



# Potential Issues with Spent Fuel Vacuum Drying Process

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## Vacuum Drying Process Event

- On August 28-29, 2010, while performing spent fuel vacuum drying at the Byron Station, the licensee suspended operations for the night and installed a chiller to remove heat
- During the night, the chiller tripped and the operations crew discovered the event the following morning



## Vacuum Drying Process Event

- While no issues occurred with the Vacuum Drying System, this event raised questions and concerns to the potential vulnerabilities that might exist within the Vacuum Drying Process
- On May 2, 2011 the staff issued Information Notice 2011-10 discussing its concerns with the Vacuum Drying System/Process relative to the Byron Event



# Vacuum Drying Systems Discussion

- Vacuum drying systems used at some Nuclear Power Plants (NPP) are usually very simplistic
- When performing drying operations, the canister is connected to the vacuum pump through a hose that could rupture allowing air ingress to the cavity
- This may be the case for an unmonitored system as in the loss of cooling event case



## Vacuum Drying Systems Discussion

- Assuming a vacuum drying system failure were to occur and air ingress into the canister, oxidation could occur rapidly and cause significant swelling of fuel pellets and fragments
- This failure could result in gross fuel cladding breaches and release of fission products to the surrounding cask environment, if the time-at-elevated temperature after water removal is excessive



# Vacuum Drying Systems Discussion

- Large cladding breaches could result in loss of retrievability and a configuration not analyzed for thermal, confinement, shielding, and criticality
- Further, the release of fuel fines or grain-sized powder into the inner cask environment from ruptured fuel may be a condition outside the licensing basis for the cask system



## Vacuum Drying System Discussion

- Therefore the staff is seeking to better understand if there are vulnerabilities of vacuum drying systems to failure modes that would allow air ingress into the canister (and if so what actions have been taken or proposed to date)
- The staff is also seeking to address whether vacuum drying systems are correctly categorized with regards to their significance to safety

## Conclusions

- The staff is gathering information and exploring whether additional regulatory actions are necessary
- The staff is interested in seeking input from the industry on this matter