

Principles of Nuclear Safety

Module 15

IMPAIRMENTS *of* **Safety Systems**

Slide 1

Definition

An impairment of a Safety Related System is a failure such that the system would operate with reduced redundancy or margin of safety, or would fail to meet its design intent.

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Concerns re SSS impairment

- How serious is it--loss of redundancy (level 3) or badly impaired capability (level 1)?
- How can the overall risk be minimized?
 - guidance in the operating instructions?
- How long will repairs take?
- Can unit continue to operate, given the estimated repair time versus the grace period prescribed in operating instructions?

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Level 3 SSS Impairment

- Reduced redundancy or safety margin, but system still meets design intent, even for worst case process failure
 - eg, single channel failure in 2/3 trip logic
- Slightly increased risk to public safety, since a level 2 or 1 impairment is more likely for the duration of a level 3 impairment (fewer incremental failures required)
- No increase in radioactive, environmental releases, even for worst case process failure

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Level 2 SSS Impairment

- System can still operate, but with reduced effectiveness for worst case process failure
 - eg, some SAs fail to drop fast enough
 - eg, some, but not full design ECI flow
- Moderately increased public risk--some increase in release for worst case failure
- Adequate protection for less severe incidents

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Level 1 SSS Impairment

- inadequate protection against worst case process failure:
 - eg, half SAs fail to drop on request
 - eg, no ECI flow
 - eg, airlock seals deflated on both doors
 - eg, 2 of 3 SDS channels unavailable
- much increased public risk--potentially large releases for worst case process failure

Slide 6

Generic Response to SSS Impairments

- Reduce likelihood of process upsets
 - suspend fuelling, testing, maintenance and discretionary power maneuvers
- Initiate repairs
- Make notifications (Manager, AECB,...)
- If repairs take longer than the prescribed grace period, proceed to state in which the impaired SSS is not required (typically the GSS)

No action results in elevated nuclear safety risk, and an OP&P violation
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