



# Crediting Operator Actions: Recent NRC Guidance Initiatives

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# Recent NRC Initiatives

- Established guidance for crediting operator actions in diversity and defense-in-depth analyses
- Reviewed NRC's Consistency in Treatment of *"Manual Actions"* Across Regulatory Applications



# Crediting Operator Actions in D3 Analyses



- Diversity and Defense-in-Depth (D3) analyses of digital plant protection systems may identify vulnerabilities to common cause failure a safety function
- A diverse automatic back-up system or manual operator action are both options for addressing identified vulnerabilities
- NRC developed guidance for crediting manual operator actions in D3 analyses

# Crediting Operator Actions in D3 Analyses



## Challenges:

- Limited HSI design detail
- Potential for relatively short times for operator actions
- Reasonable assurance that credited actions are both feasible and reliable



# Crediting Operator Actions in D3 Analyses

## Current Guidance:

- Interim Staff Guidance on Highly Integrated Control Rooms – Human Factors Issues, Rev. 1

## Key Features:

- Applicable to certain beyond design-basis events
- Can be used to credit actions required in less than 30 minutes
- Provides guidance from initial time estimates through final validation and long-term maintenance

# Crediting Operator Actions in D3 Analyses



## Current Guidance - Overview:

- Phase 1: Analysis
  - Estimating time available and time required
- Phase 2: Preliminary Validation
- Phase 3: Integrated System Validation
- Phase 4: Maintaining Long-term Integrity of Credited Actions



# Crediting Operator Actions in D3 Analyses



Current Guidance – Relationship to other guidelines:

- ANS 58.8, Time Response Design Criteria for Safety-Related Operator Actions - 1994
- NUREG-0711, Rev 2. Human Factors Engineering Program Review Model



# Crediting Operator Actions in D3 Analyses



Future Guidance:

- Appendix A to Chapter 18 of NRC's Standard Review Plan for LWRs (NUREG-0800)





# Recent NRC Initiatives

- Interim Staff Guidance on Highly Integrated Control Rooms – Human Factors Issues, Revision 1
- Consistency in NRC’s Treatment of “*Manual Actions*” Across Regulatory Applications



# Consistency Across Regulatory Applications



- Review initiated by senior managers as a continuous improvement initiative
- Conducted by an inter-office working group comprised of representatives from
  - Office of Nuclear Regulatory Research
  - Office of New Reactors
  - Office of Nuclear Security and Incident Response
  - Office of Nuclear Material Safety and Safeguards



# Consistency Across Regulatory Applications



## Scope:

- Licensing, oversight/inspection, & enforcement
- Use by
  - Office of Nuclear Reactor Regulation
  - Office of New Reactors
  - Office of Nuclear Security and Incident Response
  - Office of Nuclear Material Safety and Safeguards
  - Office of Nuclear Regulatory Research



# Consistency Across Regulatory Applications



## Major Activities:

- Identify the regulatory processes in which manual actions are credited
- Identify the methods and criteria NRC uses to determine the acceptability of manual actions
- Identify the need for consistency or bases for differences between regulatory applications
- Identify the current initiative/practices that ensure consistency

# Consistency Across Regulatory Applications



Examples of specific applications:

- Accident and Transient Analyses
- D3 Analyses
- Probabilistic Risk Assessments
- Fire Protection Programs
- Power Upgrades
- Control Room Modifications
- Target Set Identification and Analyses

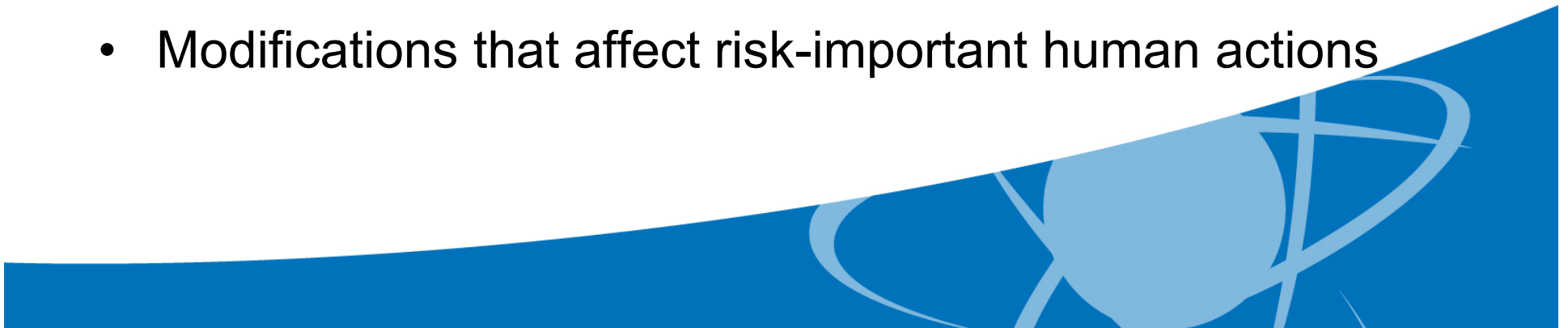


# Consistency Across Regulatory Applications



Examples of specific applications (continued):

- Items Relied Upon for Safety in Integrated Safety Assessments
- Accident Sequence Precursor Analyses
- Alternate Source Term Analyses
- Significance Determination Process
- Enforcement Discretion
- Modifications that affect risk-important human actions



# Consistency Across Regulatory Applications



## Approach:

- Reviewed Available Guidance, including
  - Standard Review Plans
  - Regulatory Guides
  - NUREGs
  - Inspection Manuals/Procedures
  - Consensus standards
- Interviewed technical review staff (as needed)



# Consistency Across Regulatory Applications

Guidance Documents	Common Factors					Specific Factors																
	Time Sufficiency	Training / Qualifications	Procedures	Environmental Conditions	Required Information/Indications	Personnel / Equipment Required	Duration of time that manual action is to be credited	Design / Human-Machine Interface	Design nuances that may complicate manual action	Differences between automatic and manual mode	Range of plant conditions	Risk significance of action	Recognition of Action Initiators	Communication s	Teamwork	NRC precedent decision	Access / Ingress / egress	Ability and time to recover from errors	Adversary Interference	Change in Automation?	Change in Tasks?	Change in Performance Context?
IN 97-78	1	x	x	x	x	x						x					x	x				
IM Part 9900, Operability	2	x	x	x	x	3	x	4	x	x							x			x		
ANSI/ANS 58.8	x	5	5	x	5	5		5				8	x	x			x	7	6			
NUREG-1764, (Screening)	x	9	9	9	25	x		9			x	x	25	9	9	9	25			x	x	x
NUREG-0800, Chapter 18 / NUREG-1764, Level 1 Review	FRA TA V&V	x	x	TA	TA	x		HSI	V&V		TA			TA V&V	V&V	x						
NUREG-1852	x	x	x	x	x	13					14			x	15		x	14				
NUREG-1792 <sup>(24)</sup>	x	x	x	x	x	x		x			x	x	x	x	x		x	x	x			
NUREG/CR-6883	x	x	x	30	32			x	31					33								
IP 71111.21	x	x	10	x	x	x						x					x	x				
DI&C ISG-05	x	x	x	11	x	x		12	12		x		12	12	12	x	11	x				
NUREG-1520	16	x	x	x	23	23	x	18	21	x		x	x	x	17	20	x	x	19	xv	x	x
NUREG-1513	x	x	x	x	x	x	x	x	x	x		x	x		17	x		x		x	x	x
Regulatory Guide 5.81	26	x	x	x	27, 29	x							27, 29	27, 29			28		x			
NEI 06-12	x		x	x	x	x	x				x			x			x		x			



# Consistency Across Regulatory Applications



## Common Factors

- Time Sufficiency
- Training/Qualifications
- Procedures
- Environmental Conditions
- Required Information/Indications

## Specific Factors (examples)

- Duration of credit
- Differences between automatic & manual mode
- Design nuances that may complicate action
- Teamwork, Communication
- Ability and Time to Recover from Errors



# Consistency Across Regulatory Applications



Differences among applications due to:

- Goals and objectives of guideline
- Scope of manual actions addressed
- Level of detail
- Review Method
- Review Resources



# Consistency Across Regulatory Applications



## General Conclusions

- Agency guidance generally supports consistent review of manual actions
- Differences are justified by application-specific considerations
- Methods for enhancing consistency of reviews might include:
  - Inform reviewers about related guidance
  - Improve guidance documents
  - Staff knowledge transfer



# Current & Future Initiatives

- Establish a centralized electronic repository of review guidelines and precedent safety evaluations
- Publish working group's assessment as a NUREG-KM
- Complete Appendix A to SRP Chapter 18
- Support revision of ANS 58.8



# Thank You!

