

# *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.**

Slide 2

## *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?

Slide 3

## *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

Slide 4

## *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

Slide 5

## *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**