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U.S. Nuclear Regulatory Commission
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Braidwood Station, Units 1 and 2
Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. STN 50-456 and STN 50-457

Subject: 2006 Triennial Chlorine Survey Report

The purpose of this letter is to transmit the results of the 2006 Triennial Chlorine Survey. In support of Braidwood Technical Specification (TS) Amendment No. 60 issued on February 28, 1995, a commitment was made to perform chlorine surveys every three years and to perform associated evaluations to ensure that the risk to the control room personnel from any potential chlorine accident is maintained sufficiently small. Additionally, a commitment was made to document the results in its annual reports. The chlorine surveys and associated evaluations have been performed since issuance of Braidwood TS Amendment No. 60. However, the results have not been documented in any annual report. To satisfy this commitment, the latest Triennial Chlorine Survey results are provided in Attachment 1. Additionally, this issue has been captured in our corrective action process.

If you have any questions regarding this matter, please contact Mr. Dale Ambler, Regulatory Assurance Manager, at (815) 417-2800.

Sincerely,



Keith J. Polson
Site Vice President
Braidwood Station

Attachment: 2006 Triennial Chlorine Survey Report

ATTACHMENT 1

2006 Triennial Chlorine Survey Report

2006 Triennial Chlorine Survey Report

1. Executive Summary

A triennial survey of potential sources of chlorine was conducted by Braidwood Station to ensure that the risk to the control room personnel from any potential chlorine accident is maintained sufficiently small. It was necessary to determine if there were any stationary users or transports of chlorine that would exceed the minimum acceptable quantities within calculated minimum acceptable distances. A Chlorine Production Report (Reference 1) was obtained from The Chlorine Institute, Inc., and provides a list of chlorine producers and suppliers. Disaster agencies of Will, Grundy and Kankakee Counties were contacted to provide information regarding users of chlorine in their county. Municipal Water and Wastewater Treatment Facilities within a 10-mile radius of the plant were contacted. The Santa Fe and the Union Pacific Railroads were also contacted to determine if there were any shipments of chlorine via their railroad tracks that are within a 10-mile radius of Braidwood Station. The suppliers to the chlorine users within a ten mile radius were then contacted to determine if there were any shipments of one ton containers or greater via Illinois Route 53 or 129.

The results of this survey indicate that there are no stationary users of chlorine within the minimum allowable distances, there are no normal truck shipments of significant size within the minimum allowable distances and the probability of an accident via railroad is not considered credible. Therefore, an accident involving chlorine is not considered a credible design basis event that could affect Control Room Habitability.

2. Background

Original licensing of Braidwood Station required a survey of industries and transportation routes in the site vicinity that may use, store, and/or transport hazardous chemicals. In support of removal of the chlorine monitors for the control room intake an analysis was performed and the results provided to the NRC in a letter dated June 3, 1986. The analysis involved a survey of offsite sources of chlorine within 5 miles of the station, a calculation of the toxic gas and infiltration, and a probability of the rupture of a chlorine tank car on the Norfolk and Western Railroad. By letter dated March 4, 1987, the NRC staff approved the proposal to remove the chlorine detectors from the control room ventilation system. In its safety evaluation, the NRC staff required Braidwood Station to demonstrate that the control room ventilation could be isolated, and required Braidwood Station to demonstrate annually the control room integrity as it relates to the chlorine intrusion concern. By letter dated May 6, 1987, Braidwood Station submitted a request to include a Technical Specification (TS) surveillance to verify that the control room ventilation can be placed in the recirculation mode manually and committed to demonstrate control room integrity. This commitment and TS Surveillance were approved with the issuance of NUREG-1002, Supplement 3, "Safety Evaluation Report," dated May 1987.

By letter dated January 5, 1994, Braidwood Station provided a new evaluation and survey to demonstrate that the chlorine hazard to the control room had become practically zero. This analysis was initiated because the Norfolk and Western Railroad tracks near the vicinity of Braidwood Station were removed, thereby reducing the potential for a chlorine spill. The 1986 analysis and subsequent requirement to demonstrate control room ventilation integrity were based on the fact that chlorine was transported on the railroad tracks.

The 1994 analysis was completed by Sargent & Lundy engineers to evaluate the effects of a postulated offsite chlorine release on control room habitability and was conducted in two parts. The first part consisted of calculating the minimum distance from the control room intake as a

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function of chlorine spillage. This calculation determined that, for a one-ton spillage quantity, the minimum distance from the control room intake to meet the Regulatory Guide 1.95, "Protection of Nuclear Power Plant Control Room Operators Against an Accidental Chlorine Release," Revision 1, January 1977, limit of parts per million, is 4900 feet. The calculation also determined that the minimum acceptable distance for a stationary 90-ton spillage to be 6.4 miles.

The second part of the analysis consisted of conducting a survey of stationary users of chlorine and transported shipments of chlorine. Sargent and Lundy conducted the stationary chlorine survey within the 10-mile radius of the station, because it would envelope the critical radius of 6.4 miles for the largest container size, which is 90 tons. The results of the survey showed that there were no stationary users within the ten miles that would pose a toxic threat to control room personnel. Sargent and Lundy then conducted a transported chlorine survey within a 10-mile radius of the Braidwood Station. The survey indicated that there were no railroads within this radius that could transport chlorine and the largest shipment by truck would be one ton. The analysis determined the probability of an accidental release from a truck on State Route 50 or 129, which are near Braidwood Station, to be 2.0×10^{-6} . The probability that when the concentration of chlorine in the control room reaches toxic limit, it will incapacitate the operators and cause a core damaging accident resulting in fission products release in excess of 10 CFR Part 100 is below 0.1. With the probability of chlorine release of 2.0×10^{-6} , the overall probability of such an event is, therefore, within the acceptable limits of NUREG-0800, SRP 2.2.3.II. The analysis concluded that because of low probability of release from a transported chlorine source and no potential for stationary chlorine release that could pose a threat to control room habitability, the requirement to demonstrate annually the control room ventilation integrity as it relates to the chlorine intrusion concern and the surveillance requirement to demonstrate manual isolation of the control room ventilation could be removed. Removal of this surveillance requirement was issued in Braidwood TS Amendment No. 60. In support of this TS Amendment, a commitment was made to perform chlorine surveys every 3 years and to perform associated evaluations to ensure that the risk to the control room personnel from any potential chlorine accident is maintained sufficiently small. Additionally, a commitment was made to document the results in its annual reports. The commitment to periodically survey the Braidwood vicinity for potential new sources of chlorine provides assurance that no new toxic threats to the control room habitability will go unnoticed.

3. 2006 Chlorine Survey Results

Calculations were performed to determine the minimum acceptable distances as a function of spillage quantity based on standard shipping size containers. The minimum acceptable distances from the intake are 1460 feet, 4900 feet, 3.3 miles, 4.9 miles and 6.4 miles for 150 pound cylinder, one ton container, 20 ton tanker truck, 50 ton railroad tank car and 90 ton railroad tank car, respectively.

A survey was performed to determine if there were any stationary users or transports of chlorine that would exceed the minimum acceptable quantities within the distances specified above. A list of chlorine producers and suppliers was obtained from the Chlorine Institute. Disaster agencies of Will, Grundy and Kankakee Counties were contacted to provide information regarding users of chlorine in their county. Table 1 provides information obtained from reviewing county documents regarding chlorine users. Municipal Water and Wastewater Treatment Facilities within a 10-mile radius of the plant were contacted. Table 2 provides a list of the local municipalities contacted and information regarding chlorine usage and their

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suppliers. The Santa Fe and the Union Pacific Railroads were also contacted to determine if there were any shipments of chlorine via their railroad tracks that are within a 10-mile radius of Braidwood Station. The suppliers to the chlorine users within a 10-mile radius were then contacted to determine if there were any shipments of one ton containers or greater via Illinois Route 53 or 129. Table 3 provides a list of the suppliers contacted and information obtained regarding chlorine usage. The results revealed that there are no stationary users that exceed the minimum acceptable quantities within the allowable distances. Stationary users within a 10-mile radius used 150-pound containers or less.

The survey revealed that there is no increase in the probability of truck shipments that exceed the minimum acceptable quantities within the allowable distances. Information obtained from the Chlorine Institute revealed that local suppliers shipped chlorine in one-ton containers or less. Hawkins Supplies, Alexander Chemical Company, Hydrite Chemical Company, Uhlich Chemical Inc., and Rowell Chemical Corporation were contacted to verify the size of shipments transported. Illinois Route 53 or 129 were determined not be practical routes for shipping one ton or greater containers of chlorine via truck.

Information obtained from the Union Pacific and Burlington Northern Santa Fe (BNSF) Railroads revealed that the most recent yearly number of chlorine shipments within a 10-mile radius of Braidwood Station is 30. In accordance with Regulatory Guide 1.78, "Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release," June 1974, rail shipments of 30 or more are considered frequent. Therefore, an analysis was performed in accordance with NUREG-0800 to determine if a chlorine release is considered a credible accident. Utilizing the following equation (consistent with the Sargent & Lundy evaluations described above in support of Braidwood TS Amendment No. 60):

$$f = f_T \times n_{cl} \times d_{cl} \times p_{r/a} \times p_{w/a}$$

Where:	f	=	the frequency of a chlorine accident release due to a rail accident
	f_T	=	the frequency of a chlorine release due to a rail accident
	n_{cl}	=	the number of chlorine shipments per year
	d_{cl}	=	the applicable rail distance traveled per shipment of chlorine
	$p_{r/a}$	=	the probability of release given a train accident
	$p_{w/a}$	=	probability that the wind is blowing towards the plant

the probability of an accident involving a release from a rail tank car containing chlorine that would affect habitability of the control room was calculated to be 1.47×10^{-9} .

Based on the guidance in NUREG-0800 Section 2.2.3, accidents are not considered credible if their frequency is demonstrated to be less than 1×10^{-6} /year based on conservative assumptions or less than 1×10^{-7} /year based on realistic data and assumptions. Therefore, chlorine release due to a train accident remains a non-credible accident.

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4. Conclusion

The results of this survey indicate that there are no stationary users of chlorine within the minimum allowable distances, there are no normal truck shipments of significant size within the minimum allowable distances and the probability of an accident via railroad is not considered credible. Therefore, an accident involving chlorine is not considered a credible design basis event that could affect Control Room Habitability.

5. Reference

1. The Chlorine Institute, Inc., "Pamphlet 10, North American Chlor-Alkali Industry Plants and Production Report – 2004," April 2005.

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**Table 1
County Agencies Contacted**

Organization	Reportable users of chlorine within 10-mile radius of Braidwood Station?
Emergency Services and Disaster Agency of Will County	None
Emergency Services and Disaster Agency of Grundy County	None
Emergency Services and Disaster Agency of Kankakee County	None

**Table 2
Municipalities Contacted Regarding Chlorine Usage**

Municipality	Contact	Phone	Chlorine Usage	Supplier
Wilmington	Ken Jeffries	(815) 476-6732	150 lb. cylinders	Alexandra Chemical
Braidwood	Dave Tutterow	(815) 651-9487	150 lb. cylinders	Alexandra Chemical
Coal City	Jerry Patton	(815) 634-8731	150 lb. cylinders	Ulrich Chemical
Diamond	Jerry Patton	(815) 671-0034	None	N/A
Gardner	George Churchill	(815) 237-2592	150 lb. cylinders	Ulrich Chemical
South Wilmington	George Persak	(815) 237-2830	150 lb. cylinders	Ulrich Chemical
Braceville	Randy Berry	(815) 274-3653	150 lb. cylinders	Ulrich Chemical
Mazon	Jeff Marques	(815) 448-2206	55 gallon drums	Ulrich Chemical
East Brooklyn	George Persak	(815) 237-2830	150 lb. cylinders	Ulrich Chemical
Godley Park District	Joe Cosgrove	(815) 458-6129	55 gallon drums	Ulrich Chemical

**Table 3
Suppliers of Chlorine**

Supplier	Contact	Phone	Supplies only one ton or less?
Hawkins Supplies	Mike Carroll	Contacted via e-mail	Yes
Hydrite Chemical Company	Greg Michaelson	(847) 540-5811	Yes
Ulrich Chemical, Inc.	Brian Pitkin	(317) 898-8632	Yes*
Rowell Chemical Corporation	Kip Coco	(630) 920-8833	Yes
Alexandra Chemical Corporation	Gil Leavitt	(630) 955-6050	Yes

* Rail car would be the next larger size.