Item 32

Water Fowl (Scaup) Entrainment Incident Report (June 2000)

NIAGARA MOHAWK POWER CORPORATION

Nine Mile Point Nuclear Station
Oswego County
Lycoming, New York

Duck Impingement Report/Unit 1

May 2000

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1.0 Introduction

On January 28, 2000 it was documented that Unit 1 had impinged approximately 100 (Aythya Marile) Greater Scaup and (Aythya Affiance) Lesser Scaup ducks in the screenwell building of Unit 1 in the vicinity of the bar trash racks and the traveling water screens. It was estimated at the time that approximately 500-700 ducks had been rafting on Lake Ontario in the vicinity of Unit 1's intake structure. The evening prior to this documented event, the plant had been placed into a reverse flow condition for deicing of the hexagonal intake structure located approximately 850 feet offshore. It is suspected that this reverse flow condition had contributed to the impingement of these ducks.

The New York State Department of Environmental Conservation, Region 7, Divisions of Water and Fish & Wildlife as well as the United States Fish and Wildlife Service (Cortland, NY office) were informed of this incident. Per the request of the U.S. Fish and Wildlife, their Enforcement Division was contacted to arrange for the pick-up of the carcasses for forensic analysis. The carcasses were picked-up on February 8, 2000, at the time of this report NMPNS had not received any analysis report from the governing agency.

On March 2, 2000, seven live ducks were observed by station staff swimming in front of screens 11, 12 and 13 in the Unit 1 screenwell. Once again the U. S. Fish & Wildlife were contacted regarding these live ducks (the same species as noted from the January 28th event) and to provide any advice for the rescue of these fowl. Because of the water level below the access deck in the screenwell building (the water level is approximately 20 feet below this deck), no safe solution was determined; therefore, the ducks were left in the screenwell and daily observations have been made by Environmental Protection personnel.

This report summaries the event, the background and analysis on this event and a corrective action/preventative measures to close out the DER related to this impingement issue. The DER, DER No. 1-2000-0323, was initially signed on January 28, 2000 with a completed close out date of June 6, 2000.

2.0 System Description

The NMPNS, Unit 1 utilities a 1,850-megawatt (thermal) boiling water reactor that was designed and manufactured by General Electric Corporation along with a turbine generator that has a net electrical output of 610 megawatts. This unit uses a once-through, non-contact, cooling water system to dissipate thermal energy from the condensers and auxiliary service water cooling. The cooling water is withdrawn from Lake Ontario by via the intake structure that is located approximately 850 feet from the existing shoreline, this intake structure is a hexagonal concrete structure located in approximately 18 feet of water (mean lake level). This intake structure has six inlet panels that are 5 feet high by 10 feet in length, these are guarded by galvanized steel racks (10" mesh size) to prevent large objects from entering the intake tunnel. The maximum intake velocity at this point is 2 feet per second.

Once the cooling water enters the intake, it flows through the intake tunnel (10 feet in diameter with a maximum velocity of 8fps) and flows through the bar trash racks and intake through-flow traveling screens. The trash racks are used for the removing of large items, this is the location of removal of the impinged ducks from the January 28, 2000 event. The through flow traveling screens, with an approach velocity of approximately 0.85 fps, periodically rotate and are washed to remove accumulations of debris and matter (including impinged organisms) that have passed through the trash racks, this material is sluiced to the return line that discharges into Lake Ontario.

After the cooling waters have passed through the plant (250,000 gallons per minute for the main circulating water system and approximately 18,000 gpm for the service water system), the water is discharged back to Lake Ontario through a 10 foot diameter tunnel with the velocity being 8fps in the tunnel. The circulated cooling water is then discharged to the lake through the discharge structure that is located in approximately 8.5 feet of water (mean lake level) about 335 feet from the existing shoreline. The discharge velocity through this structure is approximately 4fps.

3.0 Avian Species

The coastal area of Lake Ontario supports a large number of avian species. Numerous species migrate through this area on their way to winter/summer holding regions and some utilize the coastal area for such. This area is recognized as an established corridor within the Atlantic Flyway for migrator waterfowl and birds of prey (raptors).

During the winter months, a large number of waterfowl (ducks & geese) congregate along these coastal areas including the waters in the vicinity of the NMPNS. This over wintering population of waterfowl includes Greater Scaup (Aythya Marile) and Lesser Scaup (Aythya Affiance), Golden Eye (Bucephala Clangule), Merganser (Mergus Merganser), Canvasbacks (Aythya Valisineria), and Oldsquaw (Chamgula Hyemalis). The Lesser Scaup are the most abundant for this time of the year (winter) with Canvasbacks and Oldsquaw have the least numbers in the winter.

The Scaups may mass in large rafts numbering from the hundreds and into the thousands. During the Fall and Winter months this Federally Protected waterfowl is hunted on open waters of large lakes and bays. The hunting season is regulated by both the U. S. Fish & Wildlife and the state regulatory authority (the NYSDEC in this case). During the Spring and Summer Scaups frequent smaller bodies of water such as ponds and marsh lands. The combined populations of Greater and Lesser Scaups form the second largest population of ducks (Mallards are at the top of the list), but there populations have been on a downward swing in the late 1990's.

The Lesser Scaups have one of the more extensive breeding ranges of any North American species of ducks. Their breeding area extends from Minnesota west to northern California (Southern boundary) and north to the Bering Sea and eastwardly to the Northwest Territories in Canada. Smaller colonies of Lesser Scaup have been known to breed in Eastern Canada, but for the most part they breed in the Northwest portion of the continent. They winter in the Eastern half of the continent with their fall migration routes heading in a southeasterly direction from Alaska to the eastern seaboard and the Gulf of Mexico.

Scaups feed by diving to depths of 10-25 feet deep and have been known to dive to depths of 40 feet on occasion. They primarily feed on aquatic animal life (fish), but have been known to feed on seeds and leafy structures. The presence of zebra mussels in the waters of Lake Ontario also provide the Scaup with a new food source. The density of zebra mussels have been found to number into the hundreds of thousands per square meter in Lake Ontario providing and excellent food source for these waterfowl. (Zebra Mussels are very prevalent in and around NMPNS Unit 1 intake structure).

4.0 Impingement Events

NMPNS Environmental Protection researched available plant sources to determine if previous duck impingement events had been reported to the NYSDEC in years past. Information regarding such events are listed below:

- AEP's Cook Nuclear Station, December 1991 - January 1992 - Lesser & Greater Scaup (Aythya Marile & Aythya Affiance)

  A large unspecified number of ducks were discovered on a daily basis in the screenwash in the facility's forebay during this time period. The controlling federal and state agencies performed autopsies on the impinged ducks and determined that they had been feeding on zebra mussels. Numerous techniques were employed to scare the ducks away from the plant's intake structure that met with minimal success. The removal of the food source (the zebra mussels) proved to be the most successful method to eliminate/minimize the impingement of Lesser & Greater Scaup.

- NMP-1, December 28-29, 1993: - Lesser & Greater Scaup (Aythya Marile & Aythya Affiance)

  On December 28 & 29, 1993, 2 ducks were collected as part of a 24 hour impingement sample event as required by the facility's SPDES Permit biological monitoring program. The ducks were identified as one Lesser Scaup and one Greater Scaup. The ducks were collected after the screen wash operation, these ducks would have been discharged to the lake without NMP personnel noticing the duck impingement.

- JAF, January 15 & 16, 1994: Lesser & Greater Scaup (Aythya Marile & Aythya Affiance)

  EA Engineering identified ducks in the JAF fish/debris baskets.

- NMP Unit 1, January 15 & 16, 1994: Lesser & Greater Scaup (Aythya Marile & Aythya Affiance)

  Environmental Protection performed a review of all correspondence between NMP and the NYSDEC. No correspondence associated with the duck kill for this event was discovered. In addition to this review, the DER database was searched for information regarding the 1994 incident. There were no DERs written on the event.

  Documentation was found that the Supervisor of Environmental Protection contacted EA Engineering, Science and Technology about the ducks found in the NMP-1 intake screenwell. EA identified the ducks as 28 Greater Scaup and 3 Lesser Scaup. EA Engineering contacted Dr. Guy Baldassarre of SUNY-College of Environmental Science and Forestry for possible causes of the duck impingement. Dr. Baldassarre supported two likely causes: 1) The ducks while feeding, had gotten caught under an ice edge and drowned. 2) They could have been feeding on zebra mussels attached to the intake structure and were sucked in and drowned within the intake system.

4.0 Impingement Events (Cont'd)

- JAF, 1997: Lesser & Greater Scaup (Aythya Marile & Aythya Affiance)

  Mr. Robert Brown from the JAF nuclear facility was contacted about the 1997 duck kill event. Mr. Brown stated that no specific operational changes or structural changes were made to prevent future reoccurrence.

- RGE, Ginna Station~1998: Lesser & Greater Scaup (Aythya Marile & Aythya Affiance); no additional information is available.

- NMP Unit 1, January 2000: Lesser & Greater Scaup (Aythya Marile & Aythya Affiance)

  Following the realignment of the plant circulating water system from reverse flow to normal flow configuration, approximately 100+ bluebill ducks (Aythya Marile & Aythya Affiance) were impinged.

5.0 Preventative Measures

On March 30, 2000, the Utility Water Action Group, through the request of NMPC Environmental Affairs Department, requested that it's members provide any available information regarding duck impingement that they may have experienced in the past. At the time of this report, only one member company (AEP) had responded regarding their experience with impingement of waterfowl at their facilities. However, the AEP official from their corporate environmental office, had stated that their facilities had not experienced the magnitude or the frequency that had occurred at the NMPNS Unit 1 over the last few years.

On March 24, 2000, NMPNS's Environmental Protection staff had received additional information from AEP's Cook Nuclear Plant. In 1992 the Cook Station had also experienced a duck impingement event that resulted in a number of preventative techniques that were employed to deter ducks away from the station's intake structure. These measures included blanks being shot from the shoreline and from an inflatable boat, and the deployment predator "owl's eyes" on rafts. These measures were only marginally effective and were torn away from their moorings in foul weather conditions. The Cook Station even employed the use of a helicopter that temporarily scattered the rafted ducks. The measures listed above only provided short-term solutions, their long-term solution was the removal of the food source from the intake structure that provided to be very successful. NMPNS Unit 2 and JAF currently have a preventative maintenance procedure in place to clean their intake structure.

5.1 Structural Measures

One of the possible solutions for avoiding a duck impingement during reverse flow operations at Unit 1 is to relocate the opening for intake streaked to a depth that will be out of the diving depth/range of the ducks.

Referring to Figure III-21 of the UFSAR (Updated Final Safety Analysis Report for Nine Mile Point Unit 1), the bottom of the intake tunnel is located approximately 60 feet below the surface of the lake. Water enters the intake tunnel at approximately 18 feet below the lake surface via a vertical bell shape tunnel that connects to the horizontal tunnel. The intake tunnel is 1100 feet long.

In order to relocate the intake structure another 20 feet in depth, a new vertical tunnel would need to be cut and a new structure located atop of this new shaft. This will be a major construction project and for the work to be performed approximately 40 feet below the lake surface. This will incur an exorbitant construction cost and have a significant impact on the plant operating safety. This would also increase the risk of worker safety during the construction stage if construction were to be initiated.

In regards to the plant safety issue, Lake Ontario is the ultimate heat sink for the decay heat removal from the nuclear fuel and for the overall unit cooling system. The Service Water System provides lake water to cool various safety and non-safety related components and systems throughout the plant. The major components to which the Service Water System provides cooling water for are: Reactor Building Closed Loop Cooling (RBCLC) Heat Exchangers, Turbine Building Closed Loop Cooling Heat Exchangers, Various Reactor Building HVAC Systems, Turbine Building HVAC Systems, Radwaste Building Coolers, etc. The continuous availability of the supply of cooling water to these systems is absolutely essential to plant safety.

5.1 Structural Measures (Cont'd)

The Service Water System is needed while the plant is online or in outage situation. The cooling water to the Spent Fuel Pool is provided by the RBCLC which is provided by the Service Water System. If a construction project is undertaken, the flow to the Service Water System from the lake will need to be shut off. A secondary water supply to the Service Water System could be engineered but a reliability risk would be associated with such a system. This will increase the chances of an accident and could endanger the life and health of the public. This type of activity would likely be prohibited by Nuclear Regulatory Commission (NRC) regulations.

5.2 Administrative/Procedural Action

The intake structure most likely is infested with zebra mussels. The intake structure is approximately 9 feet above the natural lake bottom and 9 feet from the surface. The location of the intake structure provides an environment that is conductive to propagate zebra mussels and a readily available source of the food that the ducks can feed on (buffet). One possible solution to reducing the number of ducks impinged is to remove this food source. This would require mechanical cleaning of the intake structure by divers. Preliminary inquires to the NYSDEC indicates that no specific NYSDEC permits is required for the removal of the mussels.

Environmental Protection will have to submit a letter to the Regional Permit Administrator prior to performing the work.

After the initial cleaning of the intake structure, a program will need to be established to control the population of mussels on the intake structure. Two methods are proposed: 1) Schedule a mechanical clean approximately every year (based on life cycle of asiatic/zebra mussel). 2) Perform a thermal treatment of the Unit 1 intake structure yearly. The NYSDEC had approved a thermal treatment process, however, on January 19, 1995 NMP Environmental Protection notified the NYSDEC that NMP-1 would not be thermally treating the intake structure due to engineering and safety concerns. Due to the regulatory requirements associated with a thermally treat schedule of the intake structure, it is recommended that a mechanical cleaning be scheduled every year.

In addition to the above cleaning operation, the operation procedure, N1-OP-19, could be revised to control the return to normal flow configuration from a reverse flow operations during time periods when the waterfowl in question are in a less active feeding mode. These exclusion times would be an hour before and after both sunrise and sunset.

5.3 Termination of Reverse Flow Operation

Another possible solution to avoid the duck impingement is to eliminate the reverse flow operation and provide an alternative to deicing the intake structure. The reverse flow operation is performed a few times a year under extremely cold conditions during the winter months. On very cold, clear calm nights radiant cooling from the lake results in ice forming around the opening of the intake structure. In order to melt the ice and warm up the water temperature around the opening of the intake tunnel, warm water from the plant is discharged through the intake tunnel.

The only way the water around the opening of intake tunnel could be kept warm is to install heaters at this location. The high circulating water flow would require installation of very large heaters for the purpose of deicing, these heaters would have a large draw on house services for electrical power. Again, this will involve a significant construction project with exorbitant costs. This project seems impractical and presents risks.

6.0 Conclusion

In conclusion, the impingement numbers of Greater and Lesser Scaup at Unit 1 could be greatly reduced if not totally mitigated all together by setting into place procedural controls/modifications in addition to the removal of the food source from the intake structure. The procedure for reverse flow operations, N1-OP-19, has been modified to make operations personnel aware that the return to normal flow operations can only occur during periods, when the ducks in question are in their less active feeding mode. This time frame would be from an hour after sunrise to an hour before sunset, and from an hour after sunset to an hour before sunrise. However, a previous will be included in this procedure to return to normal operation during the exclusion time in periods of emergency icing conditions when plant safety dictates such an override of the procedure.

In conjunction with the above recommended procedural modification, it is recommended that the removal of the food source (Zebra Mussels) at the intake structure be initiated by cleaning the intake structure in the late summer or early fall. A PID, # N26361, was initiated on May 11, 2000 and was assigned to Unit 1 Maintenance to have this task completed on an annual basis. In performing this measure, NMPNS Unit 1 would eliminate a food source for the ducks. This has been demonstrated as a cost-effective measure at AEP's Cook Nuclear Station as a mitigating measure.

7.0 References

1. DER 1-2000-0323
2. Final Environmental Statement, NMP-1 & NMP-2
3. NMP-1 USAR
4. P&ID No. C-15451-C, C-15449-C, C-15448-C
5. Alert - Request for Duck Impingement Information, Hunton & Williams dated March 30, 2000.
6. Ducks, E-mail, from G. Michael McPeck to Kent Stoffle, April 8, 2000
7. Duck found in the NMP-1 Intake Area, EA Engineering, January 18, 1994
8. Request to Mr. Michael J. Calaban to Perform a Thermal Treatment of the NMP-1 Intake Structure, H. Flanagan, October 28, 1994
9. NYSDEC Approval; Mr. Paul Kolokowski, December 9, 1994
10. Telecon to Mr. Michael J. Calaban from H. Flanagan, Cancellation of Thermal Treatment at NMP-1, January 19, 1995.
11. Environmental Report Operating License Stage Nine Mile Point Nuclear Station-U2, Section 2.4.1.1.3.2.
12. AEP's, Cook Nuclear Plant Report, Ducks Attempt to Control Zebra Mussel Infestation on Lake Michigan, by Mr. John P. Carlson and Mr. Eric C. Mallen, February 1992.
13. Memorandum from W. J. Holzhauer to Ms. Janet Marsden, Duck Kill at Nine Mile Point Unit One, March 17, 2000