

Westinghouse Non Proprietary Class 3

NRC/WOG Meeting

**WOG Risk-Informed ATWS Model
Configuration Management Program**

March 16, 2004

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NRC/WOG Meeting
ATWS Configuration Management Program
Agenda

- Introductions
- Objectives of the Meeting
- Background Information
- ATWS Configuration Management Program (CMP) Discussion
 - General Approach
 - Applicability
 - Overall CMP Structure and Administrative Control
 - Compensatory Actions
 - Time Allowed in an Unfavorable Configuration
- WCAP-15831-P RAIs
- Summary and Actions

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NRC/WOG Meeting
ATWS Configuration Management Program
Objectives of the Meeting

- To present and discuss the WOG proposed ATWS Configuration Management Program.
- To discuss the NRC's RAIs on WCAP-15831-P "WOG Risk-Informed ATWS Assessment and Licensing Implementation Process".

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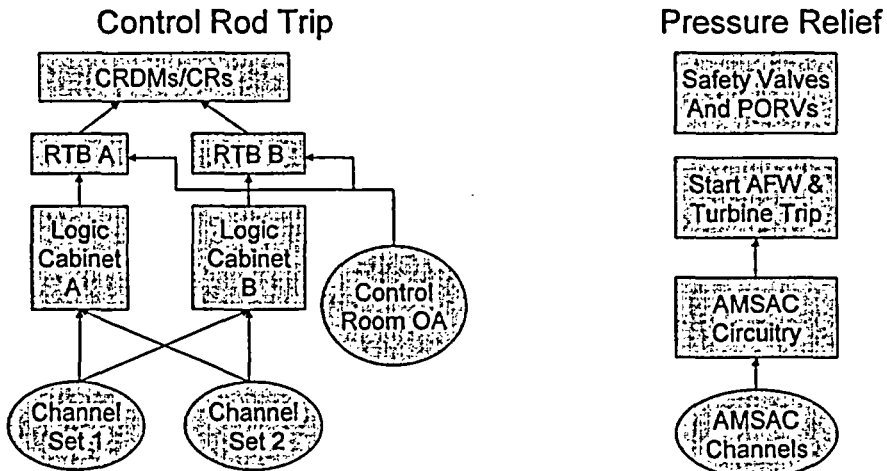
NRC/WOG Meeting
ATWS Configuration Management Program
Background Information

- NRC issued an extensive set of RAIs on the WCAP in July 2003
- NRC & WOG met on December 11, 2003 to discuss the WOG's concerns with the NRC's review of the WCAP
 - The Staff is interested in working with the WOG to develop a CMP to maintain defense-in-depth for ATWS events
 - The Staff agreed to issue a less onerous set of RAIs, if the WOG agreed to remove the risk-based approach to configuration management
- The WOG issued a letter on December 30, 2003 retracting the risk-based approach proposed in the WCAP
- The WOG has developed an approach to the ATWS CMP

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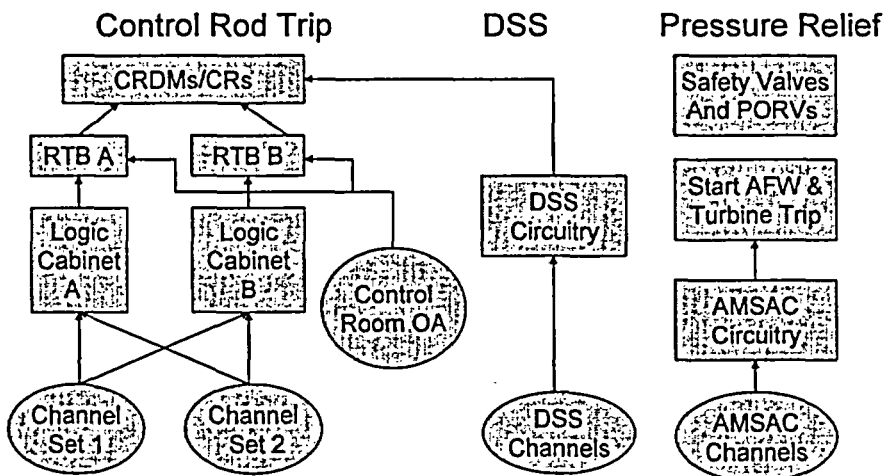
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ATWS Configuration Management Program
Background Information: Defense-in-Depth



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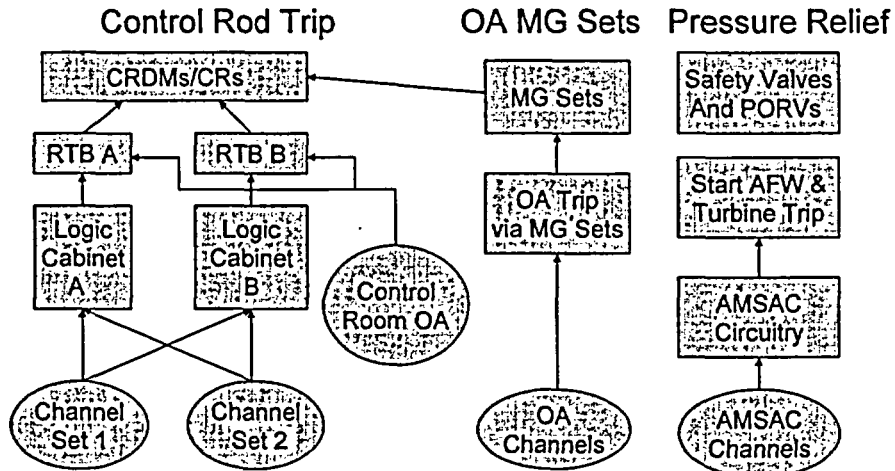
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ATWS Configuration Management Program
Background Information: Defense-in-Depth



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Background Information: Defense-in-Depth



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ATWS CMP: General Approach

- Based on unfavorable exposure times (UETs)
- Control plant equipment availability such that the plant is operating in a configuration that can mitigate the ATWS pressure transient (favorable configuration)
 - Equipment of interest: control rod drive system, AMSAC, auxiliary feedwater, turbine trip, and pressurizer safety valves and PORVs
 - Dependent on the time in the cycle

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ATWS CMP: General Approach (Cont'd)

- Plant operation in an unfavorable configuration can occur, but for limited periods of time
- Identify compensatory actions that can be taken to return to a favorable configuration or to reduce the probability of an ATWS event
- Table 1 provides sample UETs for a high reactivity core
 - High reactivity core represents aggressive, but realistic use of PMTC Tech Spec
 - HZP MTC is +5 pcm/°F
- Table 2 provides acceptable plant configurations (partial list) based on the UETs in Table 1

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Table 1: UETs, High Reactivity Core, Equilibrium Xenon

Case	Rod Insertion	PORVs Available	Auxiliary Feedwater	UET (days)
1	No	2	100%	0 – 110
2	No	2	50%	0 – 134
3	No	1	100%	0 – 170
4	No	1	50%	0 – 192
5	No	0	100%	0 – 238
6	No	0	50%	0 – 259
7	Yes	2	100%	None
8	Yes	2	50%	14 – 65
9	Yes	1	100%	0 – 115
10	Yes	1	50%	0 – 136
11	Yes	0	100%	0 – 164
12	Yes	0	50%	0 – 187

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Table 2: CMP Approach, High Reactivity Core

Time In Cycle (days)	Rod Control System: Automatic	Rod Control System: Manual	AFW Maintenance Acceptable	Number of PORVs Required
0 - 14	X		Yes	2
14 - 65	X		No	2
65 - 110	X		Yes	2
110 - 115	X		Yes	2
		X	No	2
115 - 134	X		Yes	2
	X		No	1
		X	No	2
134 - 136	X		Yes	2
	X		No	1
		X	Yes	2

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ATWS CMP: Applicability

- Divide plants into three groups (based on future core design plans) - base on availability of diverse scram system (DSS) and consistent with the ATWS Rule and basis
- Group 1: Plants with a DSS – the ATWS CMP is not applicable.
- Group 2: Plants consistent with the ATWS Rule (AMSAC) and basis, and no DSS, are not required to implement the ATWS CMP – 5% UET for reference conditions or MTC limits
- Group 3: Plants consistent with the ATWS Rule (AMSAC), but not the basis, and no DSS, are required to implement the ATWS CMP

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ATWS CMP: Structure and Control

- Capabilities
 - Track availability of equipment important to ATWS pressure transient mitigation
 - Identify configurations that do not maintain ATWS defense-in-depth
 - Track the time of individual entries into an unfavorable configuration
 - Track the cumulative time spent in unfavorable configurations
 - Provide information on the time remaining in the UET for plant configurations

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ATWS CMP: Structure and Control (Cont'd)

- Capabilities (Cont'd)
 - Identify the remaining time in the UET for the various plant configurations
 - Provide compensatory actions if an unfavorable condition cannot be exited prior to expiration of the time allowed in the unfavorable configuration

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ATWS CMP: Structure and Control (Cont'd)

- Structure of the ATWS CMP
 - Configuration Risk Management Program (CRMP) used by utilities to address the Maintenance Rule requirement
 - CRMP tracks equipment availability
 - Natural fit to add the ATWS CMP to the plant's CRMP
- Location of the ATWS CMP
 - CRMP typically in the TRM or plant procedures
 - Tying the ATWS CMP into the CRMP would subject the ATWS CMP to the same controls as the CRMP

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ATWS CMP: Compensatory Actions

- Several actions can be taken to address ATWS defense-in-depth – any one can satisfy compensatory action requirement
 - Implement a back-up reactor trip
 - UET re-calculation (remove conservatism)
 - Plant power reduction
 - Plant shutdown – not being considered due to:
 - Increased personnel exposure to repair a leaky PORV immediately following a shutdown
 - Unacceptable impact on plant economics
- Suspend T&M on components important to ATWS mitigation and to reactor trip

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ATWS CMP: Compensatory Actions (Cont'd)

- Implement a back-up reactor trip
 - Alternate method to remove power to the control rod drive mechanisms (CRDMs)
 - Interrupt power to the CRDM motor-generator sets
 - Operator action from the control room or dedicated operator stationed at the MG set in communication with control room
 - Provides a backup reactor trip diverse from the reactor protection system (RPS)
 - Similar to ATWS Rule DSS, but not automatic
 - May require minor plant modification, operator training, and EOP change

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ATWS CMP: Compensatory Actions (Cont'd)

- UET re-calculation
 - Re-calculation of plant and cycle specific UETs can provide shorter UETs
 - Generic (conservative) set of UETs may be in use
 - End-of-cycle burn-up assumptions may be too conservative
 - Plant specific analysis may allow operation at 100% power for a longer period of time with equipment inoperable
 - Requires standard, analytical tools to determine plant specific UETs

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ATWS CMP: Compensatory Actions (Cont'd)

- Plant power reduction
 - Reduce the plant power to a level where the plant configuration becomes favorable
 - Reduced pressure relief capability required for lower power levels
 - Operate at the reduced power level until the configuration becomes favorable at higher power levels as the time into the cycle increases
 - This could have a significant adverse impact on power production
 - May be acceptable for short periods of time
 - Requires standard, analytical tools to determine the appropriate power level
 - Least desirable action

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ATWS CMP: Compensatory Actions (Cont'd)

- T&M on components important to RT and ATWS mitigation
 - Suspend T&M activities on the RPS and ATWS mitigation components
 - RPS: reactor trip breakers, logic cabinets, analog channels
 - ATWS mitigation: AMSAC, AFW, PORVs, safety valves
 - Re-schedule activities that put the plant in a higher trip potential configuration

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ATWS CMP: Time Allowed in Unfavorable Configuration

- 30 day cumulative time limit in an unfavorable configuration is proposed
 - A 5% UET for a 500 day fuel cycle equates to 25 days
 - Industry and NRC pursuing a RI Tech Spec directed at a flexible outage time with a 30 day backstop
 - The risk associated with blocking a PORV is very low – RG 1.177 approach gives an AOT of ~4 months
- Provides sufficient time for a plant to:
 - Exit the unfavorable condition or
 - Implement compensatory actions

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WCAP-15831-P RAIs

- WCAP-15831-P provides an approach that WOG plants can use to address ATWS, it is not a bounding analysis
- Implementation of this approach is voluntary – other approaches can be followed (burnable poisons, DSS, limits on MTC)
- No plans to do conservative (design basis type) UET calculations, but will use best estimate UETs
 - Based on characteristics of the coming cycle
 - Account for variability in the previous cycle operating window

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ATWS Configuration Management Program
WCAP-15831-P RAIs

- This approach does not minimize UETs, but develops a process to maintain defense-in-depth to ATWS
- Only high level requirements of the CMP will be included in the WCAP – detailed procedures etc. will be developed on a plant specific basis

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ATWS Configuration Management Program
Summary and Actions

- Meeting wrap-up
- Final observations
- Next steps