From:	Andrews, Sherry E
To:	Miller, Ed
Cc:	Robertson, Jeffrey N; Hentz, Lee A
Subject:	[External_Sender] MNS Ice Condenser Door LAR presentation - 8-12-15
Date:	Monday, August 10, 2015 3:42:27 PM
Attachments:	MNS-TS-3.6.13 new Insert.pdf MNS-TS-3.6.13 current.pdf MNS Ice Cond LID LAR presentation.pdf

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Ed-

Please find attached three documents that I will be using to present the MNS Ice Condenser Door license amendment request (LAR) proposal for our call on 8-12-15 at 13:00.

Please let me know if you have any questions.

Thanks for your time!

Sherry Andrews
Duke Energy
McGuire Nuclear Station
Regulatory Affairs Group
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TS SR 3.6.13: INSERT NEW CONDITION B

CONDITION		REQUIRED ACTION		COMPLETION TIME
B.	One or more lower inlet doors having an invalid open alarm by the Inlet Door Position Monitoring System.	B.1	Verify ice bed temperatures ≤ 27°F.	Once per 4 hours
		AND		
		B.2	Verify affected ice bed temperatures are not on an increasing trend.	Once per 12 hours
		AND		
		B.3	Verify each affected lower inlet door is closed with a remote camera system.	Once per 7 days

3.6 CONTAINMENT SYSTEMS

3.6.13 Ice Condenser Doors

LCO 3.6.13 The ice condenser lower inlet doors, intermediate deck doors, and top deck doors shall be OPERABLE and closed.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

----------NOTE----------

1. Separate Condition entry is allowed for each ice condenser door.
2. Entry into Condition B is not required due to personnel standing on or opening an intermediate deck or top deck door for short durations to perform required surveillances, minor maintenance such as ice removal or routine tasks such as system walkdowns.

CONDITION		REQUIRED ACTION		COMPLETION TIME
A.	One or more ice condenser lower inlet doors inoperable due to being physically restrained from opening.	A.1	Restore lower inlet door to OPERABLE status.	1 hour
B.	One or more ice condenser doors inoperable for reasons other than Condition A or not closed.	B.1	Verify maximum ice bed temperature is $\leq$ 27°F.	Once per 4 hours
		AND		
		B.2	Restore ice condenser door to OPERABLE status and closed positions.	14 days

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Required Action and associated Completion Time of Condition B not met.	C.1 Restore ice condenser door to OPERABLE status and closed position.	48 hours
D. Required Action and associated Completion Time of Condition A or C not met.	D.1 Be in MODE 3. AND D.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.13.1 Verify all lower inlet doors indicate closed by the Inlet Door Position Monitoring System.	In accordance with the Surveillance Frequency Control Program
SR 3.6.13.2 Verify, by visual inspection, each intermediate deck door is closed and not impaired by ice, frost, or debris.	In accordance with the Surveillance Frequency Control Program
SR 3.6.13.3 Verify, by visual inspection, each top deck door: a. Is in place; and b. Has no condensation, frost, or ice formed on the door that would restrict its opening.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.13.4	Verify, by visual inspection, each lower inlet door is not impaired by ice, frost, or debris.	In accordance with the Surveillance Frequency Control Program
SR 3.6.13.5	Verify torque required to cause each lower inlet door to begin to open is $\leq$ 675 in-lb, and verify free movement of the door.	In accordance with the Surveillance Frequency Control Program
SR 3.6.13.6	(deleted)	
SR 3.6.13.7	Verify for each intermediate deck door: a. No visual evidence of structural deterioration; b. Free movement of the vent assemblies; and c. Free movement of the door.	In accordance with the Surveillance Frequency Control Program

McGuire Nuclear Station Ice Condenser Door LAR

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Agenda

- Take a Minute

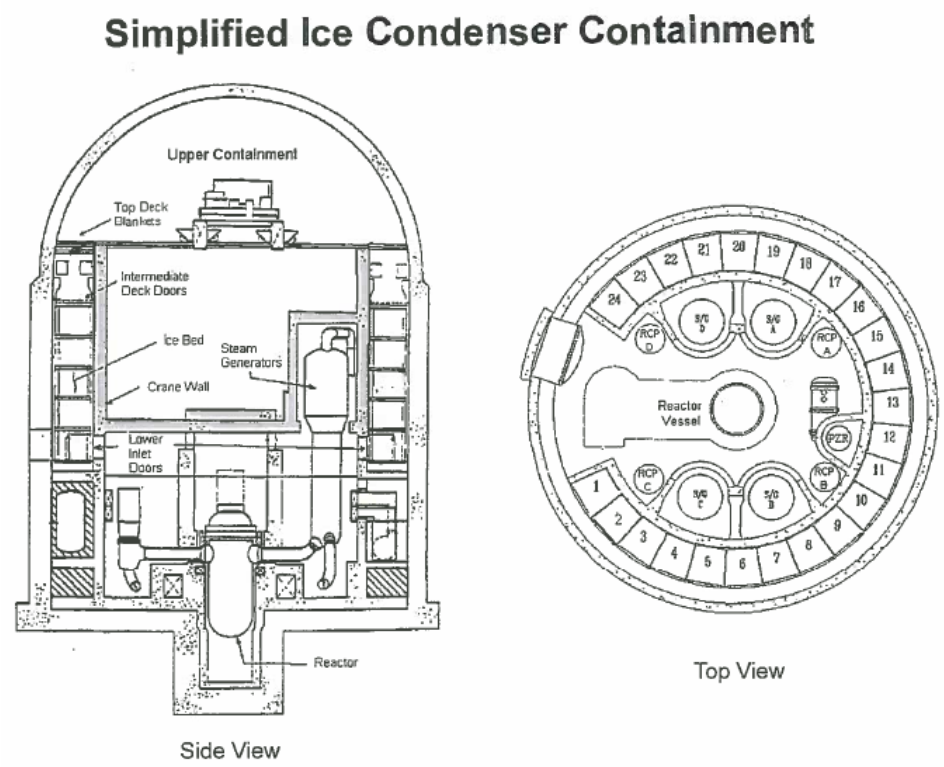
- Overview of LAR Proposal
- Ice Condenser System and Lower Inlet Doors
- Current TS 3.6.13 - Ice Condenser Doors
- Issue Summary
- Proposed TS 3.6.13 Revision
- Deterministic Justification
- Preliminary Information
- Questions?

Overview of LAR Proposal

- The proposed license amendment request (LAR) would revise the McGuire TS 3.6.13, “Ice Condenser Doors,” to add a new Condition, applicable when one or more lower inlet doors has an *invalid* open alarm as indicated by the Inlet Door Position Monitoring System.
- The change proposes an alternate method of verifying the lower inlet door(s) are closed by verifying ice bed temperatures, monitoring temperature trends, and remotely inspecting the door with a video camera system.
- This License Amendment is needed to preclude an unnecessary plant shutdown caused by an invalid "ICE COND LOWER INLET DOORS OPEN" alarm.
- This proposed LAR would be applicable for both MNS Unit 1 and Unit 2.
- This proposed LAR uses a deterministic engineering justification.

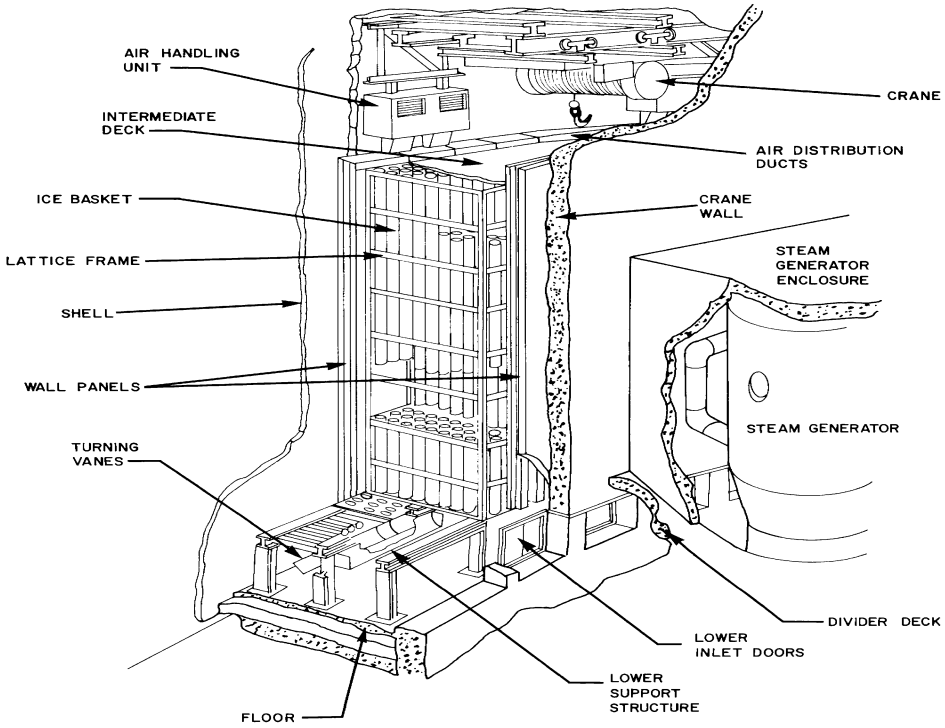
Ice Condenser System and Lower Inlet Doors

- The ice condenser is an annular compartment enclosing approximately 300 degrees of the perimeter of the upper containment compartment.
- The Ice Condenser doors consist of the lower inlet doors (LIDs), the intermediate deck doors, and the top deck doors.
- The functions of the doors are to:
  - Seal the ice condenser from air leakage and provide thermal/humidity barriers during the lifetime of the unit; and
  - Open in the event of a Design Basis Accident (DBA) to direct the hot steam-air mixture from the DBA into the ice bed.
- The doors (closed) ensure the ice stored in the ice bed is preserved during normal operation and that the ice condenser functions as designed if called upon to act as a passive heat sink following a DBA.



Ice Condenser System and Lower Inlet Doors

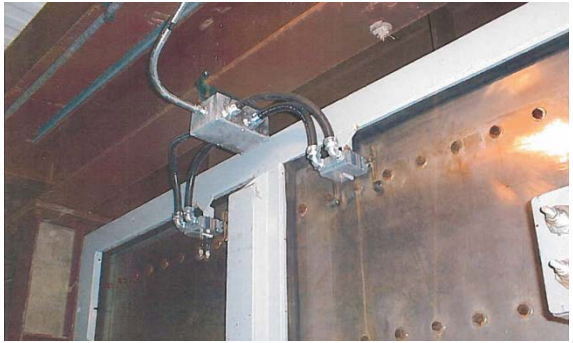
- The LIDs form the insulated barrier between the ice condenser and the lower containment.
- There are 48 LIDs arranged in pairs of two (one Bay).
- The LIDs are provided with tension spring mechanisms. The zero load position of the spring mechanisms is set such that, with zero differential pressure across the door panels, the gasket holds the door slightly open.
- The developed ice condenser cold head assists with compression of the LID gasket seals.

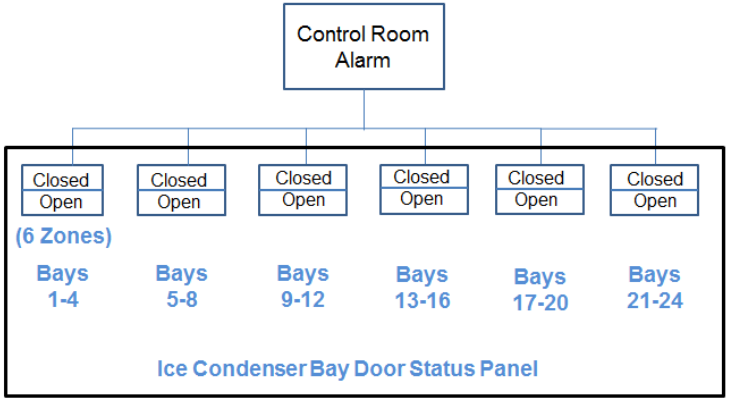


Ice Condenser System and Lower Inlet Doors

LID Position Indication:

- Limit switches are mounted on the LID frames with one limit switch per door panel, 48 door panels total per Containment.
- Doors must be effectively sealed before the switches are actuated.
- For door monitoring purposes, the ice condenser is divided into six zones.
- The affected zone status (open/closed door) is indicated on a local panel located outside of the ice condenser lower personnel access door. The panel is accessible during power operation.
- Each zone contains four lower inlet door Bays (eight doors), of which any door can feed the monitoring panel and affected zone status.
- A single annunciator window in the Control Room gives a common alarm signal when any door is open.



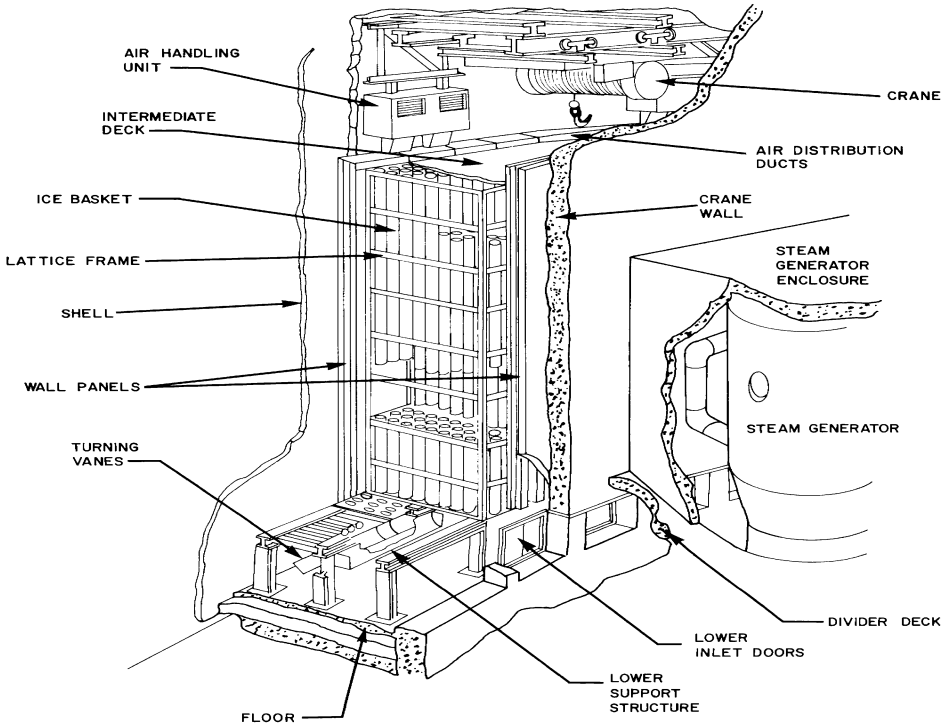


One Zone contains 4 Bays (8 doors) - 1 Bay contains 2 doors

48 Lower Ice Condenser Doors (LIDs) Total
24 Bays Total

Ice Bed Temperature Monitoring:

- 48 resistance temperature detectors are mounted on ice bed probes attached to lattice frames throughout the ice bed.
- A recorder is mounted in the Control Room, and an annunciator panel provides an alarm for a preset deviation from limits of ice bed equilibrium temperature.



Current Tech Spec 3.6.13 - Ice Condenser Doors

3.6.13 Ice Condenser Doors

LCO 3.6.13 The ice condenser lower inlet doors, intermediate deck doors, and top deck doors shall be OPERABLE and closed.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTIONS

---NOTE---

1. Separate Condition entry is allowed for each ice condenser door.
2. Entry into Condition B is not required due to personnel standing on or opening an intermediate deck or top deck door for short durations to perform required surveillances, minor maintenance such as ice removal or routine tasks such as system walkdowns.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more ice condenser lower inlet doors inoperable due to being physically restrained from opening.	A.1 Restore lower inlet door to OPERABLE status.	1 hour
B. One or more ice condenser doors inoperable for reasons other than Condition A or not closed.	B.1 Verify maximum ice bed temperature is ≤ 27°F. AND B.2 Restore ice condenser door to OPERABLE status and closed positions.	Once per 4 hours 14 days

(continued)

Current Tech Spec 3.6.13 - Ice Condenser Doors

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Required Action and associated Completion Time of Condition B not met.	C.1 Restore ice condenser door to OPERABLE status and closed position.	48 hours
D. Required Action and associated Completion Time of Condition A or C not met.	D.1 Be in MODE 3. AND D.2 Be in MODE 5.	6 hours 36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.6.13.1 Verify all lower inlet doors indicate closed by the Inlet Door Position Monitoring System.	In accordance with the Surveillance Frequency Control Program

Issue Summary

- On May 13, 2013, the Control Room received an annunciator alarm: "ICE COND LOWER INLET DOORS OPEN" on Unit 1.
- Upon validation at the local alarm panel in upper containment, this alarm corresponded to the LIDs located in Ice Condenser Bays 21 through 24. TS 3.6.13 Condition B - Required Actions were entered.
- With the use of a light and video camera lowered down into the ice bays (lowered from upper containment), it was verified that the LIDs in bays 21 through 24 were in fact closed. No air movement was detected and no melting of ice or frosting on the LIDs was noted (these would be indications that an LID was slightly cracked open).
- Concluded that at least one LID limit switch was slightly out of adjustment, and investigation effort isolated the open limit switch contact to the one on LID 21R.
- The limit switches cannot be adjusted during power operation due to personnel dose concerns.

Issue Summary

- During the last refueling outage (spring 2013), an LID seal (the seal around the periphery of the door portal frame) was replaced in Bay 21.
- The seal corresponding to LID 21R placed the limit switch of the Inlet Door Position Monitoring System in a slightly different position due to the new seal thickness.
- The limit switch was not adjusted following the seal replacement, which likely increased its sensitivity to movement of the door.
- While the required channel check on the Inlet Door Position Monitoring System prior to Mode change was successful, operation at full thermal power in lower containment likely created conditions different enough to heighten this sensitivity.

Issue Summary

- On May 13, 2013, the Lower Containment Ventilation System fans had been shifted from low speed to high speed to cool lower containment for entry on containment valve work. The fan shift caused a slight temporary pressure variation in containment, which can decrease the differential pressure across the LIDs between lower containment and the ice condenser.
- It was following this evolution that the 21R LID limit switch indicated open on the local panel and in the Control Room.
- Several attempts were made to re-seat the suspect LID to the indication limit switch. These included cooling the ice condenser area to increase the cold head and lightly pushing on each door remotely with specialized tooling.
- On May 16, 2013, with the use of specialized tooling, enough pressure was applied to LID 21R to make the limit switch contact and clear the alarm. After waiting 12 hours (length of the SR frequency), TS 3.6.13 Condition B Required Actions were exited.
- LID 21R limit switch was readjusted to accommodate the new door seal during the subsequent Unit 1 refueling outage (fall 2014).

Issue Summary

- In light of the issue summary, Duke Energy is requesting this TS change in the event that an LID alarm is received and the alarm cannot be cleared by use of special tooling.
- Due to the combination of 48 LID panels in existence with MNS's extended plant license, the potential exists for future similar alarms. New door seals may not be as compressed as old seals. Lower containment ventilation realignments and temperature changes could activate a similar such alarm situation.
- Maintenance procedures governing the inspections and corrective actions for LIDs addressing seal replacement(s) have been modified to include a limit switch adjustment post seal replacement.

Issue Summary

- LID position (OPEN/CLOSED) is based on the contact state of the limit switches located on the 48 LIDs.
- During the Modes of Applicability, LID position is important for ice condenser Operability determination, since an open LID (gross leakage) will allow thermal energy from lower containment to enter the ice bed, challenging the ice inventory available for DBA scenarios.
- Other methods exist besides the Inlet Door Position Monitoring System to check the ice bed for unwanted thermal energy ingress, including monitoring the installed resistance temperature detectors in the ice bed. This monitoring is currently part of TS 3.6.12 (Ice Bed) (Verifies ice bed temperature at or below 27°F every 12 hrs per TS SR) and TS 3.6.13, so a parallel method to the Inlet Position Monitoring System is already in place providing defense-in-depth for potential inadvertent gross LID leakage.
- It is feasible to determine the LID position (OPEN/CLOSED) if the limit switch becomes non-functional for any reason by monitoring other parameters in the lower ice condenser plenum…

Duke Energy proposes a NEW Condition B to TS 3.6.13 as follows:

CONDITION		REQUIRED ACTION		COMPLETION TIME
B.	One or more lower inlet doors having an invalid open alarm by the Inlet Door Position Monitoring System.	B.1	Verify ice bed temperatures ≤ 27°F.	Once per 4 hours
		AND		
		B.2	Verify affected ice bed temperatures are not on an increasing trend.	Once per 12 hours
		AND		
		B.3	Verify each affected lower inlet door is closed with a remote camera system.	Once per 7 days

In the event that a visual inspection, combined with no notable ice bed temperature change, indicates one or more lower inlet doors has an invalid open alarm by the Inlet Door Position Monitoring System:

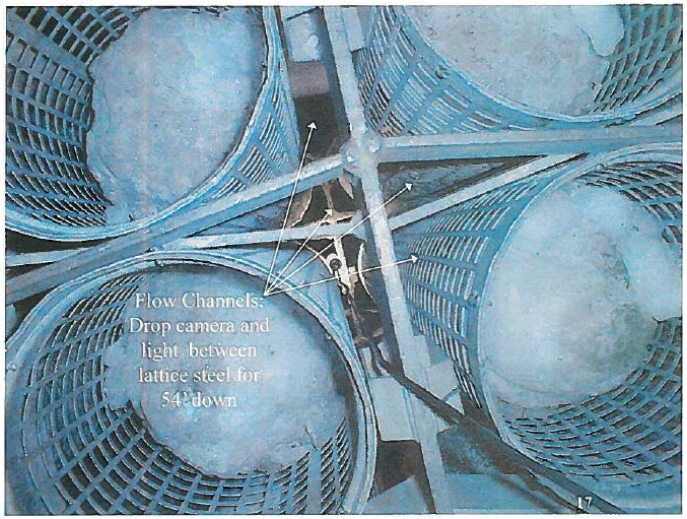
- The ice bed temperature will be monitored on a four hour basis to verify at or below 27°F.
  - The Frequency of 4 hours is based on the fact that temperature changes cannot occur rapidly in the ice bed because of the large mass of ice involved.

- The affected ice bed temperatures will be monitored for trends every 12 hours.
  - The temperatures of the ice bed for the affected zone must be monitored every 12 hours for notable trends. Temperature information is collected to spot a pattern or trend. This trend can be helpful in determining unusual changes, negative changes, and to initiate action before more significant problems occur.
  - The 12 hour trend comparison is justified based upon the ice bed temperature must be verified every 4 hours to be below or maintained at 27°F.

- The current TS 3.6.13 allowance for the 14 day Required Action if an LID is open provides further confidence in the soundness of the ice bed inventory as long as ice bed temperatures are maintained at or below 27°F by the Ice Condenser cooling system.
- As discussed in the Bases for current TS 3.6.13, ice bed temperature is required to be monitored once per four hours to ensure that the open or inoperable LID is not allowing enough air leakage to cause the maximum ice bed temperature to approach the melting point. The Frequency of 4 hours is based on the fact that temperature changes cannot occur rapidly in the ice bed because of the large mass of ice involved.
- The current TS 3.6.13 Required Action B.2 Completion Time of 14 days is based on long term ice storage tests that indicate that if the temperature is maintained below 27°F, there would not be a significant loss of ice from sublimation.

Weekly Video Camera Inspection:

- The affected lower inlet door must be inspected remotely with a video camera on a weekly basis.
- From the Ice Condenser intermediate deck area, a light and camera are lowered approximately 54 feet to each lower inlet door in the affected zone.
- The camera will be looking for frost and condensation on the door surface, vapor/mist coming from the top of the door, ice formation on the concrete floor, and air movement between lower containment and the ice bay. Air movement will be detected via a flag attached to the camera. If any significant quantity of moist air from lower containment is leaking past an LID seal, it will do so near the top of the door, and in addition create a visible vapor/mist as the movement of warm air moisture condenses in the cold air conditions present in the lower ice condenser plenum area.



- Video Camera System Overview:
  - Waterproof inspection camera suited for extreme environmental conditions.
  - Camera head is attached to a 60 foot cable and displays picture on an LCD color monitor with video recording capability.
  - Broadcasts sharp, high resolution images.
  - Camera control box gives the user manual capability to adjust zoom, focus, pan, tilt, shutter, and exposure settings.
  - Camera also uses adjustable spot and flood lights to allow the ability to light up a narrow target or a wide area.
  - Pan 180 degrees and tilt 110 degrees.
  - 40x zoom ratio (10x optical, 4x digital).

- The weekly inspection by video camera is justified based on the high confidence that the ice bed temperature is verified at or below 27°F every four hours, temperatures in the affected zone are monitored every 12 hours for an increasing trend, and the remaining LIDs are verified closed every 12 hours per the TS SR.

Deterministic Justification

- In addition, the open/closed status of the remaining (unaffected) LIDs will be performed using the local alarm panel in upper containment on a 12 hour frequency per TS SR 3.6.13.1 in accordance with the Surveillance Frequency Control Program.
- The existence of gross ingress of air from lower containment through an open LID will remove the remaining cold head in the ice condenser lower plenum, causing the opening of the other LIDs.
- Once this occurs, the local alarm panel outside the ice condenser lower plenum will show many bay groups illuminated. This result is unavoidable if the cold head is lost, and was the basis for the ice condenser system design in order to protect against preferential melting of ice bed inventory in a localized area.
- If the local alarm panel is not showing other zones of lower inlet doors off their seals, it is highly unlikely that a lower inlet door is open to the point of allowing gross leakage, and only small volume leakage past the door seal or a limit switch issue is indicated.

- The information discussed in this presentation is preliminary in nature and has not yet been fully validated or vetted through the Duke Energy License Amendment Request review process which includes review and approval by the McGuire site Plant Operating and Review Committee (PORC).

- Questions?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