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Evaluation of Risk Significance Associated with Apparent Violations

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Background

- In 2014, NFS had two events that were initially classified as Apparent Violations of a Severity Level II significance based on the examples & guidance contained in the NRC's Enforcement Manual and Enforcement Policy
- Even before the NRC initiated their inspection of the issues, NFS began evaluating their significance using internal assessment tools and NRC IMC 2606, *Assessment Of The Change In Risk Resulting From a Violation at a Fuel Cycle Facility*
- NFS staff worked with the NRC inspectors to explain the methodology used along with the input and assumptions applied to the risk determinations performed on both events.

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EVENT #1

SRE Valves Rendered Inoperable

- An operator was observed improperly operating two spring-return valves that were designated as IROFS
- With the valves rendered inoperable, they were not able to perform their intended safety function
- Initial assessment indicated that the likelihood of a chemical accident sequence increased and that a potential failure to meet 10CFR70.61 Performance Requirements had existed
- Immediate actions taken by NFS terminated the event and several actions were taken prior to restarting the process line involved in the event

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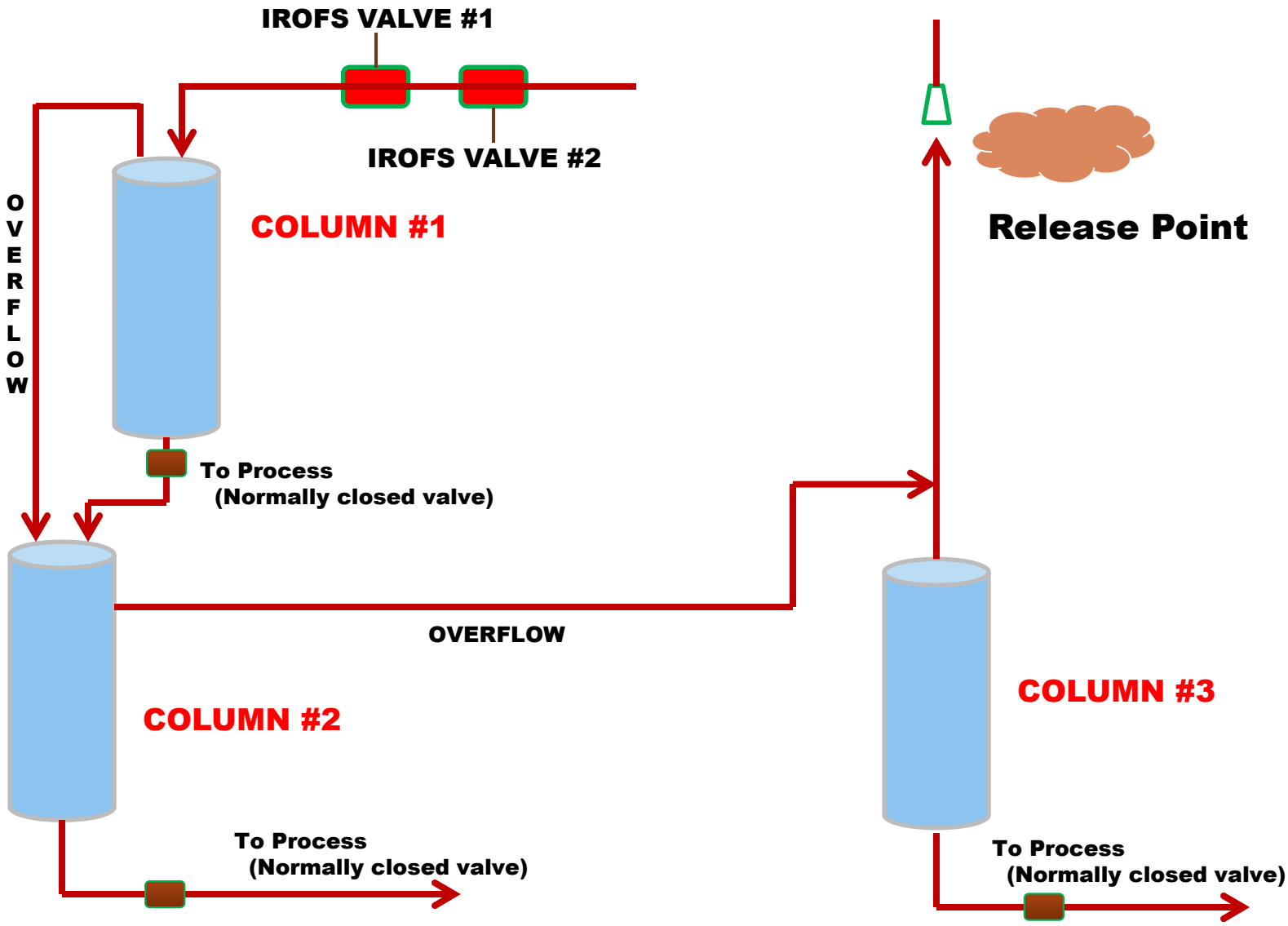
Flow Path of Concern



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Quantitative Risk Assessment

- NFS initially performed a Quantitative Risk Assessment using known distances to egress points, flow rates at specific points in the system and Consequence Event Thresholds to determine the chemical exposure risk of the event to workers
- Based on established Consequence Event Thresholds, the following time periods were calculated:
  - Time to reach an Intermediate Consequence: ~90 min.
  - Time to reach a High Consequence: ~10 hrs.
- NFS began conducting a risk assessment of the event using the guidance in IMC 2606

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IMC 2606 Assessment

(06.01) - Applicable Accident Sequence(s)

- Chemical Exposure (predominant sequence – determined to become **Not Unlikely** with loss of IROFS without mitigation or further analysis)

(06.04) – Duration of Event

- Time violation existed: <1 minute

(06.05) – Uncredited Controls

- Solution is readily detectable based on odor which provides Margin for Detection prior to reaching threshold
- Building was occupied at the time of the event allowing for ready detection of solution leak early in a release
- Routine Security patrols passing through the area would have noted a puddle of solution or the solution smell
- Supervisor makes frequent rounds of area to ensure operations are being performed correctly

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IMC 2606 Assessment Results

- Through the application of the approved ISA methodology, the event was shown to be Highly Unlikely by NFS
- NFS's IMC 2606 Assessment was provided to the NRC for review and served as one input to the NRC's assessment of the event
- Inspectors independently confirmed that the event remained Highly Unlikely and that the input used by NFS in assessing the event was justified and verifiable
- Event was dispositioned as a Severity Level IV violation with no civil penalties assessed

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EVENT #2

Unanalyzed Condition Identified in Processing Area

- A previously unrecognized, unanalyzed potential flow path for process solution was identified during troubleshooting / maintenance activities
- A stainless steel thermowell had allowed a small quantity of uranium-bearing process solution to leak into an electrical junction box
- The process solution had adversely affected the control circuit inside the thermowell which is what triggered the troubleshooting activities.
- No process solution was found downstream of the thermowell

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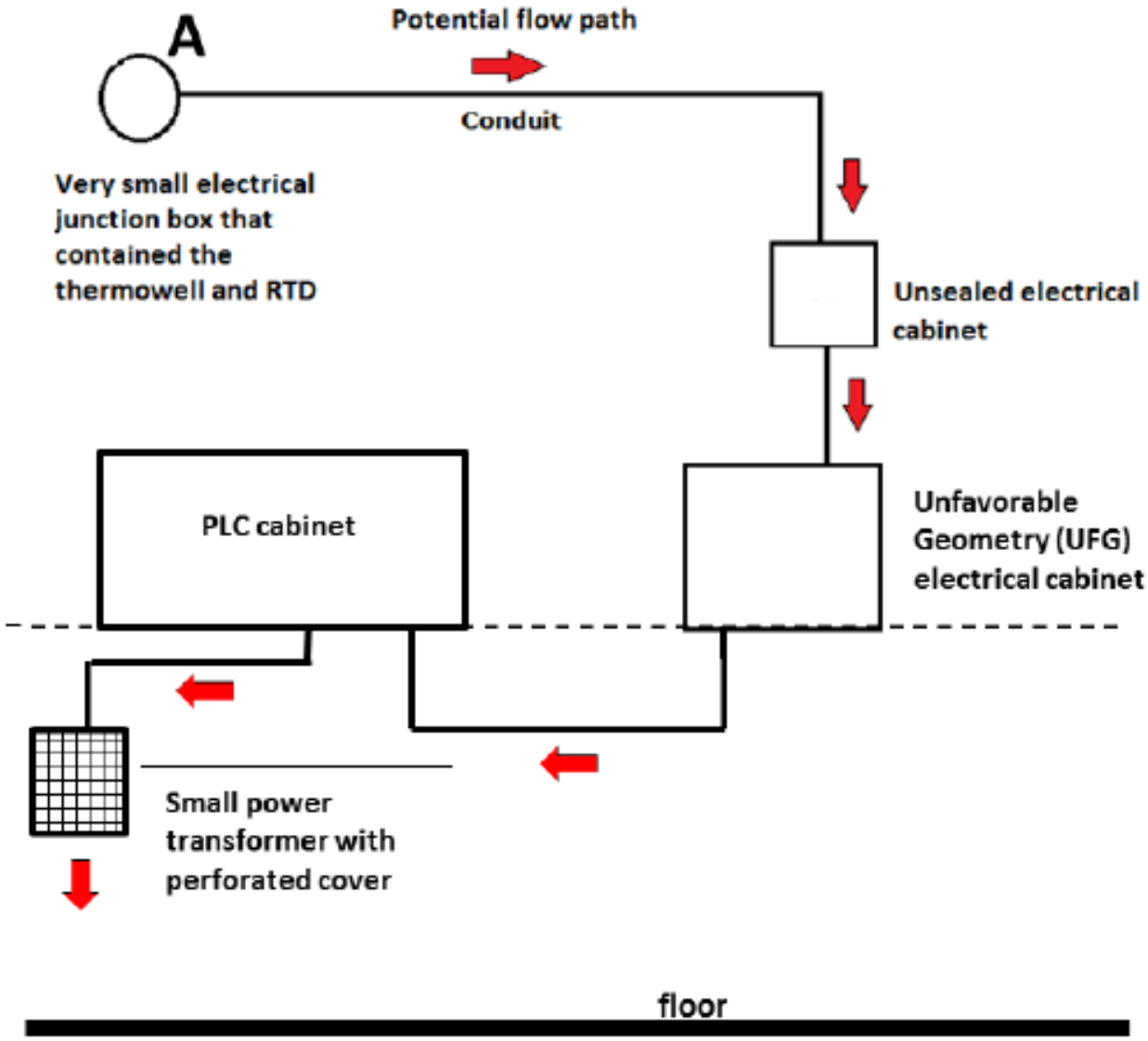
Flow Path of Concern



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IMC 2606 Assessment

(06.01) - Applicable Accident Sequence(s)

- Nuclear Criticality - (unanalyzed condition) - potential inadvertent transfer of fissile material from favorable to unfavorable geometry through electrical conduit

(06.02) – Consequence

- For a High Consequence event, unanalyzed condition could not immediately demonstrate that the event remained Highly Unlikely

(06.04) – Controls

- Since this accident sequence was previously unanalyzed, no specific controls were documented to satisfy the requirement for High Consequence events to be Highly Unlikely

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IMC 2606 Assessment cont.

(06.05) – Uncredited Controls

- Approved NCSE's had evaluated small leaks and determined that they were not a concern to Criticality Safety
- Heater control circuit that used the RTD in the thermowell was an IROFS which was credited in an Accident Sequence
- RTD / Thermowell interface limited the amount of process solution that could migrate into the electrical junction box
- Impact of the process solution on electrical components would be readily evident; i.e., resulted in troubleshooting activities
- Relatively large amount of material would have had to migrate through the electrical system over an extended period of time for an event to occur – this loss of material would have been detected and actions taken to identify the discrepancy / correct the condition before sufficient quantity had leaked from the process stream

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IMC 2606 Assessment Results

- Through the application of the approved ISA and NCSE methodology documents, the event was shown to be Highly Unlikely by NFS
- NFS's IMC 2606 Assessment was provided to the NRC for review and as one input to the NRC's independent assessment of the event
- Some assumptions and assigned values in the NFS document were challenged by the NRC
- While the NRC's assessment contained some differences, the final outcome was that the event remained Highly Unlikely
- Event was dispositioned as a Severity Level IV violation with no civil penalties assessed

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Key Take-Aways

- Reviewing IMC 2606 **before** an event occurs is essential to ensure the process is understood and can be documented using the appropriate NRC-approved assumptions and bases
- When informed that an issue is being considered for potential "Escalated Enforcement", determine if IMC 2606 can be applied to assess the risk resulting from the event or issue and initiate the process internally as soon as possible
- Communication between the licensee and the NRC needs to be started early and continue as both sides work through the risk significance determination to avoid last minute surprises

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