



CMD 25-M24 - CNSC Staff Submission

Increased Fish Impingement at Bruce A NGS

Classification	UNCLASSIFIED
Type of CMD	Original
CMD Number	25-M24
Reference CMD(s)	N/A
Type of report	Event Initial Report
Public meeting date	June 3, 2025
Word e-Doc #	7475758 – EN 7522846 – FR
PDF e-Doc #	7522833 – EN 7522842 – FR
Summary	<p>This CMD is an Event Initial Report to provide further details to the Commission regarding an increased fish impingement event that occurred at Bruce A NGS beginning in February 2025. This report outlines an overview, implications, and actions taken and planned by CNSC staff and Bruce Power for this event.</p> <p>Preliminary information on this event was presented to the Commission as part of a verbal update during the Status Report on Power Reactors (CMD 25-M17) at the Commission Meeting on February 25, 2025.</p>
Actions required	There are no actions requested of the Commission. This CMD is for information only.



CMD 25-M24

Increased Fish Impingement at Bruce A NGS

Signed by:

2025-05-21

X

Signed by: Richardson, Ross

Ross Richardson for

Alex Viktorov

Director General, Directorate of Power Reactor Regulation



EVENT INITIAL REPORT (EIR)

E-DOCS-# 747575t

EIR: Increased Fish Impingement at Bruce A NGS	
Prepared by: Directorate of Power Reactor Regulation (DPRR) and Bruce Regulatory Program Division (BRPD)	
Licensee: Bruce Power Inc.	Location: Bruce Nuclear Generating Station (NGS) A
Date Event was Discovered: 2025-02-13	Have Regulatory Reporting Requirements been met? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Proactive Disclosure: Licensee: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> CNSC: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Overview	
Reporting Criteria: 15) Issues, events, occurrences that the Directors-General (DGs) or their designates judge to have potential for repercussions outside the CNSC and for which the DGs or their designates believe the Commission should be informed.	
Description: Increasing numbers of Gizzard Shad fish were observed being impinged on the Condenser Cooling Water (CCW) intake screens since January 30, 2025. On February 13, 2025, there was a substantial increase in fish impingement, which led to high differential pressure across the CCW traveling screens, and reduced flow through the CCW system, from debris carryover. The impact of the debris carryover on condenser vacuum led to Bruce Power conservatively taking Unit 2 offline via a manual setback to zero power. The significant fish run in the forebay also led to Unit 1 being derated to 87% full power. Unit 3 was in a Major Component Replacement outage, and the Unit 3 CCW pumps were not in service. Unit 4 had also recently begun a Major Component Replacement outage; however, all three of the Unit 4 CCW pumps were still in service. The impacts on the CCW pumps that led to Bruce Power's operator actions on Units 1 and 2 are described in the Causes section below. The Bruce Power Emergency Management Centre (EMC) was partially activated to coordinate planning, resources, and offsite support for this event. On February 15, 2025, Bruce Power transitioned response from the EMC to an Issues Resolution Team stationed at Bruce A to implement the mitigation and contingency action plans. The IRT stood down on March 26, 2025, and Bruce Power continued monitoring of the situation via normal operations.	
Cause(s): There was a significant increase in the number of Gizzard Shad fish entering the forebay and subsequently being impinged on the Bruce A pumphouse cooling water intake traveling screens. The accumulation of impinged fish on the Unit 1, 2, and 4 CCW screens and pump wells caused a high-pressure differential across the CCW traveling screens and debris carryover into the condenser waterboxes. This resulted to multiple pump trips occurring throughout the course of February 13, to all three of the CCW pumps in Units 1, 2, and 4. Due to the impacts this had on maintaining condenser vacuum, this led to Bruce Power's decision to remove Unit 2 from service. A root cause investigation was recently completed by Bruce Power to determine the causes of the increased fish impingement. Bruce Power is also looking at the response to the event, actions that came from previous similar events, whether there were any design or maintenance issues with the travelling screens or recirculation system, and environmental considerations that may have contributed to this event.	
Impact of the Event	
On People: How many workers have been (or may be) affected? None How many members of the public have been (or may be) affected by the event? None How were they affected? N/A	
On the Environment: Under normal operation, fish, algae and other debris that are impinged on the travelling screens are removed, and collected in a basket, where Bruce Power can identify and count the number of fish that are impinged. This data is reported by Bruce Power	

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to Fisheries and Oceans Canada (DFO) for the purpose of demonstrating compliance with the Fisheries Act Authorization, as well as to the CNSC as part of the licensee's environmental monitoring program.

On February 27, 2025, Bruce Power submitted correspondence to the Department of Fisheries and Oceans (DFO), indicating that they exceeded the number of the impinged fish that is permitted by their Fisheries Act Authorization (FAA). Bruce Power has a FAA from DFO which permits the loss of fish up to a maximum of 6,600 kg/yr, using a Habitat Productivity Index (HPI) metric. On May 6, 2025 Bruce Power submitted additional correspondence to DFO with an update on the event. According to the May 6 submission to DFO, it is estimated that a total of between 3,816,056 and 4,951,993 Gizzard Shad had been impinged at Bruce A between January 30, 2025, and March 26, 2025. This equates to approximately 377,548kg and 489,934kg of fish expressed as a HPI, in accordance with the FAA.

Other Implications:

Bruce A has a common forebay that draws water from Lake Huron to provide cooling water to the pumphouses for all units. This water comes in from a deep-water intake channel, 550m offshore, 11m below the surface with a velocity cap. The velocity cap is meant to reduce water velocity at the intake, reducing the number of fish that will end up in the forebay. Bruce A has a common water discharge channel for all cooling water exiting the station that sends warmed water back to Lake Huron. A recirculation system diverts, during the winter months, some of the warmed water back to the forebay to raise the temperature as a means of preventing frazil ice formation (tiny, needle-like crystals that form in water in supercooled, turbulent conditions). These Bruce A structures are depicted in Figure 1 below.

There are three primary systems that draw water from the forebay for cooling purposes: CCW, Low Pressure Service Water (LPSW), and Common Service Water (CSW). Fish impingement and frazil ice accumulation have the potential to block flow through these systems and thus impair the heat removal from reactor fuel and the irradiated fuel bays. Frazil ice is normally mitigated by recirculating warmer discharge water from the operating units back into the forebay. If all units are removed from service during colder weather conditions, there is a greater potential for frazil ice formation in the forebay which could potentially lead to the loss of the cooling systems. Most notably, the loss of LPSW would be a design basis event (DBE) due to insufficient cooling water for decay heat removal from the shutdown reactors.

Licensee Actions

Taken or in Progress:

In response to this event, Bruce Power initiated the following corrective actions to maintain safe operation at Bruce A:

1. Additional measures to ensure that Unit 1 continued to safely remain in operation to provide discharge heat to the forebay. These measures included prevention of condenser macrofouling, and inspection and cleaning of the water boxes to maintain stable condenser pressure.
2. Ensured continued operation of CCW pumps on Units 2 and 4 while the reactors were offline, to divert fish away from the CCW system of the operating Unit 1, distributing them across the CCW systems of three units as opposed to all on the operating Unit 1. An engineering health assessment was completed for all Bruce A CCW pumps, and no issues with their short-term operation were identified.
3. Using their Operational Decision Making (ODM) process, Bruce Power returned Unit 2 to service, initially at a low power, on February 16, 2025. This was to provide additional heat to the forebay and prevent frazil ice accumulation. To ensure stable condenser pressure and safe operation of Unit 2, the same measures (item #1 above) were implemented for Unit 2.
4. Mitigation measures to remove fish from the intake channel, cooling systems (pump wells) and the forebay. In addition to the primary removal methods of the traveling screens and existing debris removal system, supporting methods included manual retrieval with baskets, extraction by submersible pumps and vacuum suction trucks, recirculation gate screen cleaning to clear impingement and blockages, and using a crane and gill net to pull fish from the forebay.
5. Prevention of continued fish ingress into the intake and discharge channels. Methods included inspections and cleaning of, and repairs to, the recirculation gate barrier, the installation of diversion nets at both the intake (i.e., in front of the west end complex bridge) and discharge (i.e., in front of the recirculation gate) channels to minimize fish ingress to the pumphouses, deployment of a net across the forebay, pumping fish from the forebay into dewatering bins, the installation of a mesh screen at the Unit 4 pumphouse inlet to slow the rate of fish movement toward the traveling screens and further divert fish from the operating units, and the maximization of CCW flow at the end of the intake channel by running additional Unit 4 CCW pumps, to further divert fish from Units 1 and 2.
6. Additional monitoring activities to better understand fish movement patterns and densities, interactions with the barriers, and the main points of entry and travel paths. Observations were conducted via aerial drone surveys, recirculation duct cameras and stationary sound navigation and ranging (SONAR) mapping in the forebay. Furthermore, monitoring of the surrounding lake nearshore and offshore fish populations was conducted by underwater remotely operated vehicles (ROV).

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7. As part of their 2025 thermal risk assessment methodology submitted to CNSC staff on March 17, 2025, Bruce Power included an action to further evaluate the impacts from cold shock to Gizzard Shad.
8. Development of a frazil ice mitigation plan focused on the LPSW system, and applying a method to supply additional heat to the LPSW screens.
9. Development of a contingency plan for the safe shutdown of the units should it become necessary. This included actions to ensure there are supplies of heat available to prevent freezing of the pipes in the station.

Bruce Power also raised a Station Condition Record (SCR) for this event to capture all actions taken, as well as initiated a root cause investigation (RCI) to determine the causes, including looking at the response to the event, actions that came from previous similar events, whether there were any design or maintenance issues with the travelling screens or recirculation system and environmental considerations that may have contributed to this event. Results from Bruce Power's RCI will help determine the corrective actions, including modifications and upgrades to plant design, that are necessary for long-term prevention of recurrence.

Bruce Power has also taken action in the area of communicating and working with the relevant regulatory agencies:

1. In accordance with REGDOC-3.1.1, Bruce Power submitted Preliminary Event Report B-2025-447121, *Gizzard Shad Run Impacts Bruce A*, to CNSC staff on February 27, 2025.
2. Bruce Power maintained engagement with the Department of Fisheries and Oceans (DFO) throughout this event, providing periodic updates. Formal correspondences to address the ongoing nature of this event, and implications as they relate to the Fisheries Act Authorization (FAA) were submitted to DFO on February 27, 2025, and May 6, 2025. In addition to the updated estimates of fish impinged at Bruce A, the May 6 submission also included shoreline observations, environmental conditions (i.e., water temperature, weather patterns, lake currents), biological/chemical analysis of the Gizzard Shad, and plant operations (i.e., Bruce A effluent quality and quantity) leading up to and during this event.
3. Bruce Power provided initial notification to the Ministry of Environment, Conservation and Parks (MECP) on February 15, 2025. MECP is the provincial regulatory authority for the Bruce A Environmental Compliance Approval that contains conditions, including release limits, in which Bruce Power must follow. A formal written event report for releases associated with the event and event response was submitted to MECP on February 27, 2025.

Bruce Power maintained communication with the local Indigenous Nations and communities throughout this event. Initial notification of the fish run was provided to Saugeen Ojibway Nation (SON) on January 30, and following this notification began a series of minimum weekly meetings (daily meetings for first week following the on-set of the event) which included SON's technical staff and Leadership representatives. Beginning on February 7 through April 17, weekly written summaries were provided to SON. SON technical staff accompanied Bruce Power Environment staff to the pumphouses on nine occasions between February 3 and April 1. The walkdowns on February 14, 21 and March 20, included more in-depth inspection of the discharge channel, recirculation gate, and forebay, in addition to the pumphouses. On April 10, SON technical staff participated in testing of sound and light fish deterrent systems at the Bruce A discharge.

Bruce Power also engaged with members of the Historic Saugeen Métis (HSM) and the Métis Nation of Ontario (MNO) Region 7, providing initial notification on February 3, 2025, and six follow-up updates between February 10 and April 6, as well as additional verbal discussion and written response to questions raised during regular meetings by both HSM (March 13 and March 31) and MNO (March 12 and March 20). Chippewas of Kettle and Stony Point (CKSPFN) were also provided information about the fish run during a meeting on March 3, and detailed discussion during a station tour on May 1, 2025.

Bruce Power also communicated this event to the public, including informing the mayors of Kincardine and Saugeen Shores, as well as posting updates to their website on February 14, 2025 and March 28, 2025.

Planned:

Bruce Power has additional actions planned in the follow-up to this event:

1. As mentioned above, Bruce Power has completed a RCI to identify the causes of the increased fish impingement, and based on its conclusions will develop and implement mid-term and long-term mitigation measures required to prevent recurrence.
2. Bruce Power indicated that the submission provided to DFO and CNSC on May 6, 2025, represents an interim update on the follow-up to this event that is considered ongoing. Bruce Power committed to submitting additional regulatory reporting to DFO and CNSC by August 29, 2025, that includes a full summary of the root and contributing causes, and actions from the RCI.
3. Continued engagement with the local Indigenous Nations and Communities with respect to follow-up activities.

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CNSC Actions

Taken or in Progress:

When the fish impingement event started on January 30th, on-site inspectors performed a walkdown of the pump house and the traveling screens. A large number of fish were present; however, it was still within the capacity of the travelling screens to remove.

CNSC staff received an immediate verbal notification of the event (Bruce Power taking Unit 2 offline) at approximately 20:13 on February 13, 2025, CNSC staff began closely monitoring the evolution of the situation via routine monitoring.

During the morning of February 14, 2025, CNSC site inspectors conducted inspections of the Bruce A pump houses and confirmed that Bruce Power staff were implementing mitigation measures to remove fish from the cooling systems.

At 15:09 on February 14, 2025, CNSC staff moved from routine monitoring into an enhanced monitoring response level, in accordance with the CNSC Nuclear Emergency Response Plan. CNSC staff's reasons for moving to enhanced monitoring included:

1. The potential for further escalation of fish impingement.
2. The increased risk of insufficient cooling water supply for decay heat removal from the offline units.
3. Bruce Power initially standing up their EMC to coordinate their response to this event.
4. Potential attention from the public, involved organizations and/or media.

Following the escalation to enhanced monitoring, CNSC staff continued close monitoring of the situation, and maintained communication with Bruce Power. Updates on station status, progress of Bruce Power's actions, and CNSC staff's oversight were provided to all relevant stakeholders in a timely manner. This consisted of daily updates to the CNSC Duty Officer and Senior Management, as well as externally to the Federal Nuclear Emergency Response Plan (FNEP), Provincial Emergency Operations Centre (PEOC) and the Government of Canada (GOC).

On February 14, 2025, CNSC staff communicated this event to the public with posts on the CNSC website and on social media, both with links to Bruce Power's initial public statement. CNSC staff posted a subsequent update on their website on March 28, 2025, directing visitors to an updated public statement from Bruce Power.

In the morning of February 17, 2025, CNSC site inspectors conducted follow-up onsite verifications of Bruce Power's mitigation measures for fish removal; this included an inspection of the Bruce A intake channel and the pump houses. Site inspectors observed that the volume of fish impinged had significantly decreased from the previous inspection on February 14, and that it continued to be the gizzard shad species.

In addition, DPRR staff liaised with the CNSC's Corporate and Regulatory Communications staff to prepare information in case of media interest. Information on this event was posted to the CNSC external website. Indigenous Nations and communities in the vicinity of the Bruce NGS were notified of this event by CNSC staff.

At 16:51 on February 23, 2025, CNSC staff terminated the enhanced monitoring response level and returned to routine monitoring. CNSC staff's decision was based on:

1. Unit 1 remained stable at 90% full power and continued to provide recirculation heat to the forebay to reduce the risk of frazil ice formation.
2. Unit 2 was returned to service on February 22, 2025, providing additional recirculation heat to the forebay.
3. The risk of potentially losing cooling water to remove decay heat from this ongoing event had decreased with the return to service of Unit 2 and from the significant reduction of fish observed from the pump houses.
4. The implementation of forebay fish ingress mitigation/prevention measures.
5. Bruce Power stood down their EMC and has transitioned to an Issue Resolution Team that took over coordination of their onsite response activities to this situation.
6. Bruce Power's commitment to continue working with environmental agencies (MECP and DFO) regarding the volume of fish removed. Media/public response to this event was limited and there were no regulatory items of concern.

CNSC staff also informed the local Indigenous communities throughout this event. An email notification was sent to representatives from the Saugeen Ojibway Nation (SON), Historic Saugeen Metis (HSM), and Metis Nation of Ontario (MNO) Region 7. In addition, CNSC staff also met with SON on February 20 and 27, 2025, to provide further details on the event, as well as listen to SON's concerns.

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On March 11, 2025, CNSC site inspectors, accompanied by environmental specialists in the Health Science and Environmental Compliance Division (HSECD) and observers from the HSM conducted a follow-up inspection of the Bruce A pumphouses and forebay to maintain visibility on the progress made with the mitigation measures, as well as verify compliance with regulatory requirements. A response was requested from Bruce Power for two items observed during this field inspection. The items were in relation to the tagging of fish and updates to Bruce Power's Fish Run procedure as a result of the event. CNSC staff were satisfied with the response provided from Bruce Power and no further follow-up was required from this field inspection.

On May 5, 2025, CNSC staff issued formal correspondence to Bruce Power that expressed their regulatory position, as summarized below, for this event, acknowledged Bruce Power's response and actions taken to-date, and stated that the review of all observations and information received is ongoing. CNSC staff noted that this event was an abnormal occurrence that presented challenges to Bruce Power's ability to protect the environment and required the implementation of mitigation measures to maintain safe operation of Bruce A, and raised two Action Items with requests for additional information for items in the areas of environmental impact and the reliability of the cooling water systems. This included a request to re-evaluate the fish impingement and entrainment conclusions made in the 2022 Environmental Risk Assessment (ERA) with consideration of the impacts of this event.

Planned:

Given the notable impact on the fish population and the protection of the environment, and the potential consequences this event had on the safe operation of Bruce A in terms of cooling water supply and the removal of decay heat from the offline reactor units, CNSC staff intend to proceed with the following additional actions in response to this event:

- Through routine surveillance and monitoring processes, maintain continued oversight to verify the effectiveness of the actions Bruce Power implemented above for fish removal and prevention of continued ingress, as well as safe operation of the Bruce A units.
- CNSC staff will continue to review the information received from Bruce Power regarding this event through the normal REGDOC-3.1.1 reporting process, as well as the completed RCI and additional information requested via the Action Items to determine if the actions taken are sufficient and will prevent recurrence, or if further action is required.
- CNSC staff will ensure that any environmental impacts resulting from this event are analyzed and addressed by Bruce Power; this includes working with DFO through the Memorandum of Understanding (MOU) to provide support in their response to the FAA implications.

CNSC staff will continue to inform the local Indigenous communities on the progress of the mitigation measures, and work with them to ensure their concerns with this event are addressed. Due to the interest expressed by SON, CNSC staff have committed to collaborate with SON on all follow-up activities related to this event.

Additional reporting to the Commission Members anticipated:

- ☐ Yes
☒ No

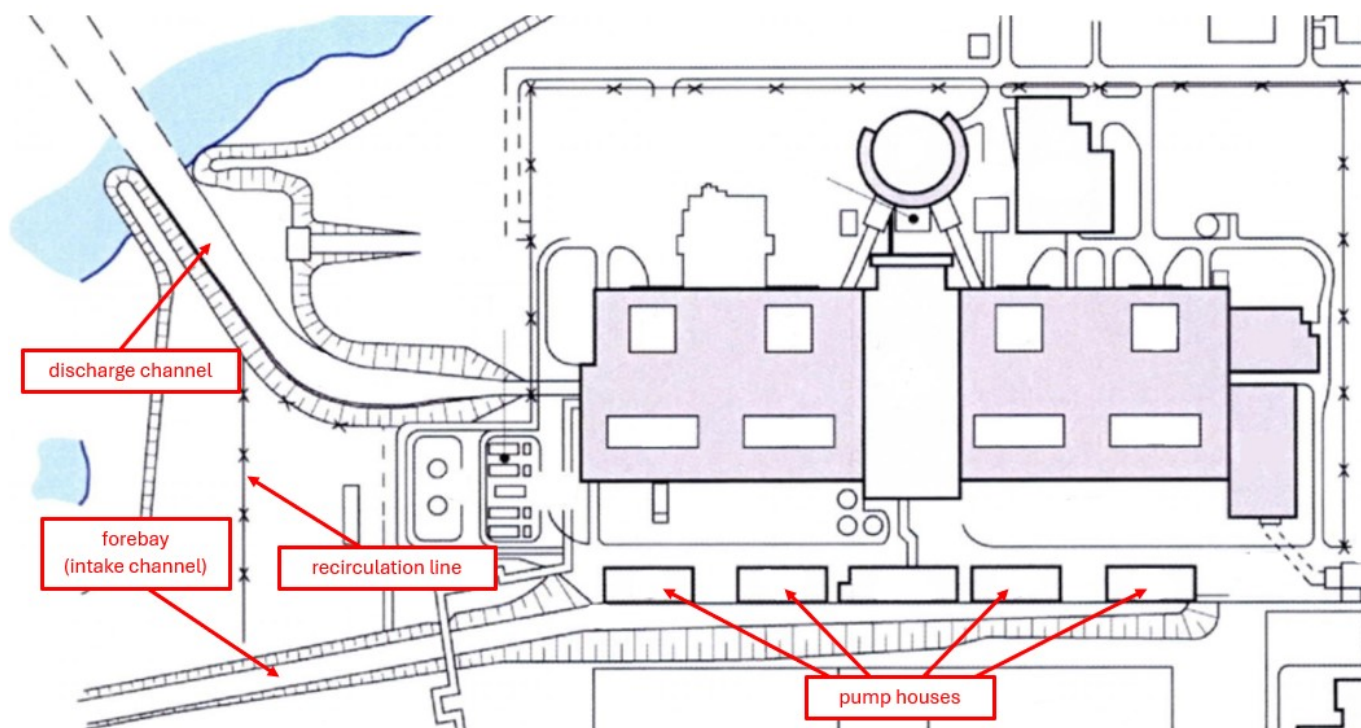


Figure 1: Layout of Bruce A (source: Bruce Power)