

# **Leaks and Spills At U.S. Commercial Nuclear Power Plants**

**January, 2017**

## **Introduction**

This is a list of reactor sites that experienced a leak or spill to the environment at some time since initial startup. The list only includes leaks or spills where the concentration of tritium in the leak source or groundwater sample was greater than 20,000 picocuries per liter (pCi/L). The term “leaks and spills” includes all types of non-routine releases in which tritium from reactor operation contacted the soil in an unintended fashion.

## **Source of Information**

Recent information was compiled by NRC staff based on input from the nuclear power plant staff, whereas historical information is based on Annual Radioactive Effluent Release Reports, Annual Radiological Environmental Operating Reports, Groundwater Questionnaires, Preliminary Notifications, Event Notifications, Licensee Event Reports, NRC Inspection Reports, Special Reports, and other documents submitted by the licensees to the NRC.

## **Contents**

The tritium concentrations listed include (1) the approximate historical maximums and (2) the “current” concentrations. The values shown provide a reasonable indication of the magnitude and extent of the historical leaks and spills as well as the current conditions at these sites.

The value listed as the “current concentration of tritium” is the highest tritium concentration found in the environment as a result of a leak or spill from the site. The current concentrations listed below provide a reasonable approximation of the tritium concentration currently on each site. If a value has not been updated within the past year, it indicates the value listed is a good approximation of the current site conditions. The current status of these sites reflects the most recently available information as of the date shown at the top of this page. This list will be revised semi-annually.

Samples are collected from onsite and offsite locations. Samples are collected from both drinking water wells and non-drinking water sample points (e.g., storm drains, man holes, bore holes, piezometer tubes, monitoring wells, surface water, puddles, and rain water). All of these samples are evaluated for inclusion in this list. Although some values in the list exceed 20,000 pCi/L, none of those samples were from a drinking water well or from a municipal drinking water system. In fact, although samples are collected from drinking water wells and municipal drinking water systems, none of those samples have ever exceeded 20,000 pCi/L. As a result, a value of 20,000 pCi/L in this list does not imply the drinking water standard in EPA’s Safe Drinking Water Act has been exceeded.

After a radioactive leak or spill, tritium is generally the first radionuclide to be identified in groundwater. This is because tritium travels through the soil faster than other radionuclides. Leaks and spills at some sites (e.g., Indian Point, Braidwood) involved nuclides other than tritium (e.g., Cobalt-60, Cobalt-58, Cesium-134, Cesium-137, Strontium-90, Nickel-63), but those radionuclides are not included in this list.

## **Summary**

There are 65 locations in the United States where commercial nuclear power plants are or have been recently operating. Records indicate 46 of these sites have had leaks or spills that involved tritium concentrations greater than or equal to 20,000 pCi/L at some time during their operating history. Seven sites are currently reporting tritium, from a leak or spill, in excess of 20,000 pCi/L. Although many sites have had leaks or spills involving tritium, no site is currently detecting tritium in the offsite environment, or in drinking water, in excess of 20,000 pCi/L.

Tritium rapidly disperses and dissipates in the environment, and as a result, tritium from leaks and spills is typically not detected outside the facility boundary. The historical data indicates in only one instance, at Braidwood, was tritium from a leak or spill found in the offsite environment in excess of 20,000 pCi/L. All samples from Braidwood since 2008 indicate tritium is no longer present in excess of 20,000 pCi/L in either the onsite or the offsite environment.

**List of Historical Leaks and Spills At U.S. Commercial Nuclear Power Plants**

It is imperative that the preceding paragraphs accompany any reproduction of this list so that the information is communicated in the proper context.

January, 2017 updates

| Plant             | Historical Maximum Tritium Concentration, pCi/l | Date of Historical Maximum Tritium | Current Concentration of Tritium, pCi/l |
|-------------------|---|------------------------------------|---|
| Beaver Valley     | 25,583  | September, 2010                    | 8,809                                   |
| Braidwood         | 247,000   | 1998                               | 1,690                                   |
| Browns Ferry      | 7,520,000                                       | January, 2015                      | 8,630                                   |
| Brunswick         | 19,000,000                                      | December, 2010                     | 280,943                                 |
| Byron             | 82,000  | February, 2006                     | 623                                     |
| Callaway          | 1,600,000                                       | July, 2014                         | 1,957                                   |
| Catawba           | 47,500  | October, 2007                      | 4,450                                   |
| Columbia          | 270,000   | March, 1993                        | 1,300                                   |
| Davis-Besse       | 37,500  | October, 2008                      | 2,200                                   |
| Dresden           | 10,312,000                                      | July, 2004                         | 251,000                                 |
| Duane Arnold      | 2,150,000                                       | October, 2012                      | 2,700                                   |
| Fitzpatrick, J.A. | 105,000   | April, 2010                        | 4,136                                   |
| Ginna, R.E.       | 20,000  | 1995                               | Not detectable                          |
| Grand Gulf        | 2,240,000                                       | March, 2014                        | 2,240,000                               |
| Hatch, E.I.       | 6,840,000                                       | September, 2011                    | 22,000                                  |
| Indian Point      | 14,800,000                                      | February, 2016                     | 1,000,000                               |
| Limerick          | 3,950,000                                       | February, 2009                     | 369                                     |
| LaSalle           | 1,230,000                                       | July, 2010                         | 11,000                                  |
| Millstone         | 4,000,000                                       | November, 2007                     | 8,110                                   |
| Monticello        | 21,300  | September, 2009                    | 451                                     |
| Nine Mile Point   | 44,000  | August, 2012                       | 251                                     |
| North Anna        | 79,559  | August, 2013                       | 5,500                                   |
| Oconee            | 45,000  | December, 2011                     | 7,830                                   |
| Oyster Creek      | 10,000,000                                      | 2009                               | 2,250                                   |
| Palisades         | 217,351   | December, 2009                     | 13,560                                  |
| Palo Verde        | 4,200,000                                       | March, 1993                        | Not detectable                          |
| Peach Bottom      | 196,000   | March, 2010                        | 9,010                                   |
| Perry             | 59,900  | 2006                               | 231                                     |
| Pilgrim           | 69,000  | December, 2013                     | 5,080                                   |
| Quad Cities       | 7,500,000                                       | 2008                               | 15,700                                  |

|                   |            |                |                |
|-------------------|------------|----------------|----------------|
| River Bend        | 1,135,000  | February, 2013 | 577,000        |
| Salem             | 15,000,000 | April, 2003    | 47,900         |
| Seabrook          | 750,000    | 1999           | 2,080          |
| Sequoyah          | 25,060     | 2015           | 9,547          |
| St. Lucie         | 161,000    | 2000           | 2,100          |
| Summer            | 23,000     | July, 2011     | 1,500          |
| Surry             | 31,900     | October, 2007  | 9,000          |
| Susquehanna       | >20,000    | 1995           | Not detected   |
| Three Mile Island | 900,000    | 1981           | 8,360          |
| Turkey Point      | >20,000    | 1979           | 3,816          |
| Vogtle            | >20,000    | 1990s          | <1,000         |
| Waterford         | 22,000     | 1997           | Not detectable |
| Watts Bar         | 550,000    | February, 2005 | 3,362          |