The Horizontal Band Saw Incident at the B&W NOG-L Facility
Horizontal Band Saw
Timeline Leading to the Event

• In storage in a SeaLand container
• SER 03-087 requests use of saw in a new sectioning facility.
• NCS requirement:
  • Favorable geometry coolant system
  • 350 g $^{235}$U limit
  • Built-in sump must be disabled
• Diverter tray designed in March 2004
  • No formal review of the tray design
Favorable Geometry System
Diverter Tray
Diverter Tray Installed
Time Line Leading to the Event

• Equipment released on May 12, 2004.
• Release stated: NCS verified that the machine was connected to the new coolant system.
  ‣ No check was made to verify that the old sump was unusable.
  ‣ The sump inlets and outlets were plugged but the sump was never sealed off.
• Operators were not aware there was a sump in the saw.
July 15, 2009

- Operators noticed an oily substance leaking from a screw hole on the side of the saw.
- Used a screw to plug the leak.
- Notified the area manager.
- Work was stopped and NCS was notified.
July 15, 2009

• The operator removed the diverter tray.
  ‣ Original sump was full of cutting fluid
  ‣ Leaking screw hole was near the top of the sump
• The area was secured and cordoned off.
• Safety basis was reviewed and determined that no controls were in place to ensure safe operation.
July 15, 2009

• ESH&S manager, NCS manager and an NCS engineered returned for a further look at the saw.
• Estimated volume was 53 liters and there was an unknown amount of uranium.
• The EOC was activated.
• An Alert was declared.
• NRC Operations Center was notified.
• NCS Engineer was on the bridge line with the NRC.
July 15, 2009

• Assessment of the configuration:
  ‣ Cutting fluid does not chemically react with the uranium
  ‣ No agitation or flow in the system
  ‣ A layer of uranium-bearing sludge could be on the bottom
  ‣ Estimated critical mass was 1300 g $^{235}$U

• No immediate action was required since the system was static.
July 15, 2009

• Handheld NDA measurements did not indicate a layer of uranium material in the sump.
• COLIWASA sampling did not find a sludge layer in the sump.
• Highest well count results from COLIWASA samples was 0.18 g $^{235}$U/liter
• The EOC stood down but the area remained cordoned off.
Recovery

• Cutting fluid was drained into 2.5 liter bottles and counted.
• Only a small amount of saw fines were found.
• Total estimated $^{235}\text{U}$ was 13.76 g.
Conclusions from Investigation

• Diverter tray design not evaluated.
  ‣ Tray did not completely divert liquid flow.
  ‣ Tray could vibrate out of position during operation.

• NCS Requirement not adequately verified.
  ‣ Disabling of the sump not adequately verified.
Corrective Actions

• Equipment Modification
  ‣ Equipment re-evaluated and modified under current change management procedures.
  ‣ Sump was removed.

• NCS release
  ‣ Enhances instructions on verification of requirements.
  ‣ Implemented requirement that two NCS engineers perform verifications.

• Performed extent-of-cause and condition reviews.
Presentation to the NRC

• Calculated minimum critical mass: 1430 g $^{235}$U.
• The system is cleaned out after a calculated loss of 350 g $^{235}$U.
• Total losses (May 2006 to July 2009), 981 g $^{235}$U
• Criticality would require:
  ‣ Four occurrences of the diverter tray not fully installed and
  ‣ All the cutting fluid bypassing the diverter tray and entering the sump when the calculated loss was at 350 g $^{235}$U.
• Conclusion: Criticality could not have happened.