Australian Conservation Foundation  
Conservation Council of SA

July 2016

**This file contains the section on nuclear transport from the above submission.**

The full submission is posted at <https://nuclear.foe.org.au/waste-import>

Direct link to full submission:

<https://nuclear.foe.org.au/wp-content/uploads/SA-Joint-Select-Cttee-FoE-ACF-CCSA-final.pdf>

## 2020 UPDATES

The plan to import nuclear waste from around the world to South Australia has been abandoned. However the Australian government is still targeting SA (a site near Kimba) for a national nuclear waste dump so transport risk issues are still relevant.

For information relevant to the Kimba nuclear dump controversy (esp. transport) see:

\* <https://nuclear.foe.org.au/waste>

\* David Noonan, Feb. 2020, 'Napandee nuclear waste dump nomination also targets Whyalla port', <https://nuclear.foe.org.au/wp-content/uploads/Transport-Napandee-Nuclear-Store-targets-Whyalla-Port-Feb2020.pdf>

\*Natalie Wasley, 14 August 2018, 'Responsibility overboard: the shocking record of the company shipping nuclear waste to Australia', <http://www.onlineopinion.com.au/view.asp?article=19892&page=0>

| <b>CONTENTS:</b>              | <b>Page</b> |
|-------------------------------|-------------|
| 1. Summary                    | 1           |
| 2. Transport risks            | 2           |
| 3. Waste transport            | 7           |
| 4. Sea transport              | 8           |
| 5. Nuclear transport security | 12          |

## 1. Summary

The SA Joint Select Committee might want to consider the implications of any proposal to abandon plans for dedicated, new infrastructure (e.g. port, rail) in favour of existing infrastructure. It should be noted that from 1999–2002 Pangea Resources initially envisaged dedicated infrastructure but as its plans advanced it increasingly favoured the use of existing infrastructure. A shift from dedicated to existing infrastructure would have significant implications for the economics of the project as well as public health and environmental risks.

The Royal Commission report states: "During the past 50 years, approximately 7000 international shipments of used nuclear fuel, including nine that have left Australia for reprocessing, have been undertaken. In this time, no accident involving a breach of the package and the release of its

contents has occurred. The same record applies to international transport of high and intermediate level waste."

That claim is incorrect and is refuted by documented evidence provided to – and ignored by – the Royal Commission. For example a whistleblower sparked a major controversy over frequent excessive radioactive contamination of waste containers, rail cars, and trucks in France and Germany. International transport regulations for spent fuel shipments were constantly violated over a period of many years and this was done knowingly. Another example concerns the derailment of a train wagon carrying spent fuel in December 2013, 3 km from Paris, with testing by AREVA revealing a hotspot on the rail car.

Numerous other train derailments involving nuclear materials transport have been documented. It is unsettling to consider the multiple derailments on the Ghan train line in Australia in the relatively short period of time it has been in operation.

Transport incidents and accidents are routine in countries with significant nuclear industries. The case of the UK is pertinent. A UK government database contains information on 1018 events from 1958 to 2011 (an average of 19 incidents each year).

There were 187 events during the shipment of irradiated nuclear fuel flasks from 1958–2004 in the UK (an average of four per year):

- 33% involved excess contamination on the surface of the flask;
- 24% involved collisions and low speed derailments of the conveyance;
- 16% involved flask preparation faults, and loading/unloading faults;
- 13% involved excess contamination of conveyance;
- 11% involved faults with the conveyance; and
- the remainder included three cases involving fire on a locomotive with no damage to flasks.

The French nuclear safety agency IRSN produced a report summarising radioactive transport accidents and incidents from 1999–2007. The database lists 901 events from 1999–2007 – on average 100 events annually or about two each week. The IRSN report notes that events where there is contamination of packages and means of transport were still frequent in 2007.

Potential costs of transport accidents: Spent fuel / high level nuclear waste transport accidents have the potential to be extraordinarily expensive. Dr. Marvin Resnikoff and Matt Lamb from Radioactive Waste Management Associates in New York City calculated 355–431 latent cancer fatalities attributable to a "maximum" hypothetical rail cask accident, compared to the US Department of Energy's estimate of 31 fatalities. Using the Department of Energy's model, they calculated that a severe truck cask accident could result in US\$20 billion to US\$36 billion in clean-up costs for an accident in an urban area, and a severe rail accident in an urban area could result in costs from US\$145 billion to US\$270 billion.

Transport and nuclear security: Nuclear engineer Dr John Large writes: "Movement of nuclear materials is inherently risky both in terms of severe accident and terrorist attack. Not all accident scenarios and accident severities can be foreseen; it is only possible to maintain a limited security cordon around the flask and its consignment; ... terrorists are able to seek out and exploit vulnerabilities in the transport arrangements and localities on the route; and emergency planning is difficult to maintain over the entire route."

## 2. Transport risks

The scale of the proposed transports – 138,000 tonnes of high level waste and 390,000 cubic metres of intermediate level waste – is unprecedented. Globally, high level nuclear waste shipments amount to 80,000 tonnes in a 45-year period since 1971.<sup>1</sup>

The Royal Commission's Final Report notes that "if a cask was lost at sea and was irrecoverable, there is a potential for some members of the public consuming locally sourced seafood to receive a very small dose of radiation".

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This claim is incorrect and is refuted by documented evidence provided to – and ignored by – the Royal Commission.<sup>2</sup>

For example:

**Germany – a nuclear 'cartel of liars':** A whistleblower supplied the WISE-Paris NGO with information which sparked a major controversy over frequent excessive radioactive contamination of waste containers, rail cars, and trucks.<sup>3</sup> Nuclear waste shipments from German nuclear reactor sites to reprocessing plants in the UK and France were banned, and transport within France was suspended, in the aftermath of the controversy. WISE-Paris summarised the controversy:<sup>4</sup>

*There are two scandals, both unprecedented. The first lies in the fact that for 15 years the nuclear industry – power plants, transport companies, plutonium factories and nuclear safety institutes in France, Germany, Switzerland and the UK at least – have managed to hide the fact that the international transport regulations for spent fuel shipments have been constantly violated, up to levels exceeding several thousand times the limit. This is all the more stunning as the original recommendation stems from the industry friendly, heavily pro-nuclear International Atomic Energy Agency (IAEA) in Vienna.*

*The second scandal derives from the fact that the French nuclear safety authority DSIN has been aware of the problem since autumn 1997, agreed with the French nuclear industry representatives over the wording of a mere "cleanliness problem", and kept silent until a journalistic investigation brought the story to light. The safety authority neither informed its ministers nor its foreign counterparts and, of course, nor did it inform the public. Worse, when the story broke, the authority played the role of the tough transparent State control agency*

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<sup>1</sup> World Nuclear Association, "Transport of Radioactive Materials", Sept 2011, [www.world-nuclear.org/information-library/nuclear-fuel-cycle/transport-of-nuclear-materials/transport-of-radioactive-materials.aspx](http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/transport-of-nuclear-materials/transport-of-radioactive-materials.aspx); and Jacobs MCM, p.152.

<sup>2</sup> [www.foe.org.au/sites/default/files/NFCRC%20submission%20FoEA%20ACF%20CCSA-FINAL-AUGUST-2015.pdf](http://www.foe.org.au/sites/default/files/NFCRC%20submission%20FoEA%20ACF%20CCSA-FINAL-AUGUST-2015.pdf)  
[www.foe.org.au/sites/default/files/NFCRC-response-tent-findings-CCSA-ACF-FoE-18March2016-final\\_0.pdf](http://www.foe.org.au/sites/default/files/NFCRC-response-tent-findings-CCSA-ACF-FoE-18March2016-final_0.pdf)

<sup>3</sup> WISE-Paris, Plutonium Investigation, No.6, May-June 1998,  
[www.wise-paris.org/index.html?/english/ournewsletter/6\\_7/contents.html](http://www.wise-paris.org/index.html?/english/ournewsletter/6_7/contents.html)  
and

[www.wise-paris.org/english/ournewsletter/6\\_7/no6\\_7.pdf](http://www.wise-paris.org/english/ournewsletter/6_7/no6_7.pdf)

<sup>4</sup> [www.wise-paris.org/index.html?/english/ournewsletter/6\\_7/editorial.html&/english/frame/menu.html](http://www.wise-paris.org/index.html?/english/ournewsletter/6_7/editorial.html&/english/frame/menu.html)

*finally cleaning up ... without actually taking any kind of regulatory or disciplinary consequences, while downplaying health consequences and the persistent outrageous violation of regulations.*

*The risk seems rather high that people have been exposed to significant levels of radiation over the period the contaminated transports have crossed countries. Worse, hot particles have been spread into the environment along rail tracks and roads. People might actually continue to get contaminated presently and for a long time to come.*

French Environment Minister Dominique Voynet said: "Beyond the level of contamination, I'm shocked by the fact that as soon as one asks some simple questions to the operators, one realises that this has been going on for years, that the three companies questioned (EDF, Transnucléaire, COGEMA) were perfectly aware of it and that they have not said anything."

In Germany, an opinion poll found that 72% of respondents thought that further nuclear waste shipments would be "irresponsible". The opinion poll found a dramatic increase in opposition to nuclear power, with 76% of respondents supporting the idea of a law to phase out nuclear power. The police trade union speaker Konrad Freiberg called the nuclear industry a "cartel of liars" which "has driven democracy against the wall".

**Here is another example which refutes the Royal Commission's incorrect claim:** 23 December 2013: A rail freight wagon carrying nuclear waste was derailed at a depot in Drancy, 3 km northeast of Paris. The wagon carried spent fuel from the Nogent nuclear power plant destined for AREVA's reprocessing plant at La Hague in Normandy. Although no leakage of radiation was measured at the accident location, the Nuclear Safety Authority (ASN) reported that subsequent testing by AREVA revealed a hotspot on the rail car that delivered a dose of 56 microsievert. An investigation into the origin of the contamination is underway.<sup>5</sup>

**Here is another example which refutes the Royal Commission's incorrect claim:** A serious nuclear transport incident occurred in the UK in 2002.<sup>6</sup> AEA Technology was fined £250,000 for the incident during a 130-mile truck journey. A highly radioactive beam was emitted from a protective flask as it was driven across northern England and it was "pure good fortune" that no-one was dangerously contaminated, Leeds Crown Court was told. The problem arose when a plug was left off a specially-built 2.5-tonne container carrying radioactive material on a lorry. Staff used the wrong packaging equipment and failed to carry out essential safety checks before the radioactive cobalt-60 (decommissioned cancer treatment equipment) was transported from West Yorkshire to Cumbria. The court heard the 8mm-wide beam of radiation escaped through the bottom of the flask, pointing directly into the ground, throughout the three-hour road journey. Had the beam travelled horizontally, anyone within 280 metres would have been at risk of contamination from a beam of gamma rays up to 1000 times more powerful than a "very high dose rate". Radiation experts from the Health and Safety Executive said that anyone exposed to the beam could have exceeded the legal dose within seconds and suffered burns within minutes.

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<sup>5</sup> International Panel on Fissile Materials, 21 Jan 2014, [http://fissilematerials.org/blog/2014/01/nuclear\\_train\\_accident\\_in.html](http://fissilematerials.org/blog/2014/01/nuclear_train_accident_in.html)

<sup>6</sup> UK Health and Safety Executive, 2006, 'Transport case prompts HSE reminder on the importance of radiation protection controls', [www.hse.gov.uk/press/2006/e06017.htm](http://www.hse.gov.uk/press/2006/e06017.htm)  
See also: 'Firm fined £250,000 over radioactive leak', *The Scotsman*, 21 February 2006, <http://news.scotsman.com/topics.cfm?tid=112&id=267752006>  
See also: 'Toxic truck leak a radiation near-miss', 22 February 2006, [www.theaustralian.news.com.au/common/story\\_page/0,5744,18231965%5E2703,00.html](http://www.theaustralian.news.com.au/common/story_page/0,5744,18231965%5E2703,00.html)

One scientist estimated that someone standing a metre from the source and in the direct path of the rays would have been dead in two hours. The judge, Norman Jones, QC, said staff at the firm had acted in a "cavalier and somewhat indifferent" manner with a "degree of arrogance" towards their duties. He said the risk from the leak had been "considerable". In addition to the fine, he ordered the company to pay more than £150,000 in costs to the UK Health and Safety Executive.

No doubt there are other examples of dangerous transport accidents involving spent fuel / high level waste. The Royal Commission failed to carry out the necessary research, ignored information provided to it in submissions and repeated false industry claims regarding nuclear transport.

It should be noted that there have been **other train derailments** involving nuclear waste. For example, a train carrying three casks with about 180 tons of high-level radioactive waste derailed near Apach (France) on 3 February 1997. The waste was on its way from the nuclear power plant in Lingen (Germany) to Sellafield, UK, for reprocessing. The train was going at about 30 kilometres per hour, and the casks did not turn over. The incident was not a unique event. On 15 January 1997 a nuclear fuel cask derailed in front of the German nuclear power plant at Krümmel during a track change, and on 3 February 1997 the engine driver of a nuclear waste transport from Krümmel suffered from a faint.<sup>7</sup>

Transportation of nuclear waste by rail from a port to a storage/disposal site is proposed by Pangea-successor and others. Thus it is notable that there have been **numerous train derailments in Australia** over the past decade. Some examples are noted here:

- 12 December 2006 – Northern Territory – another derailment on the Adelaide to Darwin railway. Two locomotives and 11 carriages of the Ghan were derailed 130 kms south of Darwin when the train and a road-train collided. A 50-year-old female passenger was in a critical but stable condition while three others were being treated for less serious injuries. Great Southern Railways said it could take five days to clear the railway.<sup>8</sup>
- A serious derailment occurred on 27 December 2011, when a Darwin bound train carrying copper concentrate (with trace uranium, 0.008%) from the Prominent Hill mine derailed into the Edith River northwest of Katherine. Floodwaters from a recent cyclone caused the river crossing to flood and wash out. It was estimated that 1200 tonnes of copper concentrate spilled into the Edith River when 13 carriages overturned into the river. More carriages derailed but did not overturn, and debris from carriages was recovered up to 5km down stream. The company exporting the copper, OZ Minerals, had been operating under an exemption to the Australian Code for the Transport of Dangerous Goods, granted by SafeWorkSA and NT WorkSafe. Instead of being transported in sealed containers, the copper was simply in metal tubs with tarpaulin covering.<sup>9</sup>

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<sup>7</sup> WISE News Communique #467, February 28, 1997

Die Tageszeitung (FRG) February 5, 1997

Greenpeace press release February 4, 1997

<sup>8</sup> 'Crash sparks calls for Adelaide to Darwin rail line probe', <http://theaustralian.com.au/national-affairs/crash-sparks-calls-for-adelaide-to-darwin-rail-line-probe/story-fn59niix-1226390639315>

'Nuke warning in Ghan crash', 13 December 2006, [www.news.com.au/couriermail/story/0,23739,20925432-5010960,00.html](http://www.news.com.au/couriermail/story/0,23739,20925432-5010960,00.html)

'Investigations begin into Ghan derailment', 13 December 2006, <http://abc.net.au/news/australia/nt/alice/200612/s1810195.htm>

<sup>9</sup>

<http://news.smh.com.au/breaking-newsnational/nt-rail-line-remains-cut-after-floods-20111228-1pcf.html>  
AAP, April 18, 2012 – 'Pacific Highway site 'clear' of radioactive waste, Roads Minister Duncan Gay says'

- 2012, June 7 – Northern Territory – train derailment. A Pacific National freight train carrying 6000 tonnes of manganese derailed in the NT blocking the railway and stranding 240 Ghan passengers in Alice Springs as the track was blocked. Some reports had the derailment near Alice Springs, others 60 kms north of Tennant Creek and others much closer to Muckaty land which is being targeted for a national radioactive waste facility. Muckaty traditional owner, Penelope Phillips from the Wirntiku group, said the train derailment raises concerns about the safety of transporting radioactive material. "I think it's an omen to people, to let them know to stop trying to talk about that Muckaty waste coming to the country, whether it's by rail or train," she says. Cat Beaton from the Environment Centre NT raised concerns about plans to use the train line to transport 1.2 million tonnes of copper/uranium concentrate annually from the Olympic Dam mine in SA to the Port of Darwin.<sup>10</sup>
- On 25 November 2012, 14 carriages of a freight train bound for Adelaide were overturned near Cadney Park in South Australia, and other carriages derailed. Strong winds were the cause of the accident which caused "significant damage" to containers and carriages, and damaged 300m of track.

**UK:** Transport incidents and accidents are routine in countries with significant nuclear industries. The case of the UK is pertinent. A UK government database – Radioactive Material Transport Event Database (RAMTED) – contains information on 1018 events from 1958 to 2011 (an average of 19 incidents each year).<sup>11</sup> Of 806 incidents in the UK between 1958–2004, 2.3% (19 incidents) resulted in individual whole-body doses over 1 mSv, or extremity doses over 50 mSv. There were 187 events during the shipment of irradiated nuclear fuel flasks from 1958–2004 in the UK<sup>12</sup> – 23% of the total number of 806 recorded incidents:

- 33% involved excess contamination on the surface of the flask;
- 24% involved collisions and low speed derailments of the conveyance;
- 16% involved flask preparation faults, and loading/unloading faults;
- 13% involved excess contamination of conveyance;
- 11% involved faults with the conveyance; and
- the remainder included three cases involving fire on a locomotive with no damage to flasks

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'Radioactive transport accident New South Wales 1980', [antinuclear.net/2012/04/18/radioactive-transport-accident-new-south-wales-1980/](http://antinuclear.net/2012/04/18/radioactive-transport-accident-new-south-wales-1980/)

ATSB, 2012 - Australian Transport Safety Bureau, "Derailment of freight train 7AD1 at Edith River near Katherine, NT", [atsb.gov.au/publications/investigation\\_reports/2011/rair/ro-2011-019.aspx](http://atsb.gov.au/publications/investigation_reports/2011/rair/ro-2011-019.aspx)

<sup>10</sup> NT News, [www.ntnews.com.au/article/2012/06/08/306471\\_ntnews.html](http://www.ntnews.com.au/article/2012/06/08/306471_ntnews.html)

Train derailment fuels Muckaty fears, 8 June 2012, [www.abc.net.au/local/stories/2012/06/08/3521295.htm](http://www.abc.net.au/local/stories/2012/06/08/3521295.htm)

Freight train derails in NT, 8 June 2012, <http://news.ninemsn.com.au/national/8480633/freight-train-derails-in-nt>

<sup>11</sup> Some recent annual reviews of transport incidents in the UK are posted at

<http://webarchive.nationalarchives.gov.uk/20140722091854/www.hpa.org.uk/Publications/Radiation/CRCEScientificAndTechnicalReportSeries/>

Some earlier annual reviews are posted at:

<http://webarchive.nationalarchives.gov.uk/20140722091854/www.hpa.org.uk/Publications/Radiation/HPARPDSeriesReports/>

The most recent annual review is as follows: M.P. Harvey and A.L Jones, Aug 2012, 'HPA-CRCE-037 - Radiological Consequences Resulting from Accidents and Incidents Involving the Transport of Radioactive Materials in the UK – 2011 Review', [www.hpa.org.uk/Publications/Radiation/CRCEScientificAndTechnicalReportSeries/HPACRCE037/](http://www.hpa.org.uk/Publications/Radiation/CRCEScientificAndTechnicalReportSeries/HPACRCE037/)

<sup>12</sup> J.S. Hughes, D. Roberts, and S.J. Watson, July 2006, 'Review of Events Involving the Transport of Radioactive Materials in the UK, from 1958–2004, and their Radiological Consequences',

[http://webarchive.nationalarchives.gov.uk/20140714084352/www.hpa.org.uk/webc/HPAwebFile/HPAweb\\_C/1194947346295](http://webarchive.nationalarchives.gov.uk/20140714084352/www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1194947346295)

**Canada:** 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.<sup>13</sup> The information is contained in a notice 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; 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.

**France:** In 2008, the French nuclear safety agency IRSN produces a report summarising radioactive transport accidents and incidents from 1999–2007. The IRSN manages a database listing reported deviations, anomalies, incidents and accidents (known in a generic way as "events") relating to transport. The database lists 901 events from 1999–2007 – on average 100 events annually or about two each week. The IRSN report notes:<sup>14</sup>

- Events where there is contamination of packages and means of transport were still frequent in 2007.
- The number of events related to a defect in package stowing was significant, as was the number involving shocks on packages during handling. "Analysis of these two types of event reveals failures of information or training of the operators."
- "A number of events have been induced by human error in conditioning the radioactive contents of the packages, leading to significant consequences on the safety of the package. In particular, the incident with the highest level of gravity on the INES scale since 1999 (an incident which occurred on 27th December 2001 at Roissy airport during transit between Sweden and the United States) is linked to an error in packaging iridium capsules in the package, which led to their displacement in a portion of the cavity without radiation protection."
- "Finally, efforts should continue to prevent losses of packages and, if necessary, to find the lost packages quickly in order to avoid significant risks to uninformed persons in the event of unsupervised opening of these packages."

**USA:** In the eight years from 2005 to 2012, 72 incidents involving trucks carrying radioactive material on US highways caused US\$2.4 million in damage and one death, according to the Transportation Department's Pipeline and Hazardous Materials Safety Administration.<sup>15</sup>

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<sup>13</sup> John Spears, 15 Nov 2013, 'Trucks with radioactive cargo fail inspections', [www.thestar.com/business/2013/11/15/trucks\\_with\\_radioactive\\_cargo\\_fail\\_inspections.html](http://www.thestar.com/business/2013/11/15/trucks_with_radioactive_cargo_fail_inspections.html)

Ministry of Transportation – Undertaking #61: [www.ceaa-acee.gc.ca/050/documents/p17520/95562E.pdf](http://www.ceaa-acee.gc.ca/050/documents/p17520/95562E.pdf)

<sup>14</sup> IRSN (France), 21 October 2008, 'Information report: Incidents in transport of radioactive materials for civil use: IRSN draws lessons from events reported between 1999 and 2007',

[www.irsn.fr/EN/publications/technical-publications/Documents/IRSN\\_ni\\_transports\\_analysis\\_20081021.pdf](http://www.irsn.fr/EN/publications/technical-publications/Documents/IRSN_ni_transports_analysis_20081021.pdf)

[www.irsn.fr/EN/Library/Documents/IRSN\\_ni\\_transports\\_analysis\\_20081021.pdf](http://www.irsn.fr/EN/Library/Documents/IRSN_ni_transports_analysis_20081021.pdf)

[www.irsn.fr/EN/Pages/home.aspx](http://www.irsn.fr/EN/Pages/home.aspx)

<sup>15</sup> Anna M. Tinsley, 15 April 2012, 'Radioactive waste may soon travel on DFW highways',

<http://web.archive.org/web/20130504150446/www.star-telegram.com/2012/04/15/3884220/radioactive-waste-may-soon-travel.html>

**Potential costs of transport accidents:** Spent fuel / high level nuclear waste transport accidents have the potential to be extraordinarily expensive. Dr. Marvin Resnikoff and Matt Lamb from Radioactive Waste Management Associates in New York City calculated 355–431 latent cancer fatalities attributable to a "maximum" hypothetical rail cask accident, compared to the US Department of Energy's estimate of 31 fatalities. Using the Department of Energy's model, they calculated that a severe truck cask accident could result in US\$20 billion to US\$36 billion in clean-up costs for an accident in an urban area, and a severe rail accident in an urban area could result in costs from US\$145 billion to US\$270 billion.<sup>16</sup>

### 3. Waste transport

A few examples of accidents and incidents involving the transport of radioactive waste are noted here.

September 2002: A truck carrying nuclear waste from Idaho to the Waste Isolation Pilot Plant in New Mexico, USA, ran off Interstate 80 in Wyoming. The driver said he felt ill and attempted to pull over, but he blacked out before he made it to the roadside. The truck crossed the median, headed across the westbound lane and left the road. The accident was the second in less than two weeks. On Aug. 25, a truck bound for the WIPP plant near Carlsbad was hit by an alleged drunk driver. Nobody was injured and no contaminants were released in either accident, WIPP officials said.<sup>17</sup>

23 December 2013: A rail freight wagon carrying nuclear waste was derailed at a depot in Drancy, 3 km northeast of Paris. The wagon carried spent fuel from the Nogent nuclear power plant destined for AREVA's reprocessing plant at La Hague in Normandy. Although no leakage of radiation was measured at the accident location, the Nuclear Safety Authority (ASN) reported that subsequent testing by AREVA revealed a hotspot on the rail car that delivered a dose of 56 micro-sieverts. An investigation into the origin of the contamination is underway.<sup>18</sup>

1976, Kentucky, USA: Six drums containing radioactive waste burst open after they rolled off tractor-trailer trucks in Ashfield, Kentucky, USA. Two drivers were slightly injured. When the highway was cleaned, checks indicated radioactivity.<sup>19</sup>

3 February 1997 – High-level nuclear waste transport derails. A train carrying three casks with about 180 tons of high-level radioactive waste derailed near Apach (France). The waste was on its way from the nuclear power plant in Lingen (Germany) to Sellafield, UK, where it is to be reprocessed. The train was going at about 30 km per hour, and the casks did not turn over. The incident was not a unique event. On 15 January 1997 a nuclear fuel cask derailed in front of the German nuclear power plant at Krümmel during a track change, and on 3 February 1997 the engine driver of a nuclear waste transport from Krümmel suffered from a faint.<sup>20</sup>

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<sup>16</sup> 7 July 2000, [www.state.nv.us/nucwaste/news2000/nn10719.htm](http://www.state.nv.us/nucwaste/news2000/nn10719.htm)

<sup>17</sup> AP, 9 Sept 2002, 'WIPP truck runs off highway in Wyoming', [http://lubbockonline.com/stories/090902/upd\\_075-3941.shtml](http://lubbockonline.com/stories/090902/upd_075-3941.shtml)

<sup>18</sup> International Panel on Fissile Materials, 21 Jan 2014, [http://fissilematerials.org/blog/2014/01/nuclear\\_train\\_accident\\_in.html](http://fissilematerials.org/blog/2014/01/nuclear_train_accident_in.html)

<sup>19</sup> Legislative Research Service Paper, Parliamentary Library, Canberra

<sup>20</sup> WISE News Communique #467, February 28, 1997  
Die Tageszeitung (FRG) February 5, 1997



16 January 2014: A driver abandoned his stricken car at a level crossing moments before it was dragged 300 metres down a railway track by an empty nuclear waste train. The train is used to take spent nuclear fuel to Sellafield but, as it was returning to Cheshire, was empty.<sup>21</sup>

#### 4. Sea transport

In May 2013, fire damaged the Atlantic Cartier ship carrying nine tons of uranium hexafluoride while it was in the Port of Hamburg. (According to some reports the ship was also carrying 11.6 tons of uranium oxide.) The uranium hexafluoride was destined for the Areva-owned uranium enrichment plant at Lingen, Lower Saxony. Authorities said containers with dangerous substances were promptly removed from the ship. Firefighters took 16 hours to douse the fire, with a shortage of extinguishing agent in the region hampering their efforts. Five fire-fighting boats and 296 fire-fighters were involved. Only 500 metres from the burning ship, around 35,000 people were involved in a civic event – they were not warned about the potential hazards and they were not directed to move away.<sup>22</sup>



*The Atlantic Cartier in Hamburg.*

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Greenpeace press release February 4, 1997

<sup>21</sup> CORE Briefing, 15 Jan 2014, [www.corecumbria.co.uk/newsapp/pressreleases/pressmain.asp?StrNewsID=331](http://www.corecumbria.co.uk/newsapp/pressreleases/pressmain.asp?StrNewsID=331)  
[www.lancasterguardian.co.uk/news/nuclear-waste-train-in-50mph-smash-1-6376671](http://www.lancasterguardian.co.uk/news/nuclear-waste-train-in-50mph-smash-1-6376671)

Morning Star, 16 Jan 2014, [www.morningstaronline.co.uk/a-e91c-Level-crossing-crash-exposes-dangers-of-nuclear-trains](http://www.morningstaronline.co.uk/a-e91c-Level-crossing-crash-exposes-dangers-of-nuclear-trains)

Lancaster Guardian, 16 Jan 2014, [www.lancasterguardian.co.uk/news/nuclear-waste-train-in-50mph-smash-1-6376671](http://www.lancasterguardian.co.uk/news/nuclear-waste-train-in-50mph-smash-1-6376671)

<sup>22</sup> Martyn Lowe, 25 Aug 2013, 'Next Destination – Antwerp', [www.theproject.me.uk/?p=492](http://www.theproject.me.uk/?p=492)

Maritime Bulletin, 17 May 2013,

[www.news.odin.tc/index.php?page=view/article/416/Fire-on-ro-ro-Atlantic-Cartier-could-spark-explosions-and-radioactive-contamination-Hamburg](http://www.news.odin.tc/index.php?page=view/article/416/Fire-on-ro-ro-Atlantic-Cartier-could-spark-explosions-and-radioactive-contamination-Hamburg)

The Local, 17 May 2013, [www.thelocal.de/national/20130517-49777.html](http://www.thelocal.de/national/20130517-49777.html)

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

Fairplay, 22 May 2013,

[www.fairplay.co.uk/login.aspx?reason=denied\\_empty&script\\_name=/secure/display.aspx&path\\_info=/secure/display.aspx&articlename=dn0020130522000014](http://www.fairplay.co.uk/login.aspx?reason=denied_empty&script_name=/secure/display.aspx&path_info=/secure/display.aspx&articlename=dn0020130522000014)

July 2002: UK destroyer HMS Nottingham ran aground on the submerged but well-charted Wolf Rock near Lord Howe Island. A 50 metre hole is torn down the side of the vessel from bow to bridge, flooding five of her compartments and nearly causing her to sink.<sup>23</sup>

A 2001 report, 'A Review of Aspects of the Marine Transport of Radioactive Materials', by visiting UK-based marine pollution expert Tim Deere-Jones, revealed confusion about which Australian State or Commonwealth agency would take responsibility for an at-sea nuclear accident. It found that up to eight different agencies could be involved in an emergency that would probably involve State emergency personnel who lack nuclear emergency equipment or training. The report found that the Pacific Nuclear Transport Ltd (PNTL) ships, Pacific Pintail and Pacific Teal, which travelled close to the Australian coast via the Tasman Sea, and the Bougeunais, which carried nuclear waste from Sydney, did not meet the highest safety standards.<sup>24</sup>

Edwin Lyman, (then) Scientific Director at the Nuclear Control Institute, wrote in a 1999 paper:<sup>25</sup>

*"Recently, the IAEA has demonstrated an alarming lack of interest in the enforcement of its own regulations. For example, the IAEA standards for external contamination of shipping casks were found last year to have been routinely violated all over Western Europe for a decade or longer, by factors of up to ten thousand. One of the contributing factors was a design flaw that made adequate decontamination of some shipping casks very difficult. However, instead of reviewing the standards that permitted these casks to be licensed, it took no action. This merely reinforced the attitude which led to the problem in the first place – a pervasive belief on the part of shippers that IAEA standards were unnecessarily stringent and could be ignored. The public has no way of knowing how many other aspects of the existing regulations are treated in such a cavalier fashion. ...*

*The shipping packages now used to transport large quantities of radioactive material (RAM) by sea are designed to meet a set of performance requirements known as "Type B" standards, which are defined in the IAEA's transport standards, the most recent of which are the "Regulations for the Safe Transport of Radioactive Material" (1996 edition). Most notably, the standards require that Type B packages withstand a series of drop tests from a height of 9 meters, followed by an 800 degrees C fire for thirty minutes, without significant breach of the containment. For packages containing large inventories of RAM, an immersion test in water at 200 meters' depth for one hour is required.*

*These standards were originally developed for land-based modes of transport, and questions have arisen regarding their adequacy for packages used for sea shipments, which may be subject to more severe accident conditions, including more energetic collisions, long-duration, high-temperature fires and long-term immersion or immersion at greater depths. The IAEA's response to this issue has been two-fold. First, it argues that although accident conditions that occur aboard ships may be more severe than the Type B testing regimen, the actual accident environment experienced by a RAM package most likely would be less severe. Second, it claims that Type B packages have substantial safety margins built into them, so that even if they experience more severe conditions than they were designed to withstand they will "fail gracefully" rather than abruptly.*

*There is scant evidence, however, for either of these assumptions. ...*

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<sup>23</sup> [www.mapw.org.au/files/2009-06-29\\_fact-sheet\\_Nukeships-BW.pdf](http://www.mapw.org.au/files/2009-06-29_fact-sheet_Nukeships-BW.pdf)

[https://en.wikipedia.org/wiki/HMS\\_Nottingham\\_%28D91%29](https://en.wikipedia.org/wiki/HMS_Nottingham_%28D91%29)

<sup>24</sup> Greenpeace, 15 March 2001, 'Australia not prepared for a nuclear accident at sea'

<sup>25</sup> Edwin Lyman, October 1999, 'The Sea Shipment of Radioactive Materials: Safety and Environmental Concerns', [www.nci.org/e/el-malaysia.htm](http://www.nci.org/e/el-malaysia.htm)

*Recent evidence indicates that the long-term public health consequences of a severe accident during the sea transport of highly radioactive materials could be comparable to those resulting from a loss-of-containment accident at a nuclear reactor. On the other hand, the shippers of RAM and regulatory authorities are unable to provide convincing arguments that the risk of such an accident is negligible. Therefore, the safety case for these shipments has not been made."*

## **Atlantic Osprey**

Pangea-successor ARIUS proposed dedicated ships being used to transport nuclear waste to Australia, meeting the strictest standards. In reality, there is a history of sub-standard ships being used to transport nuclear materials. For example, the Atlantic Osprey, owned by the UK Nuclear Decommissioning Authority, was used to transport nuclear materials until it was retired in late 2013.<sup>26</sup>

It was an old converted car ferry, lacking the safety and security attributes of other nuclear cargo carriers. A 2010 assessment by NDA-subsiary International Nuclear Services of the Atlantic Osprey conceded the reduced 'public acceptance and political credibility' of transporting Category 1 nuclear material on the ship, and admitted that reservations about the Atlantic Osprey's continued use for Category 1 cargoes had been expressed by France's safety authority.<sup>27</sup>

In 2002, an engine fire broke out on the Atlantic Osprey while it was crossing the Manchester Ship Canal, although there was no nuclear material on board at the time.<sup>28</sup> The ship experienced engine failures, fires and cases of drifting at sea.<sup>29</sup>

## **UK report**

The Atlantic Osprey has been taken out of service but questions remain about the adequacy of ships still being used for nuclear transports. The UK Nuclear Free Local Authorities noted in 2014: "In the example of the Atlantic Cartier, it was transporting significant amounts of uranium hexafluoride ... but also other dangerous chemicals, explosive materials and cars for export. Last year it was involved in a major fire, where a significant radioactive emergency incident was only narrowly averted in Hamburg Port, Germany. Less than four months later the vessel was back in operation, delivering and unloading at UK ports such as Liverpool. This is despite a long list of safety concerns<sup>30</sup> on the vessel that had been identified over the past few years."<sup>31</sup>

Launching a detailed Policy Briefing written by independent marine pollution consultant Tim Deere-Jones, the Nuclear Free Local Authorities' recommendations included:<sup>32</sup>

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<sup>26</sup> [www.world-nuclear-news.org/WR-Final-voyage-for-Atlantic-Osprey-2208147.html](http://www.world-nuclear-news.org/WR-Final-voyage-for-Atlantic-Osprey-2208147.html)

<sup>27</sup> November 2012, 'Yet more 'intolerable risk' as Sellafield MOX fuel awaits shipment to Germany', [www.corecumbria.co.uk/newsapp/pressreleases/pressmain.asp?StrNewsID=310](http://www.corecumbria.co.uk/newsapp/pressreleases/pressmain.asp?StrNewsID=310)

<sup>28</sup> Treacy Hogan, 28 March 2002, 'Protests after fire on Sellafield nuclear waste ship', [www.unison.ie](http://www.unison.ie)

<sup>29</sup> Safe Energy E-Journal, No.57, December 2012, [www.no2nuclearpower.org.uk/documents/SAFE\\_ENERGY\\_No57.pdf](http://www.no2nuclearpower.org.uk/documents/SAFE_ENERGY_No57.pdf)

<sup>30</sup> NFLA media release, 28 August 2013, [www.nuclearpolicy.info/docs/news/NFLA\\_Atlantic\\_Cartier\\_concerns.pdf](http://www.nuclearpolicy.info/docs/news/NFLA_Atlantic_Cartier_concerns.pdf)

<sup>31</sup> Nuclear Free Local Authorities, 4 March 2014, 'NFLA publishes marine nuclear materials transportation briefing which raises concerns over emergency procedures for lower level mixed material vessel shipments', [www.nuclearpolicy.info/docs/news/NFLA\\_nuclear\\_marine\\_transport\\_briefing.pdf](http://www.nuclearpolicy.info/docs/news/NFLA_nuclear_marine_transport_briefing.pdf)

<sup>32</sup> Nuclear Free Local Authorities, 4 March 2014, 'NFLA publishes marine nuclear materials transportation briefing which raises concerns over emergency procedures for lower level mixed material vessel shipments', [www.nuclearpolicy.info/docs/news/NFLA\\_nuclear\\_marine\\_transport\\_briefing.pdf](http://www.nuclearpolicy.info/docs/news/NFLA_nuclear_marine_transport_briefing.pdf)

- ships carrying dangerous cargoes into any port should be issued with a public notice about the potential dangers which they might cause;
- any ship carrying radioactive materials should have regular fire inspections;
- any ship which fails to pass such tests should be prevented from sailing;
- the ship owners and the ship management should be held legally responsible for any breach of these regulations;
- any ship carrying radioactive materials should be subject to a new set of rigorous fire and safety standards regulations;
- international shipping regulations are changed so that no radioactive materials can be transported on any ships which carry either explosives, or highly inflammable liquid gases.

Tim Deere-Jones said:

*"It is evident from my ongoing research that the safety of the majority of maritime transports of radioactive materials through European waters cannot be guaranteed. The regulations covering such transports are generally little better than those covering "non-radioactive" cargos. The UK National Marine Pollution Plan, in common with many other National Plans, contains no specific plan for response to maritime radiological incidents. European Port and Local Authorities, Emergency Responders and Government Agencies appear similarly poorly prepared for reaction to such events. In order to forestall a serious maritime radiological accident, I fully support the NFLA call for improvements to the management of such shipments and for both Nation States and the International Maritime Organisation to tighten the current lax international regulations."*<sup>33</sup>

### **Parida ship fire**

In October 2014, a ship carrying radioactive waste which was set adrift in the North Sea after it caught fire caused the evacuation of the nearby Beatrice oil platform, part-owned by Ithaca Energy. The MV Parida was transporting six 500-litre drums of cemented radioactive waste from Scrabster in northern Scotland to Antwerp, Belgium, when the fire broke out in one of its funnels. The blaze was put out by the ship's crew. Meanwhile 52 workers were airlifted off the oil platform as a precaution in case the drifting MV Parida struck it. The ship was subsequently towed to a secure pier at the Port of Cromarty Firth by a commercial operator, despite the Aberdeen coastguard sending two emergency tugs to assist. The cargo was reportedly undamaged. The waste was from the Dounreay experimental nuclear power plant.<sup>34</sup>

Angus Campbell, the leader of the Western Isles Council, said the Parida incident highlighted the need for a second coastguard tug in the Minch. "A ship in similar circumstances on the west coast

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<sup>33</sup> Nuclear Free Local Authorities, 4 March 2014, 'NFLA publishes marine nuclear materials transportation briefing which raises concerns over emergency procedures for lower level mixed material vessel shipments', [www.nuclearpolicy.info/docs/news/NFLA\\_nuclear\\_marine\\_transport\\_briefing.pdf](http://www.nuclearpolicy.info/docs/news/NFLA_nuclear_marine_transport_briefing.pdf)

<sup>34</sup> Andrew Snelling, 9 Oct 2014, 'Oil rig evacuated after radioactive fire', [www.energynewspremium.net/StoryView.asp?storyID=826936500&section=General+News&sectionsource=s63&asp\\_dsc=yes](http://www.energynewspremium.net/StoryView.asp?storyID=826936500&section=General+News&sectionsource=s63&asp_dsc=yes)

NFLA / KIMO, 8 Oct 2014, 'NFLA and KIMO call for urgent inquiry into Parida nuclear waste transport fire off the Moray Firth', [www.nuclearpolicy.info/docs/news/NFLA\\_KIMO\\_Parida\\_incident.pdf](http://www.nuclearpolicy.info/docs/news/NFLA_KIMO_Parida_incident.pdf)

West Highland Free Press 26 July 2014, [www.whfp.com/2014/07/25/concern-over-nuclear-waste-shipments/](http://www.whfp.com/2014/07/25/concern-over-nuclear-waste-shipments/)

16 Oct 2014, 'Call for safety review following ship fire', [www.fia.uk.com/en/information/details/index.cfm/call-for-safety-review-following-ship-fire](http://www.fia.uk.com/en/information/details/index.cfm/call-for-safety-review-following-ship-fire)

World Nuclear News, 8 Oct 2014, [www.world-nuclear-news.org/WR-Dounreay-ready-to-assist-fire-investigation-08101401.html](http://www.world-nuclear-news.org/WR-Dounreay-ready-to-assist-fire-investigation-08101401.html)

would be reliant on the Northern Isles-based ETV [emergency towing vessel] which would take a considerable amount of time to get to an incident in these waters."<sup>35</sup>

## 5. Nuclear transport security

Hirsch et al. summarise some of the security risks associated with the transport of nuclear materials:<sup>36</sup>

*During transport, radioactive substances are a potential target for terrorists. Of the numerous materials being shipped, the following are the most important:*

- 1. Spent fuel elements from nuclear power plants and highly active wastes from reprocessing (high specific inventory of radioactive substances)*
- 2. Plutonium from reprocessing (high radiotoxicity, particularly if released as aerosol)*
- 3. Uranium hexafluoride – uranium has to be converted into this chemical form in order to undergo enrichment (high chemical toxicity of released substances, resulting in immediate health effects in case of release).*

*Since the amounts transported with one shipment are about several tonnes at most, the releases to be expected will be smaller by orders of magnitudes than those that result from attack of a storage facility – even if the transport containers are severely damaged. On the other hand, the place where the release occurs cannot be foreseen, as attacks can occur, in principle, everywhere along the transport routes. Those routes often go through urban areas; for example at ports or during rail transport. Thus, releases can take place in densely populated regions, leading to severe damage to many people, even if the area affected is comparatively small.*

Nuclear engineer Dr John Large writes:

*"Movement of nuclear materials is inherently risky both in terms of severe accident and terrorist attack. Not all accident scenarios and accident severities can be foreseen; it is only possible to maintain a limited security cordon around the flask and its consignment; ... terrorists are able to seek out and exploit vulnerabilities in the transport arrangements and localities on the route; and emergency planning is difficult to maintain over the entire route."*<sup>37</sup>

### Examples of nuclear transport security incidents

In 1998, Greenpeace protesters easily boarded a ship carrying highly radioactive waste. A Panama Canal Commission (PCC) memo, obtained through a Freedom of Information Act request, found that "communication, command and control ... was dysfunctional" when the Greenpeace protesters boarded the ship as it entered the Panama Canal. The PCC report noted that patrol boats had failed to spot the Greenpeace launch and that the ship's crew had thought the

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<sup>35</sup> Herald, 30 July 2014 [www.heraldsotland.com/news/home-news/plans-for-radioactive-waste-by-sea-are-criticised.24898732](http://www.heraldsotland.com/news/home-news/plans-for-radioactive-waste-by-sea-are-criticised.24898732)

<sup>36</sup> Helmut Hirsch, Oda Becker, Mycle Schneider and Antony Froggatt, April 2005, 'Nuclear Reactor Hazards: Ongoing Dangers of Operating Nuclear Technology in the 21st Century', report prepared for Greenpeace International, [www.greenpeace.org/international/press/reports/nuclearreactorhazards](http://www.greenpeace.org/international/press/reports/nuclearreactorhazards)

<sup>37</sup> Quoted in UK Nuclear Free Local Authorities, May 2016, "Briefing: Nuclear security concerns – how secure is the UK civil nuclear sector?", [www.nuclearpolicy.info/wp/wp-content/uploads/2016/05/A258\\_NB145\\_Nuclear\\_Security\\_concerns.pdf](http://www.nuclearpolicy.info/wp/wp-content/uploads/2016/05/A258_NB145_Nuclear_Security_concerns.pdf)

demonstrators to be security personnel boarding the ship. Greenpeace and the Nuclear Control Institute noted: "Had the ship been boarded by a group of well-armed attackers instead of peaceful demonstrators, its cargo would have been in grave jeopardy, with potentially catastrophic consequences for the people of Panama. Given the shippers' frequently professed concerns about security, we were astonished to discover how thoroughly inept and ineffective were the security arrangements at the Panama Canal. In fact, essential elements of the security system did not work."<sup>38</sup>

Tom Bielefeld discusses an incident in Mexico in 2014:<sup>39</sup>

*At 1:30 a.m. on December 2, gunmen forced two truck drivers who had taken a nap at a gas station on the outskirts of Mexico City to surrender their vehicle. The thieves took off with the truck's heavy and hazardous cargo: a decommissioned teletherapy unit that was once used for cancer treatment and still contained a small capsule of highly radioactive material. The capsule's contents – some 3,000 curies of cobalt-60 – made it a "category 1" radiation source, the most dangerous of five categories defined by the IAEA to rank radioactive materials according to the risk they pose to people working with them. Taken out of their shielding containers, category-1 sources can kill anyone who is exposed to them at close range for a few minutes to an hour.*

*Two days later, the police found the radioactive capsule abandoned in a corn field. Although someone had extracted the capsule from its shielding (and likely received an unhealthy radiation dose in the process), there were no immediate reports of serious injuries and no contamination found in the area nearby. Thus the consequences of this incident appeared to be less grave than in two earlier cases – in Brazil in 1987, and in Thailand in 2000 – when unsuspecting scavengers who dismantled old radiotherapy machines exposed themselves and their families to very high doses of radiation. Four of the exposed people died in Brazil, and three in Thailand, and more were seriously injured. The cost of cleanup and recovery for their communities was substantial.*

*Officials, especially in the United States, were relieved that the stolen Mexican capsule did not end up with terrorists, who could have used it to build a "dirty bomb." Even though many planning scenarios predict that such a bomb would probably cause few radiation-related deaths, its economic impact could be disastrous.*

...

*Perhaps the most worrisome lesson of the Mexican incident and the other ones above is this: If hapless truck-jackers can steal high-activity sources by accident, a well-organized terrorist group could certainly do so in a planned operation.*

Transport of uranium ore from the Bagjata mine to the Uranium Corporation of India Limited (UCIL) processing plant was suspended after an ore-laden truck was torched by Maoists on 7 May 2014.<sup>40</sup> Fifteen armed people pulled the driver down from the vehicle and then set it ablaze. The

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<sup>38</sup> 22 Dec 1998, 'Major Security Breach at Panama Canal revealed as the next nuclear waste shipment looms', [www.nci.org/pr/pr122298.htm](http://www.nci.org/pr/pr122298.htm)

Panama Canal Commission's Director of Safety, Environment and Security, 1998, 'Pacific Swan Greenpeace Incident', [www.nci.org/seatrans.htm](http://www.nci.org/seatrans.htm)

<sup>39</sup> Tom Bielefeld, 23 Jan 2014, 'Mexico's stolen radiation source: It could happen here', <http://thebulletin.org/mexico%E2%80%99s-stolen-radiation-source-it-could-happen-here>

<sup>40</sup> [www.dnaindia.com/india/report-maoists-set-truck-carrying-uranium-for-ucil-ablaze-1986317](http://www.dnaindia.com/india/report-maoists-set-truck-carrying-uranium-for-ucil-ablaze-1986317)  
<http://timesofindia.indiatimes.com/city/ranchi/Suspension-of-ore-transportation-hits-uranium-work-at-UCIL/articleshow/34961281.cms>  
<http://timesofindia.indiatimes.com/city/ranchi/Frequent-threats-from-rebels-worry-UCIL-officials/articleshow/29483709.cms>

Maoists had reportedly been demanding permanent jobs for locals as compensation for acquisition of their land in Bagjata. About 150 families were displaced to make way for the Bagjata mine and had not been compensated. "If such violent activities continue to recur time and again, we apprehend it wouldn't be easy for us to function here," a senior UCIL official said.

July 2006 – Scotland – reporter plants fake bomb on train carrying nuclear waste: An investigation was underway after a newspaper reporter planted a fake bomb on a train carrying nuclear waste. The journalist from the *Daily Mirror* claimed he had wandered up to the unattended wagons at a north-west London depot. The reporter said his only ID as a rail worker was a fluorescent orange jacket and hard hat, on sale at any builders' merchants. "This was not a one-off. It was the tenth time I had wandered freely into the depot," he said. The rail company had already been criticised for "serious lapses" – the government's Office for Civil Nuclear Safety outlined serious failings in supervision at the sidings in 2005.<sup>41</sup>

March 2009 – An overseas company had made several shipments of nuclear fuel feedstock to another country, calling into a UK port en route. The company forged a UK approval document, and further investigation revealed that two other shipments had taken place with suspect UK approvals.<sup>42</sup>

13 April 1981 – Brisbane, Australia: A panel van carrying infectious and radioactive waste and a quantity of the pesticide 245T was stolen in Brisbane. Police said it contained one drum of radioactive waste, six drums of infectious waste and a quantity of 245T.<sup>43</sup>

On 17 October 2001, then ANSTO CEO Helen Garnett said that claims "that security is wanting at the Lucas Heights Science and Technology Centre ... is far from the truth."<sup>44</sup> Exactly two months later, several dozen Greenpeace protesters clambered over the spent fuel storage building and the reactor, while a paraglider enjoyed the scenery from ANSTO's 'secure' airspace.

In Canada, the Nuclear Safety Commission listed 17 cases from 2005 to 2013 in which radioactive materials were stolen from vehicles, or in which the vehicle itself was stolen with a radiation source in the trunk. Five of these cases involved radiography cameras, all of which were eventually recovered.<sup>45</sup>

About 330 kilograms of weapons-grade uranium in the form of naval fuel was stolen from a US plant in the 1960s. Multiple cases of naval HEU thefts were also reported in Russia in the early 1990s.<sup>46</sup>

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<sup>41</sup> Tom Parry, 22 July 2006, 'N-TRAIN FIRM RAPPED BEFORE OVER SECURITY EXCLUSIVE', [www.mirror.co.uk/news/tm\\_objectid=17428696%26method=full%26siteid=94762%26headline=n%2dtrain%2dfirm%2drapped%2dbefore%2dover%2dsecurity-name\\_page.html](http://www.mirror.co.uk/news/tm_objectid=17428696%26method=full%26siteid=94762%26headline=n%2dtrain%2dfirm%2drapped%2dbefore%2dover%2dsecurity-name_page.html)

'Probe after reporter plants fake bomb on nuclear train', *The Scotsman*, 21 July 2006, <http://news.scotsman.com/uk.cfm?id=1061462006>

<sup>42</sup> M. Harvey and A. Jones, 2011, 'Radiological Consequences Resulting from Accidents and Incidents Involving the Transport of Radioactive Materials in the UK – 2010 Review', HPA-CRCE-024, [www.hpa.org.uk/Publications/Radiation/CRCEScientificAndTechnicalReportSeries/HPACRCE024/](http://www.hpa.org.uk/Publications/Radiation/CRCEScientificAndTechnicalReportSeries/HPACRCE024/)

<sup>43</sup> *Courier Mail* 14/4/81

<sup>44</sup> *Australian Financial Review*, letter.

<sup>45</sup> Tom Bielefeld, 23 Jan 2014, 'Mexico's stolen radiation source: It could happen here', <http://thebulletin.org/mexico%E2%80%99s-stolen-radiation-source-it-could-happen-here>

<sup>46</sup> Sébastien Philippe, 4 Sept 2014, 'Bringing law to the sea: safeguarding the naval nuclear fuel cycle', <http://thebulletin.org/bringing-law-sea-safeguarding-naval-nuclear-fuel-cycle7418>

According to Mark Gaffney, author of *Dimona: the Third Temple* (1989), Israel smuggled nuclear technology (triggers, known as krytrons) out of the US, and hijacked a ship on the high seas loaded with uranium ore.<sup>47</sup>

### **Nuclear transport security: US reports**

A March 2014 report by the James Martin Center for Nonproliferation Studies found that in 2013, there were 153 cases where authorities in 30 countries lost control of some of their radiological and nuclear materials.<sup>48</sup> Most cases (141) involved materials that are radioactive but not usable in nuclear weapons. In about half of cases, the report blamed the loss of the materials on "negligence" by the people handling them. In 29% of the cases, the materials were lost or stolen during transit. The report states:

*Nearly one-third of all documented incidents in 2013 (29 percent) involved material in transit. Of the 30 reported thefts of material, 57 percent involved transportation, while 15 percent of the 73 losses did.*

*Incidents that occurred in transport are further classified as either "movement," in which the device was in a moving vehicle (28 incidents); or "stationary" (14 incidents), in which the vehicle was not in motion at the time of the incident. Notably, all stationary incidents were thefts.*

*The most publicized incident in 2013 was a theft during movement. On December 2, 2013, gunmen near Mexico City forced the drivers of a truck transporting a decommissioned cancer therapy machine to abandon their vehicle. The machine contained an encapsulated Category 1 cobalt-60 source (reportedly about 3,000 curies), thus posing serious safety and security concerns. Mexican authorities appealed to the public for help locating the truck and its contents, while also alerting the thieves to the dangerous nature of the radioactive material sealed inside the device. Two days later, police recovered the material in a cornfield, with the truck nearby.*

*Since thefts of materials in transit are of particular policy interest, the database further classifies thefts into additional subcategories, possibly illuminating areas of security vulnerability. First, thefts during transit are sub-classified as "stolen from vehicle" (11 incidents); "stolen with vehicle" (2 incidents); "stolen from individual" (2 incidents); or "unknown" (2 incidents).*

*An example of a "stolen from vehicle" incident was reported on February 4, 2013, in Phoenix, Arizona, where an individual broke into a locked steel box bolted to the bed of a truck parked outside a private home and stole a density gauge. There is no proof that the individual was aware of what he was stealing; many such crimes appear to be thefts of opportunity. One "stolen with vehicle" incident occurred on November 18, 2013, when an individual stole a truck carrying a density gauge while the truck was parked outside of a home. As in most cases classified as "stolen with vehicle," it appears that the individual targeted the vehicle without being aware of its contents.*

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See also:

Victor Gilinsky and Roger J. Mattson, 17 April 2014, 'Did Israel steal bomb-grade uranium from the United States?', <http://thebulletin.org/did-israel-steal-bomb-grade-uranium-united-states7056>

<sup>47</sup> Mark H. Gaffney, 'Obama Plays Hardball with Israel?', [www.informationclearinghouse.info/article40994.htm](http://www.informationclearinghouse.info/article40994.htm)

<sup>48</sup> Nuclear Threat Initiative / James Martin Center for Nonproliferation Studies, March 2014, 'CNS Global Incidents and Trafficking Database: 2013 Annual Report', [www.nti.org/media/pdfs/global\\_trafficking\\_report.pdf?\\_=1395275964](http://www.nti.org/media/pdfs/global_trafficking_report.pdf?_=1395275964)



*In one "stolen from individual" incident, an individual was riding a passenger train and carrying a portable industrial X-ray device. At one point, the individual noticed the device was missing and reported it stolen.*

*Thefts during transit are also sub-classified according to whether the material stolen was attended or unattended when the theft occurred. The material was attended at the time of the theft in only three of the 17 thefts during transit. In the remaining 14 incidents, the material had been left unattended when the theft occurred. ...*

*Policy Implication 5: Focusing on Security for Materials in Transit*

*Increased policy emphasis should be given to how to improve security for radioactive materials in transit. National regulatory policies differ. In some cases, new regulatory requirements or guidelines may be useful.*

*However, simple improvements to end-user training and awareness could also significantly decrease the number of incidents occurring in transit.*

*In most countries, once a device containing radioactive material is licensed for use, there appears to be little regulation governing its transportation and storage (this is particularly true of IAEA Category 3, 4, and 5 sources). In the United States, while radioactive sources must be locked into vehicles while in transit, regulations do not prohibit leaving sources in an unattended vehicle. Incident data for 2013, which includes multiple thefts from parked vehicles, suggests the possible need for additional regulation of radioactive materials while in transit, such as requiring that materials not be left unattended for lengthy periods in areas where there is general public access.*

*Many of the incidents that occurred during transport reflect simple negligence, and could easily have been avoided (e.g., incidents in which a licensee forgot to secure a source, and the source fell off the truck while in transit). Such incidents reinforce Key Finding 4, concerning the need to improve nuclear security training for personnel working with radioactive materials.*

Harvard University's Tom Bielefeld, a physicist specialising in nuclear security and nonproliferation research, wrote in *The Bulletin of the Atomic Scientists* in 2014 about nuclear transport security issues in the USA:<sup>49</sup>

*For transport security, the active involvement of all stakeholders is of particular importance. On the road, there are fewer technical protection measures available than inside buildings, so security depends even more on the people in charge: the drivers. They must be vigilant and prepared. This is primarily the responsibility of their bosses, who, in turn, must be able to rely on adequate rules and specific guidance from the regulator. Businesses must also be able to count on responsive state agencies and law enforcement. The federal government can set financial incentives to invest in better security. It is also in a unique position to provide the other parties with the information necessary to better understand the nature of the threats they might be facing. Here are some specific recommendations for the various parties involved in transport security:*

- *The NRC must further strengthen its regulations. Given the scale of damage that a "dirty bomb" could cause, it's difficult to understand why there are still no armed escorts required for category-1 transports. A real-time location-tracking system should be mandatory, not just for vehicles transporting category-1 sources, but also for those with category-2 sources. Similarly, the requirement for drivers to identify "safe havens" for rest stops, before their trip begins, should be extended to category-2 transports.*

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<sup>49</sup> Tom Bielefeld, 23 Jan 2014, 'Mexico's stolen radiation source: It could happen here', <http://thebulletin.org/mexico%E2%80%99s-stolen-radiation-source-it-could-happen-here>

- *The states could do a lot more, too. Those that do not yet require armed escorts for category-1 transports should implement such a policy soon – and not wait for the NRC to change its rules. And if there is one lesson from the Mexican incident for the states, it's that all of them should be proactive when it comes to helping licensees identify secure parking areas.*
- *The companies themselves play the main role in protecting radioactive sources. They need to be aware that someone might be after their cargo. Drivers, in particular, must be trained to follow security protocols, avoid risky situations, and respond appropriately should they come under attack. Managers should equip their trucks with low-cost security systems—such as GPS tracking systems, duress buttons, or vehicle disabling devices—even when they are not legally required to do so.*
- *Improving transport security remains an urgent matter for all parties involved, but the NRC and the states must pave the way – and quickly. In addition to the measures outlined above, a new program should be initiated in which experts from government and industry work together to develop better security concepts for sources in transit.*

**Nuclear transport security: March 2014 Nuclear Security Summit.** Only five states – Japan, France, South Korea, the UK and the USA – endorsed a statement on nuclear transport security risks. Commitments include adopting the recommendations of the yet-to-be published IAEA 'Implementing Guide on the Security of Nuclear Material in Transport', and "consider[ing] mutually exchanging information on physical protection and the security of other radioactive materials ... in order to capture good practices and lessons learned." Harvard University's Matthew Bunn said the transportation gift basket "is as weak as dishwater," and he took exception to its suggestion that "the security record of civilian transport of nuclear materials has been excellent" historically. "It used to be legal to send plutonium by regular mail," Bunn noted, "and the industry complained loudly when the [U.S. Nuclear Regulatory Commission] started requiring any armed guards at all."<sup>50</sup>

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<sup>50</sup> Douglas P. Guarino, 26 March 2014, 'Nations Pledge to Follow Security Guidelines for 'Dirty Bomb' Material', [www.nti.org/gsn/article/nations-pledge-follow-security-guidelines-dirty-bomb-material/](http://www.nti.org/gsn/article/nations-pledge-follow-security-guidelines-dirty-bomb-material/)  
 Joint Statement: [www.nss2014.com/sites/default/files/documents/joint\\_statement\\_on\\_transport\\_security\\_final.pdf](http://www.nss2014.com/sites/default/files/documents/joint_statement_on_transport_security_final.pdf)  
[www.whitehouse.gov/the-press-office/2014/03/25/fact-sheet-enhancing-security-maritime-supply-chain-gift-basket](http://www.whitehouse.gov/the-press-office/2014/03/25/fact-sheet-enhancing-security-maritime-supply-chain-gift-basket)